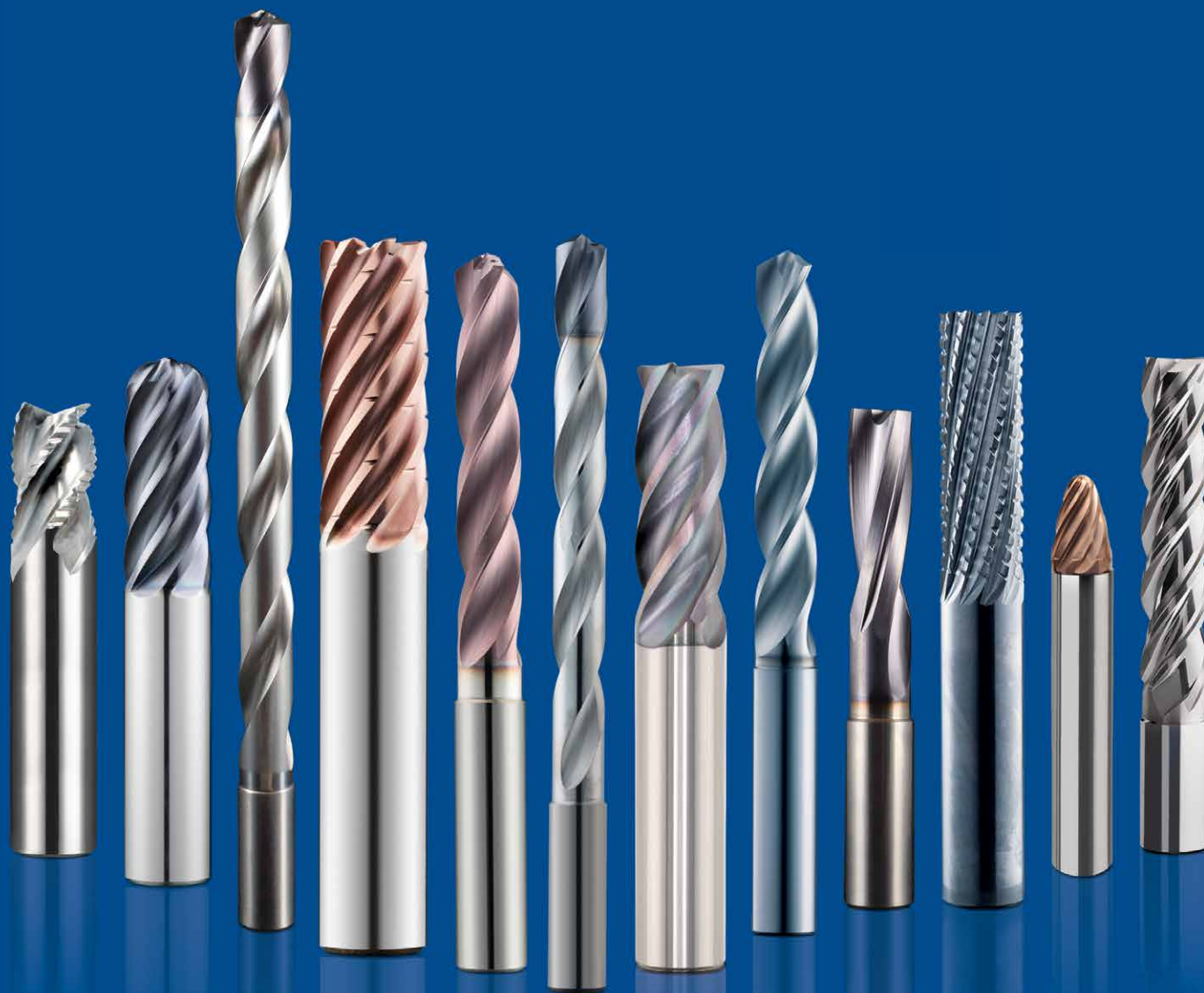


Global Product Catalog



v26.1



VALUE AT THE SPINDLE

KYOCERA SGS Precision Tools (KSPT) is an ISO 9001:2015 Certified manufacturer of industry leading round solid carbide cutting tools. State of the art manufacturing and warehouse facilities have the capacity and processes to meet the quality and delivery demands of customers in all markets around the world. Complete inspections performed within its metallurgical lab and manufacturing quality departments ensure the use of high quality carbide and reliable manufacturing consistency regardless of when a cutting tool is produced.

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

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



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Technical Centers in North America and Europe

Cutting Tool Innovation

Our mission is to deliver value at the spindle. We achieve this by engineering advanced, application-driven cutting tool geometries using the latest technologies and techniques. Every tool we design is built to push the limits of performance and move the industry forward.

- Precision measuring and tool monitoring technology
- Ongoing market research and innovation
- Unique, high-performance tool designs



Technical Training & Education

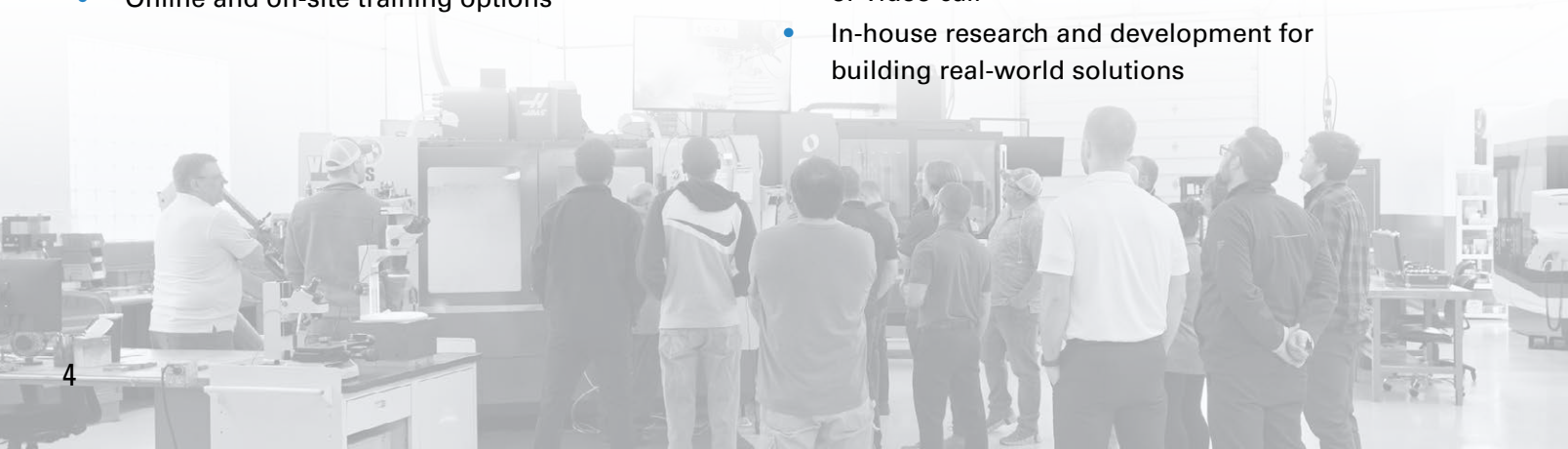
We believe in empowering machinists at every stage of their journey. Our training programs are hands-on, immersive, and tailored to real-world challenges, because great tools are only as good as the people who run them.

- Core training for both customers and KYOCERA SGS team members
- On-site tool clinics and cutting demonstrations
- Online and on-site training options

Application Support & Testing

Every job is different and so is every solution. Our engineers work directly with you to replicate real machining conditions, test potential setups, and recommend the best approach, all without interrupting your own production.

- Extensive inventory of holders, fixturing, materials, coolants, and machines
- Application troubleshooting by phone, email, or video call
- In-house research and development for building real-world solutions





Comprehensive Tooling Services

Tooling Services Facilities

KYOCERA SGS delivers expert tooling services designed to extend tool life, improve performance, and meet your specific application needs. From **Reconditioning**, **Recoating**, and **Regrinding** to **Custom Specials** and **Alterations**, our solutions are backed by the deep expertise of our KYOCERA SGS Technical Support Teams.

We proudly provide tooling services across North America and Europe, offering precision support wherever you need it.

U.S.A.

KYOCERA SGS Precision Tools

150 Marc Drive
Cuyahoga Falls, Ohio 44223 U.S.A.
(330) 686-5700
sales@kyocera-sgstool.com

KYOCERA SGS Precision Tools

West Coast Service Center

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Orange, California 92867 U.S.A.
(714) 363-3701
sgswest@kyocera-sgstool.com

Europe

KYOCERA SGS Precision Tools

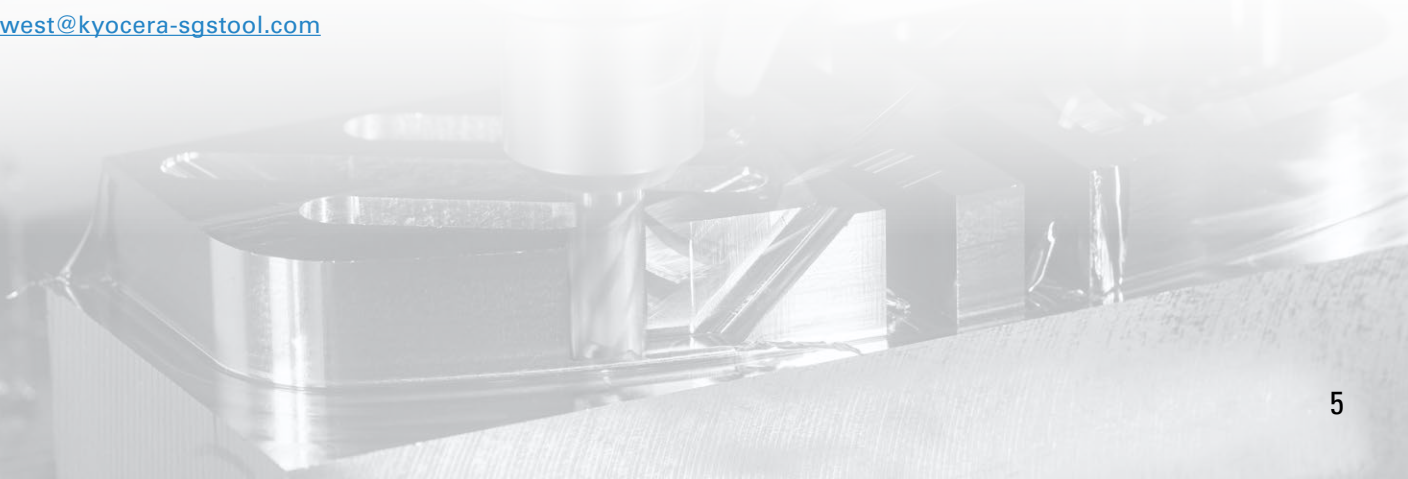
10 Ashville Way
Wokingham, Berkshire
RG41 2PL England
(44) 1189-795-200
saleseu@kyocera-sgstool.com



BEFORE



AFTER





Custom Engineered Tooling Solutions

Complex Solutions Made Easy

At the heart of our engineered custom tooling capabilities lies our dedication to providing our customers with comprehensive solutions that align seamlessly with their needs. With the ability to integrate patented, industry-leading designs into each uniquely tailored tool, we ensure a perfect fit for your specific application.

Technology-Driven Capabilities

- **Complex** custom tool designs
- **Tailor-made** machining solutions
- **Complete** project management



Start an online quote request with us today!



North
America



Europe

- Custom End Mills
- Custom Drills
- Custom Reamers
- Custom Chamfer & Rounding
- Custom Threading
- Combination Tooling
- Bulb Tooling
- Dovetail & T-Slots
- Form Tooling
- Taper Ball Nose Tools
- Micro Tooling



KYOCERA SGS Precision Tools | Europe

More than just another cutting tool supplier



www.kyocera-sgstool.co.uk

KYOCERA SGS Precision Tools Europe

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



KYOCERA SGS Precision Tools Europe offers a full range of end mill and drill products:

- Multi-Million Euro Warehouse Stocking Full Range of Catalogue Products
- Same Day Shipment on Stock Items
- Multi-Lingual Sales and Technical Support
- Online Portal for Stock Availability
- High Performance Product and Application Training, Including KYOCERA SGSTool Clinics

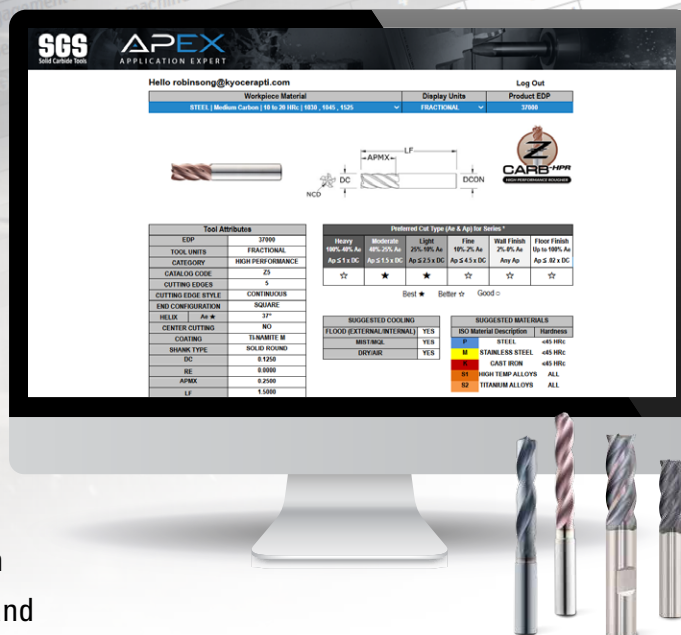
Additional Services

- A Fast Track for Special Tools Via Our Rapid Response Centre
- Inhouse PVD coating facility and R&D Centre
- Product Research and Development
- Product Engineering and Tool Application Support
- CAD/CAM Software Support



APEX

APPLICATION EXPERT



Say hello to APEX: Application Expert
KYOCERA SGS's enhanced web application
designed to make your SGS tool selection and
parameter setup faster and more effective!

OPTIMIZE TOOL PERFORMANCE

Gain essential application data to optimize tool
performance, including cutting parameters
and material recommendations.

SAVE TIME

Easily select application types, units, and
materials with our user-friendly interface and
autofill features.

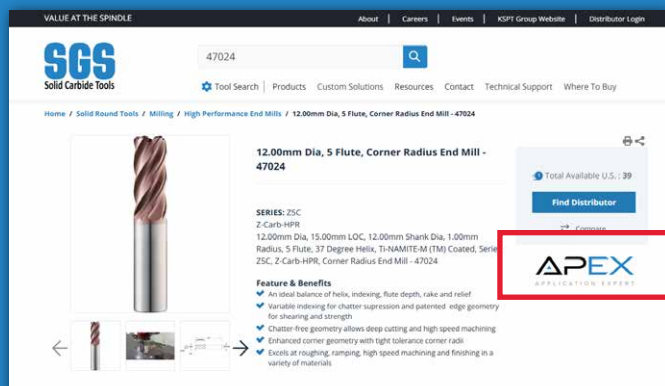
COMPARE AND CUSTOMIZE

Use powerful tools to tailor results, compare
up to five options, and visualize ramping
parameters with detailed drawings.

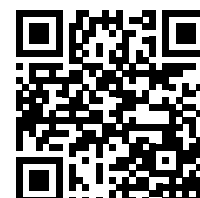
EXPORT AND SHARE

Generate PDFs with application data, add
comments, and print precise line drawings
with detailed specifications.

Visit: www.kyocera-sgstool.com/apex



or Click the APEX Logo
on any Product Detail Page.



Common Legend

Leyenda habitual

Légende commune

Gemeinsame Legende

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.
BESTELLEN: Bitte Menge und EDV-Nummer angeben.
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 Atención al Cliente.
POLITIQUE DE RETOUR: Tous les produits retournés doivent être accompagnés d'un numéro RMA.
Contacter votre interlocuteur commercial pour obtenir un numéro RMA.
RÜCKNAHMEGARANTIE: Eine RMA-Nummer (Rücksendegenehmigung) muss bei allen Produktrücksendungen beiliegen.
Wenden Sie sich bitte an Ihren Kundendienstmitarbeiter für RMA-Nummer.

REGULATION SAFETY GLASSES SHOULD ALWAYS BE WORN WHEN USING HIGH-SPEED CUTTING EQUIPMENT

DEBEN USARSE GAFAS PROTECTORAS CUANDO SE UTILICEN EQUIPOS DE ALTA VELOCIDAD

DES LUNETTES DE SÉCURITÉ DOIVENT ÊTRE IMPÉRATIVEMENT PORTÉES LORS D'UTILISATION D'OUTILS À GRANDE VITESSE

BEI SCHNELL LAUFENDEN SPANABHEBENDEN MASCHINEN MÜSSEN IMMER DIE VORGESCHRIEBENEN SICHERHEITSBRILLEN GETRAGEN WERDEN



WARNING: This product can expose you to chemicals including Cobalt, which is known to the State of California to cause cancer. For more information go to www.p65warnings.ca.gov



ADVERTENCIA: Este producto puede exponerlo a químicos como el Cobalto, reconocido como cancerígeno en el estado de California. Para más información visite esta página web: www.p65warnings.ca.gov



ATTENTION: Ce produit vous expose aux produits chimiques incluant le Cobalt, qui est reconnu par l'Etat de Californie à être une cause de cancer. Pour plus d'information veuillez regarder sur: www.p65warnings.ca.gov



WARNUNG: Dieses Produkt kann Sie mit Chemikalien wie Kobalt aussetzen, das dem Staat Kalifornien als krebserregend bekannt ist. Für weitere Informationen, besuchen Sie: www.p65warnings.ca.gov

**INTELLECTUAL PROPERTY
PROPIEDAD INTELECTUAL
PROPRIÉTÉ INTELLECTUELLE
GEISTIGES EIGENTUM**

KYOCERA SGS Precision Tools holds more than 20 patents globally. Please visit our website at www.kyocera-sgstool.com to learn more.

KYOCERA SGS Precision Tools posee más de 20 patentes a nivel mundial. Para más información, visite nuestra página web www.kyocera-sgstool.com.

KYOCERA SGS Precision Tools possède plus de 20 brevets mondialement reconnus. Pour plus d'information, veuillez consulter notre site web www.kyocera-sgstool.com.

KYOCERA SGS Precision Tools besitzt mehr als 20 Patente weltweit. Bitte besuchen Sie unsere Webseite www.kyocera-sgstool.com für weitere Informationen.

Common Legend **Leyenda habitual** **Légende commune** **Gemeinsame Legende**

MATERIALS **MATERIALES** **MATÉRIAUX** **WERKSTOFFE**



Steels (P)
Aceros
Aciers
Stähle



Stainless Steels (M)
Aceros Inoxidables
Aciers inoxydables
Nichtrostende Stähle



Cast Iron (K)
Acero de Fundición
Fonte
Grauguss



Non-Ferrous (N)
No Férricos
Non Ferreux
Nichteisenmetalle



High Temp Alloys (S)
Aleaciones Termorresistentes
Alliages hautes températures
Warmfeste Legierungen



Hardened Steels (H)
Aceros Endurecidos
Aciers Trempés
Gehärteter Stahl

TOOL LENGTH **LONGITUDES DE HERRAMIENTAS** **LONGUEUR DE L'OUTIL** **WERKZEUGLÄNGE**



Stub
Corta
Court
Kurze Bauform



Regular
Media
Moyen
Standard



Long
Larga
Long
Lang



Long Reach Neck
Larga con cuello
Détalonnage longue
portée
Freischliff



Extra Long
Extra-larga
Extra-long
Extra-Lang

FLUTES **FILOS** **DENTS** **SCHNEIDEN**



2 Flutes
2 Filos
2 Dents
2 Schneiden



3 Flutes
3 Filos
3 Dents
3 Schneiden



4 Flutes
4 Filos
4 Dents
4 Schneiden



5 Flutes
5 Filos
5 Dents
5 Schneiden



6 Flutes
6 Filos
6 Dents
6 Schneiden



7 Flutes
7 Filos
7 Dents
7 Schneiden



8 Flutes
8 Filos
8 Dents
8 Schneiden



9 Flutes
9 Filos
9 Dents
9 Schneiden



10 Flutes
10 Filos
10 Dents
10 Schneiden



11 Flutes
11 Filos
11 Dents
11 Schneiden



12 Flutes
12 Filos
12 Dents
12 Schneiden

End Mill Legend

Leyenda fresas

Légende fraise

Fräser-Legende

END CONFIGURATIONS CONFIGURACIONES DE LA PUNTA FORME DE L'OUTIL EN BOUT ENDENAUSFÜHRUNG



Ball
Estérica
Boule
Kugelskopf



Corner
Plana con
borde romo
Rayon
mit Eckenradius



Square
Plana
Non rayonné
Scharfkantig

SIDE PROFILE PERFIL LATERAL PROFIL LATÉRAL SEITENPROFIL



Linear taper
Perfil Cónico
Conique Droit
Linear Kegel



Tapered Circle
Segment
Perfil Cónico de
Segmento Circular
Conique Segment
de Cercle
Tonnen Segment



Picatinny Recoil
Groove
Fresa Riel Picatinny
Rainure Décalée
Picatinny
Picatinny Rückstoss
Nut



Picatinny Dovetail
Form
Fresa de Forma
Picatinny Cola de
Milano
Queue d'aronde
Picatinny
Picatinny Schwal-
benschwanz Form

SHANK TYPE TIPO DE VÁSTAGO TYPE DE QUEUE SCHAFTART



Common
Normal
Dégagée
Standard



Straight
Recto
Cylindrique
Gerade



WELDON
Drive Flat
Plano en el zanco
Entrainement
méplat
Spannfläche



DIN6535 HB
Drive Flat
DIN 6535 HB
Plano en el zanco
DIN 6535 HB
Entrainement
méplat DIN 6535 HB
Spannfläche
DIN 6535 HB

HELIX ANGLES ANGULOS DE LAS HELICES SPANWINKEL ANGLES DE L'HÉLICE



Right Spiral
Hélice con corte
a la derecha
Hélice droite
Rechtsspirale



Left Spiral
Hélice con corte
a la izquierda
Hélice gauche
Linksspirale



Variable Right Spiral
Hélice con corte a
la derecha y ángulo
variable
Hélice droite variable
Rechtsspirale,
variabel

COOLANT OPTIONS OPCIONES DE REFRIGERACIÓN OPTIONS DE REFOIDISSEMENT KÜHLSCHMIERMittel-Optionen



Internal Coolant
Refrigeración interna
Refrondissement
interne
Innenkühlung



JetStream Coolant
Slots
Ranuras de refrigeración
JetStream
Fentes de refroidissement
JetStream
JetStream-
Kühlmittelschlitze

RAKE ANGLE ANGULO DE DESPRENDIMIENTO ANGLE DE COUPE SPANWINKEL



Positive
Positivo
Positif
Positiv



Neutral
Neutro
Neutre
Neutral

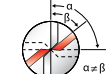


Negative
Negativo
Négatif
Negativ



Variable
Variable
Variable
Variabel

ADDITIONAL GEOMETRY GEOMETRÍAS ADICIONALES GÉOMÉTRIE SUPPLÉMENTAIRE WEITERE BAUFORMEN



Flute Spacing
Unequal
Espaciado
desigual de los
filos
Denture décalée
Nutenabstand
Ungleich



Chip Breaker
Rompevirutas
Brise-copeaux
Spanteiler

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

All tools are straight or non-tapered unless noted
Todas las herramientas son rectas o no cónicas a menos que se indique lo contrario
Tous les outils sont droits ou non coniques, sauf indication contraire
Alle Werkzeuge sind gerade oder nicht konisch, sofern nicht anders angegeben



Drill Legend



Leyenda brocas



Légende perçage



Bohrer-Legende

SHANK TYPE TIPO DE VÁSTAGO TYPE DE TIGE SCHAFTART



Common
Normal
Dégagée
Standard



Straight
Recto
Cylindrique
Gerade

REACH ALCANCE LONGUEUR NUTZLÄNGE

3xD

3xD Reach
Alcance 3xD
Longueur 3xD
3xD Nutzlänge

5xD

5xD Reach
Alcance 5xD
Longueur 5xD
5xD Nutzlänge

8xD

8xD Reach
Alcance 8xD
Longueur 8xD
8xD Nutzlänge

12xD

12xD Reach
Alcance 12xD
Longueur 12xD
12xD Nutzlänge

HELIX ANGLES ANGULOS DE LAS HELICES ANGLES DE L'HÉLICE SPANWINKEL



Right Spiral
Hélice con corte
a la derecha
Hélice à droite
Rechtsspirale



None
Ninguno
Aucun
gerade genutet

COOLANT OPTIONS OPCIONES DE REFRIGERACIÓN OPTIONS DE REFRROIDISSEMENT KÜHLSCHMIERMittel-Optionen



Internal Coolant
Refrigeración interna
Refrroidissement interne
Innenkühlung



External Coolant
Refrigeración externa
Refrroidissement externe
Auskühlung

POINT ANGLE ÁNGULO DE PUNTA POINT D'ANGLE SPITZENWINKEL



Point Angle
Angulo de la Punta
Angle de pointe
Spitzenwinkel



Point Angles
Ángulos de punta
Angles de pointe
Spitzenwinkel

CHAMFER ANGLE ÁNGULO DE CHAFLÁN ANGLE DE CHANFREIN FASENWINKEL



Chamfer Angle
Ángulo de chaflán
Angle de chanfrein
Fasenwinkel

NUMBER OF MARGINS NÚMERO DE MÁRGENES NOMBRE DE MARGES ANZAHL DER RÄNDER



2 Margins
2 Márgenes
2 Marges
2 Ränder



3 Margins
3 Márgenes
3 Marges
3 Ränder



4 Margins
4 Márgenes
4 Marges
4 Ränder

NUMBER OF FLUTES FILOS DENTS SCHNEIDEN



1 Flute
1 Filo
1 Dent
1 Schneiden



2 Flutes
2 Filos
2 Dents
2 Schneiden



3 Flutes
3 Filos
3 Dents
3 Schneiden

Router Legend

Leyenda ranuradores

Légende détourage

Konturenfräser-Legende

SHANK TYPE TIPO DE VÁSTAGO TYPE DE TIGE SCHAFTART



Straight
Recto
Cylindrique
Gerade

RAKE ANGLE ANGULO DE DESPRENDIMIENTO ANGLE DE PENTE SPANWINKEL



Positive
Positivo
Positif
Positiv



Neutral
Neutro
Neutre
Neutral



Negative
Negativo
Négatif
Negativ



Variable
Variable
Variable
Variabel

HELIX ANGLES ANGULOS DE LAS HELICES ANGLES DE L'HELICE SPANWINKEL



Right Spiral
Hélice con corte
a la derecha
Hélice à droite
Rechtsspirale



Left Spiral
Hélice con corte
a la izquierda
Hélice à gauche
Linksspirale

ADDITIONAL GEOMETRY GEOMETRÍAS ADICIONALES GÉOMÉTRIE SUPPLÉMENTAIRE WEITERE BAUFORMEN



Left Hand Cut Direction
Fresado sentido izquierda
Coupe vers la gauche
Rechtsschneidend



Right Hand Cut Direction
Fresado sentido derecha
Coupe vers la droite
Linksschneidend



Chip Breaker
Rompevirutas
Brise-copeaux
Spanbrecher

Coatings

Ti-NAMITE and Di-NAMITE Tool Coatings are specifically engineered for KSPT solid carbide rotary tools. The coating lineup includes proprietary processes that result in optimized tool life and increased speed and feed rates in a variety of applications.



	Coating	Identifying Color	Layer Structure	Thickness	Hardness (HV)	Coefficient of Friction (Fretting)	Thermal Stability	General Information
Ti-NAMITE	Titanium Nitride (TiN)	gold	Multilayer	1–5 microns	2200	0.40–0.65	600°C / 1112°F	A general purpose coating with good adhesion and abrasion resistant properties. Suitable for a wide variety of materials.
Ti-NAMITE-A	Aluminum Titanium Nitride (AlTiN)	dark grey	Nano structure	1–5 microns	3700	0.30	1100°C / 2010°F	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.
Ti-NAMITE-B	Titanium DiBoride (TiB2)	light grey-silver	Monolayer	1–2 microns	4000	0.10–0.20	850°C / 1562°F	This ceramic based coating ensures a smooth surface and a low affinity to cold welding or edge build up, which makes it optimal for aluminum, copper, and other non-ferrous applications. It has high toughness and high hardness.
Ti-NAMITE-C	Titanium Carbonitride (TiCN)	pink-red	Multilayer	1–5 microns	3000	0.30–0.45	400°C / 752°F	A very wear resistant coating with high toughness and shock resistance. Good in interrupted cuts found in applications like milling.
Ti-NAMITE-X	Proprietary (TX)	black	Nano Composite	1–5 microns	3600	0.45	1150°C / 2100°F	The structural design of Ti-Namite-X is adapted to meet a diverse range of applications; everything from high- and low-alloy steels to hardened materials (up to 65 HRC core hardness). Ti-Namite-X is suitable for operations which require high cutting speeds, high temperatures at the cutting edge, and high metal removal rates.
Di-NAMITE	Crystalline Diamond (Diamond)	black	Monolayer	6–20 microns	>8000	0.15–0.20	800°C / 1470°F	This is the hardest coating available with the best abrasion resistance. Diamond coating is suitable for machining highly abrasive, non-ferrous materials such as CFRP and graphite.
Ti-NAMITE-M	Proprietary (TM)	copper	Nano Composite	1–5 microns	3600	0.45	1150°C / 2100°F	Features include high wear resistance, reduced friction, and excellent prevention of edge build up. This coating provides superior material removal rates and tool life when used in high performance operations with difficult to machine materials like titanium.
Ti-NAMITE-H	Proprietary (TH)	copper	Nano Composite	1–5 microns	3800	0.30	1100°C / 2010°F	This coating demonstrates a superior combination of hardness and adhesion in hard machining of molds and dies and machining high-alloy stainless steels for high temperature applications such as turbines. The smooth surface ensures optimum surface quality and decreases the temperature in the cutting zone by reducing friction.
MEGACOAT NANO	Proprietary (MN)	Purple iridescent	Nano Composite	1–5 microns	3600	0.45	1150°C / 2100°F	The nano-layers of this coating provide high hardness for exceptional wear resistance and high oxidation resistance that allows for operation at high temperatures. The layered structure also gives the coating the toughness required to resist chipping. Megacoat Nano is particularly effective in high efficiency machining applications.

Other coatings available upon request.

Coating Application Guide

Preferred Applications for Coatings ★ Best ☆ Better ○ Good (blank) Not Recommended		Low Carbon ≤ 20 HRC	Medium Carbon, Alloy 20 to 35 HRC	High Carbon, Alloy 35 to 45 HRC	Ferritic & Martensitic ≤ 45 HRC	Austenitic & Duplex ≤ 25 HRC	Precipitation Hardened ≤ 45 HRC	Low Alloy, Grey, Ductile ≤ 25 HRC	Med-High Alloy, Nodular 25 to 35 HRC	High Alloy, Nodular ≥ 35 HRC	Aluminum Alloys	Copper Alloys	Plastics, Composites	Titanium Alloys ≤ 45 HRC	Iron, Nickel, Cobalt Alloys ≤ 45 HRC	Refractory Alloys, Mo, Ta, W ≤ 35 HRC	High Carbon, Med Alloy 45 to 50 HRC	Tool, Mold & Die 45 to 55 HRC	Tool, Mold & Die 55 to 65 HRC
Coating	Type	Steel			Stainless Steel			Cast Iron			Non Ferrous			HRSA			Hard Steel		
Ti-NAMITE	Titanium Nitride (TiN)	○									○	☆							
Ti-NAMITE-A	Aluminum Titanium Nitride (AlTiN)	☆	☆	☆	★	★	★	○	○	○				☆	★	★	○	○	○
Ti-NAMITE-B	Titanium DiBoride (TiB2)										★	★	○	☆					
Ti-NAMITE-C	Titanium Carbonitride (TiCN)										☆	○	☆						
Ti-NAMITE-X	Proprietary (TX)	★	★	★	☆	☆	☆	☆	☆	☆				☆	☆	☆	★	★	★
Di-NAMITE	Crystalline Diamond (Diamond)												★						
Ti-NAMITE-M	Proprietary (TM)	★	★	★	☆	☆	☆	★	★	★				★	☆	☆	☆	☆	☆
Ti-NAMITE-H	Proprietary (TH)	★	★	★	☆	☆	☆	★	★	★				★	☆	☆	☆	☆	☆
MEGACOAT NANO	Proprietary (MN)	☆	☆	☆	★	☆	★	☆	☆	☆				★	☆	☆			

High Performance End Mills



Milling

HIGH PERFORMANCE END MILLS	SERIES	DESCRIPTION	PAGE	S&F PAGE
Z-Carb-XPR	ZR	4 Flute Plunging / Ramping / Rougher Square End Fractional	30	32
	ZRCR	4 Flute Plunging / Ramping / Rougher Corner Radius Fractional	30	32
	ZRM	4 Flute Plunging / Ramping / Rougher Square End Metric	34	35
	ZRMCR	4 Flute Plunging / Ramping / Rougher Corner Radius Metric	34	35
Z-Carb-AP	Z1PCR	4 Flute Variable Rake Corner Radius Fractional	37	43
	Z1P	4 Flute Variable Rake Square End Fractional	37	43
	Z1PB	4 Flute Variable Rake Ball End Fractional	40	43
	Z1PLC	4 Flute Variable Rake Long Reach Corner Radius Fractional	41	43
	Z1PLB	4 Flute Variable Rake Ball End Long Reach Fractional	42	43
	Z1MPCR	4 Flute Variable Rake Corner Radius Metric	45	49
	Z1MP	4 Flute Variable Rake Square End Metric	45	49
	Z1MPB	4 Flute Variable Rake Ball End Metric	47	49
	Z1MPIC	4 Flute Variable Rake Intermediate Reach Corner Radius Metric	48	49
	Z1MPLC	4 Flute Variable Rake Long Reach Corner Radius Metric	48	49
Z-Carb-HTA	ZH1CR	4 Flute Variable Geometry High Temp Alloys Corner Radius Fractional	51	52
	ZH1MCR	4 Flute Variable Geometry High Temp Alloys Corner Radius Metric	53	54
	ZH1MCRS	4 Flute Variable Geometry High Temp Alloys Stub Corner Radius Metric	53	54
Z-Carb-MD	ZD1CR	4 Flute Variable Geometry Hard Materials Long Reach Corner Radius Fractional	55	56
	ZD1MCR	4 Flute Variable Geometry Hard Materials Long Reach Corner Radius Metric	55	56
Z-Carb-HPR	Z5	5 Flute Rougher Square End Fractional	57	66
	Z5CR	5 Flute Rougher Corner Radius Fractional	57	66
	Z5L	5 Flute Rougher Long Reach Square End Fractional	64	66
	Z5LCR	5 Flute Rougher Long Reach Corner Radius Fractional	64	66
	Z5MCR	5 Flute Rougher Corner Radius Metric	68	72
	Z5MLCR	5 Flute Rougher Long Reach Corner Radius Metric	71	72
V-Carb	55	5 Flute Finisher & Semi-Finisher Square End Fractional	74	77
	55CR	5 Flute Finisher & Semi-Finisher Corner Radius Fractional	74	77
	55B	5 Flute Finisher & Semi-Finisher Ball End Fractional	76	77
	55M	5 Flute Finisher & Semi-Finisher Square End Metric	79	82
	55MCR	5 Flute Finisher & Semi-Finisher Corner Radius Metric	79	82
	55MB	5 Flute Finisher & Semi-Finisher Ball End Metric	81	82
T-Carb	51	6 Flute High Speed Machining Square End Fractional	84	87
	51CR	6 Flute High Speed Machining Corner Radius Fractional	84	87

Speed & Feed Recommendations listed after each series

HIGH PERFORMANCE END MILLS	SERIES	DESCRIPTION	PAGE	S&F PAGE
	51L	6 Flute High Speed Machining Square End Long Reach Fractional	85	87
	51LC	6 Flute High Speed Machining Long Reach Corner Radius Fractional	85	87
	51B	6 Flute High Speed Machining Ball End Fractional	86	87
	51LB	6 Flute High Speed Machining Ball End Long Reach Fractional	86	87
	51M	6 Flute High Speed Machining Square End Metric	89	92
	51MCR	6 Flute High Speed Machining Corner Radius Metric	89	92
	51ML	6 Flute High Speed Machining Square End Long Reach Metric	90	92
	51MLC	6 Flute High Speed Machining Long Reach Corner Radius Metric	90	92
	51MB	6 Flute High Speed Machining Ball End Metric	91	92
	51MLB	6 Flute High Speed Machining Ball End Long Reach Metric	91	92
H-Carb	77	7 Flute High Efficiency Square End Fractional	94	96
	77CR	7 Flute High Efficiency Corner Radius Fractional	94	96
	77M	7 Flute High Efficiency Square End Metric	98	101
	77MCR	7 Flute High Efficiency Corner Radius Metric	98	101
Multi-Carb	66	Multi-Flute Finisher Square End Fractional	103	104
	66CR	Multi-Flute Finisher Corner Radius Fractional	103	104
	66M	Multi-Flute Finisher Square End Metric	106	107
	66MCR	Multi-Flute Finisher Corner Radius Metric	106	107
	67B	Multi-Flute Tapered (Circle Segment) Form Tools Metric	109	110
Series 33	33CR	3 Flute Difficult to Machine Materials Corner Radius Fractional	111	112
	33MCR	3 Flute Difficult to Machine Materials Corner Radius Metric	114	115
Series 7	7	4 Flute Variable Geometry Long Length Square End Fractional	117	119
	7B	4 Flute Variable Geometry Long Length Ball End Fractional	118	119
	7M	4 Flute Variable Geometry Long Length Square End Metric	120	121
	7MB	4 Flute Variable Geometry Long Length Ball End Metric	120	121
Turbo-Carb	56B	2 Flute Contouring Long Reach Ball End Fractional	122	123
	56MB	2 Flute Contouring Long Reach Ball End Metric	122	123
Power-Carb	57	6 Flute Finisher Square End Fractional	124	125
	57M	6 Flute Finisher Square End Metric	124	126
CFRP Slow Helix	27	4 Flute Slow Helix Square End Fractional	127	128
	27M	4 Flute Slow Helix Square End Metric	127	129
Picatinny Rail Tools	PRT	3 Flute Non-Ferrous Recoil Groove Tool Fractional	130	131
	PRT	5 Flute Non-Ferrous Dovetail Form Tool Fractional	133	134
	PRT	3 Flute Ferrous Recoil Groove Tool Fractional	130	131
	PRT	5 Flute Ferrous Dovetail Form Tool Fractional	133	134

Speed & Feed Recommendations listed after each series

FRESAS DE ALTO RENDIMIENTO	SERIE	DESCRIPCIÓN	PÁGINA	S&F PÁGINA
Z-Carb-XPR	ZR	4 filos, penetración / inclinación / desbastador, punta cuadrada, fraccional	30	32
	ZRCR	4 filos, penetración / inclinación / desbastador, radio angulado, fraccional	30	32
	ZRM	4 filos, penetración / inclinación / desbastador, punta cuadrada, métrico	34	35
	ZRMCR	4 filos, penetración / inclinación / desbastador, radio angulado, métrico	34	35
Z-Carb-AP	Z1PCR	4 filos, inclinación variable, radio angulado, fraccional	37	43
	Z1P	4 filos, inclinación variable, punta cuadrada, fraccional	37	43
	Z1PB	4 filos, inclinación variable, punta esférica, fraccional	40	43
	Z1PLC	4 filos, inclinación variable, largo alcance, radio angulado, fraccional	41	43
	Z1PLB	4 filos, inclinación variable, punta esférica, largo alcance, fraccional	42	43
	Z1MPCR	4 filos, inclinación variable, radio angulado, métrico	45	49
	Z1MP	4 filos, inclinación variable, punta cuadrada, métrico	45	49
	Z1MPB	4 filos, inclinación variable, punta esférica, métrico	47	49
	Z1MPIC	4 filos, inclinación variable, medio alcance, radio angulado, métrico	48	49
	Z1MPLC	4 filos, inclinación variable, largo alcance, radio angulado, métrico	48	49
Z-Carb-HTA	ZH1CR	4 filos, geometría variable, aleaciones termorresistentes, radio angulado, fraccional	51	52
	ZH1MCR	4 filos, geometría variable, aleaciones termorresistentes, radio angulado, métrico	53	54
	ZH1MCRS	4 filos, geometría variable, aleaciones termorresistentes, versión corta, radio angulado, métrico	53	54
Z-Carb-MD	ZD1CR	4 filos, geometría variable, materiales duros, largo alcance, radio angulado, fraccional	55	56
	ZD1MCR	4 filos, geometría variable, materiales duros, largo alcance, radio angulado, métrico	55	56
Z-Carb-HPR	Z5	5 filos, desbastador, punta cuadrada, fraccional	57	66
	Z5CR	5 filos, desbastador, radio angulado, fraccional	57	66
	Z5L	5 filos, desbastador, largo alcance, punta cuadrada, fraccional	64	66
	Z5LCR	5 filos, desbastador, largo alcance, radio angulado, fraccional	64	66
	Z5MCR	5 filos, desbastador, radio angulado, métrico	68	72
	Z5MLCR	5 filos, desbastador, largo alcance, radio angulado, métrico	71	72
V-Carb	55	5 filos, acabador y semiacabador, punta cuadrada, fraccional	74	77
	55CR	5 filos, acabador y semiacabador, radio angulado, fraccional	74	77
	55B	5 filos, acabador y semiacabador, punta esférica, fraccional	76	77
	55M	5 filos, acabador y semiacabador, punta cuadrada, métrico	79	82
	55MCR	5 filos, acabador y semiacabador, radio angulado, métrico	79	82
	55MB	5 filos, acabador y semiacabador, punta esférica, métrico	81	82
T-Carb	51	6 filos, mecanizado de alta velocidad, punta cuadrada, fraccional	84	87
	51CR	6 filos, mecanizado de alta velocidad, radio angulado, fraccional	84	87
	51L	6 filos, mecanizado de alta velocidad, punta cuadrada, largo alcance, fraccional	85	87
	51LC	6 filos, mecanizado de alta velocidad, largo alcance, radio angulado, fraccional	85	87
	51B	6 filos, fresa esférica para mecanizados de alta velocidad, fraccional	86	87
	51LB	6 filos, fresa esférica larga para mecanizados de alta velocidad, fraccional	86	87
	51M	6 filos, mecanizado de alta velocidad, punta cuadrada, métrico	89	92
	51MCR	6 filos, mecanizado de alta velocidad, radio angulado, métrico	89	92
	51ML	6 filos, mecanizado de alta velocidad, punta cuadrada, largo alcance, métrico	90	92
	51MLC	6 filos, mecanizado de alta velocidad, largo alcance, radio angulado, métrico	90	92
	51MB	6 filos, fresa esférica para mecanizados de alta velocidad, métrico	91	92
	51MLB	6 filos, fresa esférica larga para mecanizados de alta velocidad, métrico	91	92
H-Carb	77	7 filos de alta eficiencia, punta cuadrada, fraccional	94	96
	77CR	7 filos de alta eficiencia, radio angulado, fraccional	94	96
	77M	7 filos métrica de alta eficiencia, punta cuadrada, métrico	98	101
	77MCR	7 filos métrica de alta eficiencia, radio angulado, métrico	98	101
Multi-Carb	66	Filo múltiple, acabador, punta cuadrada, fraccional	103	104
	66CR	Filo múltiple, acabador, radio angulado, fraccional	103	104
	66M	Filo múltiple, acabador, punta cuadrada, métrico	106	107
	66MCR	Filo múltiple, acabador, radio angulado, métrico	106	107
	67B	Fresas de forma cónica de segmento circular de múltiples filos, métrico	109	110
Serie 33	33CR	3 filos, materiales difíciles de mecanizar, radio angulado, fraccional	111	112
	33MCR	3 filos, materiales difíciles de mecanizar, radio angulado, métrico	114	115
Serie 7	7	4 filos, geometría variable, longitud larga, punta cuadrada, fraccional	117	119
	7B	4 filos, geometría variable, longitud larga, punta esférica, fraccional	118	119
	7M	4 filos, geometría variable, longitud larga, punta cuadrada, métrico	120	121
	7MB	4 filos, geometría variable, longitud larga, punta esférica, métrico	120	121
Turbo-Carb	56B	2 filos, contorneado, largo alcance, punta esférica, fraccional	122	123
	56MB	2 filos, contorneado, largo alcance, punta esférica, métrico	122	123
Power-Carb	57	6 filos, acabador, punta cuadrada, fraccional	124	125
	57M	6 filos, acabador, punta cuadrada, métrico	124	126
Helicoidal de avance lento CFRP	27	4 filos, helicoidal de avance lento, punta cuadrada, fraccional	127	128
	27M	4 filos, helicoidal de avance lento, punta cuadrada, métrico	127	129
Herramientas de riel	PRT	Herramienta de ranura de retroceso no ferrosa de 3 filos fraccional	130	131
Picatinny	PRT	Herramienta de forma de cola de milano no ferrosa de 5 filos fraccional	133	134
	PRT	Herramienta de ranura de retroceso ferrosa de 3 filos fraccional	130	131
	PRT	Herramienta de cola de milano ferrosa de 5 filos fraccional	133	134

Recomendaciones de velocidades y avances mostradas tras cada serie

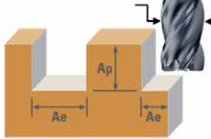
FRAMES A DETOURER UNIVERSELLES	SÉRIES	DESCRIPTION	PAGE	S&F PAGE
Z-Carb-XPR	ZR	4 dents non rayonné pour plongée / ramppage / ébauche (fractionnel)	30	32
	ZRCR	4 dents rayonnée pour plongée / ramppage / ébauche (fractionnel)	30	32
	ZRM	4 dents non rayonné pour plongée / ramppage / ébauche (métrique)	34	35
	ZRMCR	4 dents rayonnée pour plongée / ramppage / ébauche (métrique)	34	35
Z-Carb-AP	Z1PCR	4 dents pas décalé et hélice variable rayonnés (fractionnel)	37	43
	Z1P	4 dents pas décalé et hélice variable non rayonné (fractionnel)	37	43
	Z1PB	4 dents à vague de coupe variable à bout hémisphérique (fractionnel)	40	43
	Z1PLC	4 dents pas décalé et hélice variable rayonnés (fractionnel)	41	43
	Z1PLB	4 dents à vague de coupe variable longue portée à bout hémisphérique (fractionnel)	42	43
	Z1MPCR	4 dents pas décalé et hélice variable rayonnés (métrique)	45	49
	Z1MP	4 dents pas décalé et hélice variable non rayonné (métrique)	45	49
	Z1MPB	4 dents à vague de coupe variable à bout hémisphérique (métrique)	47	49
	Z1MPIC	4 dents pas décalé, hélice variable, détalonné, rayonnés (métrique)	48	49
	Z1MPLC	4 dents pas décalé et hélice variable rayonnés (métrique)	48	49
	Z1MPLB	4 dents pas décalé et hélice variable rayonnés (métrique)	48	49
Z-Carb-HTA	ZH1CR	4 dents géométrie variable alliages haute température rayonné (fractionnel)	51	52
	ZH1MCR	4 dents géométrie variable alliages haute température rayonné (métrique)	53	54
	ZH1MCRS	4 dents géométrie variable, alliages haute température, longueur de l'outil court, rayonné (métrique)	53	54
Z-Carb-MD	ZD1CR	4 dents géométrie variable matériaux durs longue portée rayonné (fractionnel)	55	56
	ZD1MCR	4 dents géométrie variable matériaux durs longue portée rayonné (métrique)	55	56
Z-Carb-HPR	Z5	5 dents non rayonné pour l'ébauche (fractionnel)	57	66
	Z5CR	5 dents rayonnée pour l'ébauche (fractionnel)	57	66
	Z5L	5 dents non rayonné pour l'ébauche, longue portée (fractionnel)	64	66
	Z5LCR	5 dents rayonnée pour l'ébauche, longue portée (fractionnel)	64	66
	Z5MCR	5 dents rayonnée pour l'ébauche (métrique)	68	72
	Z5MLCR	5 dents rayonnée pour l'ébauche, longue portée (métrique)	71	72
V-Carb	55	5 dents en bout de finition et semi-finition plat (fractionnel)	74	77
	55CR	5 dents en bout de finition et semi-finition rayonné (fractionnel)	74	77
	55B	5 dents en bout de finition et semi-finition hémisphérique (fractionnel)	76	77
	55M	5 dents en bout de finition et semi-finition plat (métrique)	79	82
	55MCR	5 dents en bout de finition et semi-finition rayonné (métrique)	79	82
	55MB	5 dents en bout de finition et semi-finition hémisphérique (métrique)	81	82
T-Carb	51	6 dents pour usinage grande vitesse non rayonné (fractionnel)	84	87
	51CR	6 dents pour usinage grande vitesse rayonné (fractionnel)	84	87
	51L	6 dents pour usinage grande vitesse non rayonné extra longue (fractionnel)	85	87
	51LC	6 dents pour usinage grande vitesse extra longue rayonné (fractionnel)	85	87
	51B	6 dents hémisphérique UGV dimensions cotes (fractionnel)	86	87
	51LB	6 dents hémisphérique détalonnée UGV dimensions cotes (fractionnel)	86	87
	51M	6 dents pour usinage grande vitesse non rayonné (métrique)	89	92
	51MCR	6 dents pour usinage grande vitesse rayonné (métrique)	89	92
	51ML	6 dents pour usinage grande vitesse non rayonné extra longue (métrique)	90	92
	51MLC	6 dents pour usinage grande vitesse extra longue rayonné (métrique)	90	92
	51MB	6 dents hémisphérique UGV dimensions cotes (métrique)	91	92
	51MLB	6 dents hémisphérique détalonnée UGV dimensions cotes (métrique)	91	92
H-Carb	77	7 dents hautes performances droite côtes (fractionnel)	94	96
	77CR	7 dents hautes performances torique côtes (fractionnel)	94	96
	77M	7 dents hautes performances droite côtes (métrique)	98	101
	77MCR	7 dents hautes performances torique côtes (métrique)	98	101
Multi-Carb	66	Multi-dents non rayonné pour finition (fractionnel)	103	104
	66CR	Multi-dents rayonné pour finition (fractionnel)	103	104
	66M	Multi-dents non rayonné pour finition (métrique)	106	107
	66MCR	Multi-dents rayonné pour finition (métrique)	106	107
	67B	Fraises de forme segmentaire conique à dents multiples (métrique)	109	110
Série 33	33CR	3 dents rayonné pour l'ébauche dans tous les matériaux sauf non-ferreux (fractionnel)	111	112
	33MCR	3 dents rayonné pour l'ébauche dans tous les matériaux sauf non-ferreux (métrique)	114	115
Série 7	7	4 dents géométrie variable à queue longue non rayonné (fractionnel)	117	119
	7B	4 dents géométrie variable à queue longue à bout hémisphérique (fractionnel)	118	119
	7M	4 dents géométrie variable à queue longue non rayonné (métrique)	120	121
	7MB	4 dents géométrie variable à queue longue à bout hémisphérique (métrique)	120	121
Turbo-Carb	56B	2 dents contournage longue portée à bout hémisphérique (fractionnel)	122	123
	56MB	2 dents contournage longue portée à bout hémisphérique (métrique)	122	123
Power-Carb	57	6 dents en bout de finition plat (fractionnel)	124	125
	57M	6 dents en bout de finition plat (métrique)	124	126
CFRP hélice lente	27	4 dents hélice lente non rayonné (fractionnel)	127	128
	27M	4 dents hélice lente non rayonné (métrique)	127	129
Outils de rail Picatinny	PRT	Outil de rainure de recul non ferreux à 3 dents (fractionnel)	130	131
	PRT	Outil de forme en queue d'aronde non ferreux à 5 dents (fractionnel)	133	134
	PRT	Outil de rainure de recul ferreux à 3 dents (fractionnel)	130	131
	PRT	Outil en queue d'aronde ferreux à 5 dents (fractionnel)	133	134

Recommandations de vitesse et avance indiquées après chaque série

HOCHLEISTUNGS-SCHAFTFRÄSER	SERIE	BESCHREIBUNG	SEITE	S&F SEITE
Z-Carb-XPR	ZR	Zölliger Eintauchen / Rampenfahren / Schruppen mit 4 Schneiden ohne Eckenradien	30	32
	ZRCR	Zölliger Eintauchen / Rampenfahren / Schruppen mit 4 Schneiden und Eckenradien	30	32
	ZRM	Eintauchen / Rampenfahren / Schruppen mit 4 Schneiden ohne Eckenradien	34	35
	ZRMCR	Eintauchen / Rampenfahren / Schruppen mit 4 Schneiden und Eckenradien	34	35
Z-Carb-AP	Z1PCR	Zölliger Fräser mit 4 variablen Schneiden und Eckenradien	37	43
	Z1P	Zölliger Fräser mit 4 variablen Schneiden ohne Eckenradien	37	43
	Z1PB	Zölliger Radiuschaftfräser mit 4 Schneiden und variablem Spanwinkel	40	43
	Z1PLC	Zölliger Langlochfräser mit 4 variablen Schneiden und Eckenradien	41	43
	Z1PLB	Zölliger Radiuschaftfräser mit 4 Schneiden und variablem Spanwinkel	42	43
	Z1MPCR	Fräser mit 4 variablen Schneiden und Eckenradien	45	49
	Z1MP	Fräser mit 4 variablen Schneiden ohne Eckenradien	45	49
	Z1MPB	Radiuschaftfräser mit 4 Schneiden und variablem Spanwinkel	47	49
	Z1MPIC	Fräser mittlerer Länge mit 4 variablen Schneiden und Eckenradien	48	49
	Z1MPLC	Langlochfräser mit 4 variablen Schneiden und Eckenradien	48	49
Z-Carb-HTA	ZH1CR	Hochwarmfester zölliger Fräser mit 4 variablen Schneiden und Eckenradien	51	52
	ZH1MCR	Hochwarmfester Fräser mit 4 variablen Schneiden und Eckenradien	53	54
	ZH1MCRS	Hochwarmfester Fräser mit 4 variablen Schneiden und Eckenradien	53	54
Z-Carb-MD	ZD1CR	Zölliger Langlochfräser mit 4 variablen Schneiden, Eckenradien und Form aus Hartmetall	55	56
	ZD1MCR	Langlochfräser mit 4 variablen Schneiden, Eckenradien und Form aus Hartmetall	55	56
Z-Carb-HPR	Z5	Zölliger Schruppfräser mit 5 Schneiden ohne Eckenradien	57	66
	Z5CR	Zölliger Schruppfräser mit 5 Schneiden und Eckenradien	57	66
	Z5L	Zölliger Langlochfräser Schruppfräser mit 5 Schneiden ohne Eckenradien	64	66
	Z5LCR	Zölliger Langlochfräser Schruppfräser mit 5 Schneiden und Eckenradien	64	66
	Z5MCR	Schruppfräser mit 5 Schneiden und Eckenradien	68	72
	Z5MLCR	Langlochfräser Schruppfräser mit 5 Schneiden und Eckenradien	71	72
V-Carb	55	Zölliger Schlicht- und Halbschlichtfräser mit 5 Schneiden ohne Eckenradien und variabler Form	74	77
	55CR	Zölliger Schlicht- und Halbschlichtfräser mit 5 Schneiden ohne Eckenradien	74	77
	55B	Schlicht- und Halbschlicht-Radiuschaftfräser mit 5 Schneiden ohne Eckenradien	76	77
	55M	Schlicht- und Halbschlichtfräser mit 5 Schneiden ohne Eckenradien und variabler Form	79	82
	55MCR	Schlicht- und Halbschlichtfräser mit 5 Schneiden und Eckenradien	79	82
	55MB	Schlicht- und Halbschlicht-Radiuschaftfräser mit 5 Schneiden und variabler Form	81	82
T-Carb	51	Zölliger Schaftfräser für die Hochgeschwindigkeitsbearbeitung mit 6 Schneiden ohne Eckenradien	84	87
	51CR	Zölliger Fräser für die Hochgeschwindigkeitsbearbeitung mit 6 Schneiden und Eckenradien	84	87
	51L	Zölliger Langloch-Schaftfräser aus Schnellstahl mit 6 Schneiden ohne Eckenradien	85	87
	51LC	Zölliger Langlochfräser für die Hochgeschwindigkeitsbearbeitung mit 6 Schneiden und Eckenradien	85	87
	51B	6-Schneider Vollradiusfräser für Hochgeschwindigkeitsbearbeitung	86	87
	51LB	6-Schneider Vollradiusfräser mit Freischliff für Hochgeschwindigkeitsbearbeitung	86	87
	51M	Schaftfräser für die Hochgeschwindigkeitsbearbeitung mit 6 Schneiden ohne Eckenradien	89	92
	51MCR	Fräser für die Hochgeschwindigkeitsbearbeitung mit 6 Schneiden und Eckenradien aus Schnellstahl	89	92
	51ML	Langloch-Schaftfräser aus Schnellstahl mit 6 Schneiden ohne Eckenradien	90	92
	51MLC	Langlochfräser für die Hochgeschwindigkeitsbearbeitung mit 6 Schneiden und Eckenradien	90	92
	51MB	6-Schneider Vollradiusfräser für Hochgeschwindigkeitsbearbeitung	91	92
	51MLB	6-Schneider Vollradiusfräser mit Freischliff für Hochgeschwindigkeitsbearbeitung	91	92
H-Carb	77	Zölliger Hocheffizienter mit 7 Schneiden ohne Eckenradien	94	96
	77CR	Zölliger Hocheffizienter mit 7 Schneiden und Eckenradien	94	96
	77M	Hocheffizienter mit 7 Schneiden ohne Eckenradien	98	101
	77MCR	Hocheffizienter mit 7 Schneiden und Eckenradien	98	101
Multi-Carb	66	Zölliger mehrschneidiger Schlichtfräser ohne Eckenradien	103	104
	66CR	Zölliger mehrschneidiger Schlichtfräser mit Eckenradien	103	104
	66M	mehrschneidiger Schlichtfräser ohne Eckenradien	106	107
	66MCR	mehrschneidiger Schlichtfräser mit Eckenradien	106	107
Serie 33	67B	Mehrschneidige konische Kreissegment-Formfräser	109	110
	33CR	Zölliger Fräser mit 3 Schneiden und Eckenradien für schwerspanbare Werkstoffe	111	112
	33MCR	Fräser mit 3 Schneiden und Eckenradien für schwerspanbare Werkstoffe	114	115
Serie 7	7	Zölliger Langloch-Schaftfräser mit 4 Schneiden ohne Eckenradien und variabler Form	117	119
	7B	Zölliger Langloch-Radiuschaftfräser mit 4 Schneiden und variabler Form	118	119
	7M	Langloch-Schaftfräser mit 4 Schneiden ohne Eckenradien und variabler Form	120	121
	7MB	Langloch-Radiuschaftfräser mit 4 Schneiden und variabler Form	120	121
Turbo-Carb	56B	Zölliger Langloch-Profil-Radiuschaftfräser mit 2 Schneiden	122	123
	56MB	Langloch-Profil-Radiuschaftfräser mit 2 Schneiden	122	123
Power-Carb	57	Zölliger Schlichtfräser mit 6 Schneiden ohne Eckenradien	124	125
	57M	Schlichtfräser mit 6 Schneiden ohne Eckenradien	124	126
CFRP Slow Helix	27	Zölliger Schaftfräser mit 4 steilen Schneiden ohne Eckenradien	127	128
	27M	Schaftfräser mit 4 steilen Schneiden ohne Eckenradien	127	129
Picatinny	PRT	3 Flöte Nichteisen-Rückstoßnut Nut Grove Bruchteil	130	131
Schienenwerkzeuge	PRT	5 Flöte Nichteisen-Schwalbenschwanzform-Werkzeug Bruchteil	133	134
	PRT	3 Rillen-Eisenrückstoß-Nutwerkzeug fraktioniert	130	131
	PRT	5 Flöte Eisen Schwalbenschwanz Werkzeug gebrochen	133	134

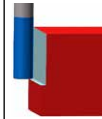
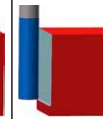
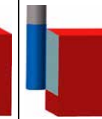
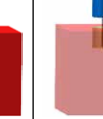
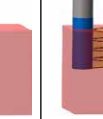
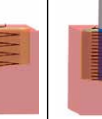
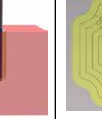
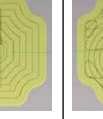
Empfehlungen für Drehzahl & Vorschub im Anhang zu jeder Serie

End Mill Matrix

Preferred materials for each Series are designated below.			Coolant required in these materials Plunging not recommended in these materials																	
Cut depths (Ae & Ap) are based on a percentage of the cutter diameter (DC)  Material hardness and machinability affect speed, feed, and cut depths. Long flute or long reach tools require reduced rates and cut depths.			Material																	
						 									 					
			Low Carbon ≤ 20 HRC	Medium Carbon, Alloy 20 to 35 HRC	High Carbon, Alloy 35 to 45 HRC	Ferritic & Martensitic ≤ 45 HRC	Austenitic & Duplex ≤ 25 HRC	Precipitation Hardened ≤ 45 HRC	Low Alloy, Grey, Ductile ≤ 25 HRC	Med-High Alloy, Nodular 25 to 35 HRC	High Alloy, Nodular ≥ 35 HRC	Aluminum Alloys	Copper Alloys	Plastics, Composites	Titanium Alloys ≤ 45 HRC	Iron, Nickel, Cobalt Alloys ≤ 45 HRC	Refractory Alloys, Mo, Ta, W ≤ 35 HRC	High Carbon, Med Alloy 45 to 50 HRC	Tool, Mold & Die 45 to 55 HRC	Tool, Mold & Die 55 to 65 HRC
Name	Series	Page	Steel			Stainless Steel			Cast Iron			Non Ferrous			HRSA			Hard Steel		
Series 33	33	111	★	★	★	★	★	☆	★	★	☆				★	☆	☆	○	○	
Z-Carb XPR	ZR	30	★	★	★	★	★	★	★	★	★				★	★	★	☆	○	
Z-Carb-AP	Z1P	37	★	★	★	★	★	★	★	★	★				★	★	★	☆	○	
Z-Carb-HTA	ZH1	51	★	★	★	★	★	★	★	★	★				★	★	★	☆	○	
Series 7	7	117	★	★	★	★	★	★	★	★	★				★	★	☆	☆	○	
Z-Carb HPR	Z5	57	★	★	★	★	★	★	★	★	★				★	★	★	☆	○	
V-Carb	55	74	★	★	★	★	★	★	★	★	★				★	★	☆	○	○	
T-Carb	51	84	★	★	★	★	★	★	★	★	★				★	★	★	☆	○	
H-Carb	77	94	★	★	★	★	★	★	★	★	★				★	★	★	☆	○	
Multi Carb	66	103	★	★	★	★	☆	★	★	★	★				★	★	★	☆	○	
Multi Carb-B	67B	109	★	★	★	★	★	★	★	★	★				★	★	★	☆	○	
Picatinny Groove F	PRT	130 & 133	★	★	★	★	★	★							★					
Picatinny Dovetail F	PRT	130 & 133	★	★	★	★	★	★							★					
Turbo Carb	56B	122	★	★	★				★	★	★							★	★	★
Z-Carb-MD	ZD1	55			☆					☆	★							★	★	★
Power-Carb	57	124									☆							★	★	★
Ski-Carb	44	181										★	☆	○						
S-Carb 2 Flute	47	174										★	★	○						
S-Carb 3 Flute	43	152										★	★	○						
S-Carb APR-3	43APR-3	141										★	★	○						
S-Carb APR-4	43APR-4	144										★	★	○						
S-Carb APF	43APF	146										★	★	○						
S-Carb APF-B	43APF-B	150										★	★	☆						
Picatinny Groove NF	PRT	130 & 133										★								
Picatinny Dovetail NF	PRT	130 & 133										★								
Slow Helix	27	127											☆	★						
CCR	20-CCR	390												★						
CCR Coarse	31-CCR	394												★						
Compression Router	25	397												★						
Up Cut Router	21	400										☆	○	★						
Down Cut Router	22	401										☆	○	★						

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www.kyocera-sgstool.com/apex

End Mill Matrix

Preferred Cut Type for Series ★ Best ☆ Better ○ Good (blank) Not Recommended						Preferred Entry Method for Series			Preferred Tool Path for Series	
Unless blank, a high quality wall or floor finish can be achieved with any Series with adjusted speed & feed.						Speed & Feed are based on ramp angle.			For rough milling, HEM tool paths are usually preferred in most situations, however, Standard paths may be more efficient using suitable tools with moderate to heavy cut types.	
Heavy	Moderate	Light	Fine	Finish-Wall	Finish - Floor	Plunge	Straight Ramp	Helical Ramp	Standard Path	HEM Path
Ae = 1 to .4 x DC Ap ≤ 1 x DC	Ae = .4 to .25 x DC Ap ≤ 1.5 x DC	Ae = .25 to .1 x DC Ap ≤ 2.5 x DC	Ae = .1 to .02 x DC Ap ≤ 4.5 x DC	Ae ≤ .02 x DC any Ap	Ae ≥ .5 x DC Ap ≤ .02 x DC	Ap ≤ 1 x DC lower feed rates	Ap ≤ 2 x DC medium feed rates	Ap ≤ 4 x DC higher feed rates		
										
★	★	☆	☆	○	☆	☆	★	★	★	☆
★	★	☆	☆	○	★	★	★	★	★	☆
★	★	☆	☆	○	☆	☆	★	★	★	☆
★	★	☆	☆	○	☆	☆	★	★	★	☆
○	○	○	★	★	☆		○	☆	○	☆
☆	★	★	☆	☆	☆		★	★	★	★
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★	★	☆	☆	○	☆	○	☆	★	★	☆
○	○	☆	☆	☆	☆				★	☆

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End Mill Matrix

Name	Series	Flute Count	Cut Dia. Range inch mm	Cut Length Availability (x DC)	Reach Option (x DC)	End Styles Square (S) Radius (R) Ball (B)
Series 33	33	3	0.125 to 1 3 to 20	2.25 to 3	—	R
Z-Carb XPR	ZR	4	0.250 to 0.750 6 to 20	2 to 3	—	S,R
Z-Carb-AP	Z1P	4	0.0156 to 1 1 to 25	1 to 3.25	2.5 to 8.5	S, R, B
Z-Carb-HTA	ZH1	4	0.250 to 1 6 to 20	1.25 to 3	—	R
Series 7	7	4	0.125 to 1 3 to 25	2.25 to 8.25	—	S, B
Z-Carb HPR	Z5	5	0.125 – 1 6 – 25	1 to 3	4	S, R
V-Carb	55	5	0.125 to 1 6 to 20	1.25 to 5	—	S, R, B
T-Carb	51	6	0.250 to 1 6 to 20	1.25 to 3	3.25 to 5.5	S, R
H-Carb	77	7	0.250 to 1 6 to 25	2.5 to 4	—	S, R
Multi Carb	66	7, 9, 11	0.188 to 1 6 to 25	1.5 to 3.25	—	S, R
Multi Carb-B	67	4, 6, 8	— 6 to 16	1.2 to 1.9	—	B
Picatinny Groove F	PRT	3	0.2100 —	0.56	—	S
Picatinny Dovetail F	PRT	5	0.6050 —	0.68	—	S
Turbo Carb	56B	2	0.031 to 0.750 1 to 20	1	2 to 2.25	B
Z-Carb-MD	ZD1	4	0.118 to 0.750 5 to 20	1 to 1.25	2.25 to 5	R
Power-Carb	57	6	0.250 to 0.500 6 to 20	2 to 2.25	—	S
Ski-Carb	44	2	0.250 to 1 3 to 20	1.25 to 7	—	S, R
S-Carb 2 Flute	47	2	0.125 to 1 3 to 25	1 to 3	3 to 9	S, B
S-Carb 3 Flute	43	3	0.125 to 1 3 to 25	1 to 7	2.25 to 8.5	S, R, B
S-Carb APR-3	43APR-3	3	0.750 to 1 12 to 26	1.25 to 1.75	3 to 4	S, R
S-Carb APR-4	43APR-4	4	20 to 25	1.25 to 1.75	2.25 to 3.5	S, R
S-Carb APF	43APF	4	0.500 to 0.750 6 to 25	2.5 to 4	3 to 5	S, R
S-Carb APF-B	43APF-B	3, 4	— 6 to 16	1.2 to 1.9	—	B
Picatinny Groove NF	PRT	3	0.2100 —	0.56	—	S
Picatinny Dovetail NF	PRT	3	0.6050 —	0.68	—	S
Slow Helix	27	4	0.250 to 0.750 6 to 16	1.75 to 4	—	S
CCR	20-CCR	5, 8, 10, 12	0.250 to 0.500 2 to 12	2.75 to 4	—	S
CCR Coarse	31-CCR	5, 7, 8, 10	0.250 to 0.500 6 to 12	2.75 to 4	—	S
Compression Router	25	4, 6, 8	0.250 to 0.500 6 to 12	2.75 to 4	—	S
Up Cut Router	21	2	0.125 to 0.750 3 to 12	2.5 to 4.25	—	S
Down Cut Router	22	2	0.125 to 0.750 3 to 12	2.5 to 4.25	—	S

End Mill Matrix

Chipbreaker Option	Shank Option Solid Round (SR) Weldon Flat (WF) Jet Stream (JS) Coolant Hole (CH)	Center Cutting	Helix Angle	Flute Index	Coating	Maximum Recommended Ramp Angle °
By Request	SR, WF	Yes	32 / 48	Unequal	Ti-NAMITE-A	90
By Request	SR, WF	Yes	varies	Unequal	Ti-NAMITE-X MEGACOAT NANO	90
By Request	SR, WF, JS	Yes	35 / 38	Unequal	Ti-NAMITE-X	90
By Request	SR, WF	Yes	38 / 41	Unequal	Ti-NAMITE-A	20
By Request	SR	Yes	38	Unequal	Ti-NAMITE-A	1
By Request	SR, WF, CH	No	37	Unequal	Ti-NAMITE-M Ti-NAMITE-A MEGACOAT NANO	7
By Request	SR, WF	Yes	45	Unequal	Ti-NAMITE-A	5
By Request	SR	Yes	41	Unequal	Ti-NAMITE-X	3
In Stock Available	SR	No	37	Unequal	Ti-NAMITE-M Ti-NAMITE-A	1
By Request	SR	No	35	Equal	Ti-NAMITE-X	1
By Request	SR	Yes	varies	Equal	Ti-NAMITE-H	1
Not Available	SR	Yes	35	Unequal	Ti-NAMITE-M	—
Not Available	SR	No	37	Unequal	Ti-NAMITE-M	—
By Request	SR	Yes	30	Equal	Ti-NAMITE-X	25
By Request	SR	Yes	42 / 45	Unequal	Ti-NAMITE-X	2
By Request	SR	Yes	45	Equal	Ti-NAMITE-X	1
By Request	SR, WF	Yes	45	Equal	uncoated or Ti-NAMITE-B	90
By Request	SR	Yes	35	Equal	uncoated or Ti-NAMITE-B	90
In Stock Available	SR	Yes	38	Equal	uncoated or Ti-NAMITE-B	90
Standard	CH	Yes	38	Unequal	Ti-NAMITE-B	90
Standard	CH	Yes	38 / 41	Unequal	Ti-NAMITE-B	90
By Request	CH	Yes	38 / 41	Unequal	Ti-NAMITE-B	25
By Request	SR	Yes	varies	Equal	Ti-NAMITE-B	1
Not Available	SR	Yes	38	Equal	Ti-NAMITE-B	—
Not Available	SR	No	38	Equal	Ti-NAMITE-B	—
By Request	SR	Yes	10, 12	Unequal	uncoated or Di-NAMITE	5
Standard	SR	Based upon end style	15	Equal	uncoated or Di-NAMITE	5 (for end cut styles)
Standard	SR	Based upon end style	15	Equal	uncoated or Di-NAMITE	5 (for end cut styles)
By Request	SR	Yes	30	Equal	uncoated or Di-NAMITE	5
By Request	SR	Yes	35	Equal	various optional	90
By Request	SR	Yes	35	Equal	various optional	—

Application Tips

Tool	• Whenever possible, select an end mill with the largest diameter, shortest flute length, and shortest overall length for the best rigidity • Long flute tools are not intended for pocketing, slotting, or heavy profiling – limit Ae to .02D • High Performance tools minimize cycle time and extend tool life
Tool Holders	• Holders with adequate gripping pressure and TIR are required • Stub holders or zero length collet style holders are recommended for heavy stock removal • When using solid holders, hand ground screw flats are not recommended
Workpiece	• Secure clamping of the workpiece will reduce chatter and deflection
Machine	• Spindle must be in optimum condition for precise TIR and maximum tool life • Sufficient horsepower is required to perform at recommended speeds and feeds • Reduce rates for low power machines to prevent workpiece and / or tool damage
Coolant	• Avoid re-milling chips through use of air blast or liquid coolant as necessary • Maintain clean coolant with appropriate concentration • General recommendations: —Water Soluble Oil or Air Blast: Tool Steels, Mold & Die Steels, Carbon or Alloy Steels —Water Soluble Oil: Stainless Steels, Titanium, High Temperature Alloys, Non-Ferrous Alloys
Methods	• Climb milling is generally preferred • Attention to programming details, tool holders, TIR, balance, fixturing, etc. improve cutting tool performance and extend tool life

END MILLING GUIDELINE

DC = cutting diameter APMX = flute length

Speeds and Feeds for Cut Types are based on Radial Width ($\overline{Ae}$) and Axial Depth ($\overline{Ap}$)

Reductions to Speeds and Feeds may be necessary when:

- Ae and Ap exceed recommendations
- Using long flute or extended reach tools
- Using long tool holders
- Machining materials harder than listed

ENTRY METHODS

Pre-Drilled Hole

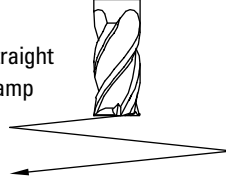


Pre-drilling is the preferred entry method for most applications.

Helical Ramp



Straight Ramp



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

Plunge



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

Herramientas	• Siempre que sea posible, seleccione la herramienta de mayor diámetro y menor longitud total y de filo para obtener una mayor rigidez. • Las herramientas con filos largos no son recomendadas para operaciones de apertura de cajas en el maquinado, operación de ranurado o perfilado pesado – limitar la profundidad radial (Ae) a .02D • Las herramientas de alto desempeño minimizan el tiempo de ciclo del maquinado y extienden la vida útil de la herramienta
Portaherramientas	• Los Portaherramientas deberán tener buena presión de amarre para la sujeción de la herramienta y una concentricidad máxima indicada (TIR) • Se recomienda usar portaherramientas de amarre directo cortos, o de boquilla con longitud cero para lograr un máximo arranque de viruta • Cuando se utilicen portaherramientas de amarre directo, no se recomienda hacer manualmente el plano para la sujeción del tornillo en el zanco de la herramienta
Pieza a maquinar	• La buena sujeción de la pieza a maquinar reducirá la vibración y la desviación de la herramienta
Máquina	• El husillo de la maquina debe estar en condiciones optimas, para asegurar la concentricidad de giro (TIR) y asegurar el máximo rendimiento de la herramienta • Para lograr los avances y velocidades recomendados, se necesita suficiente potencia (HP) en la maquina • Reducir los parámetros de corte en maquinas de baja potencia (HP) para prevenir el daño en la herramienta o pieza de trabajo
Refrigeración	• Evite el re-maquinado de virutas usando aire a presión o líquido refrigeración según sea necesario • Mantener limpio la refrigeración con su concentración adecuada • Recomendaciones generales: –Para el maquinado de aceros de herramienta, para Moldes y Dados o Aleaciones de Bajo Carbón, utilice Aceite Soluble en Agua o aire a presión –Para el maquinado de Aleaciones Inoxidables, Aleaciones Termorresistentes, Titanio y Aleaciones No Ferrosas, utilice solamente Aceite Soluble en Agua
Métodos	• Se recomienda el maquinado en sentido ascendente o trepado • El cuidado en los detalles de la programación, la 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

GUÍAS DE FRESADO

DC = diámetro de corte APMX = largo de filo

Las velocidades y avances para cortes están basados en la profundidad radial ($\overrightarrow{Ae}$), y profundidad axial ($\overrightarrow{Ap}$)

Reducciones en velocidades y avances serán necesarias cuando:

- Ae y Ap exceda las recomendaciones
- Se utilicen filos largos o herramientas de largo alcance
- Se utilicen portaherramientas largos
- Se maquinen materiales más duros que los recomendados

MÉTODOS DE ENTRADA

Barreno previo

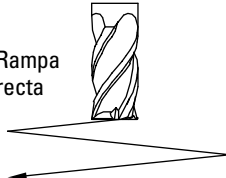


Preferentemente usar un barreno previo como método de entrada para la mayor parte de las aplicaciones.

Rampa helicoidal



Rampa recta



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

Agujero o Barrenado



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

Conseils relatifs à l'application

Outil	• Chaque fois que possible, choisissez une fraise de plus grand diamètre possible, la plus courte possible, elle garantira la meilleure rigidité • Les outils longs ne sont pas optimum pour l'ébauche, le pocketing, le rainurage – Ae limité à 0,02 D • Les outils Haute performance optimisent les temps de cycle et de augmentent la durée de vie
Porte-outils	• Des attachements à serrage puissant et à faux rond précis sont recommandés • Attachements à méplats ou pinces à serrage nominale sont recommandées pour les ébauches • Lorsque vous utilisez des attachement rigides, les serrage de l'outil par vis ne sont pas recommandés
Pièce	• Le système de fixation et de bridage de la pièce devra permettre de réduire les vibrations et la déformation
Machine	• Broche doit être en bon état optimal au niveau de son faux rond • Suffisamment puissance est nécessaire pour effectuer à des vitesses recommandées et se nourrit • Réduire les efforts pour les machines de faible puissance pour éviter l'endommagement de la pièce et / ou de l'outil
Liquide de refroidissement	• Évitez les recyclage de copeaux par l'utilisation de soufflage d'air comprimé ou de liquide de refroidissement. • Maintenir le lubrifiant propre à la concentration appropriée • Recommandations générales – –Huile soluble ou Air comprimé: aciers à outils, aciers pour moules, aciers au carbone ou alliés –Huile soluble: aciers inoxydables, titane, alliages à haute température, alliages non ferreux
Méthodes	• L'usinage en avalant est généralement préconisé • 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

GUIDE DU FRAISAGE

DC = diamètre de coupe APMX = longueur de coupe

Vitesses & avances pour ces cas d'usinage sont basées sur l'engagement radial (A_e), et axial (A_p)

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

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

TYPES D'ENTREE MATIERE

Preperçage

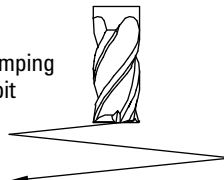


Le préperçage est la méthode préférable dans la plupart de applications.

Ramping hélicoïdal



Ramping droit



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

Plongée



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

Werkzeug	• Wählen Sie möglichst immer den Schafffräser mit dem größten Durchmesser, der kürzesten Schneide und Gesamtlänge, um eine hohe Steifigkeit zu erhalten • Langlochschaftfräser sind nicht zum Taschen-, Schlitz- oder Profilfräsen bestimmt – die Dehnung auf $A_e 0,2$ der Streckgrenze nicht überschreiten • Hochleistungswerkzeuge minimieren die Bearbeitungszeit und verlängern die Werkzeugstandzeit
Werkzeughalter	• Es werden Spannzangen mit genauem Rundlauf benötigt • Steilkegel oder bündige Spannfutter werden bei hohem Materialabtrag empfohlen • Von der Verwendung fester handverschraubter Halterungen wird abgeraten
Werkstück	• Sicheres Werkzeugspannen verringert Vibrationen und das Auswandern aus der Spannvorrichtung
Werkzeugmaschine	• Die Spindel muss in optimalem Zustand sein, um einen genauen Rundlauf und maximale Standzeit zu erzielen • Für die empfohlenen Drehzahlen und Vorschubgeschwindigkeiten ist genügend Leistung bereitzustellen • Bei leistungsschwachen Antrieben sind die Werte zu verringern, um Beschädigungen am Werkstück und/oder Werkzeug zu vermeiden
Kühlmittel	• Das Stauen der Späne durch Luftstrahl oder flüssige Kühlmittel möglichst verhindern • Kühlmittel in geeigneter Konzentration verwenden • Allgemeine Empfehlungen: – Wasser-Öl-Emulsionen oder Luftstrahl: Werkzeugstähle, Form- und Schneidstähle, unlegierte oder legierte Stähle – Wasser-Öl-Emulsion: Nichtrostender Stahl, Titan, Warmfeste Legierungen, Nichteisenlegierungen
Verfahren	• Vorzugsweise Gleichlaufräsen anwenden • Das Beachten der Fräsparemeter, Werkzeughalter, Rundlauf, Auswuchten, Einspannen, usw. verbessert die Schnittleistung und verlängert die Standzeit

RICHTWERTE ZUM FRÄSEN

DC = Fräsdurchmesser APMX = Schnittlänge

Drehzahl und Vorschub für Fräsarbeiten hängen von Radialbreite (A_e) und Frästiefe (A_p) ab

Drehzahl und Vorschub müssen ggfs. verringert werden wenn:

- die empfohlenen Werte für A_e und A_p überschritten werden
- lange Schneiden oder Langschaftfräser verwendet werden
- lange Werkzeughalter verwendet werden
- die Werkstoffe härter als vorgesehen sind

VORBEREITUNGEN

Vorbohrung

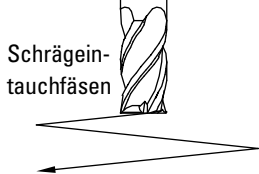


Vorbohren ist in den meisten Fällen ratsam.

Zirkulareintauchfräsen



Schrägeintauchfräsen

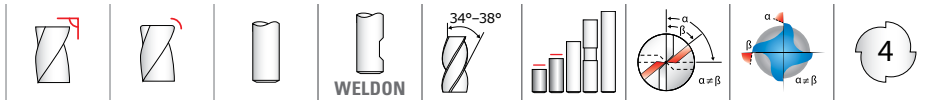


Alternative Verfahren sind Zirkulareintauchen und Schrägeintauchen. Starke Tauchwinkel erfordern verringerte Vorschubgeschwindigkeiten. Geringe Tauchwinkel ermöglichen höhere Vorschubgeschwindigkeiten und verlängern die Standzeit. Verwenden Sie die Drehzahlen und Vorschübe zum Schlitzfräsen für Tauchwinkel von 1° bis 2° . Den Vorschub auf 25 % verringern, wenn der Tauchwinkel 6° erreicht. Standardwerkzeuge und / oder schwer zu bearbeitende Werkstoffe verlangen kleine Tauchwinkel und verringerte Vorschubgeschwindigkeiten.

Stechen

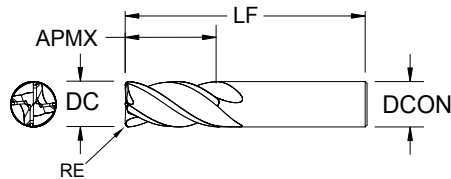


Stechen Sie in Nichteisenmetalle und kurzspanende Werkstoffe nur mit Schlitzfräsdrehzahl und 25 % der Schlitzvorschubgeschwindigkeit ein.



ZR • ZRCR

FRACTIONAL SERIES



- Excels in advanced axial workpiece entry techniques, including plunging, ramping, and helical interpolation
- Variable helix, rake, and flute indexing eliminates harmonics, suppresses chatter, produces ideal chip shape, and controls cutting zone temperature
- End teeth wiper flat increases corner strength and significantly improves workpiece floor surface finish
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials ≤ 45 HRc (≤ 420 Bhn)

inch					EDP NO.			
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	Ti-NAMITE-X (TX)	Ti-NAMITE-X (TX) W/FLAT	MEGACOAT NANO (MN)	MEGACOAT NANO (MN) W/FLAT
1/4	1/2	2-1/2	1/4	—	39802	—	39800	—
1/4	1/2	2-1/2	1/4	0.010	39806	—	39804	—
1/4	1/2	2-1/2	1/4	0.015	39810	—	39808	—
1/4	1/2	2-1/2	1/4	0.020	39814	—	39812	—
1/4	1/2	2-1/2	1/4	0.030	39818	—	39816	—
1/4	3/4	2-1/2	1/4	—	39803	—	39801	—
1/4	3/4	2-1/2	1/4	0.010	39807	—	39805	—
1/4	3/4	2-1/2	1/4	0.015	39811	—	39809	—
1/4	3/4	2-1/2	1/4	0.020	39815	—	39813	—
1/4	3/4	2-1/2	1/4	0.030	39819	—	39817	—
5/16	13/16	2-1/2	5/16	—	39821	—	39820	—
5/16	13/16	2-1/2	5/16	0.015	39823	—	39822	—
5/16	13/16	2-1/2	5/16	0.020	39825	—	39824	—
5/16	13/16	2-1/2	5/16	0.030	39827	—	39826	—
3/8	5/8	2	3/8	0.020	39839	—	39836	—
3/8	7/8	2-1/2	3/8	—	39830	39831	39828	39829
3/8	7/8	2-1/2	3/8	0.010	39833	—	39832	—
3/8	7/8	2-1/2	3/8	0.015	39835	—	39834	—
3/8	7/8	2-1/2	3/8	0.020	39840	39841	39837	39838
3/8	7/8	2-1/2	3/8	0.030	39844	39845	39842	39843
3/8	7/8	2-1/2	3/8	0.060	39848	39849	39846	39847
7/16	1	2-3/4	7/16	—	39851	—	39850	—
7/16	1	2-3/4	7/16	0.020	39853	—	39852	—
1/2	5/8	2-1/2	1/2	0.030	39877	—	39872	—
1/2	1	3	1/2	—	39858	39859	39854	39855
1/2	1	3	1/2	0.010	39864	—	39862	—
1/2	1	3	1/2	0.015	39869	39870	39866	39867
1/2	1	3	1/2	0.030	39878	39879	39873	39874
1/2	1	3	1/2	0.060	39884	—	39882	—
1/2	1-1/4	3-1/4	1/2	—	39860	39861	39856	39857
1/2	1-1/4	3-1/4	1/2	0.010	39865	—	39863	—
1/2	1-1/4	3-1/4	1/2	0.015	39871	—	39868	—
1/2	1-1/4	3-1/4	1/2	0.030	39880	39881	39875	39876
1/2	1-1/4	3-1/4	1/2	0.060	39885	—	39883	—

TOLERANCES (inch)

1/4 DIAMETER

DC = +0.0000/-0.0012

DCON = h_6

RE = +0.0000/-0.0020

>1/4-3/8 DIAMETER

DC = +0.0000/-0.0016

DCON = h_6

RE = +0.0000/-0.0020

>3/8-3/4 DIAMETER

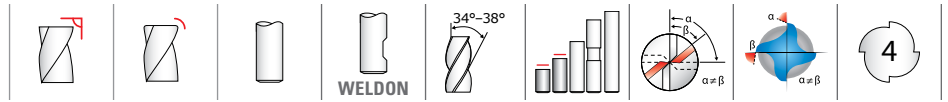
DC = +0.0000/-0.0020

DCON = h_6

RE = +0.0000/-0.0020

STEELS
STAINLESS STEELS
CAST IRON
HIGH TEMP ALLOYS

continued on next page



TOLERANCES (inch)

1/4 DIAMETER

DC = +0.0000/-0.0012

DCON = h_6

RE = +0.0000/-0.0020

>1/4-3/8 DIAMETER

DC = +0.0000/-0.0016

DCON = h_6

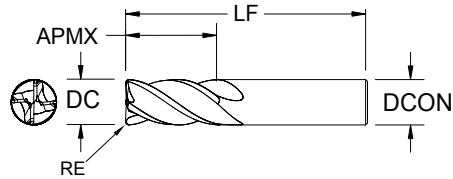
RE = +0.0000/-0.0020

>3/8-3/4 DIAMETER

DC = +0.0000/-0.0020

DCON = h_6

RE = +0.0000/-0.0020



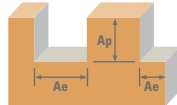
ZR • ZRCR
FRACTIONAL SERIES

CONTINUED

inch					EDP NO.			
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	TI-NAMITE-X (TX)	TI-NAMITE-X (TX) W/FLAT	MEGACOAT NANO (MN)	MEGACOAT NANO (MN) W/FLAT
9/16	1-1/8	3-1/2	9/16	—	39887	—	39886	—
9/16	1-1/8	3-1/2	9/16	0.030	39889	—	39888	—
5/8	1-1/4	3-1/2	5/8	—	39892	39893	39890	39891
5/8	1-1/4	3-1/2	5/8	0.030	39896	39897	39894	39895
5/8	1-1/4	3-1/2	5/8	0.040	39900	39901	39898	39899
5/8	1-1/4	3-1/2	5/8	0.060	39903	—	39902	—
3/4	1-1/2	4	3/4	—	39905	—	39904	—
3/4	1-1/2	4	3/4	0.030	39907	—	39906	—
3/4	1-1/2	4	3/4	0.040	39909	—	39908	—
3/4	1-1/2	4	3/4	0.060	39911	—	39910	—
3/4	1-1/2	4	3/4	0.125	39913	—	39912	—

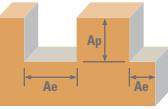
STEELS
STAINLESS STEELS
CAST IRON
HIGH TEMP ALLOYS

Z-Carb-XPR



Series ZR, ZRCR Fractional		Hardness	Ae Ap Ae x DC Ap x DC		Vc (sfm)	DC • in								
						1/4	3/8	1/2	5/8	3/4				
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.25	≤ APMX	675 (540-810)	RPM	10314	6876	5157	4126	3438		
			Slot 	1	≤ 1	450 (360-540)	Fz	0.0017	0.0029	0.0041	0.0045	0.0048		
							Feed (ipm)	70	80	85	73	66		
		Plunge 	1	≤ 1	640 (512-768)	RPM	6876	4584	3438	2750	2292			
						Fz	0.0014	0.0025	0.0035	0.0039	0.0042			
						Feed (ipm)	39	45	48	42	39			
		ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 375 Bhn or ≤ 40 HRc	Profile 	≤ 0.25	≤ APMX	525 (420-630)	RPM	8022	5348	4011	3209	2674	
				Slot 	1	≤ 1	350 (280-420)	Fz	0.0011	0.0024	0.0036	0.0039	0.0042	
								Feed (ipm)	35	50	58	50	45	
	Plunge 		1	≤ 1	500 (400-600)	RPM	5348	3565	2674	2139	1783			
						Fz	0.0010	0.0021	0.0031	0.0034	0.0037			
						Feed (ipm)	21	29	33	29	26			
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2		≤ 375 Bhn or ≤ 40 HRc	Profile 	≤ 0.25	≤ APMX	240 (192-288)	RPM	7640	5093	3820	3056	2547	
				Slot 	1	≤ 0.5	160 (128-192)	Fz	0.0009	0.0019	0.0028	0.0031	0.0033	
								Feed (ipm)	28	38	43	38	34	
		Plunge 	1	≤ 0.5	220 (176-264)	RPM	3667	2445	1834	1467	1222			
						Fz	0.0009	0.0018	0.0026	0.0030	0.0033			
						Feed (ipm)	13	17	19	17	16			
		M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.25	≤ APMX	540 (432-648)	RPM	2445	1630	1222	978	815
					Slot 	1	≤ 1	360 (288-432)	Fz	0.0008	0.0016	0.0023	0.0026	0.0028
									Feed (ipm)	8	10	11	10	9
	Plunge 			1	≤ 1	510 (408-612)	RPM	3362	2241	1681	1345	1121		
							Fz	0.0007	0.0014	0.0021	0.0023	0.0025		
							Feed (ipm)	10	13	14	12	11		
	STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L			≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.25	≤ APMX	375 (300-450)	RPM	8251	5501	4126	3300	2750
					Slot 	1	≤ 0.5	250 (200-300)	Fz	0.0011	0.0022	0.0032	0.0035	0.0038
									Feed (ipm)	36	47	53	46	42
6° Ramp 			1	≤ 0.5	350 (280-420)	RPM	5501	3667	2750	2200	1834			
						Fz	0.0010	0.0019	0.0028	0.0031	0.0033			
						Feed (ipm)	22	28	31	27	24			
STAINLESS STEELS (PH) 13-8 PH, 15-5PH, 17-4 PH, CUSTOM 450			≤ 325 Bhn or ≤ 35 HRc	Profile 	≤ 0.25	≤ APMX	360 (288-432)	RPM	7793	5195	3896	3117	2598	
				Slot 	1	≤ 1	240 (192-288)	Fz	0.0009	0.0017	0.0025	0.0028	0.0030	
								Feed (ipm)	28	36	39	34	31	
	6° Ramp 		1	≤ 1	340 (272-408)	RPM	5730	3820	2865	2292	1910			
						Fz	0.0009	0.0018	0.0026	0.0030	0.0034			
						Feed (ipm)	21	27	30	28	26			

Continued on next page

Series ZR, ZRCR Fractional		Hardness			Vc (sfm)	DC • in								
			Ae x DC	Ap x DC		1/4	3/8	1/2	5/8	3/4				
K	CAST IRONS (LOW & MEDIUM ALLOY) Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	Profile 	≤ 0.25	≤ APMX	630 (504-756)	RPM	9626	6418	4813	3851	3209		
				1	≤ 1	420 (336-504)	Fz	0.0013	0.0023	0.0033	0.0038	0.0042		
							Feed (ipm)	50	59	64	58	54		
							RPM	6418	4278	3209	2567	2139		
				1	≤ 1	600 (480-720)	Fz	0.0011	0.0020	0.0029	0.0033	0.0037		
							Feed (ipm)	28	34	37	34	32		
							RPM	9168	6112	4584	3667	3056		
				1	≤ 1	600 (480-720)	Fz	0.0010	0.0018	0.0026	0.0030	0.0033		
							Feed (ipm)	36	44	48	44	41		
	RPM	5730					3820	2865	2292	1910				
	CAST IRONS (HIGH ALLOY) Gray, Malleable, Ductile	≤ 260 Bhn or ≤ 26 HRc	Profile 	≤ 0.25	≤ APMX	375 (300-450)	Fz	0.0009	0.0018	0.0026	0.0030	0.0034		
				1	≤ 1	250 (200-300)	Feed (ipm)	21	27	30	28	26		
							RPM	3820	2547	1910	1528	1273		
							Fz	0.0008	0.0016	0.0023	0.0026	0.0029		
				1	≤ 1	350 (280-420)	Feed (ipm)	12	16	18	16	15		
							RPM	5348	3565	2674	2139	1783		
							Fz	0.0007	0.0014	0.0021	0.0023	0.0026		
				1	≤ 1	350 (280-420)	Feed (ipm)	15	20	22	20	19		
RPM							1604	1070	802	642	535			
Fz	0.0006	0.0013					0.0019	0.0023	0.0026					
S	SUPER ALLOYS (NICKEL , COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	≤ 300 Bhn or ≤ 32 HRc	Profile 	≤ 0.25	≤ APMX	105 (84-126)	Feed (ipm)	4	5	6	6	6		
				1	≤ 0.375	70 (56-84)	RPM	1070	713	535	428	357		
							Fz	0.0005	0.0011	0.0017	0.0020	0.0022		
							Feed (ipm)	2	3	4	3	3		
				1	≤ 0.5	100 (80-120)	RPM	1528	1019	764	611	509		
							Fz	0.0005	0.0010	0.0015	0.0018	0.0020		
							Feed (ipm)	3	4	5	4	4		
			SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	≤ 400 Bhn or ≤ 43 HRc	Profile 	≤ 0.25	≤ APMX	60 (48-72)	Fz	0.0006	0.0011	0.0016	0.0020	0.0024
						1	≤ 0.375	40 (32-48)	Feed (ipm)	2	3	3	3	3
	RPM	611							407	306	244	204		
	Fz	0.0005							0.0010	0.0014	0.0018	0.0021		
		1			≤ 0.5	50 (40-60)	Feed (ipm)	1	2	2	2	2		
							RPM	764	509	382	306	255		
							Fz	0.0005	0.0009	0.0013	0.0016	0.0019		
		1			≤ 0.5	50 (40-60)	Feed (ipm)	1	2	2	2	2		
							RPM	917	611	458	367	306		
			Fz	0.0006			0.0011	0.0016	0.0020	0.0024				
	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	≤ 350 Bhn or ≤ 38 HRc	Profile 	≤ 0.25	≤ APMX	270 (216-324)	Feed (ipm)	17	20	22	21	20		
			1	≤ 0.5	180 (144-216)	RPM	2750	1834	1375	1100	917			
						Fz	0.0009	0.0017	0.0024	0.0028	0.0031			
						Feed (ipm)	10	12	13	12	11			
			1	≤ 0.5	250 (200-300)	RPM	3820	2547	1910	1528	1273			
						Fz	0.0008	0.0015	0.0022	0.0025	0.0028			
						Feed (ipm)	12	15	17	15	14			
TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al			≤ 440 Bhn or ≤ 47 HRc	Profile 	≤ 0.25	≤ APMX	150 (120-180)	RPM	2292	1528	1146	917	764	
					1	≤ 0.375	100 (80-120)	Fz	0.0009	0.0017	0.0025	0.0030	0.0034	
	Feed (ipm)	8						10	11	11	10			
	RPM	1528						1019	764	611	509			
		1		≤ 0.5	140 (112-168)	Fz	0.0008	0.0015	0.0022	0.0026	0.0030			
						Feed (ipm)	5	6	7	6	6			
						RPM	2139	1426	1070	856	713			
		1		≤ 0.5	140 (112-168)	Feed (ipm)	6	8	9	8	8			
						Fz	0.0007	0.0014	0.0020	0.0023	0.0027			
RPM			2292			1528	1146	917	764					

Bhn (Brinell) HRc (Rockwell C)

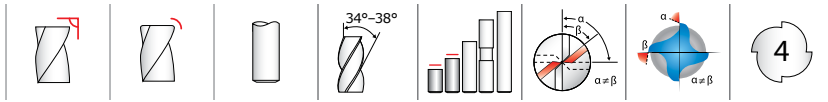
rpm = Vc x 3.82 / DC

ipm = Fz x 4 x rpm

reduce speed and feed for materials harder than listed

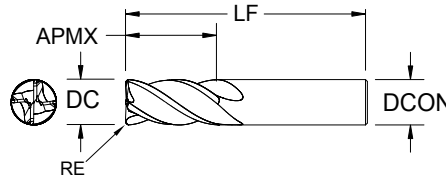
reduce feed and Ae when finish milling (.02 x DC maximum)

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)



ZRM • ZRMCR

METRIC SERIES



- Excels in advanced axial workpiece entry techniques, including plunging, ramping, and helical interpolation
- Variable helix, rake, and flute indexing eliminates harmonics, suppresses chatter, produces ideal chip shape, and controls cutting zone temperature
- End teeth wiper flat increases corner strength and significantly improves workpiece floor surface finish
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials ≤ 45 HRc (≤ 420 Bhn)

inch					EDP NO.	
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	Ti-NAMITE-X (TX)	MEGACOAT NANO (MN)
6,0	13,0	57,0	6,0	—	47801	47800
6,0	13,0	57,0	6,0	0,50	47803	47802
6,0	13,0	57,0	6,0	1,00	47805	47804
8,0	19,0	63,0	8,0	—	47807	47806
8,0	19,0	63,0	8,0	0,50	47809	47808
8,0	19,0	63,0	8,0	1,00	47811	47810
8,0	19,0	63,0	8,0	2,00	47813	47812
10,0	22,0	72,0	10,0	—	47815	47814
10,0	22,0	72,0	10,0	0,50	47817	47816
10,0	22,0	72,0	10,0	1,00	47819	47818
10,0	22,0	72,0	10,0	2,00	47821	47820
12,0	26,0	83,0	12,0	—	47823	47822
12,0	26,0	83,0	12,0	0,50	47825	47824
12,0	26,0	83,0	12,0	0,75	47829	47828
12,0	26,0	83,0	12,0	1,00	47831	47830
14,0	26,0	83,0	14,0	—	47833	47832
14,0	26,0	83,0	14,0	1,00	47835	47834
16,0	32,0	92,0	16,0	—	47837	47836
16,0	32,0	92,0	16,0	1,00	47839	47838
16,0	32,0	92,0	16,0	2,00	47841	47840
16,0	32,0	92,0	16,0	3,00	47843	47842
20,0	38,0	104,0	20,0	—	47845	47844
20,0	38,0	104,0	20,0	1,00	47847	47846

TOLERANCES (mm)

6 DIAMETER

DC = +0,000/-0,030

DCON = h_6

RE = +0,000/-0,050

>6-10 DIAMETER

DC = +0,000/-0,040

DCON = h_6

RE = +0,000/-0,050

>10-25 DIAMETER

DC = +0,000/-0,050

DCON = h_6

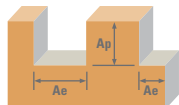
RE = +0,000/-0,050

STEELS

STAINLESS STEELS

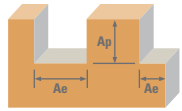
CAST IRON

HIGH TEMP ALLOYS

Series ZRM, ZRMCR Metric		Hardness			Vc (m/min)	DC • mm							
			Ae x DC	Ap x DC		6	8	10	12	16	20		
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.25	≤ APMX	206 (165-247)	RPM	10920	8190	6552	5460	4095	3276
			Fz	0.0464	0.0668	0.0870	0.1071	0.1247	0.1376				
			Feed (mm/min)	2025	2189	2280	2338	2043	1803				
		Slot 	1	≤ 1	137 (110-165)	RPM	7280	5460	4368	3640	2730	2184	
		Fz	0.0365	0.0526	0.0685	0.0843	0.0982	0.1083					
		Feed (mm/min)	1063	1149	1197	1227	1072	946					
		Plunge 	1	≤ 1	195 (156-234)	RPM	10354	7765	6212	5177	3883	3106	
		Fz	0.0334	0.0482	0.0627	0.0772	0.0882	0.0992					
		Feed (mm/min)	1384	1496	1558	1598	1369	1232					
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 375 Bhn or ≤ 40 HRc	Profile 	≤ 0.25	≤ APMX	160 (128-192)	RPM	8493	6370	5096	4247	3185	2548
			Fz	0.0324	0.0518	0.0727	0.0932	0.1096	0.1207				
			Feed (mm/min)	1100	1320	1481	1584	1396	1230				
		Slot 	1	≤ 1	107 (85-128)	RPM	5662	4247	3397	2831	2123	1699	
		Fz	0.0255	0.0408	0.0572	0.0734	0.0863	0.0950					
		Feed (mm/min)	578	693	777	831	733	645					
		Plunge 	1	≤ 1	152 (122-183)	RPM	8089	6067	4853	4044	3033	2427	
		Fz	0.0233	0.0374	0.0524	0.0672	0.0771	0.0870					
		Feed (mm/min)	755	906	1017	1087	935	844					
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 375 Bhn or ≤ 40 HRc	Profile 	≤ 0.25	≤ APMX	73 (59-88)	RPM	3883	2912	2330	1941	1456	1165
			Fz	0.0259	0.0396	0.0541	0.0685	0.0826	0.0935				
			Feed (mm/min)	402	462	504	532	481	436				
		Slot 	1	≤ 0.5	49 (39-59)	RPM	2588	1941	1553	1294	971	777	
		Fz	0.0204	0.0312	0.0426	0.0539	0.0650	0.0736					
		Feed (mm/min)	211	242	265	279	252	229					
		Plunge 	1	≤ 0.5	67 (54-80)	RPM	3559	2669	2135	1780	1335	1068	
		Fz	0.0187	0.0286	0.0390	0.0493	0.0584	0.0674					
		Feed (mm/min)	266	305	333	351	312	288					
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.25	≤ APMX	165 (132-198)	RPM	8736	6552	5242	4368	3276	2621
			Fz	0.0328	0.0488	0.0659	0.0829	0.0981	0.1090				
			Feed (mm/min)	1145	1278	1382	1449	1285	1142				
		Slot 	1	≤ 1	110 (88-132)	RPM	5824	4368	3494	2912	2184	1747	
		Fz	0.0258	0.0384	0.0519	0.0653	0.0772	0.0858					
		Feed (mm/min)	601	671	725	761	674	600					
		Plunge 	1	≤ 1	155 (124-187)	RPM	8251	6188	4950	4125	3094	2475	
		Fz	0.0236	0.0352	0.0475	0.0598	0.0692	0.0786					
		Feed (mm/min)	780	870	941	987	856	778					
	STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.25	≤ APMX	114 (91-137)	RPM	6067	4550	3640	3033	2275	1820
			Fz	0.0255	0.0390	0.0537	0.0683	0.0846	0.0979				
			Feed (mm/min)	620	710	782	829	770	713				
		Slot 	1	≤ 0.5	76 (61-91)	RPM	4044	3033	2427	2022	1517	1213	
		Fz	0.0201	0.0307	0.0423	0.0538	0.0666	0.0771					
		Feed (mm/min)	325	372	411	435	404	374					
		6° Ramp 	1	≤ 0.5	107 (85-128)	RPM	5662	4247	3397	2831	2123	1699	
		Fz	0.0184	0.0281	0.0387	0.0493	0.0599	0.0706					
		Feed (mm/min)	417	477	526	558	509	480					
	STAINLESS STEELS (PH) 13-8 PH, 15-5PH, 17-4 PH, CUSTOM 450	≤ 325 Bhn or ≤ 35 HRc	Profile 	≤ 0.25	≤ APMX	110 (88-132)	RPM	5824	4368	3494	2912	2184	1747
			Fz	0.0254	0.0390	0.0537	0.0683	0.0846	0.0979				
			Feed (mm/min)	592	681	751	796	739	684				
		Slot 	1	≤ 1	73 (59-88)	RPM	3883	2912	2330	1941	1456	1165	
		Fz	0.0200	0.0307	0.0423	0.0538	0.0666	0.0771					
		Feed (mm/min)	311	358	394	418	388	359					
		6° Ramp 	1	≤ 1	104 (83-124)	RPM	5500	4125	3300	2750	2063	1650	
		Fz	0.0183	0.0281	0.0387	0.0493	0.0599	0.0706					
		Feed (mm/min)	403	464	511	542	494	466					

Continued on next page

Z-Carb-XPR



Series ZRM, ZRMCR Metric	Hardness		Ae x DC	Ap x DC	Vc (m/min)	DC • mm									
						6	8	10	12	16	20				
K	CAST IRONS (LOW & MEDIUM ALLOY) Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	Profile 	≤ 0.25	≤ APMX	192 (154-230)	RPM	10192	7644	6115	5096	3822	3058		
			Fz				0.0363	0.0526	0.0699	0.0869	0.1059	0.1218			
			Feed (mm/min)	1481	1608	1709	1771	1619	1490						
			Slot 	1	≤ 1	128 (102-154)	RPM	6795	5096	4077	3397	2548	2038		
			Fz				0.0286	0.0414	0.0550	0.0684	0.0834	0.0959			
			Feed (mm/min)	777	844	897	929	850	782						
		Plunge 	1	≤ 1	183 (146-219)	RPM	9707	7280	5824	4853	3640	2912			
						Fz	0.0262	0.0379	0.0504	0.0626	0.0752	0.0878			
			Feed (mm/min)	1017	1104	1173	1216	1095	1023						
			CAST IRONS (HIGH ALLOY) Gray, Malleable, Ductile	≤ 260 Bhn or ≤ 26 HRc	Profile 	≤ 0.25	≤ APMX	114 (91-137)	RPM	6067	4550	3640	3033	2275	1820
					Fz				0.0255	0.0390	0.0537	0.0683	0.0846	0.0979	
					Feed (mm/min)	620	710	782	829	770	713				
	Slot 	1			≤ 1	76 (61-91)	RPM	4044	3033	2427	2022	1517	1213		
	Fz						0.0201	0.0307	0.0423	0.0538	0.0666	0.0771			
	Feed (mm/min)	325			372	411	435	404	374						
	S	SUPER ALLOYS (NICKEL , COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	≤ 300 Bhn or ≤ 32 HRc	Profile 	≤ 0.25	≤ APMX	32 (26-38)	RPM	1699	1274	1019	849	637	510	
				Fz				0.0174	0.0287	0.0413	0.0536	0.0650	0.0735		
				Feed (mm/min)	118	146	168	182	166	150					
Slot 				1	≤ 0.375	21 (17-26)	RPM	1132	849	679	566	425	340		
Fz							0.0137	0.0226	0.0325	0.0422	0.0512	0.0579			
Feed (mm/min)				62	77	88	96	87	79						
3° Ramp 			1	≤ 0.5	30 (24-37)	RPM	1618	1213	971	809	607	485			
						Fz	0.0125	0.0207	0.0298	0.0386	0.0458	0.0530			
			Feed (mm/min)	81	100	116	125	111	103						
			SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	≤ 400 Bhn or ≤ 43 HRc	Profile 	≤ 0.25	≤ APMX	18 (15-22)	RPM	971	728	582	485	364	291
					Fz				0.0166	0.0271	0.0386	0.0500	0.0611	0.0695	
					Feed (mm/min)	65	79	90	97	89	81				
Slot 		1			≤ 0.375	12 (10-15)	RPM	647	485	388	324	243	194		
Fz							0.0131	0.0213	0.0304	0.0394	0.0481	0.0547			
Feed (mm/min)		34			41	47	51	47	42						
TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si		≤ 350 Bhn or ≤ 38 HRc	3° Ramp 	1	≤ 0.5	15 (12-18)	RPM	809	607	485	404	303	243		
			Fz				0.0120	0.0195	0.0278	0.0361	0.0431	0.0501			
			Feed (mm/min)	39	47	54	58	52	49						
	Profile 		≤ 0.25	≤ APMX	82 (66-99)	RPM	4368	3276	2621	2184	1638	1310			
	Fz					0.0286	0.0429	0.0577	0.0721	0.0894	0.1040				
	Feed (mm/min)		499	563	605	630	586	545							
	TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 440 Bhn or ≤ 47 HRc	Slot 	1	≤ 0.5	55 (44-66)	RPM	2912	2184	1747	1456	1092	874		
			Fz				0.0225	0.0338	0.0454	0.0568	0.0704	0.0819			
			Feed (mm/min)	262	295	317	331	308	286						
			6° Ramp 	1	≤ 0.5	76 (61-91)	RPM	4044	3033	2427	2022	1517	1213		
			Fz				0.0206	0.0309	0.0416	0.0520	0.0635	0.0750			
			Feed (mm/min)	333	375	403	421	385	364						

Bhn (Brinell) HRC (Rockwell C)

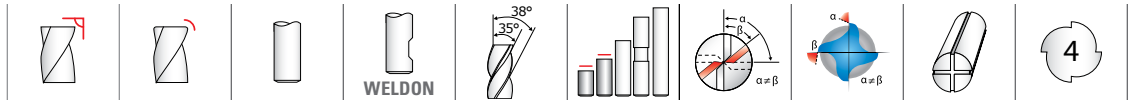
rpm = Vc x 3.82 / DC

ipm = Fz x 4 x rpm

reduce speed and feed for materials harder than listed

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

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)



TOLERANCES (inch)

≤1/8 DIAMETER

DC = +0.0005/-0.0005

DCON = h_8

RE = +0.000/-0.0010

>1/8-1/4 DIAMETER

DC = +0.000/-0.0012

DCON = h_8

RE = +0.000/-0.0020

>1/4-3/8 DIAMETER

DC = +0.000/-0.0016

DCON = h_8

RE = +0.000/-0.0020

>3/8-1 DIAMETER

DC = +0.000/-0.0020

DCON = h_8

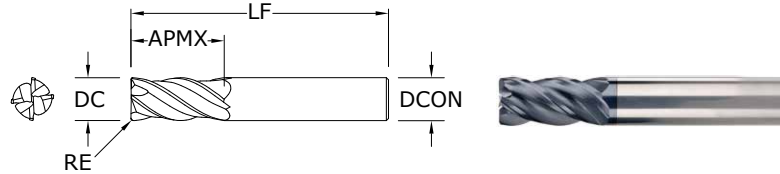
RE = +0.000/-0.0020

STEELS

STAINLESS STEELS

CAST IRON

HIGH TEMP ALLOYS



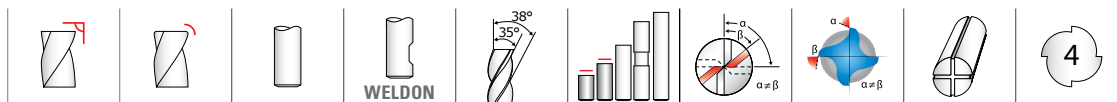
Z1PCR • Z1P
FRACTIONAL SERIES

inch					EDP NO.		
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	Ti-NAMITE-X (TX)	Ti-NAMITE-X (TX) W/FLAT	JetStream
1/64	1/32	1-1/2	1/8	0.002	36874*	—	—
1/32	5/64	1-1/2	1/8	0.005	36875*	—	—
3/64	7/64	1-1/2	1/8	0.005	36876*	—	—
1/16	3/16	1-1/2	1/8	0.005	36872*	—	—
5/64	3/16	1-1/2	1/8	0.005	36877*	—	—
3/32	9/32	1-1/2	1/8	0.010	36873*	—	—
7/64	3/8	1-1/2	1/8	0.010	36878*	—	—
1/8	1/4	1-1/2	1/8	0.015	36505	—	—
1/8	3/8	1-1/2	1/8	—	36404	—	—
1/8	3/8	1-1/2	1/8	0.010	36370	—	—
1/8	3/8	1-1/2	1/8	0.015	36851	—	—
5/32	5/16	2	3/16	0.015	36506	—	—
5/32	7/16	2	3/16	—	36406	—	—
3/16	3/8	2	3/16	0.015	36507	—	—
3/16	7/16	2	3/16	—	36408	—	—
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	—	—
7/32	3/8	2	1/4	0.020	36508	—	—
7/32	7/16	2-1/2	1/4	—	36410	—	—
1/4	7/16	2	1/4	0.020	36509	—	—
1/4	1/2	2-1/2	1/4	—	36416	—	—
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	36853	—	—
1/4	1/2	2-1/2	1/4	0.030	36373	—	—
1/4	3/4	2-1/2	1/4	—	36596	—	—
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	36854	—	—
1/4	3/4	2-1/2	1/4	0.030	36601	—	—
9/32	5/8	2-1/2	5/16	—	36418	—	—

*Variable flute spacing. Helix and rake do not vary.

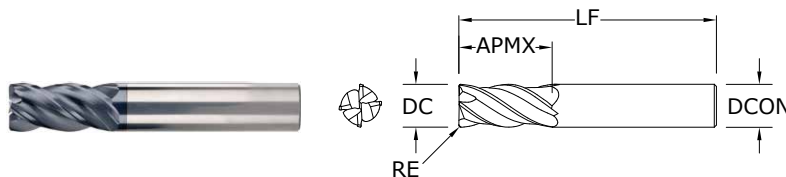
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- Variable rake geometry alters and controls the cutting dynamic taking chatter suppression to an unprecedented level
- Unequal helix design changes the cutting angle to improve harmonics
- Unequal flute spacing helps to disrupt the rhythmic pattern created by the cutting edge helping to suppress damaging harmonics
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials ≤ 45 HRc (≤ 420 Bhn)



Z1PCR • Z1P

FRACTIONAL SERIES



CONTINUED

CUTTING DIAMETER DC	LENGTH OF CUT APMX	inch			EDP NO.		
		OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	Ti-NAMITE-X (TX)	Ti-NAMITE-X (TX) W/FLAT	JetStream
5/16	1/2	2	5/16	0.020	36511	—	—
5/16	13/16	2-1/2	5/16	—	36420	—	—
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	—	—
11/32	13/16	2-1/2	3/8	—	36422	—	—
3/8	5/8	2	3/8	0.020	36513	—	—
3/8	7/8	2-1/2	3/8	—	36424	36530	—
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	—
13/32	15/16	2-3/4	7/16	—	36426	36531	—
7/16	5/8	2-1/2	7/16	0.020	36515	—	—
7/16	1	2-3/4	7/16	—	36428	36532	—
7/16	1	2-3/4	7/16	0.020	36857	36865	—
15/32	1	3	1/2	—	36430	36533	—
1/2	5/8	2-1/2	1/2	0.030	36517	—	—
1/2	1	3	1/2	—	36432	36534	36826
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	—	36597	36598	—
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	—	36436	36535	36827

TOLERANCES (inch)

≤1/8 DIAMETER

DC = +0.0005/−0.0005

DCON = h₆

RE = +0.000/−0.0010

>1/8–1/4 DIAMETER

DC = +0.000/−0.0012

DCON = h₆

RE = +0.000/−0.0020

>1/4–3/8 DIAMETER

DC = +0.000/−0.0016

DCON = h₆

RE = +0.000/−0.0020

>3/8–1 DIAMETER

DC = +0.000/−0.0020

DCON = h₆

RE = +0.000/−0.0020

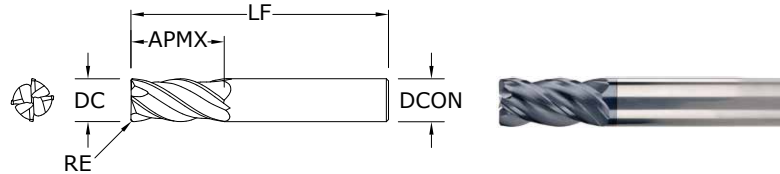
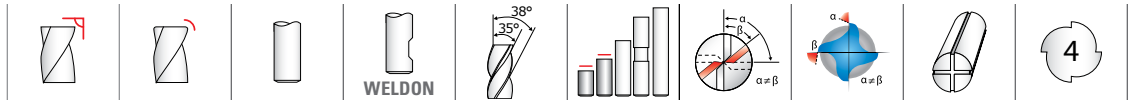
 STEELS

 STAINLESS STEELS

 CAST IRON

 HIGH TEMP ALLOYS

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Z1PCR • Z1P

FRACTIONAL SERIES

TOLERANCES (inch)

≤1/8 DIAMETER

DC = +0.0005/-0.0005

DCON = h_6

RE = +0.000/-0.0010

>1/8-1/4 DIAMETER

DC = +0.000/-0.0012

DCON = h_6

RE = +0.000/-0.0020

>1/4-3/8 DIAMETER

DC = +0.000/-0.0016

DCON = h_6

RE = +0.000/-0.0020

>3/8-1 DIAMETER

DC = +0.000/-0.0020

DCON = h_6

RE = +0.000/-0.0020

STEELS

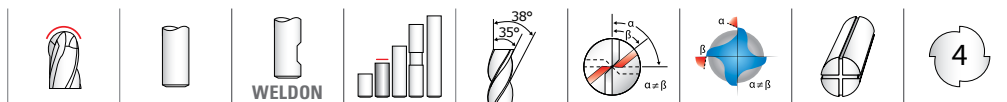
STAINLESS STEELS

CAST IRON

HIGH TEMP ALLOYS

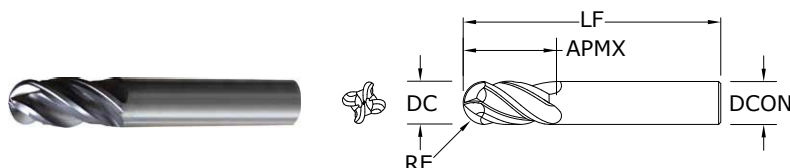
CUTTING DIAMETER DC	LENGTH OF CUT APMX	inch			EDP NO.		
		OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	Ti-NAMITE-X (TX)	Ti-NAMITE-X (TX) W/FLAT	JetStream
9/16	1-1/8	3-1/2	9/16	0.030	36860	36868	36806
5/8	3/4	3	5/8	0.040	36519	—	—
5/8	1-1/4	3-1/2	5/8	—	36440	36536	36828
5/8	1-1/4	3-1/2	5/8	0.030	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	3	3/4	0.040	36520	—	—
3/4	1-1/2	4	3/4	—	36442	36537	36829
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	—	36444	36538	36830
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

- Variable rake geometry alters and controls the cutting dynamic taking chatter suppression to an unprecedented level
- Unequal helix design changes the cutting angle to improve harmonics
- Unequal flute spacing helps to disrupt the rhythmic pattern created by the cutting edge helping to suppress damaging harmonics
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials ≤ 45 HRc (≤ 420 Bhn)



Z1PB

FRACTIONAL SERIES



- Variable rake geometry alters and controls the cutting dynamic taking chatter suppression to an unprecedented level
- Unequal helix design reduces damaging harmonics by changing the angle at which each cutting edge enters and exits the material
- Unequal flute spacing helps to disrupt the rhythmic pattern created by the cutting edge helping to suppress damaging harmonics
- Optimal material removal rates through increased feed and depths of cut
- Ball end design ideal for finishing operations in complex workpieces
- Recommended for materials ≤ 45 HRC (≤ 420 Bhn)

inch				EDP NO.		
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	Ti-NAMITE-X (TX)	Ti-NAMITE-X (TX) 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

RE = 1/2 Cutting Diameter (DC)

TOLERANCES (inch)

1/8–1/4 DIAMETER

DC = +0.0000/–0.0012

DCON = h_6

RE = +0.0000/–0.0006

>1/4–3/8 DIAMETER

DC = +0.0000/–0.0016

DCON = h_6

RE = +0.0000/–0.0008

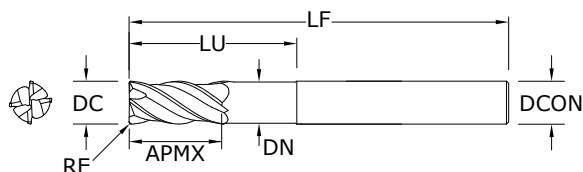
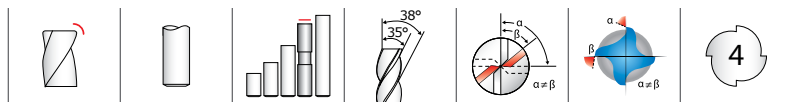
>3/8–1 DIAMETER

DC = +0.0000/–0.0020

DCON = h_6

RE = +0.0000/–0.0010

STEELS
STAINLESS STEELS
CAST IRON
HIGH TEMP ALLOYS



Z1PLC
FRACTIONAL SERIES

TOLERANCES (inch)

1/4 DIAMETER

DC = +0.0000/-0.0012

DCON = h_6

RE = +0.000/-0.005

>1/4-3/8 DIAMETER

DC = +0.0000/-0.0016

DCON = h_6

RE = +0.000/-0.005

>3/8-1 DIAMETER

DC = +0.0000/-0.0020

DCON = h_6

RE = +0.000/-0.005

STEELS

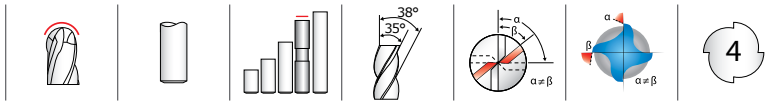
STAINLESS STEELS

CAST IRON

HIGH TEMP ALLOYS

inch							EDP NO.
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	REACH LU	NECK DIAMETER DN	CORNER RADIUS RE	Ti-NAMITE-X (TX)
1/4	1/2	2-1/2	1/4	1-1/8	.230	.020	36447
1/4	1/2	3-1/2	1/4	1-5/8	.230	.020	36448
1/4	1/2	4	1/4	1-1/4	.230	.020	36450
1/4	1/2	4	1/4	2-1/8	.230	.020	36449
5/16	13/16	3	5/16	1-3/8	.293	.020	36453
5/16	13/16	4	5/16	2	.293	.020	36454
5/16	13/16	4	5/16	1-5/8	.293	.020	36452
3/8	7/8	3	3/8	1-5/8	.355	.020	36457
3/8	7/8	5	3/8	1-7/8	.355	.020	36456
3/8	7/8	4	3/8	2-3/8	.355	.020	36458
7/16	1	6	7/16	2	.418	.020	36460
1/2	1	4	1/2	2	.480	.030	36463
1/2	1	5	1/2	3	.480	.030	36464
1/2	1	6	1/2	2-1/4	.480	.030	36462
9/16	1-1/8	6	9/16	2-1/2	.543	.030	36466
5/8	1-1/4	5	5/8	2-1/2	.605	.040	36468
5/8	1-1/4	6	5/8	3-3/4	.605	.040	36469
5/8	1-1/4	6	5/8	3	.605	.040	36470
3/4	1-1/2	6	3/4	3-1/2	.730	.040	36472
1	1-1/2	6	1	3	.980	.040	36475
1	1-1/2	6	1	4	.980	.040	36474

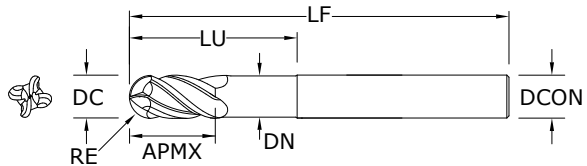
- Variable rake geometry alters and controls the cutting dynamic taking chatter suppression to an unprecedented level
- Unequal helix design changes the cutting angle to improve harmonics
- Unequal flute spacing helps to disrupt the rhythmic pattern created by the cutting edge helping to suppress damaging harmonics
- Long reach design allows for deeper and faster cuts
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials ≤ 45 HRc (≤ 420 Bhn)



Z1PLB

FRACTIONAL SERIES

- Variable rake geometry alters and controls the cutting dynamic taking chatter suppression to an unprecedented level
- Unequal helix design changes the cutting angle to improve harmonics
- Long reach design allows for deeper and faster cuts
- Ball end design ideal for finishing operations in complex workpieces
- Recommended for materials ≤ 45 HRc (≤ 420 Bhn)



CUTTING DIAMETER DC	LENGTH OF CUT APMX	inch		REACH LU	NECK DIAMETER DN	EDP NO.
		OVERALL LENGTH LF	SHANK DIAMETER DCON			Ti-NAMITE-X (TX)
1/4	1/2	4	1/4	1-1/4	.230	36480
5/16	13/16	4	5/16	1-5/8	.293	36482
3/8	7/8	5	3/8	1-7/8	.355	36486
7/16	1	6	7/16	2	.418	38490
1/2	1	6	1/2	2-1/4	.480	38492
9/16	1-1/8	6	9/16	2-1/2	.543	38496
5/8	1-1/4	6	5/8	3	.605	36500
3/4	1-1/2	6	3/4	3-1/2	.730	36502
1	1-1/2	6	1	4	.980	36504

RE = 1/2 Cutting Diameter (DC)

TOLERANCES (inch)

1/4 DIAMETER

DC = $+0.0000/-0.0012$ DCON = h_6 RE = $+0.0000/-0.0006$

>1/4-3/8 DIAMETER

DC = $+0.0000/-0.0016$ DCON = h_6 RE = $+0.0000/-0.0008$

>3/8-1 DIAMETER

DC = $+0.0000/-0.0020$ DCON = h_6 RE = $+0.0000/-0.0010$

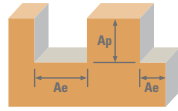
	STEELS
	STAINLESS STEELS
	CAST IRON
	HIGH TEMP ALLOYS

Series Z1P, Z1PCR, Z1PLC, Z1PB, Z1PLB Fractional		Hardness		Ae x DC Ap x DC		Vc (sfm)	DC • in							
							1/64	1/8	1/4	3/8	1/2	5/8	3/4	1
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	Profile 	≤ 0.5	≤ 1.5	555 (444-666)	RPM	135904	16961	8480	5654	4240	3392	2827	2120
						Fz	0.00005	0.00046	0.0012	0.0023	0.0031	0.0034	0.0037	0.0043
						Feed (ipm)	27.2	31.2	40.7	52.0	52.6	46.1	41.8	36.5
		Slot 	1	≤ 1	440 (352-528)	RPM	107744	13446	6723	4482	3362	2689	2241	1681
						Fz	0.00005	0.00046	0.0012	0.0023	0.0031	0.0034	0.0037	0.0043
						Feed (ipm)	21.5	24.7	32.3	41.2	41.7	36.6	33.2	28.9
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	Profile 	≤ 0.5	≤ 1.5	315 (252-378)	RPM	77135	9626	4813	3209	2407	1925	1604	1203
						Fz	0.00004	0.00034	0.0009	0.0017	0.0023	0.0026	0.0028	0.0032
						Feed (ipm)	12.3	13.1	17.3	21.8	22.1	20.0	18.0	15.4
		Slot 	1	≤ 1	250 (200-300)	RPM	61218	7640	3820	2547	1910	1528	1273	955
						Fz	0.00004	0.00034	0.0009	0.0017	0.0023	0.0026	0.0028	0.0032
						Feed (ipm)	9.8	10.4	13.8	17.3	17.6	15.9	14.3	12.2
M	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	Profile 	≤ 0.5	≤ 1.5	185 (148-222)	RPM	45301	5654	2827	1885	1413	1131	942	707
						Fz	0.00003	0.00028	0.0007	0.0014	0.0018	0.0020	0.0022	0.0026
						Feed (ipm)	5.4	6.3	7.9	10.6	10.2	9.0	8.3	7.3
		Slot 	1	≤ 1	145 (116-174)	RPM	35506	4431	2216	1477	1108	886	739	554
						Fz	0.00003	0.00028	0.0007	0.0014	0.0018	0.0020	0.0022	0.0026
						Feed (ipm)	4.3	5.0	6.2	8.3	8.0	7.1	6.5	5.8
	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	Profile 	≤ 0.5	≤ 1.5	490 (392-588)	RPM	119987	14974	7487	4991	3744	2995	2496	1872
						Fz	0.00004	0.00034	0.0009	0.0017	0.0023	0.0026	0.0028	0.0032
						Feed (ipm)	19.2	20.4	27.0	33.9	34.4	31.1	28.0	24.0
		Slot 	1	≤ 1	390 (312-468)	RPM	95500	11918	5959	3973	2980	2384	1986	1490
						Fz	0.00004	0.00034	0.0009	0.0017	0.0023	0.0026	0.0028	0.0032
						Feed (ipm)	15.3	16.2	21.5	27.0	27.4	24.8	22.2	19.1
	STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L	Profile 	≤ 0.5	≤ 1.5	340 (272-408)	RPM	83256	10390	5195	3463	2598	2078	1732	1299
						Fz	0.00003	0.00027	0.0007	0.0014	0.0018	0.0020	0.0022	0.0025
						Feed (ipm)	10.0	11.2	14.5	19.4	18.7	16.6	15.2	13.0
		Slot 	1	≤ 1	270 (216-324)	RPM	66115	8251	4126	2750	2063	1650	1375	1031
						Fz	0.00003	0.00027	0.0007	0.0014	0.0018	0.0020	0.0022	0.0025
						Feed (ipm)	7.9	8.9	11.6	15.4	14.9	13.2	12.1	10.3
	STAINLESS STEELS (PH) 13-8 PH, 15-5 PH, 17-4 PH, Custom 450	Profile 	≤ 0.5	≤ 1.5	310 (248-372)	RPM	75910	9474	4737	3158	2368	1895	1579	1184
						Fz	0.00003	0.00027	0.0007	0.0014	0.0018	0.0020	0.0022	0.0025
						Feed (ipm)	9.1	10.2	13.3	17.7	17.1	15.2	13.9	11.8
		Slot 	1	≤ 1	250 (200-300)	RPM	61218	7640	3820	2547	1910	1528	1273	955
						Fz	0.00003	0.00027	0.0007	0.0014	0.0018	0.0020	0.0022	0.0025
						Feed (ipm)	7.3	8.3	10.7	14.3	13.8	12.2	11.2	9.6

continued on next page

Z-Carb-AP

Series
Z1P, Z1PCR,
Z1PLC, Z1PB,
Z1PLB
Fractional



Z1PLC, Z1PB, Z1PLB					DC • in									
Fractional	Hardness		Ae x DC	Ap x DC	Vc (sfm)		1/64	1/8	1/4	3/8	1/2	5/8	3/4	1
K	CAST IRONS (LOW & MEDIUM ALLOY) Gray, Malleable, Ductile		≤ 0.5	≤ 1.5	445	RPM	108968	13599	6800	4533	3400	2720	2267	1700
					(356-534)	Fz	0.00005	0.00042	0.0011	0.0021	0.0028	0.0031	0.0034	0.0039
						Feed (ipm)	21.8	22.8	29.9	38.1	38.1	33.7	30.8	26.5
			1	≤ 1	355	RPM	86929	10849	5424	3616	2712	2170	1808	1356
					(284-426)	Fz	0.00005	0.00042	0.0011	0.0021	0.0028	0.0031	0.0034	0.0039
						Feed (ipm)	17.4	18.2	23.9	30.4	30.4	26.9	24.6	21.2
	CAST IRONS (HIGH ALLOY) Gray, Malleable, Ductile		≤ 0.5	≤ 1.5	340	RPM	83256	10390	5195	3463	2598	2078	1732	1299
					(272-408)	Fz	0.00004	0.00031	0.0008	0.0016	0.0021	0.0023	0.0025	0.0029
						Feed (ipm)	13.3	12.9	17.5	22.2	21.8	19.1	17.3	15.1
			1	≤ 1	270	RPM	66115	8251	4126	2750	2063	1650	1375	1031
					(216-324)	Fz	0.00004	0.00031	0.0008	0.0016	0.0021	0.0023	0.0025	0.0029
						Feed (ipm)	10.6	10.2	13.9	17.6	17.3	15.2	13.8	12.0
S	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400		≤ 0.5	≤ 1.5	80	RPM	19590	2445	1222	815	611	489	407	306
					(64-96)	Fz	0.00003	0.00025	0.0007	0.0013	0.0017	0.0019	0.0020	0.0024
						Feed (ipm)	2.4	2.4	3.3	4.2	4.2	3.7	3.3	2.9
			1	≤ 1	65	RPM	15917	1986	993	662	497	397	331	248
					(52-78)	Fz	0.00003	0.00025	0.0007	0.0013	0.0017	0.0019	0.0020	0.0024
						Feed (ipm)	1.9	2.0	2.7	3.4	3.4	3.0	2.7	2.4
	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene		≤ 0.5	≤ 1.5	62	RPM	15182	1895	947	632	474	379	316	237
					(50-74)	Fz	0.00002	0.00018	0.0005	0.0009	0.0012	0.0013	0.0014	0.0017
						Feed (ipm)	1.2	1.4	1.8	2.3	2.3	2.0	1.8	1.6
			1	≤ 1	50	RPM	12244	1528	764	509	382	306	255	191
					(40-60)	Fz	0.00002	0.00018	0.0005	0.0009	0.0012	0.0013	0.0014	0.0017
						Feed (ipm)	1.0	1.1	1.5	1.8	1.8	1.6	1.4	1.3
	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si		≤ 0.5	≤ 1.5	215	RPM	52647	6570	3285	2190	1643	1314	1095	821
					(172-258)	Fz	0.00003	0.0003	0.0008	0.0015	0.0020	0.0022	0.0024	0.0028
						Feed (ipm)	6.3	7.9	10.5	13.1	13.1	11.6	10.5	9.2
			1	≤ 1	170	RPM	41628	5195	2598	1732	1299	1039	866	649
					(136-204)	Fz	0.00003	0.0003	0.0008	0.0015	0.0020	0.0022	0.0024	0.0028
						Feed (ipm)	5.0	6.2	8.3	10.4	10.4	9.1	8.3	7.3
TITANIUM ALLOYS (DIFFICULT) Ti10V2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3Cr3Sn3Al		≤ 0.5	≤ 1.5	75	RPM	18365	2292	1146	764	573	458	382	287	
				(60-90)	Fz	0.00003	0.0003	0.0008	0.0015	0.0020	0.0022	0.0024	0.0028	
					Feed (ipm)	2.2	2.8	3.7	4.6	4.6	4.0	3.7	3.2	
		1	≤ 1	60	RPM	14692	1834	917	611	458	367	306	229	
				(48-72)	Fz	0.00003	0.0003	0.0008	0.0015	0.0020	0.0022	0.0024	0.0028	
					Feed (ipm)	1.8	2.2	2.9	3.7	3.7	3.2	2.9	2.6	

Bhn (Brinell) HRc (Rockwell C)

rpm = Vc x 3.82 / DC

ipm = Fz x 4 x rpm

maximum Slotting Ap for Z1PCR <1/8 diameter and all Z1PLC / Z1PLB is .25 x DC

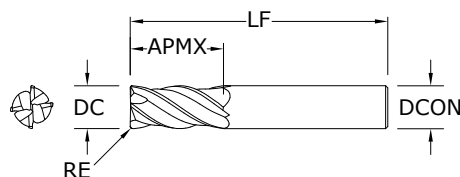
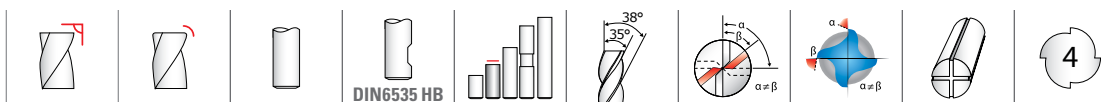
maximum Profile Ae for Z1PCR <1/8 diameter and all Z1PLC / Z1PLB is .20 x DC

reduce speed and feed for materials harder than listed

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

feed rates listed have chip thinning adjustments included where applicable

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)



**Z1MPCR •
Z1MP**
METRIC SERIES

TOLERANCES (mm)

<3 DIAMETER

DC = +0,012/-0,012

DCON = h₆

RE = +0,000/-0,025

>3-6 DIAMETER

DC = +0,000/-0,030

DCON = h₆

RE = +0,000/-0,050

>6-10 DIAMETER

DC = +0,000/-0,040

DCON = h₆

RE = +0,000/-0,050

>10-25 DIAMETER

DC = +0,000/-0,050

DCON = h₆

RE = +0,000/-0,050

STEELS

STAINLESS STEELS

CAST IRON

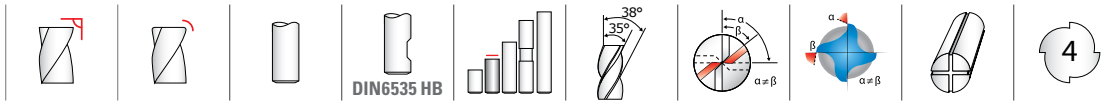
HIGH TEMP ALLOYS

CUTTING DIAMETER DC	LENGTH OF CUT APMX	mm			EDP NO.		
		OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	Ti-NAMITE-X (TX)	Ti-NAMITE-X (TX) W/FLAT	JetStream
1,0	3,0	57,0	6,0	0,1	46873*	—	—
1,5	4,5	57,0	6,0	0,1	46849*	—	—
2,0	6,0	57,0	6,0	0,2	46850*	—	—
2,5	7,0	57,0	6,0	0,2	46874*	—	—
3,0	8,0	57,0	6,0	—	46357	—	—
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	—	46358	—	—
4,0	11,0	57,0	6,0	0,3	46852	—	—
4,0	11,0	57,0	6,0	0,5	46881	—	—
5,0	13,0	57,0	6,0	—	46359	—	—
5,0	13,0	57,0	6,0	0,3	46853	—	—
6,0	13,0	57,0	6,0	—	46360	—	—
6,0	13,0	57,0	6,0	0,25	46882	—	—
6,0	13,0	57,0	6,0	0,5	46854	—	—
6,0	13,0	57,0	6,0	1,0	46855	—	—
6,0	13,0	57,0	6,0	1,5	46884	—	—
8,0	19,0	63,0	8,0	—	46362	—	—
8,0	19,0	63,0	8,0	0,5	46856	—	—
8,0	19,0	63,0	8,0	1,0	46857	—	—
8,0	19,0	63,0	8,0	1,5	46886	—	—
8,0	19,0	63,0	8,0	2,0	46887	—	—
10,0	22,0	72,0	10,0	—	46364	—	—
10,0	22,0	72,0	10,0	0,5	46858	—	—
10,0	22,0	72,0	10,0	1,0	46859	—	—
10,0	22,0	72,0	10,0	1,5	46889	—	—
10,0	22,0	72,0	10,0	2,0	46890	—	—
10,0	22,0	72,0	10,0	2,5	46891	—	—
12,0	26,0	83,0	12,0	—	46366	—	—
12,0	26,0	83,0	12,0	0,5	46860	46909	—
12,0	26,0	83,0	12,0	0,75	46861	46910	46493
12,0	26,0	83,0	12,0	1,0	46893	46911	—

*Variable flute spacing. Helix and rake do not vary.

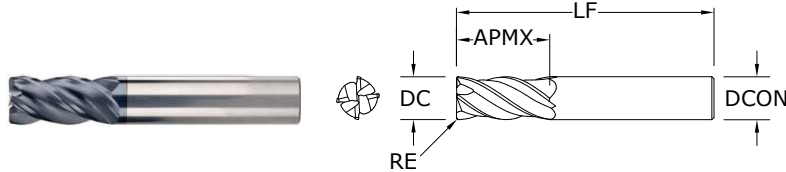
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- Variable rake geometry alters and controls the cutting dynamic taking chatter suppression to an unprecedented level
- Unequal helix design changes the cutting angle to improve harmonics
- Unequal flute spacing helps to disrupt the rhythmic pattern created by the cutting edge helping to suppress damaging harmonics
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials ≤ 45 HRc (≤ 420 Bhn)



Z1MPCR • Z1MP

METRIC SERIES



CONTINUED

CUTTING DIAMETER DC	LENGTH OF CUT APMX	mm			EDP NO.		
		OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	Ti-NAMITE-X (TX)	Ti-NAMITE-X (TX) W/FLAT	JetStream
12,0	26,0	83,0	12,0	1,5	46894	46912	—
12,0	26,0	83,0	12,0	2,0	46895	46913	—
12,0	26,0	83,0	12,0	2,5	46896	46914	—
12,0	26,0	83,0	12,0	3,0	42718	46915	42719
14,0	26,0	83,0	14,0	—	46368	—	46506
14,0	26,0	83,0	14,0	1,0	46862	46916	46494
16,0	32,0	92,0	16,0	—	46370	—	46507
16,0	32,0	92,0	16,0	1,0	46863	46917	46495
16,0	32,0	92,0	16,0	1,5	46898	46918	—
16,0	32,0	92,0	16,0	2,0	46899	46919	—
16,0	32,0	92,0	16,0	2,5	46900	46920	—
16,0	32,0	92,0	16,0	3,0	46864	46921	42721
16,0	32,0	92,0	16,0	4,0	46867	46944	—
18,0	32,0	92,0	18,0	—	46372	—	46508
20,0	38,0	104,0	20,0	—	46374	—	46509
20,0	38,0	104,0	20,0	1,0	46865	46922	46497
20,0	38,0	104,0	20,0	1,5	46903	46923	—
20,0	38,0	104,0	20,0	2,0	46904	46924	—
20,0	38,0	104,0	20,0	2,5	46905	46925	—
20,0	38,0	104,0	20,0	3,0	42722	46926	42723
20,0	38,0	104,0	20,0	4,0	46868	46945	—
20,0	38,0	104,0	20,0	5,0	46869	46946	—
25,0	38,0	104,0	25,0	—	46376	—	46510
25,0	38,0	104,0	25,0	1,0	46866	46927	46498

TOLERANCES (mm)

<3 DIAMETER

DC = +0,012/−0,012

DCON = h₆

RE = +0,000/−0,025

>3–6 DIAMETER

DC = +0,000/−0,030

DCON = h₆

RE = +0,000/−0,050

>6–10 DIAMETER

DC = +0,000/−0,040

DCON = h₆

RE = +0,000/−0,050

>10–25 DIAMETER

DC = +0,000/−0,050

DCON = h₆

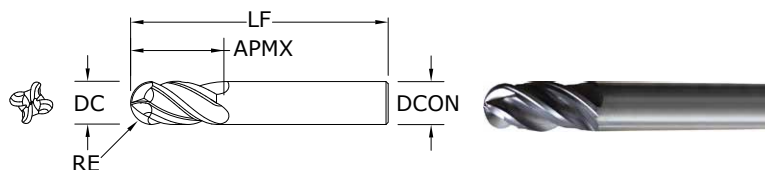
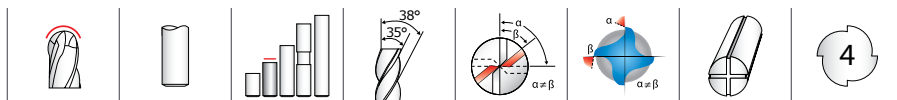
RE = +0,000/−0,050

STEELS

STAINLESS STEELS

CAST IRON

HIGH TEMP ALLOYS



Z1MPB
METRIC SERIES

TOLERANCES (mm)

3–6 DIAMETER

DC = +0,000/–0,030

DCON = h_6

RE = +0,000/–0,015

>6–10 DIAMETER

DC = +0,000/–0,040

DCON = h_6

RE = +0,000/–0,020

>10–25 DIAMETER

DC = +0,000/–0,050

DCON = h_6

RE = +0,000/–0,025

DC = +0,000/–0,050

DCON = h_6

RE = +0,000/–0,050

STEELS

STAINLESS STEELS

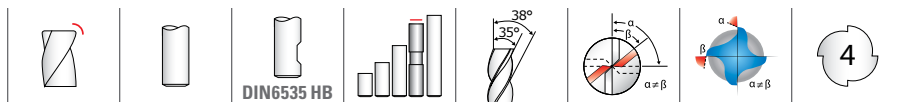
CAST IRON

HIGH TEMP ALLOYS

mm				EDP NO.	
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	Ti-NAMITE-X (TX)	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

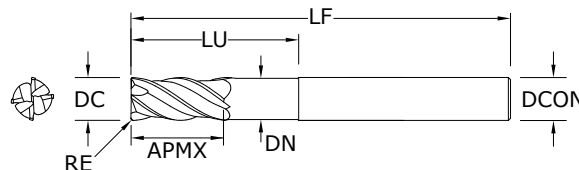
RE = 1/2 Cutting Diameter (DC)

- Variable rake geometry alters and controls the cutting dynamic taking chatter suppression to an unprecedented level
- Unequal helix design reduces damaging harmonics by changing the angle at which each cutting edge enters and exits the material
- Unequal flute spacing helps to disrupt the rhythmic pattern created by the cutting edge helping to suppress damaging harmonics
- Optimal material removal rates through increased feed and depths of cut
- Ball end design ideal for finishing operations in complex workpieces
- Recommended for materials ≤ 45 HRC (≤ 420 Bhn)



Z1MPIC • Z1MPLC

METRIC SERIES



- Variable rake geometry alters and controls the cutting dynamic taking chatter suppression to an unprecedented level
- Unequal helix design changes the cutting angle to improve harmonics
- Unequal flute spacing helps to disrupt the rhythmic pattern created by the cutting edge helping to suppress damaging harmonics
- Long reach design allows for deeper and faster cuts
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials ≤ 45 HRc (≤ 420 Bhn)

CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	mm				EDP NO.	
			SHANK DIAMETER DCON	REACH LU	NECK DIAMETER DN	CORNER RADIUS RE	Ti-NAMITE-X (TX)	Ti-NAMITE-X (TX) W/FLAT
6,0	8,0	75,0	6,0	24,0	5,49	0,5	46821	—
8,0	10,0	75,0	8,0	32,0	7,49	1,0	46822	—
8,0	10,0	75,0	8,0	32,0	7,49	2,0	46823	—
10,0	12,0	100,0	10,0	40,0	9,50	1,0	46824	—
10,0	12,0	100,0	10,0	40,0	9,50	2,0	46825	—
12,0	15,0	100,0	12,0	48,0	11,48	1,0	46826	46928
12,0	15,0	100,0	12,0	48,0	11,48	1,5	46827	46929
12,0	15,0	100,0	12,0	48,0	11,48	2,0	46828	46930
12,0	15,0	100,0	12,0	48,0	11,48	3,0	46829	46931
12,0	26,0	83,0	12,0	36,0	11,48	2,5	—	42731
12,0	26,0	83,0	12,0	36,0	11,48	3,0	—	42732
12,0	26,0	83,0	12,0	36,0	11,48	4,0	—	42733
16,0	32,0	92,0	16,0	42,0	15,49	2,5	—	42734
16,0	32,0	92,0	16,0	42,0	15,49	4,0	—	42735
16,0	32,0	92,0	16,0	42,0	15,49	6,0	—	42736
16,0	20,0	115,0	16,0	65,0	15,49	1,0	46830	46932
16,0	20,0	115,0	16,0	65,0	15,49	1,5	46831	46933
16,0	20,0	115,0	16,0	65,0	15,49	2,0	46832	46934
16,0	20,0	115,0	16,0	65,0	15,49	3,0	46833	46935
16,0	20,0	115,0	16,0	65,0	15,49	4,0	46834	46936
16,0	20,0	115,0	16,0	65,0	15,49	5,0	46835	46937
20,0	24,0	140,0	20,0	80,0	19,48	1,0	46836	46938
20,0	24,0	140,0	20,0	80,0	19,48	1,5	46837	46939
20,0	24,0	140,0	20,0	80,0	19,48	2,0	46838	46940
20,0	24,0	140,0	20,0	80,0	19,48	3,0	46839	46941
20,0	24,0	140,0	20,0	80,0	19,48	4,0	46840	46942
20,0	24,0	140,0	20,0	80,0	19,48	5,0	46841	46943
20,0	38,0	104,0	20,0	52,0	19,48	2,5	—	42737
20,0	38,0	104,0	20,0	52,0	19,48	4,0	—	42738
20,0	38,0	104,0	20,0	52,0	19,48	6,0	—	42739

TOLERANCES (mm)

6 DIAMETER

DC = $+0,000/-0,030$ DCON = h_6 RE = $+0,000/-0,050$

>6–10 DIAMETER

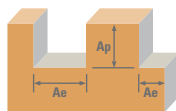
DC = $+0,000/-0,040$ DCON = h_6 RE = $+0,000/-0,050$

>10–20 DIAMETER

DC = $+0,000/-0,050$ DCON = h_6 RE = $+0,000/-0,050$

	STEELS
	STAINLESS STEELS
	CAST IRON
	HIGH TEMP ALLOYS

Series
Z1MP, Z1MPB,
Z1MPCR, Z1MPIC,
Z1MPLC
Metric

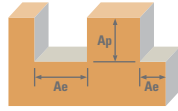


Z1MPCR, Z1MPIC, Z1MPLC Metric		Hardness	Ae Ap		Vc (m/min)		DC • mm									
			Ae x DC	Ap x DC			1	3	6	8	10	12	16	20	25	
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 275 Bhn or ≤ 28 HRc	Profile	≤ 0.5	≤ 1.5	169	RPM	53803	17934	8967	6725	5380	4484	3363	2690	2152
						(135-203)	Fz	0.0030	0.0109	0.029	0.049	0.061	0.074	0.087	0.099	0.108
							Feed (mm/min)	646	782	1040	1318	1313	1327	1170	1065	930
			134	RPM	42654	14218	7109	5332	4265	3555	2666	2133	1706			
				(107-161)	Fz	0.0030	0.0109	0.029	0.049	0.061	0.074	0.087	0.099	0.108		
					Feed (mm/min)	512	620	825	1045	1041	1052	928	845	737		
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 375 Bhn or ≤ 40 HRc	Profile	≤ 0.5	≤ 1.5	96	RPM	30537	10179	5089	3817	3054	2545	1909	1527	1221
						(77-115)	Fz	0.0023	0.0081	0.022	0.036	0.045	0.055	0.067	0.075	0.080
							Feed (mm/min)	281	330	448	550	550	560	511	458	391
			76	RPM	24235	8078	4039	3029	2424	2020	1515	1212	969			
				(61-91)	Fz	0.0023	0.0081	0.022	0.036	0.045	0.055	0.067	0.075	0.080		
					Feed (mm/min)	223	262	355	436	436	444	406	364	310		
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 375 Bhn or ≤ 40 HRc	Profile	≤ 0.5	≤ 1.5	56	RPM	17934	5978	2989	2242	1793	1495	1121	897	717
						(45-68)	Fz	0.0018	0.0066	0.017	0.030	0.037	0.043	0.051	0.059	0.065
							Feed (mm/min)	129	158	203	269	265	257	229	212	187
			44	RPM	14057	4686	2343	1757	1406	1171	879	703	562			
				(35-53)	Fz	0.0018	0.0066	0.017	0.030	0.037	0.043	0.051	0.059	0.065		
					Feed (mm/min)	101	124	159	211	208	201	179	166	146		
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 275 Bhn or ≤ 28 HRc	Profile	≤ 0.5	≤ 1.5	149	RPM	47501	15834	7917	5938	4750	3958	2969	2375	1900
						(119-179)	Fz	0.0023	0.0081	0.022	0.036	0.045	0.055	0.067	0.075	0.080
							Feed (mm/min)	437	513	697	855	855	871	796	713	608
			119	RPM	37807	12602	6301	4726	3781	3151	2363	1890	1512			
				(95-143)	Fz	0.0023	0.0081	0.022	0.036	0.045	0.055	0.067	0.075	0.080		
					Feed (mm/min)	348	408	555	681	681	693	633	567	484		
	STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L	≤ 275 Bhn or ≤ 28 HRc	Profile	≤ 0.5	≤ 1.5	104	RPM	32960	10987	5493	4120	3296	2747	2060	1648	1318
						(83-124)	Fz	0.0018	0.0064	0.017	0.030	0.037	0.043	0.051	0.059	0.063
							Feed (mm/min)	237	281	374	494	488	472	420	389	332
			82	RPM	26174	8725	4362	3272	2617	2181	1636	1309	1047			
				(66-99)	Fz	0.0018	0.0064	0.017	0.030	0.037	0.043	0.051	0.059	0.063		
					Feed (mm/min)	188	223	297	393	387	375	334	309	264		
	STAINLESS STEELS (PH) 13-8 PH, 15-5 PH, 17-4 PH, Custom 450	≤ 325 Bhn or ≤ 35 HRc	Profile	≤ 0.5	≤ 1.5	94	RPM	30052	10017	5009	3756	3005	2504	1878	1503	1202
						(76-113)	Fz	0.0018	0.0064	0.017	0.030	0.037	0.043	0.051	0.059	0.063
							Feed (mm/min)	216	256	341	451	445	431	383	355	303
			76	RPM	24235	8078	4039	3029	2424	2020	1515	1212	969			
				(61-91)	Fz	0.0018	0.0064	0.017	0.030	0.037	0.043	0.051	0.059	0.063		
					Feed (mm/min)	174	207	275	364	359	347	309	286	244		

continued on next page

Z-Carb-AP

Series
Z1MP, Z1MPB,
Z1MPCR, Z1MPIC,
Z1MPLC



Z1MPCR, Z1MPIC, Z1MPLC					Vc		DC • mm									
Metric	Hardness	Ae x DC	Ap x DC	(m/min)		1	3	6	8	10	12	16	20	25		
K	CAST IRONS (LOW & MEDIUM ALLOY) Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	Profile 	≤ 0.5	≤ 1.5	136	RPM	43139	14380	7190	5392	4314	3595	2696	2157	1726
						(109-163)	Fz	0.0028	0.0099	0.026	0.045	0.056	0.067	0.079	0.091	0.098
						Feed (mm/min)	483	569	748	971	966	963	852	785	676	
		≤ 260 Bhn or ≤ 26 HRc	Slot 	1	≤ 1	108	RPM	34414	11471	5736	4302	3441	2868	2151	1721	1377
						(87-130)	Fz	0.0028	0.0099	0.026	0.045	0.056	0.067	0.079	0.091	0.098
						Feed (mm/min)	385	454	597	774	771	769	680	626	540	
	CAST IRONS (HIGH ALLOY) Gray, Malleable, Ductile	≤ 260 Bhn or ≤ 26 HRc	Profile 	≤ 0.5	≤ 1.5	104	RPM	32960	10987	5493	4120	3296	2747	2060	1648	1318
						(83-124)	Fz	0.0020	0.0074	0.020	0.034	0.043	0.050	0.059	0.067	0.074
						Feed (mm/min)	264	325	439	560	567	549	486	442	390	
		≤ 400 Bhn or ≤ 43 HRc	Slot 	1	≤ 1	82	RPM	26174	8725	4362	3272	2617	2181	1636	1309	1047
						(66-99)	Fz	0.0020	0.0074	0.020	0.034	0.043	0.050	0.059	0.067	0.074
						Feed (mm/min)	209	258	349	445	450	436	386	351	310	
S	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	≤ 300 Bhn or ≤ 32 HRc	Profile 	≤ 0.5	≤ 1.5	24	RPM	7755	2585	1293	969	776	646	485	388	310
						(20-29)	Fz	0.0018	0.0061	0.016	0.027	0.034	0.041	0.048	0.053	0.060
						Feed (mm/min)	56	63	83	105	105	106	93	82	74	
		≤ 400 Bhn or ≤ 43 HRc	Slot 	1	≤ 1	20	RPM	6301	2100	1050	788	630	525	394	315	252
						(16-24)	Fz	0.0018	0.0061	0.016	0.027	0.034	0.041	0.048	0.053	0.060
						Feed (mm/min)	45	51	67	85	86	86	76	67	60	
	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	≤ 400 Bhn or ≤ 43 HRc	Profile 	≤ 0.5	≤ 1.5	19	RPM	6010	2003	1002	751	601	501	376	301	240
						(15-23)	Fz	0.0013	0.0043	0.011	0.019	0.024	0.028	0.033	0.037	0.042
						Feed (mm/min)	31	34	44	57	58	56	50	44	40	
		≤ 350 Bhn or ≤ 38 HRc	Slot 	1	≤ 1	15	RPM	4847	1616	808	606	485	404	303	242	194
						(12-18)	Fz	0.0013	0.0043	0.011	0.019	0.024	0.028	0.033	0.037	0.042
						Feed (mm/min)	25	28	36	46	47	45	40	36	33	
	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	≤ 350 Bhn or ≤ 38 HRc	Profile 	≤ 0.5	≤ 1.5	66	RPM	20842	6947	3474	2605	2084	1737	1303	1042	834
						(52-79)	Fz	0.0020	0.0071	0.019	0.032	0.040	0.048	0.056	0.064	0.070
						Feed (mm/min)	167	197	264	333	333	333	292	267	233	
		≤ 420 Bhn or ≤ 45 HRc	Slot 	1	≤ 1	52	RPM	16480	5493	2747	2060	1648	1373	1030	824	659
						(41-62)	Fz	0.0020	0.0071	0.019	0.032	0.040	0.048	0.056	0.064	0.070
						Feed (mm/min)	132	156	209	264	264	264	231	211	185	
	TITANIUM ALLOYS (DIFFICULT) Ti10V2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 420 Bhn or ≤ 45 HRc	Profile 	≤ 0.5	≤ 1.5	23	RPM	7271	2424	1212	909	727	606	454	364	291
						(18-27)	Fz	0.0020	0.0071	0.019	0.032	0.040	0.048	0.056	0.064	0.070
						Feed (mm/min)	58	69	92	116	116	116	102	93	81	
		≤ 420 Bhn or ≤ 45 HRc	Slot 	1	≤ 1	18	RPM	5816	1939	969	727	582	485	364	291	233
						(15-22)	Fz	0.0020	0.0071	0.019	0.032	0.040	0.048	0.056	0.064	0.070
						Feed (mm/min)	47	55	74	93	93	93	81	74	65	

Bhn (Brinell) HRc (Rockwell C)

rpm = (Vc x 1000) / (DC x 3.14)

mm/min = Fz x 4 x rpm

maximum Slotting Ap for Z1PCR <3mm diameter and all Z1MPLC / Z1MPLB is .25 x DC

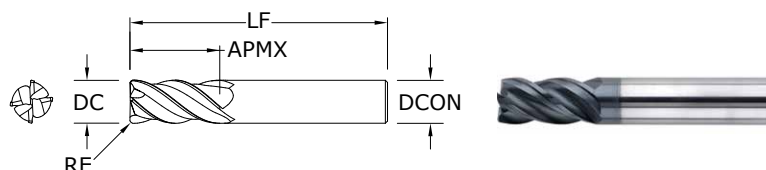
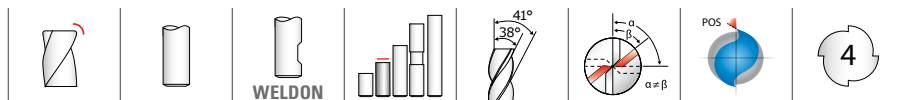
maximum Profile Ae for Z1PCR <3mm diameter and all Z1MPLC / Z1MPLB is .20 x DC

reduce speed and feed for materials harder than listed

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

feed rates listed have chip thinning adjustments included where applicable

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)



ZH1CR
FRACTIONAL SERIES

TOLERANCES (inch)

1/4 DIAMETER

DC = +0.0000/-0.0012

DCON = h_6

RE = +0.0000/-0.0020

>1/4-3/8 DIAMETER

DC = +0.0000/-0.0016

DCON = h_6

RE = +0.0000/-0.0020

>3/8-1 DIAMETER

DC = +0.0000/-0.0020

DCON = h_6

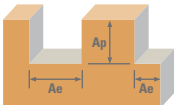
RE = +0.0000/-0.0020

HIGH TEMP ALLOYS

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

- The original Z-Carb design with an enhanced core and higher helix suited for the demands of high temperature alloys
- Unequal flute spacing helps to disrupt the rhythmic pattern created by the cutting edge helping to suppress damaging harmonics
- Optimal material removal rates through increased feed and depths of cut for difficult to machine materials
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials ≤ 45 HRc (≤ 420 Bhn)

Z-Carb-HTA

Series ZH1CR Fractional	Hardness			Vc (sfm)	Diameter (DC) (inch)							
		Ae x DC	Ap x DC		1/4	3/8	1/2	3/4	1			
HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	≤ 300 Bhn or ≤ 32 HRC		≤ 0.5	≤ 1.5	85	RPM	1299	866	649	433	325	
					(68-102)	Fz	0.0007	0.0012	0.0017	0.0020	0.0023	
						Feed (ipm)	3.6	4.2	4.4	3.5	3.0	
			1	≤ 1	70	RPM	1070	713	535	357	267	
					(56-84)	Fz	0.0007	0.0012	0.0017	0.0020	0.0023	
						Feed (ipm)	3.0	3.4	3.6	2.9	2.5	
	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	≤ 400 Bhn or ≤ 43 HRC		≤ 0.5	≤ 1.5	70	RPM	1070	713	535	357	267
						(56-84)	Fz	0.0005	0.0009	0.0012	0.0014	0.0016
							Feed (ipm)	2.1	2.6	2.6	2.0	1.7
				1	≤ 1	55	RPM	840	560	420	280	210
						(44-66)	Fz	0.0005	0.0009	0.0012	0.0014	0.0016
							Feed (ipm)	1.7	2.0	2.0	1.6	1.3
TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si		≤ 350 Bhn or ≤ 38 HRC		≤ 0.5	≤ 1.5	215	RPM	3285	2190	1643	1095	821
						(172-258)	Fz	0.0008	0.0015	0.0020	0.0024	0.0028
							Feed (ipm)	10.5	13.1	13.1	10.5	9.2
				1	≤ 1	170	RPM	2598	1732	1299	866	649
						(136-204)	Fz	0.0008	0.0015	0.0020	0.0024	0.0028
							Feed (ipm)	8.3	10.4	10.4	8.3	7.3
	TITANIUM ALLOYS (DIFFICULT) Ti10V2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 420 Bhn or ≤ 45 HRC		≤ 0.5	≤ 1.5	75	RPM	1146	764	573	382	287
						(60-90)	Fz	0.0008	0.0015	0.0020	0.0024	0.0028
							Feed (ipm)	3.7	4.6	4.6	3.7	3.2
				1	≤ 1	60	RPM	917	611	458	306	229
						(48-72)	Fz	0.0008	0.0015	0.0020	0.0024	0.0028
							Feed (ipm)	2.9	3.7	3.7	2.9	2.6

Bhn (Brinell) HRc (Rockwell C)

rpm = Vc x 3.82 / DC

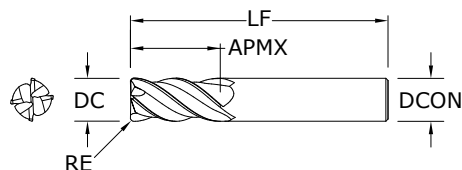
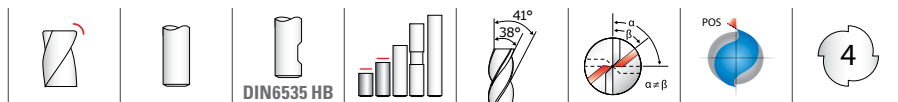
ipm = Fz x 4 x rpm

reduce speed and feed for materials harder than listed

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

feed rates listed have chip thinning adjustments included where applicable

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)



ZH1MCRS •
ZH1MCR
METRIC SERIES

TOLERANCES (mm)

6 DIAMETER

DC = +0,000/-0,030

DCON = h_6

RE = +0,000/-0,050

>6-10 DIAMETER

DC = +0,000/-0,040

DCON = h_6

RE = +0,000/-0,050

>10-20 DIAMETER

DC = +0,000/-0,050

DCON = h_6

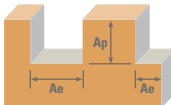
RE = +0,000/-0,050

HIGH TEMP ALLOYS

mm					EDP NO.	
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	Ti-NAMITE-A (AlTiN)	Ti-NAMITE-A (AlTiN) W/FLAT
6,0	10,0	54,0	6,0	0,5	42712	—
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	12,0	58,0	8,0	0,5	42713	—
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	14,0	66,0	10,0	0,5	42714	—
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	16,0	73,0	12,0	0,7	42715	—
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	22,0	82,0	16,0	1,0	42716	—
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
16,0	32,0	92,0	16,0	4,0	46482	46483
20,0	26,0	92,0	20,0	1,0	42717	—
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

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- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials ≤ 45 HRc (≤ 420 Bhn)

Z-Carb-HTA

Series ZH1MCRS, ZH1MCR Metric	Hardness			Vc (m/min)	DC • mm					
		Ae x DC	Ap x DC		6	10	12	20		
S	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	 Profile	≤ 0.5	≤ 1.5	26	RPM	1373	824	687	412
					(21-31)	Fz	0.017	0.032	0.041	0.053
						Feed (mm/min)	93	105	113	87
		 Slot	1	≤ 1	21	RPM	1131	679	565	339
					(17-26)	Fz	0.017	0.032	0.041	0.053
						Feed (mm/min)	77	87	93	72
	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	 Profile	≤ 0.5	≤ 1.5	21	RPM	1131	679	565	339
					(17-26)	Fz	0.012	0.024	0.029	0.037
						Feed (mm/min)	54	65	66	50
		 Slot	1	≤ 1	17	RPM	889	533	444	267
					(13-20)	Fz	0.012	0.024	0.029	0.037
						Feed (mm/min)	43	51	52	39
	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	 Profile	≤ 0.5	≤ 1.5	66	RPM	3474	2084	1737	1042
					(52-79)	Fz	0.019	0.041	0.049	0.057
						Feed (mm/min)	264	342	340	238
		 Slot	1	≤ 1	52	RPM	2747	1648	1373	824
					(41-62)	Fz	0.019	0.041	0.049	0.057
						Feed (mm/min)	209	270	269	188
TITANIUM ALLOYS (DIFFICULT) Ti10V2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	 Profile	≤ 0.5	≤ 1.5	23	RPM	1212	727	606	364	
				(18-27)	Fz	0.019	0.041	0.049	0.057	
					Feed (mm/min)	92	119	119	83	
	 Slot	1	≤ 1	18	RPM	969	582	485	291	
				(15-22)	Fz	0.019	0.041	0.049	0.057	
					Feed (mm/min)	74	95	95	66	

Bhn (Brinell) HRc (Rockwell C)

rpm = (Vc x 1000) / (DC x 3.14)

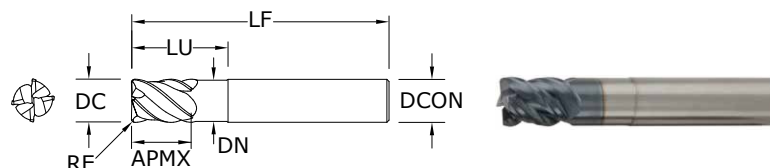
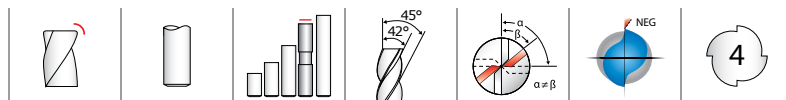
ipm = Fz x 4 x rpm

reduce speed and feed for materials harder than listed

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

feed rates listed have chip thinning adjustments included where applicable

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)



ZD1CR
FRACTIONAL SERIES

TOLERANCES (inch)

1/8-1/4 DIAMETER

DC = +0.0000/-0.0012

DCON = h_6

RE = +0.0000/-0.0020

>1/4-3/8 DIAMETER

DC = +0.0000/-0.0016

DCON = h_6

RE = +0.0000/-0.0020

>3/8-3/4 DIAMETER

DC = +0.0000/-0.0020

DCON = h_6

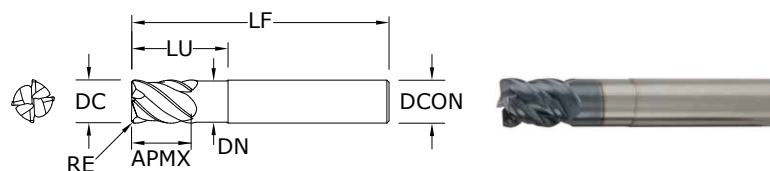
RE = +0.0000/-0.0020

STEELS

HARDENED STEELS

			inch				CORNER RADIUS RE	EDP NO.
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	REACH LU	NECK DIAMETER DN		Ti-NAMITE-X (TX)	
1/8	5/32	2-1/2	1/4	1/2	.110	.010	36780	
3/16	7/32	2-1/2	1/4	3/4	.172	.020	36781	
1/4	9/32	2-1/2	1/4	3/4	.235	.020	36782	
5/16	13/32	2-1/2	5/16	1	.297	.040	36783	
3/8	15/32	2-1/2	3/8	1	.360	.040	36784	
7/16	9/16	2-3/4	7/16	1	.422	.040	36785	
1/2	5/8	3	1/2	1-1/4	.485	.040	36786	
1/2	5/8	4-1/2	1/2	2-1/4	.485	.040	36787	
5/8	3/4	3-1/2	5/8	1-1/2	.610	.040	36788	
5/8	3/4	4-1/2	5/8	2-1/4	.610	.040	36789	
5/8	3/4	5-1/2	5/8	3-1/4	.610	.040	36790	
3/4	15/16	4	3/4	1-3/4	.735	.060	36791	
3/4	15/16	4-1/2	3/4	2-1/4	.735	.060	36792	
3/4	15/16	5-1/2	3/4	3-1/4	.735	.060	36793	

- The original Z-Carb design with negative rake, heavy core, and higher helix for strength and shearing of hard mold & die materials
- Unequal flute spacing helps to disrupt the rhythmic pattern created by the cutting edge helping to suppress damaging harmonics
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials 35-60HRC (327 to 654 Bhn)



ZD1MCR
METRIC SERIES

TOLERANCES (mm)

3-6 DIAMETER

DC = +0,000/-0,030

DCON = h_6

RE = +0,000/-0,050

>6-10 DIAMETER

DC = +0,000/-0,040

DCON = h_6

RE = +0,000/-0,050

>10-20 DIAMETER

DC = +0,000/-0,050

DCON = h_6

RE = +0,000/-0,050

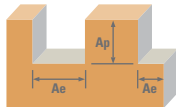
STEELS

HARDENED STEELS

			mm				CORNER RADIUS RE	EDP NO.
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	REACH LU	NECK DIAMETER DN		Ti-NAMITE-X (TX)	
3,0	4,0	57,0	6,0	15,0	2,62	0,2	46560	
4,0	5,0	57,0	6,0	15,0	3,61	0,3	46561	
5,0	6,0	57,0	6,0	15,0	4,60	0,5	46562	
6,0	7,0	57,0	6,0	15,0	5,61	1,0	46563	
8,0	10,0	63,0	8,0	25,0	7,62	1,0	46564	
10,0	12,0	72,0	10,0	30,0	9,60	1,0	46565	
12,0	15,0	83,0	12,0	35,0	11,61	1,0	46566	
16,0	20,0	92,0	16,0	45,0	15,60	1,5	46567	
20,0	24,0	104,0	20,0	55,0	19,61	2,0	46568	

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- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials 35-60HRC (327 to 654 Bhn)

Z-Carb-MD



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

Bhn (Brinell) HRc (Rockwell C)

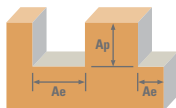
rpm = Vc x 3.82 / DC

ipm = Fz x 4 x rpm

reduce speed and feed for materials harder than listed

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

feed rates listed have chip thinning adjustments included where applicable

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)

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

Bhn (Brinell) HRc (Rockwell C)

rpm = (Vc x 1000) / (DC x 3.14)

ipm = Fz x 4 x rpm

reduce speed and feed for materials harder than listed

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

feed rates listed have chip thinning adjustments included where applicable

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)

TOLERANCES (inch)

1/8–1/4 DIAMETER

DC = +0.0000/–0.0012

DCON = h_6

RE = +0.0000/–0.0020

>1/4–3/8 DIAMETER

DC = +0.0000/–0.0016

DCON = h_6

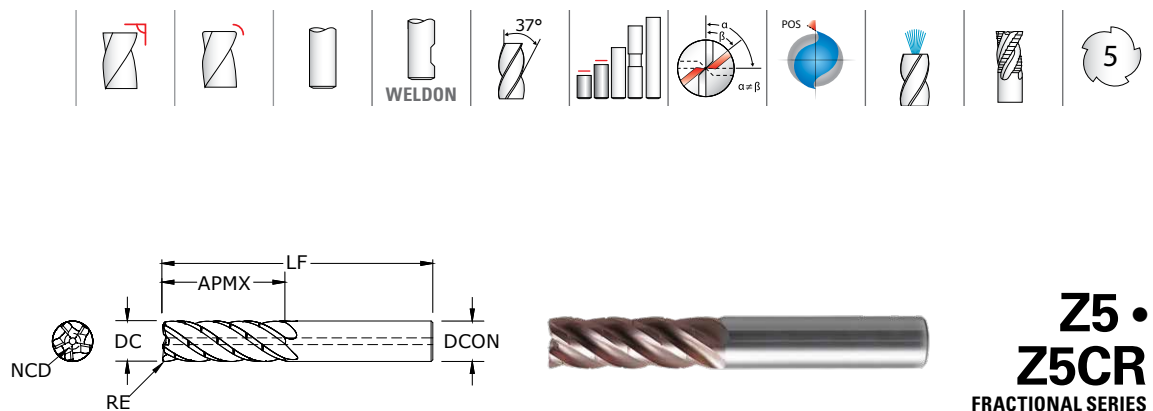
RE = +0.0000/–0.0020

>3/8–1 DIAMETER

DC = +0.0000/–0.0020

DCON = h_6

RE = +0.0000/–0.0020

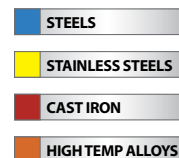


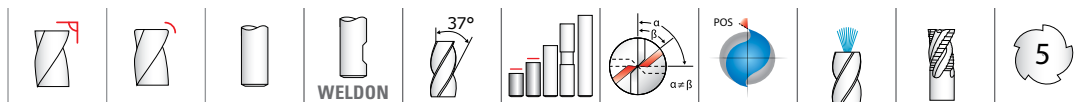
**Z5 •
Z5CR**
FRACTIONAL SERIES

inch							EDP NO.										
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	NON-CUTTING CENTER DIAMETER NCD	Ti-NAMITE-A (TA)					Ti-NAMITE-M (TM)					MEGACOAT NANO (MN)	
						STANDARD	CHIPBREAKER	INTERNAL COOLANT	CHIPBREAKER + INTERNAL COOLANT	W/FLAT	STANDARD	CHIPBREAKER	INTERNAL COOLANT	CHIPBREAKER + INTERNAL COOLANT	W/FLAT	STANDARD	W/FLAT
1/8	1/4	1-1/2	1/8	—	.044	38500	—	—	—	—	37000	—	—	—	—	—	—
1/8	1/4	1-1/2	1/8	.010	.044	38771	—	—	—	—	38770	—	—	—	—	—	—
1/8	1/4	1-1/2	1/8	.015	.044	38525	—	—	—	—	37001	—	—	—	—	—	—
1/8	1/4	1-1/2	1/8	.030	.029	38773	—	—	—	—	38772	—	—	—	—	—	—
1/8	3/8	1-1/2	1/8	—	.044	37180	—	—	—	—	37002	—	—	—	—	38700	—
1/8	3/8	1-1/2	1/8	.010	.044	38775	—	—	—	—	38774	—	—	—	—	—	—
1/8	3/8	1-1/2	1/8	.015	.044	37181	—	—	—	—	37003	—	—	—	—	38701	—
1/8	3/8	1-1/2	1/8	.030	.029	38777	—	—	—	—	38776	—	—	—	—	—	—
1/8	3/8	2	1/8	—	.044	37394	37395	—	—	—	37396	37397	—	—	—	—	—
1/8	3/8	2	1/8	.010	.044	37986	37987	—	—	—	37988	37989	—	—	—	—	—
1/8	3/8	2	1/8	.015	.044	37398	37399	—	—	—	37400	37401	—	—	—	—	—
1/8	3/8	2	1/8	.030	.029	37402	37403	—	—	—	37404	37405	—	—	—	—	—
3/16	5/16	2	3/16	—	.066	38501	—	—	—	—	37004	—	—	—	—	38702	—
3/16	5/16	2	3/16	.010	.066	38779	—	—	—	—	38778	—	—	—	—	—	—
3/16	5/16	2	3/16	.015	.066	38526	—	—	—	—	37005	—	—	—	—	38703	—
3/16	5/16	2	3/16	.030	.066	38781	—	—	—	—	38780	—	—	—	—	—	—
3/16	1/2	2	3/16	—	.066	37182	—	—	—	—	37006	—	—	—	—	38704	—
3/16	1/2	2	3/16	.010	.066	38783	—	—	—	—	38782	—	—	—	—	—	—
3/16	1/2	2	3/16	.015	.066	37183	—	—	—	—	37007	—	—	—	—	38705	—
3/16	1/2	2	3/16	.030	.066	38785	—	—	—	—	38784	—	—	—	—	—	—
3/16	9/16	2-1/2	3/16	—	.066	37406	37407	—	—	—	37408	37409	—	—	—	—	—
3/16	9/16	2-1/2	3/16	.010	.066	37410	37411	—	—	—	37412	37413	—	—	—	—	—
3/16	9/16	2-1/2	3/16	.015	.066	37414	37415	—	—	—	37416	37417	—	—	—	—	—
3/16	9/16	2-1/2	3/16	.030	.066	37418	37419	—	—	—	37420	37421	—	—	—	—	—
1/4	3/8	2-1/2	1/4	—	.088	38502	—	—	—	—	37008	—	—	—	—	38706	—
1/4	3/8	2-1/2	1/4	.010	.088	38787	—	—	—	—	38786	—	—	—	—	—	—
1/4	3/8	2-1/2	1/4	.015	.088	38527	—	—	—	—	37009	—	—	—	—	38707	—
1/4	3/8	2-1/2	1/4	.030	.088	38528	—	—	—	—	37010	—	—	—	—	—	—
1/4	3/8	2-1/2	1/4	.060	.075	38789	—	—	—	—	38788	—	—	—	—	—	—
1/4	1/2	2-1/2	1/4	—	.088	37184	—	—	—	—	37011	—	—	—	—	38708	—

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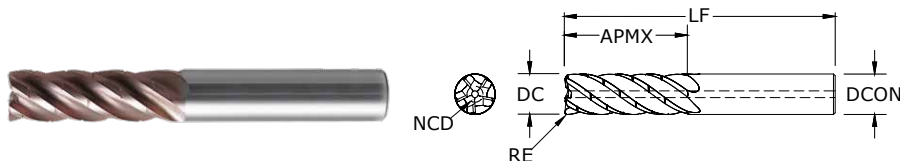
- An ideal balance of helix, indexing, flute depth, rake and relief
- Variable indexing for chatter suppression and patented edge geometry for shearing and strength
- Chatter-free geometry allows deep cutting and high speed machining
- Central coolant hole delivers coolant effectively to the cutting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





Z5 • Z5CR

FRACTIONAL SERIES



TOLERANCES (inch)

1/8–1/4 DIAMETER

DC = +0.0000/–0.0012

DCON = h_6

RE = +0.0000/–0.0020

>1/4–3/8 DIAMETER

DC = +0.0000/–0.0016

DCON = h_6

RE = +0.0000/–0.0020

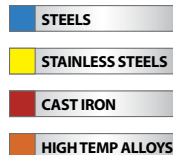
>3/8–1 DIAMETER

DC = +0.0000/–0.0020

DCON = h_6

RE = +0.0000/–0.0020

CONTINUED



inch							EDP NO.										
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	NON-CUTTING CENTER DIAMETER NCD	Ti-NAMITE-A (TA)					Ti-NAMITE-M (TM)					MEGACOAT NANO (MN)	
						STANDARD	CHIPBREAKER	INTERNAL COOLANT	CHIPBREAKER + INTERNAL COOLANT	W/FLAT	STANDARD	CHIPBREAKER	INTERNAL COOLANT	CHIPBREAKER + INTERNAL COOLANT	W/FLAT	STANDARD	W/FLAT
1/4	1/2	2-1/2	1/4	.010	.088	38793	-	-	-	-	38792	-	-	-	-	-	-
1/4	1/2	2-1/2	1/4	.015	.088	37185	-	-	-	-	37012	-	-	-	-	38709	-
1/4	1/2	2-1/2	1/4	.030	.088	37186	-	-	-	-	37013	-	-	-	-	38710	-
1/4	1/2	2-1/2	1/4	.060	.075	38795	-	-	-	-	38794	-	-	-	-	-	-
1/4	3/4	2-1/2	1/4	-	.088	37422	37423	-	-	-	37424	37425	-	-	-	-	-
1/4	3/4	2-1/2	1/4	.010	.088	37426	37427	-	-	-	37428	37429	-	-	-	-	-
1/4	3/4	2-1/2	1/4	.015	.088	37430	37431	-	-	-	37432	37433	-	-	-	-	-
1/4	3/4	2-1/2	1/4	.030	.088	37434	37435	-	-	-	37436	37437	-	-	-	-	-
1/4	3/4	2-1/2	1/4	.060	.088	37438	37439	-	-	-	37440	37441	-	-	-	-	-
5/16	7/16	2-1/2	5/16	-	.109	38503	-	-	-	-	37014	-	-	-	-	38711	-
5/16	7/16	2-1/2	5/16	.010	.109	38799	-	-	-	-	38798	-	-	-	-	-	-
5/16	7/16	2-1/2	5/16	.015	.109	38529	-	-	-	-	37015	-	-	-	-	38712	-
5/16	7/16	2-1/2	5/16	.030	.109	38801	-	-	-	-	38800	-	-	-	-	-	-
5/16	7/16	2-1/2	5/16	.060	.109	38803	-	-	-	-	38802	-	-	-	-	-	-
5/16	7/16	2-1/2	5/16	.090	.064	38805	-	-	-	-	38804	-	-	-	-	-	-
5/16	5/8	2-1/2	5/16	-	.109	38504	-	-	-	-	37016	-	-	-	-	38713	-
5/16	5/8	2-1/2	5/16	.010	.109	38807	-	-	-	-	38806	-	-	-	-	-	-
5/16	5/8	2-1/2	5/16	.015	.109	38530	-	-	-	-	37017	-	-	-	-	38714	-
5/16	5/8	2-1/2	5/16	.030	.109	38809	-	-	-	-	38808	-	-	-	-	-	-
5/16	5/8	2-1/2	5/16	.060	.109	38811	-	-	-	-	38810	-	-	-	-	-	-
5/16	5/8	2-1/2	5/16	.090	.064	38813	-	-	-	-	38812	-	-	-	-	-	-
5/16	15/16	3	5/16	-	.109	37446	37447	-	-	-	37448	37449	-	-	-	-	-
5/16	15/16	3	5/16	.010	.109	37451	37450	-	-	-	37452	37453	-	-	-	-	-
5/16	15/16	3	5/16	.015	.109	37454	37455	-	-	-	37456	37457	-	-	-	-	-
5/16	15/16	3	5/16	.030	.109	37458	37459	-	-	-	37460	37461	-	-	-	-	-
5/16	15/16	3	5/16	.060	.109	37462	37463	-	-	-	37464	37465	-	-	-	-	-
5/16	15/16	3	5/16	.090	.064	37466	37467	-	-	-	37468	37469	-	-	-	-	-
3/8	1/2	2-1/2	3/8	-	.131	38505	-	-	-	-	37018	-	-	-	-	38715	-
3/8	1/2	2-1/2	3/8	.010	.131	38815	-	-	-	-	38814	-	-	-	-	-	-
3/8	1/2	2-1/2	3/8	.015	.131	38531	-	-	-	-	37019	-	-	-	-	38716	-

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TOLERANCES (inch)

1/8-1/4 DIAMETER

DC = +0.0000/-0.0012

DCON = h_6

RE = +0.0000/-0.0020

>1/4-3/8 DIAMETER

DC = +0.0000/-0.0016

DCON = h_6

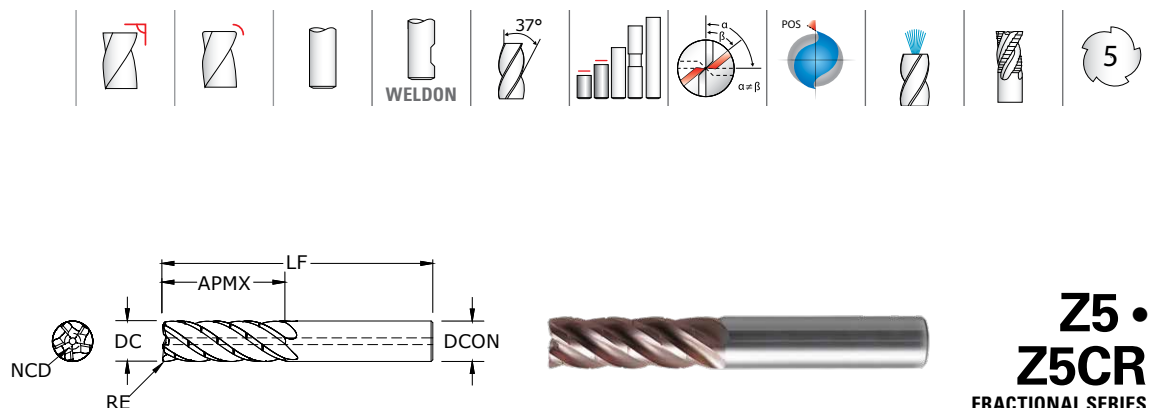
RE = +0.0000/-0.0020

>3/8-1 DIAMETER

DC = +0.0000/-0.0020

DCON = h_6

RE = +0.0000/-0.0020

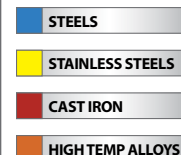


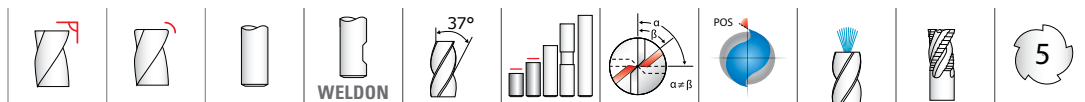
**Z5 •
Z5CR**
FRACTIONAL SERIES

inch						EDP NO.											
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	NON-CUTTING CENTER DIAMETER NCD	Ti-NAMITE-A (TA)					Ti-NAMITE-M (TM)					MEGACOAT NANO (MN)	
						STANDARD	CHIPBREAKER	INTERNAL COOLANT	CHIPBREAKER + INTERNAL COOLANT	W/FLAT	STANDARD	CHIPBREAKER	INTERNAL COOLANT	CHIPBREAKER + INTERNAL COOLANT	W/FLAT	STANDARD	W/FLAT
3/8	1/2	2-1/2	3/8	.030	.131	38532	—	—	—	—	37020	—	—	—	—	38717	—
3/8	1/2	2-1/2	3/8	.060	.131	38817	—	—	—	—	38816	—	—	—	—	—	—
3/8	1/2	2-1/2	3/8	.090	.083	38819	—	—	—	—	38818	—	—	—	—	—	—
3/8	3/4	2-1/2	3/8	—	.131	37187	—	—	—	—	37021	—	—	—	—	38718	—
3/8	3/4	2-1/2	3/8	.010	.131	38821	—	—	—	—	38820	—	—	—	—	—	—
3/8	3/4	2-1/2	3/8	.015	.131	37188	—	—	—	—	37022	—	—	—	—	38719	—
3/8	3/4	2-1/2	3/8	.030	.131	37189	—	—	—	37174	37023	—	—	—	37175	38720	—
3/8	3/4	2-1/2	3/8	.060	.131	38823	—	—	—	—	38822	—	—	—	—	—	—
3/8	3/4	2-1/2	3/8	.090	.083	38825	—	—	—	—	38824	—	—	—	—	—	—
3/8	1-1/8	3	3/8	—	.131	37470	37471	—	—	—	37472	37473	—	—	—	—	—
3/8	1-1/8	3	3/8	.010	.131	37474	37475	—	—	—	37476	37477	—	—	—	—	—
3/8	1-1/8	3	3/8	.015	.131	37478	37479	—	—	—	37480	37481	—	—	—	—	—
3/8	1-1/8	3	3/8	.030	.131	37482	37483	—	—	—	37484	37485	—	—	—	—	—
3/8	1-1/8	3	3/8	.060	.131	37486	37487	—	—	—	37488	37489	—	—	—	—	—
3/8	1-1/8	3	3/8	.090	.083	37490	37491	—	—	—	37492	37493	—	—	—	—	—
7/16	5/8	2-1/2	7/16	.015	.153	37164	—	—	—	—	37160	—	—	—	—	—	—
7/16	5/8	2-1/2	7/16	.030	.153	37165	—	—	—	—	37161	—	—	—	—	—	—
7/16	7/8	2-3/4	7/16	.015	.153	37166	—	—	—	—	37162	—	—	—	—	—	—
7/16	7/8	2-3/4	7/16	.030	.153	37167	—	—	—	—	37163	—	—	—	—	—	—
7/16	1-5/16	3	7/16	—	.153	37494	37495	—	—	—	37496	37497	—	—	—	—	—
7/16	1-5/16	3	7/16	.015	.153	37498	37499	—	—	—	37500	37501	—	—	—	—	—
7/16	1-5/16	3	7/16	.030	.153	37502	37503	—	—	—	37504	37505	—	—	—	—	—
1/2	5/8	3	1/2	—	.175	38506	—	37320	—	38512	37024	—	37321	—	37030	38721	—
1/2	5/8	3	1/2	.010	.175	38827	—	38831	—	38829	38826	—	38830	—	38828	—	—
1/2	5/8	3	1/2	.015	.175	38533	—	37330	—	38578	37025	—	37331	—	37031	38722	—
1/2	5/8	3	1/2	.030	.175	38534	—	37332	—	38579	37026	—	37333	—	37032	38723	38724
1/2	5/8	3	1/2	.060	.175	38535	—	37334	—	38580	37027	—	37335	—	37033	—	—
1/2	5/8	3	1/2	.090	.175	38536	—	37337	—	38581	37028	—	37338	—	37034	—	—
1/2	5/8	3	1/2	.120	.175	38537	—	37339	—	38582	37029	—	37340	—	37035	—	—
1/2	1	3	1/2	—	.175	38507	—	37322	—	38513	37036	—	37323	—	37042	38725	—

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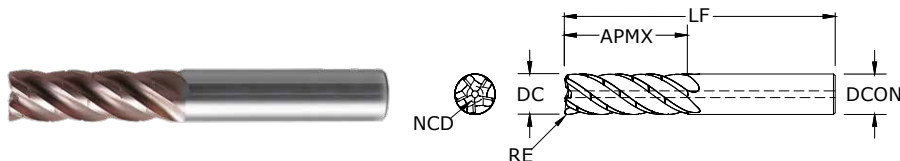
CONTINUED





Z5 • Z5CR

FRACTIONAL SERIES



TOLERANCES (inch)

1/8–1/4 DIAMETER

DC = +0.0000/–0.0012

DCON = h₆

RE = +0.0000/–0.0020

>1/4–3/8 DIAMETER

DC = +0.0000/–0.0016

DCON = h₆

RE = +0.0000/–0.0020

>3/8–1 DIAMETER

DC = +0.0000/–0.0020

DCON = h₆

RE = +0.0000/–0.0020

CONTINUED

inch						EDP NO.											
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	NON-CUTTING CENTER DIAMETER NCD	Ti-NAMITE-A (TA)					Ti-NAMITE-M (TM)					MEGACOAT NANO (MN)	
						STANDARD	CHIPBREAKER	INTERNAL COOLANT	CHIPBREAKER + INTERNAL COOLANT	W/FLAT	STANDARD	CHIPBREAKER	INTERNAL COOLANT	CHIPBREAKER + INTERNAL COOLANT	W/FLAT	STANDARD	W/FLAT
1/2	1	3	1/2	.010	.175	38833	—	38837	—	38835	38832	—	38836	—	38834	—	—
1/2	1	3	1/2	.015	.175	38538	—	37341	—	38583	37037	—	37342	—	37043	38726	—
1/2	1	3	1/2	.030	.175	38539	—	37343	—	38584	37038	—	37344	—	37044	38727	38728
1/2	1	3	1/2	.060	.175	38540	—	37345	—	38585	37039	—	37346	—	37045	—	—
1/2	1	3	1/2	.090	.175	38541	—	37348	—	38586	37040	—	37349	—	37046	—	—
1/2	1	3	1/2	.120	.175	38542	—	37350	—	38587	37041	—	37351	—	37047	—	—
1/2	1-1/4	3-1/4	1/2	—	.175	37190	—	37325	—	37194	37048	—	37324	—	37054	38729	—
1/2	1-1/4	3-1/4	1/2	.010	.175	38839	—	38843	—	38841	38838	—	38842	—	38840	—	—
1/2	1-1/4	3-1/4	1/2	.015	.175	37191	—	37352	—	37195	37049	—	37353	—	37055	38730	—
1/2	1-1/4	3-1/4	1/2	.030	.175	37192	—	37354	—	37196	37050	—	37355	—	37056	38731	38732
1/2	1-1/4	3-1/4	1/2	.060	.175	37193	—	37356	—	37197	37051	—	37357	—	37057	—	—
1/2	1-1/4	3-1/4	1/2	.090	.175	38543	—	37359	—	38588	37052	—	37360	—	37058	—	—
1/2	1-1/4	3-1/4	1/2	.120	.175	38544	—	37361	—	38589	37053	—	37362	—	37059	—	—
1/2	1-1/2	3-1/2	1/2	—	.175	37506	37508	37507	37509	—	37510	37512	37511	37513	—	—	—
1/2	1-1/2	3-1/2	1/2	.010	.175	37514	37516	37515	37517	—	37518	37520	37519	37521	—	—	—
1/2	1-1/2	3-1/2	1/2	.015	.175	37522	37524	37523	37525	—	37526	37528	37527	37529	—	—	—
1/2	1-1/2	3-1/2	1/2	.030	.175	37530	37532	37531	37533	—	37534	37536	37535	37537	—	—	—
1/2	1-1/2	3-1/2	1/2	.060	.175	37538	37540	37539	37541	—	37542	37544	37543	37545	—	—	—
1/2	1-1/2	3-1/2	1/2	.090	.175	37546	37548	37547	37549	—	37550	37552	37551	37553	—	—	—
1/2	1-1/2	3-1/2	1/2	.120	.175	37554	37556	37555	37557	—	37558	37560	37559	37561	—	—	—
5/8	3/4	3-1/2	5/8	—	.219	38508	—	38518	—	38514	37060	—	37260	—	37067	—	—
5/8	3/4	3-1/2	5/8	.010	.219	38845	—	38849	—	38847	38844	—	38848	—	38846	—	—
5/8	3/4	3-1/2	5/8	.015	.219	38545	—	38623	—	38590	37061	—	37261	—	37068	—	—
5/8	3/4	3-1/2	5/8	.030	.219	38546	—	38624	—	38591	37062	—	37262	—	37069	—	—
5/8	3/4	3-1/2	5/8	.060	.219	38547	—	38625	—	38592	37063	—	37263	—	37070	—	—
5/8	3/4	3-1/2	5/8	.090	.219	38548	—	38626	—	38593	37064	—	37264	—	37071	—	—
5/8	3/4	3-1/2	5/8	.120	.219	38549	—	38627	—	38594	37065	—	37265	—	37072	—	—
5/8	3/4	3-1/2	5/8	.190	.219	38550	—	38628	—	38595	37066	—	37266	—	37073	—	—
5/8	1-1/4	3-1/2	5/8	—	.219	37198	—	38519	—	37202	37074	—	37267	—	37081	—	—
5/8	1-1/4	3-1/2	5/8	.010	.219	38851	—	38855	—	38853	38850	—	38854	—	38852	—	—

continued on next page

TOLERANCES (inch)

1/8-1/4 DIAMETER

DC = +0.0000/-0.0012

DCON = h_6

RE = +0.0000/-0.0020

>1/4-3/8 DIAMETER

DC = +0.0000/-0.0016

DCON = h_6

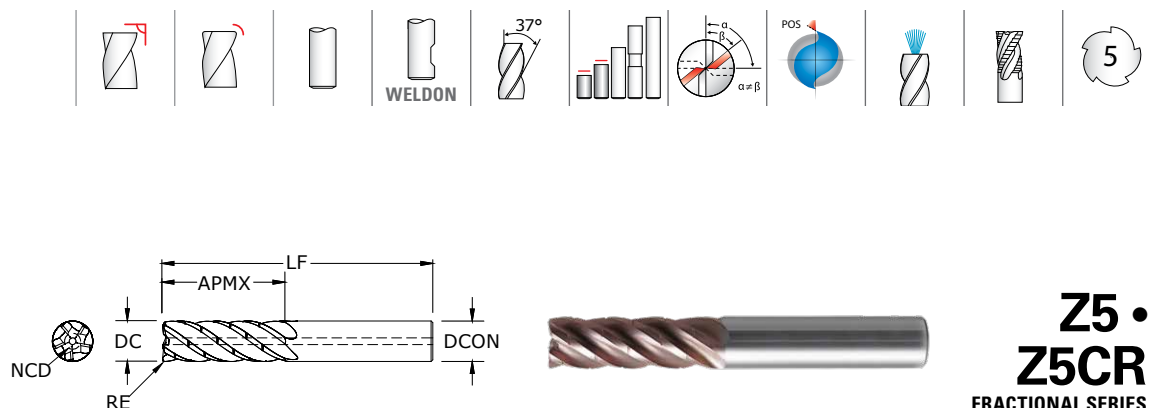
RE = +0.0000/-0.0020

>3/8-1 DIAMETER

DC = +0.0000/-0.0020

DCON = h_6

RE = +0.0000/-0.0020

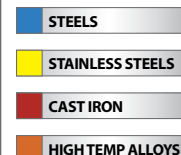


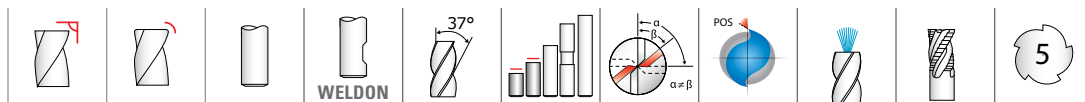
**Z5 •
Z5CR**
FRACTIONAL SERIES

inch							EDP NO.										
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	NON-CUTTING CENTER DIAMETER NCD	Ti-NAMITE-A (TA)					Ti-NAMITE-M (TM)					MEGACOAT NANO (MN)	
						STANDARD	CHIPBREAKER	INTERNAL COOLANT	CHIPBREAKER + INTERNAL COOLANT	W/FLAT	STANDARD	CHIPBREAKER	INTERNAL COOLANT	CHIPBREAKER + INTERNAL COOLANT	W/FLAT	STANDARD	W/FLAT
5/8	1-1/4	3-1/2	5/8	.015	.219	37199	—	38629	—	37203	37075	—	37268	—	37082	—	—
5/8	1-1/4	3-1/2	5/8	.030	.219	37200	—	38630	—	37204	37076	—	37269	—	37083	38733	—
5/8	1-1/4	3-1/2	5/8	.060	.219	37201	—	38631	—	37205	37077	—	37270	—	37084	—	—
5/8	1-1/4	3-1/2	5/8	.090	.219	38551	—	38632	—	38596	37078	—	37271	—	37085	—	—
5/8	1-1/4	3-1/2	5/8	.120	.219	38552	—	38633	—	38597	37079	—	37272	—	37086	—	—
5/8	1-1/4	3-1/2	5/8	.190	.219	38553	—	38634	—	38598	37080	—	37273	—	37087	—	—
5/8	1-7/8	4	5/8	—	.219	37562	37564	37563	37565	—	37566	37568	37567	37569	—	—	—
5/8	1-7/8	4	5/8	.010	.219	37570	37572	37571	37573	—	37574	37576	37575	37577	—	—	—
5/8	1-7/8	4	5/8	.015	.219	37578	37580	37579	37581	—	37582	37584	37583	37585	—	—	—
5/8	1-7/8	4	5/8	.030	.219	37586	37588	37587	37589	—	37590	37592	37591	37593	—	—	—
5/8	1-7/8	4	5/8	.060	.219	37594	37596	37595	37597	—	37598	37600	37599	37601	—	—	—
5/8	1-7/8	4	5/8	.090	.219	37602	37604	37603	37605	—	37606	37608	37607	37609	—	—	—
5/8	1-7/8	4	5/8	.120	.219	37610	37612	37611	37613	—	37614	37616	37615	37617	—	—	—
5/8	1-7/8	4	5/8	.190	.219	37618	37620	37619	37621	—	37622	37624	37623	37625	—	—	—
3/4	7/8	4	3/4	—	.263	38509	—	38520	—	38515	37088	—	37274	—	37095	—	—
3/4	7/8	4	3/4	.010	.263	38857	—	38861	—	38859	38856	—	38860	—	38858	—	—
3/4	7/8	4	3/4	.030	.263	38554	—	38635	—	38599	37089	—	37275	—	37096	—	—
3/4	7/8	4	3/4	.060	.263	38555	—	38636	—	38600	37090	—	37276	—	37097	—	—
3/4	7/8	4	3/4	.090	.263	38556	—	38637	—	38601	37091	—	37277	—	37098	—	—
3/4	7/8	4	3/4	.120	.263	38557	—	38638	—	38602	37092	—	37278	—	37099	—	—
3/4	7/8	4	3/4	.190	.263	38558	—	38639	—	38603	37093	—	37279	—	37100	—	—
3/4	7/8	4	3/4	.250	.263	38559	—	38640	—	38604	37094	—	37280	—	37101	—	—
3/4	1-1/2	4	3/4	—	.263	37206	—	38521	—	37210	37102	—	37281	—	37109	—	—
3/4	1-1/2	4	3/4	.010	.263	38863	—	38867	—	38865	38862	—	38866	—	38864	—	—
3/4	1-1/2	4	3/4	.030	.263	37207	—	38641	—	37211	37103	—	37282	—	37110	38734	—
3/4	1-1/2	4	3/4	.060	.263	37208	—	38642	—	37212	37104	—	37283	—	37111	38735	—
3/4	1-1/2	4	3/4	.090	.263	38560	—	38643	—	38605	37105	—	37284	—	37112	—	—
3/4	1-1/2	4	3/4	.120	.263	37209	—	38644	—	37213	37106	—	37285	—	37113	38736	—
3/4	1-1/2	4	3/4	.190	.263	38561	—	38645	—	38606	37107	—	37286	—	37114	—	—
3/4	1-1/2	4	3/4	.250	.263	38562	—	38646	—	38607	37108	—	37287	—	37115	—	—

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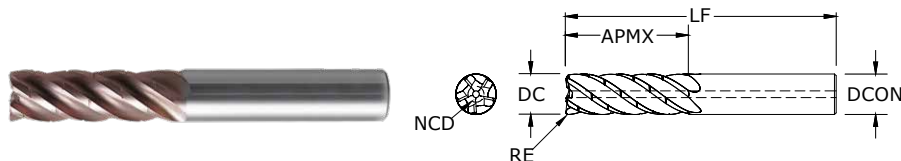
CONTINUED





Z5 • Z5CR

FRACTIONAL SERIES



TOLERANCES (inch)

1/8-1/4 DIAMETER

DC = +0.0000/-0.0012

DCON = h₆

RE = +0.0000/-0.0020

>1/4-3/8 DIAMETER

DC = +0.0000/-0.0016

DCON = h₆

RE = +0.0000/-0.0020

>3/8-1 DIAMETER

DC = +0.0000/-0.0020

DCON = h₆

RE = +0.0000/-0.0020

CONTINUED

inch						EDP NO.											
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	NON-CUTTING CENTER DIAMETER NCD	Ti-NAMITE-A (TA)					Ti-NAMITE-M (TM)					MEGACOAT NANO (MN)	
						STANDARD	CHIPBREAKER	INTERNAL COOLANT	CHIPBREAKER + INTERNAL COOLANT	W/FLAT	STANDARD	CHIPBREAKER	INTERNAL COOLANT	CHIPBREAKER + INTERNAL COOLANT	W/FLAT	STANDARD	W/FLAT
3/4	1-5/8	4	3/4	.030	.263	37222	—	—	—	—	37223	—	—	—	—	—	—
3/4	1-5/8	4	3/4	.060	.263	37224	—	—	—	—	37225	—	—	—	—	—	—
3/4	1-5/8	4	3/4	.090	.263	37226	—	—	—	—	37227	—	—	—	—	—	—
3/4	1-5/8	4	3/4	.120	.263	37228	—	—	—	—	37229	—	—	—	—	—	—
3/4	2	4-1/2	3/4	.030	.263	37230	—	—	—	—	37231	—	—	—	—	—	—
3/4	2	4-1/2	3/4	.060	.263	37232	—	—	—	—	37233	—	—	—	—	—	—
3/4	2	4-1/2	3/4	.090	.263	37234	—	—	—	—	37235	—	—	—	—	—	—
3/4	2	4-1/2	3/4	.120	.263	37236	—	—	—	—	37237	—	—	—	—	—	—
3/4	2-1/4	5	3/4	—	.263	37626	37628	37627	37629	—	37630	37632	37631	37633	—	—	—
3/4	2-1/4	5	3/4	.010	.263	37634	37636	37635	37637	—	37638	37640	37639	37641	—	—	—
3/4	2-1/4	5	3/4	.030	.263	37642	37644	37643	37645	—	37646	37648	37647	37649	—	—	—
3/4	2-1/4	5	3/4	.060	.263	37650	37652	37651	37653	—	37654	37656	37655	37657	—	—	—
3/4	2-1/4	5	3/4	.090	.263	37658	37660	37659	37661	—	37662	37664	37663	37665	—	—	—
3/4	2-1/4	5	3/4	.120	.263	37666	37668	37667	37669	—	37670	37672	37671	37673	—	—	—
3/4	2-1/4	5	3/4	.190	.263	37674	37676	37675	37677	—	37678	37680	37679	37681	—	—	—
3/4	2-1/4	5	3/4	.250	.263	37682	37684	37683	37685	—	37686	37688	37687	37689	—	—	—
1	1-1/8	4	1	—	.350	38510	—	38522	—	38516	37116	—	37288	—	37123	—	—
1	1-1/8	4	1	.010	.350	38869	—	38873	—	38871	38868	—	38872	—	38870	—	—
1	1-1/8	4	1	.030	.350	38563	—	38647	—	38608	37117	—	37289	—	37124	—	—
1	1-1/8	4	1	.060	.350	38564	—	38648	—	38609	37118	—	37290	—	37125	—	—
1	1-1/8	4	1	.090	.350	38565	—	38649	—	38610	37119	—	37291	—	37126	—	—
1	1-1/8	4	1	.120	.350	38566	—	38650	—	38611	37120	—	37292	—	37127	—	—
1	1-1/8	4	1	.190	.350	38567	—	38651	—	38612	37121	—	37293	—	37128	—	—
1	1-1/8	4	1	.250	.350	38568	—	38652	—	38613	37122	—	37294	—	37129	—	—
1	1-1/2	4	1	—	.350	37214	—	38523	—	37218	37130	—	37295	—	37137	—	—
1	1-1/2	4	1	.010	.350	38875	—	38879	—	38877	38874	—	38878	—	38876	—	—
1	1-1/2	4	1	.030	.350	37215	—	38653	—	37219	37131	—	37296	—	37138	—	—
1	1-1/2	4	1	.060	.350	37216	—	38654	—	37220	37132	—	37297	—	37139	—	—
1	1-1/2	4	1	.090	.350	38569	—	38655	—	38614	37133	—	37298	—	37140	—	—
1	1-1/2	4	1	.120	.350	37217	—	38656	—	37221	37134	—	37299	—	37141	—	—

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TOLERANCES (inch)

1/8-1/4 DIAMETER

DC = +0.0000/-0.0012

DCON = h_6

RE = +0.0000/-0.0020

>1/4-3/8 DIAMETER

DC = +0.0000/-0.0016

DCON = h_6

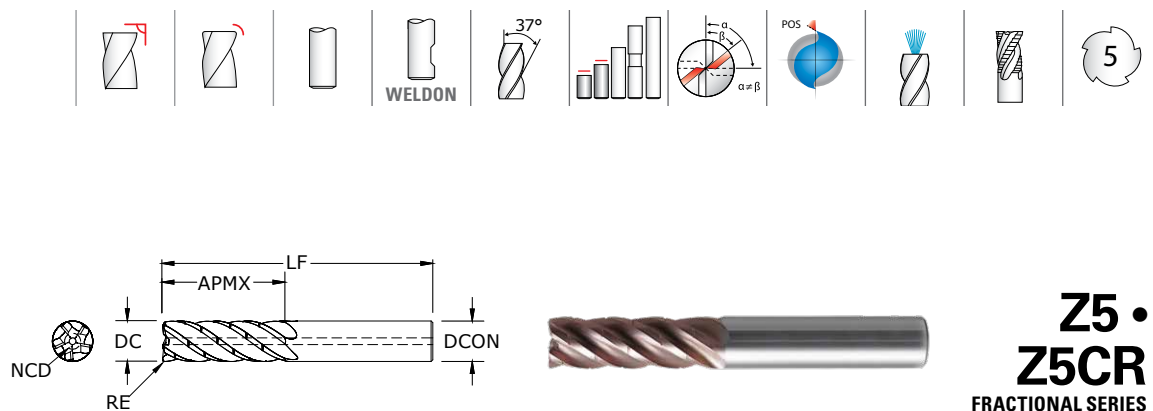
RE = +0.0000/-0.0020

>3/8-1 DIAMETER

DC = +0.0000/-0.0020

DCON = h_6

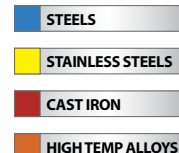
RE = +0.0000/-0.0020

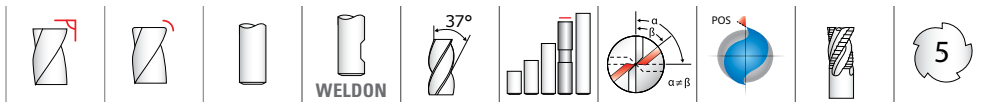


**Z5 •
Z5CR**
FRACTIONAL SERIES

inch						EDP NO.											
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	NON-CUTTING CENTER DIAMETER NCD	Ti-NAMITE-A (TA)					Ti-NAMITE-M (TM)					MEGACOAT NANO (MN)	
						STANDARD	CHIPBREAKER	INTERNAL COOLANT	CHIPBREAKER + INTERNAL COOLANT	W/FLAT	STANDARD	CHIPBREAKER	INTERNAL COOLANT	CHIPBREAKER + INTERNAL COOLANT	W/FLAT	STANDARD	W/FLAT
1	1-1/2	4	1	.190	.350	38570	—	38657	—	38615	37135	—	37300	—	37142	—	—
1	1-1/2	4	1	.250	.350	38571	—	38658	—	38616	37136	—	37301	—	37143	—	—
1	2	4-1/2	1	—	.350	38511	—	38524	—	38517	37144	—	37302	—	37151	—	—
1	2	4-1/2	1	.010	.350	38881	—	38885	—	38883	38880	—	38884	—	38882	—	—
1	2	4-1/2	1	.030	.350	38572	—	38659	—	38617	37145	—	37303	—	37152	—	—
1	2	4-1/2	1	.060	.350	38573	—	38660	—	38618	37146	—	37304	—	37153	—	—
1	2	4-1/2	1	.090	.350	38574	—	38661	—	38619	37147	—	37305	—	37154	—	—
1	2	4-1/2	1	.120	.350	38575	—	38662	—	38620	37148	—	37306	—	37155	—	—
1	2	4-1/2	1	.190	.350	38576	—	38663	—	38621	37149	—	37307	—	37156	—	—
1	2	4-1/2	1	.250	.350	38577	—	38664	—	38622	37150	—	37308	—	37157	—	—
1	1-1/2	4	1	.090	.350	38569	—	38655	—	38614	37133	—	37298	—	37140	—	—
1	1-1/2	4	1	.120	.350	37217	—	38656	—	37221	37134	—	37299	—	37141	—	—
1	1-1/2	4	1	.190	.350	38570	—	38657	—	38615	37135	—	37300	—	37142	—	—
1	1-1/2	4	1	.250	.350	38571	—	38658	—	38616	37136	—	37301	—	37143	—	—
1	2	4-1/2	1	—	.350	38511	—	38524	—	38517	37144	—	37302	—	37151	—	—
1	2	4-1/2	1	.010	.350	38881	—	38885	—	38883	38880	—	38884	—	38882	—	—
1	2	4-1/2	1	.030	.350	38572	—	38659	—	38617	37145	—	37303	—	37152	—	—
1	2	4-1/2	1	.060	.350	38573	—	38660	—	38618	37146	—	37304	—	37153	—	—
1	2	4-1/2	1	.090	.350	38574	—	38661	—	38619	37147	—	37305	—	37154	—	—
1	2	4-1/2	1	.120	.350	38575	—	38662	—	38620	37148	—	37306	—	37155	—	—
1	2	4-1/2	1	.190	.350	38576	—	38663	—	38621	37149	—	37307	—	37156	—	—
1	2	4-1/2	1	.250	.350	38577	—	38664	—	38622	37150	—	37308	—	37157	—	—
1	3	6	1	—	.350	37690	37692	37691	37693	—	37694	37696	37695	37697	—	—	—
1	3	6	1	.010	.350	37698	37700	37699	37701	—	37702	37704	37703	37705	—	—	—
1	3	6	1	.030	.350	37706	37708	37707	37709	—	37710	37712	37711	37713	—	—	—
1	3	6	1	.060	.350	37714	37716	37715	37717	—	37718	37720	37719	37721	—	—	—
1	3	6	1	.090	.350	37722	37724	37723	37725	—	37726	37728	37727	37729	—	—	—
1	3	6	1	.120	.350	37730	37732	37731	37733	—	37734	37736	37735	37737	—	—	—
1	3	6	1	.190	.350	37738	37740	37739	37741	—	37742	37744	37743	37745	—	—	—
1	3	6	1	.250	.350	37746	37748	37747	37749	—	37750	37752	37751	37753	—	—	—

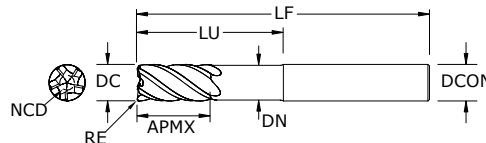
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Z5L • Z5LCR

FRACTIONAL SERIES



TOLERANCES (inch)

1/8–1/4 DIAMETER

DC = +0.0000/–0.0012

DCON = h_6

RE = +0.0000/–0.0020

>1/4–3/8 DIAMETER

DC = +0.0000/–0.0016

DCON = h_6

RE = +0.0000/–0.0020

>3/8–1 DIAMETER

DC = +0.0000/–0.0020

DCON = h_6

RE = +0.0000/–0.0020

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

STEELS
STAINLESS STEELS
CAST IRON
HIGH TEMP ALLOYS

inch								EDP NO.			
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	REACH LU	NECK DIAMETER DN	CORNER RADIUS RE	NON-CUTTING CENTER DIAMETER NCD	Ti-NAMITE-A (TA)		Ti-NAMITE-M (TM)	
								STANDARD	CHIPBREAKER	STANDARD	CHIPBREAKER
1/8	1/4	2	1/8	1/2	.119	—	.044	37754	37755	37756	37757
1/8	1/4	2	1/8	1/2	.119	.010	.044	37990	37991	37992	37993
1/8	1/4	2	1/8	1/2	.119	.015	.044	37758	37759	37760	37761
1/8	1/4	2	1/8	1/2	.119	.030	.029	37762	37763	37764	37765
3/16	3/8	2-1/2	3/16	3/4	.178	—	.066	37766	37767	37768	37769
3/16	3/8	2-1/2	3/16	3/4	.178	.010	.066	37770	37771	37772	37773
3/16	3/8	2-1/2	3/16	3/4	.178	.015	.066	37774	37775	37776	37777
3/16	3/8	2-1/2	3/16	3/4	.178	.030	.066	37778	37779	37780	37781
1/4	1/2	3	1/4	1	.238	—	.088	37782	37783	37784	37785
1/4	1/2	3	1/4	1	.238	.010	.088	37786	37787	37788	37789
1/4	1/2	3	1/4	1	.238	.015	.088	37790	37791	37792	37793
1/4	1/2	3	1/4	1	.238	.030	.088	37794	37795	37796	37797
1/4	1/2	3	1/4	1	.238	.060	.088	37798	37799	37800	37801
5/16	5/8	3	5/16	1-1/4	.297	—	.109	37806	37807	37808	37809
5/16	5/8	3	5/16	1-1/4	.297	.010	.109	37810	37811	37812	37813
5/16	5/8	3	5/16	1-1/4	.297	.015	.109	37814	37815	37816	37817
5/16	5/8	3	5/16	1-1/4	.297	.030	.109	37818	37819	37820	37821
5/16	5/8	3	5/16	1-1/4	.297	.060	.109	37822	37823	37824	37825
5/16	5/8	3	5/16	1-1/4	.297	.090	.109	37826	37827	37828	37829
3/8	3/4	4	3/8	1-1/2	.356	—	.109	37830	37831	37832	37833
3/8	3/4	4	3/8	1-1/2	.356	.010	.131	37834	37835	37836	37837
3/8	3/4	4	3/8	1-1/2	.356	.015	.131	37838	37839	37840	37841
3/8	3/4	4	3/8	1-1/2	.356	.030	.131	37842	37843	37844	37845
3/8	3/4	4	3/8	1-1/2	.356	.060	.131	37846	37847	37848	37849
3/8	3/4	4	3/8	1-1/2	.356	.090	.083	37850	37851	37852	37853
7/16	7/8	4	7/16	1-3/4	.416	—	.153	37854	37855	37856	37857
7/16	7/8	4	7/16	1-3/4	.416	.015	.153	37858	37859	37860	37861
7/16	7/8	4	7/16	1-3/4	.416	.030	.153	37862	37863	37864	37865
1/2	1	4	1/2	2	.475	—	.175	37866	37867	37868	37869
1/2	1	4	1/2	2	.475	.010	.175	37870	37871	37872	37873

continued on next page

TOLERANCES (inch)

1/8-1/4 DIAMETER

DC = +0.0000/-0.0012

DCON = h_6

RE = +0.0000/-0.0020

>1/4-3/8 DIAMETER

DC = +0.0000/-0.0016

DCON = h_6

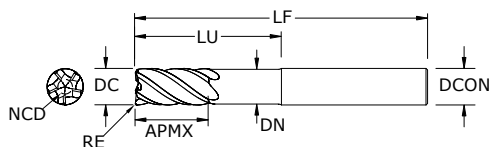
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>3/8-1 DIAMETER

DC = +0.0000/-0.0020

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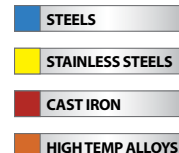
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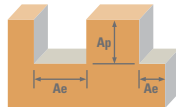
**Z5L •
Z5LCR**
FRACTIONAL SERIES

inch								EDP NO.			
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	REACH LU	NECK DIAMETER DN	CORNER RADIUS RE	NON-CUTTING CENTER DIAMETER NCD	Ti-NAMITE-A (TA)		Ti-NAMITE-M (TM)	
								STANDARD	CHIPBREAKER	STANDARD	CHIPBREAKER
1/2	1	4	1/2	2	.475	.015	.175	37874	37875	37876	37877
1/2	1	4	1/2	2	.475	.030	.175	37878	37879	37880	37881
1/2	1	4	1/2	2	.475	.060	.175	37882	37883	37884	37885
1/2	1	4	1/2	2	.475	.090	.175	37886	37887	37888	37889
1/2	1	4	1/2	2	.475	.120	.175	37890	37891	37892	37893
5/8	1-1/4	5	5/8	2-1/2	.594	—	.219	37894	37895	37896	37897
5/8	1-1/4	5	5/8	2-1/2	.594	.010	.219	37994	37995	37996	37997
5/8	1-1/4	5	5/8	2-1/2	.594	.015	.219	37898	37899	37900	37901
5/8	1-1/4	5	5/8	2-1/2	.594	.030	.219	37902	37903	37904	37905
5/8	1-1/4	5	5/8	2-1/2	.594	.060	.219	37906	37907	37908	37909
5/8	1-1/4	5	5/8	2-1/2	.594	.090	.219	37910	37911	37912	37913
5/8	1-1/4	5	5/8	2-1/2	.594	.120	.219	37914	37915	37916	37917
5/8	1-1/4	5	5/8	2-1/2	.594	.190	.219	37918	37919	37920	37921
3/4	1-1/2	6	3/4	3	.713	—	.263	37922	37923	37924	37925
3/4	1-1/2	6	3/4	3	.713	.010	.263	37926	37927	37928	37929
3/4	1-1/2	6	3/4	3	.713	.030	.263	37930	37931	37932	37933
3/4	1-1/2	6	3/4	3	.713	.060	.263	37934	37935	37936	37937
3/4	1-1/2	6	3/4	3	.713	.090	.263	37938	37939	37940	37941
3/4	1-1/2	6	3/4	3	.713	.120	.263	37942	37943	37944	37945
3/4	1-1/2	6	3/4	3	.713	.190	.263	37946	37947	37948	37949
3/4	1-1/2	6	3/4	3	.713	.250	.263	37950	37951	37952	37953
1	2	7	1	4	.950	—	.350	37954	37955	37956	37957
1	2	7	1	4	.950	.010	.350	37958	37959	37960	37961
1	2	7	1	4	.950	.030	.350	37962	37963	37964	37965
1	2	7	1	4	.950	.060	.350	37966	37967	37968	37969
1	2	7	1	4	.950	.090	.350	37970	37971	37972	37973
1	2	7	1	4	.950	.120	.350	37974	37975	37976	37977
1	2	7	1	4	.950	.190	.350	37978	37979	37980	37981
1	2	7	1	4	.950	.250	.350	37982	37983	37984	37985

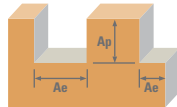
CONTINUED



Z-Carb-HPR



Series Z5, Z5CR, Z5L, Z5LC Fractional		Hardness			Vc (sfm)	DC • in								
						1/8	1/4	3/8	1/2	5/8	3/4	1		
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 275 Bhn or ≤ 28 HRC	HSM ¹ 	≤ 0.1	≤ APMX	720 (576-864)	RPM	22003	11002	7334	5501	4401	3667	2750
			Fz	0.00078	0.0021	0.0039	0.0052	0.0057	0.0062	0.0073				
			Feed (ipm)	85.8	115.5	143.0	143.0	125.4	113.7	100.4				
		Profile 	≤ 0.4	≤ APMX	555 (444-666)	RPM	16961	8480	5654	4240	3392	2827	2120	
			Fz	0.00046	0.0012	0.0023	0.0031	0.0034	0.0037	0.0043				
			Feed (ipm)	50.6	66.0	84.3	85.3	74.8	67.8	59.1				
		Slot ² 	1	≤ 1	440 (352-528)	RPM	13446	6723	4482	3362	2689	2241	1681	
			Fz	0.00046	0.0012	0.0023	0.0031	0.0034	0.0037	0.0043				
			Feed (ipm)	30.9	40.3	51.5	52.1	45.7	41.5	36.1				
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 375 Bhn or ≤ 40 HRC	HSM ¹ 	≤ 0.1	≤ APMX	410 (328-492)	RPM	12530	6265	4177	3132	2506	2088	1566
			Fz	0.00057	0.0015	0.0029	0.0038	0.0042	0.0046	0.0053				
			Feed (ipm)	35.7	47.0	60.6	59.5	52.6	48.0	41.5				
		Profile 	≤ 0.5	≤ APMX	315 (252-378)	RPM	9626	4813	3209	2407	1925	1604	1203	
			Fz	0.00034	0.0009	0.0017	0.0023	0.0026	0.0028	0.0032				
			Feed (ipm)	16.4	21.7	27.3	27.7	25.0	22.5	19.3				
		Slot ² 	1	≤ 1	250 (200-300)	RPM	7640	3820	2547	1910	1528	1273	955	
			Fz	0.00034	0.0009	0.0017	0.0023	0.0026	0.0028	0.0032				
			Feed (ipm)	13.0	17.2	21.6	22.0	19.9	17.8	15.3				
TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 375 Bhn or ≤ 40 HRC	HSM ¹ 	≤ 0.1	≤ APMX	240 (192-288)	RPM	7334	3667	2445	1834	1467	1222	917	
		Fz	0.00045	0.0012	0.0023	0.0030	0.0033	0.0036	0.0042					
		Feed (ipm)	16.5	22.0	28.1	27.5	24.2	22.0	19.3					
	Profile 	≤ 0.4	≤ APMX	185 (148-222)	RPM	5654	2827	1885	1413	1131	942	707		
		Fz	0.00028	0.0007	0.0014	0.0018	0.0020	0.0022	0.0026					
		Feed (ipm)	7.9	9.9	13.2	12.7	11.3	10.4	9.2					
	Slot ² 	1	≤ 1	145 (116-174)	RPM	4431	2216	1477	1108	886	739	554		
		Fz	0.00028	0.0007	0.0014	0.0018	0.0020	0.0022	0.0026					
		Feed (ipm)	6.2	7.8	10.3	10.0	8.9	8.1	7.2					
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 275 Bhn or ≤ 28 HRC	HSM ¹ 	≤ 0.1	≤ APMX	635 (508-762)	RPM	19406	9703	6469	4851	3881	3234	2426
			Fz	0.00057	0.0015	0.0029	0.0038	0.0042	0.0046	0.0053				
			Feed (ipm)	55.3	72.8	93.8	92.2	81.5	74.4	64.3				
		Profile 	≤ 0.4	≤ APMX	490 (392-588)	RPM	14974	7487	4991	3744	2995	2496	1872	
			Fz	0.00034	0.0009	0.0017	0.0023	0.0026	0.0028	0.0032				
			Feed (ipm)	25.5	33.7	42.4	43.1	38.9	34.9	29.9				
		Slot ² 	1	≤ 1	390 (312-468)	RPM	11918	5959	3973	2980	2384	1986	1490	
			Fz	0.00034	0.0009	0.0017	0.0023	0.0026	0.0028	0.0032				
			Feed (ipm)	20.3	26.8	33.8	34.3	31.0	27.8	23.8				
	STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L	≤ 275 Bhn or ≤ 28 HRC	HSM ¹ 	≤ 0.1	≤ APMX	440 (352-528)	RPM	13446	6723	4482	3362	2689	2241	1681
			Fz	0.00045	0.0012	0.0023	0.0030	0.0033	0.0036	0.0042				
			Feed (ipm)	30.3	40.3	51.5	50.4	44.4	40.3	35.3				
		Profile 	≤ 0.4	≤ APMX	340 (272-408)	RPM	10390	5195	3463	2598	2078	1732	1299	
			Fz	0.00027	0.0007	0.0014	0.0018	0.0020	0.0022	0.0025				
			Feed (ipm)	14.0	18.2	24.2	23.4	20.8	19.0	16.2				
		Slot ² 	1	≤ 1	270 (216-324)	RPM	8251	4126	2750	2063	1650	1375	1031	
			Fz	0.00027	0.0007	0.0014	0.0018	0.0020	0.0022	0.0025				
			Feed (ipm)	11.1	14.4	19.3	18.6	16.5	15.1	12.9				
STAINLESS STEELS (PH) 13-8 PH, 15-5PH, 17-4 PH, CUSTOM 450	≤ 325 Bhn or ≤ 35 HRC	HSM ¹ 	≤ 0.1	≤ APMX	410 (328-492)	RPM	12530	6265	4177	3132	2506	2088	1566	
		Fz	0.00045	0.0012	0.0023	0.0030	0.0033	0.0036	0.0042					
		Feed (ipm)	28.2	37.6	48.0	47.0	41.3	37.6	32.9					
	Profile 	≤ 0.4	≤ APMX	310 (248-372)	RPM	9474	4737	3158	2368	1895	1579	1184		
		Fz	0.00027	0.0007	0.0014	0.0018	0.0020	0.0022	0.0025					
		Feed (ipm)	12.8	16.6	22.1	21.3	18.9	17.4	14.8					
	Slot ² 	1	≤ 1	250 (200-300)	RPM	7640	3820	2547	1910	1528	1273	955		
		Fz	0.00027	0.0007	0.0014	0.0018	0.0020	0.0022	0.0025					
		Feed (ipm)	10.3	13.4	17.8	17.2	15.3	14.0	11.9					



Series Z5, Z5CR, Z5L, Z5LC Fractional	Hardness		Ae x DC	Ap x DC	Vc (sfm)	DC • in									
						1/8	1/4	3/8	1/2	5/8	3/4	1			
K	CAST IRONS (LOW & MEDIUM ALLOY) Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	HSM ¹ 	≤ 0.1	≤ APMX	575 (460-690)	RPM	17572	8786	5857	4393	3514	2929	2197	
			Fz	0.00071	0.0019	0.0035	0.0047	0.0052	0.0056	0.0066					
			Feed (ipm)	62.4	83.5	102.5	103.2	91.4	82.0	72.5					
		≤ 260 Bhn or ≤ 26 HRc	Profile 	≤ 0.4	≤ APMX	445 (356-534)	RPM	13599	6800	4533	3400	2720	2267	1700	
			Fz	0.00042	0.0011	0.0021	0.0028	0.0031	0.0034	0.0039					
			Feed (ipm)	28.6	37.4	47.6	47.6	42.2	38.5	33.1					
	CAST IRONS (HIGH ALLOY) Gray, Malleable, Ductile	≤ 260 Bhn or ≤ 26 HRc	Slot ² 	1	≤ 1	355 (284-426)	RPM	10849	5424	3616	2712	2170	1808	1356	
			Fz	0.00042	0.0011	0.0021	0.0028	0.0031	0.0034	0.0039					
			Feed (ipm)	22.8	29.8	38.0	38.0	33.6	30.7	26.4					
		HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	≤ 300 Bhn or ≤ 32 HRc	HSM ¹ 	≤ 0.1	≤ APMX	440 (352-528)	RPM	13446	6723	4482	3362	2689	2241	1681
				Fz	0.00053	0.0014	0.0026	0.0035	0.0039	0.0042	0.0049				
				Feed (ipm)	35.6	47.1	58.3	58.8	52.4	47.1	41.2				
SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	≤ 300 Bhn or ≤ 32 HRc		Profile 	≤ 0.4	≤ APMX	340 (272-408)	RPM	10390	5195	3463	2598	2078	1732	1299	
			Fz	0.00031	0.0008	0.0016	0.0021	0.0023	0.0025	0.0029					
			Feed (ipm)	16.1	21.8	27.7	27.3	23.9	21.6	18.8					
	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	≤ 300 Bhn or ≤ 32 HRc	Slot ² 	1	≤ 1	270 (216-324)	RPM	8251	4126	2750	2063	1650	1375	1031	
			Fz	0.00031	0.0008	0.0016	0.0021	0.0023	0.0025	0.0029					
			Feed (ipm)	12.8	17.3	22.0	21.7	19.0	17.2	15.0					
TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al		≤ 300 Bhn or ≤ 32 HRc	HSM ¹ 	≤ 0.1	≤ APMX	115 (92-138)	RPM	3514	1757	1171	879	703	586	439	
			Fz	0.00042	0.0011	0.0021	0.0028	0.0031	0.0034	0.0039					
			Feed (ipm)	7.4	9.7	12.3	12.3	10.9	10.0	8.6					
	TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 300 Bhn or ≤ 32 HRc	Profile 	≤ 0.4	≤ APMX	80 (64-96)	RPM	2445	1222	815	611	489	407	306	
			Fz	0.00025	0.0007	0.0013	0.0017	0.0019	0.0020	0.0024					
			Feed (ipm)	3.1	4.2	5.2	5.2	4.6	4.2	3.6					
TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al		≤ 300 Bhn or ≤ 32 HRc	Slot ² 	1	≤ 1	65 (52-78)	RPM	1986	993	662	497	397	331	248	
			Fz	0.00025	0.0007	0.0013	0.0017	0.0019	0.0020	0.0024					
			Feed (ipm)	2.5	3.4	4.2	4.2	3.7	3.4	3.0					
	TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 300 Bhn or ≤ 32 HRc	HSM ¹ 	≤ 0.1	≤ APMX	100 (80-120)	RPM	3056	1528	1019	764	611	509	382	
			Fz	0.00030	0.0008	0.0015	0.0020	0.0022	0.0024	0.0028					
			Feed (ipm)	4.6	6.1	7.6	7.6	6.7	6.1	5.3					
TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al		≤ 300 Bhn or ≤ 32 HRc	Profile 	≤ 0.4	≤ APMX	62 (50-74)	RPM	1895	947	632	474	379	316	237	
			Fz	0.00018	0.0005	0.0009	0.0012	0.0013	0.0014	0.0017					
			Feed (ipm)	1.7	2.3	2.8	2.8	2.5	2.2	2.0					
	TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 300 Bhn or ≤ 32 HRc	Slot ² 	1	≤ 1	50 (40-60)	RPM	1528	764	509	382	306	255	191	
			Fz	0.00018	0.0005	0.0009	0.0012	0.0013	0.0014	0.0017					
			Feed (ipm)	1.4	1.8	2.3	2.3	2.0	1.8	1.6					
TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al		≤ 300 Bhn or ≤ 32 HRc	HSM ¹ 	≤ 0.1	≤ APMX	280 (224-336)	RPM	8557	4278	2852	2139	1711	1426	1070	
			Fz	0.00050	0.0013	0.0025	0.0033	0.0036	0.0040	0.0046					
			Feed (ipm)	21.4	27.8	35.7	35.3	30.8	28.5	24.6					
	TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 300 Bhn or ≤ 32 HRc	Profile 	≤ 0.4	≤ APMX	215 (172-258)	RPM	6570	3285	2190	1643	1314	1095	821	
			Fz	0.00030	0.0008	0.0015	0.0020	0.0022	0.0024	0.0028					
			Feed (ipm)	9.9	13.1	16.4	16.4	14.5	13.1	11.5					
TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al		≤ 300 Bhn or ≤ 32 HRc	Slot ² 	1	≤ 1	170 (136-204)	RPM	5195	2598	1732	1299	1039	866	649	
			Fz	0.00030	0.0008	0.0015	0.0020	0.0022	0.0024	0.0028					
			Feed (ipm)	7.8	10.4	13.0	13.0	11.4	10.4	9.1					
	TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 300 Bhn or ≤ 32 HRc	HSM ¹ 	≤ 0.1	≤ APMX	155 (124-186)	RPM	4737	2368	1579	1184	947	789	592	
			Fz	0.00050	0.0013	0.0025	0.0033	0.0036	0.0040	0.0046					
			Feed (ipm)	11.8	15.4	19.7	19.5	17.1	15.8	13.6					
TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al		≤ 300 Bhn or ≤ 32 HRc	Profile 	≤ 0.4	≤ APMX	75 (60-90)	RPM	2292	1146	764	573	458	382	287	
			Fz	0.00030	0.0008	0.0015	0.0020	0.0022	0.0024	0.0028					
			Feed (ipm)	3.4	4.6	5.7	5.7	5.0	4.6	4.0					
	TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 300 Bhn or ≤ 32 HRc	Slot ² 	1	≤ 1	60 (48-72)	RPM	1834	917	611	458	367	306	229	
			Fz	0.00030	0.0008	0.0015	0.0020	0.0022	0.0024	0.0028					
			Feed (ipm)	2.8	3.7	4.6	4.6	4.0	3.7	3.2					

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

rpm = Vc x 3.82 / DC

ipm = Fz x 5 x rpm

1 HSM method strongly recommended, particularly when using 4 x DC tools

2 reduce Ap to ≤ 0.5 x DC when slotting with 4 x DC tools

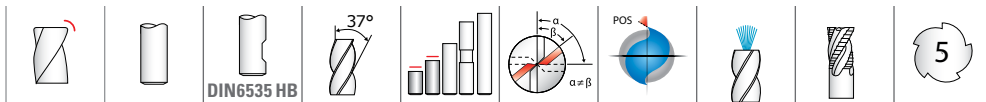
ramp up to 5 degrees using slotting speed and feed rates. Do not plunge.

reduce speed and feed for materials harder than listed

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

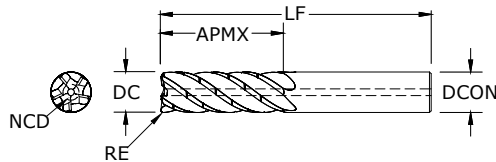
feed rates listed have chip thinning adjustments included where applicable

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)



Z5MCR

METRIC SERIES



TOLERANCES (mm)

6 DIAMETER

DC = +0,000/-0,030

DCON = h_6

RE = +0,000/-0,050

>6-10 DIAMETER

DC = +0,000/-0,040

DCON = h_6

RE = +0,000/-0,050

>10-25 DIAMETER

DC = +0,000/-0,050

DCON = h_6

RE = +0,000/-0,050

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

STEELS
STAINLESS STEELS
CAST IRON
HIGH TEMP ALLOYS

mm						EDP NO.										
CUTTING DIAMETER	LENGTH OF CUT	OVERALL LENGTH	SHANK DIAMETER	CORNER RADIUS	NON-CUTTING CENTER DIAMETER	Ti-NAMITE-A (TA)				Ti-NAMITE-M (TM)				MEGACOAT NANO (MN)		
						STANDARD	CHIPBREAKER	INTERNAL COOLANT	W/FLAT	STANDARD	CHIPBREAKER	INTERNAL COOLANT	W/FLAT	STANDARD	W/FLAT	
DC	APMX	LF	DCON	RE	NCD											
6,0	9,0	54,0	6,0	0,5	2,11	48000	-	-	-	47000	-	-	-	-	-	-
6,0	13,0	57,0	6,0	0,3	2,11	48001	-	-	-	47001	-	-	-	47098	-	-
6,0	13,0	57,0	6,0	0,5	2,11	47120	-	-	-	47002	-	-	-	47099	-	-
6,0	13,0	57,0	6,0	1,0	2,11	48002	-	-	-	47003	-	-	-	47100	-	-
6,0	13,0	57,0	6,0	1,5	2,11	48003	-	-	-	47004	-	-	-	47101	-	-
6,0	18,0	63,0	6,0	0,3	2,11	47480	47481	-	-	47482	47483	-	-	-	-	-
6,0	18,0	63,0	6,0	0,5	2,11	47484	47485	-	-	47486	47487	-	-	-	-	-
6,0	18,0	63,0	6,0	1,0	2,11	47488	47489	-	-	47490	47491	-	-	-	-	-
6,0	18,0	63,0	6,0	1,5	2,11	47492	47493	-	-	47494	47495	-	-	-	-	-
8,0	11,0	58,0	8,0	0,5	2,79	48004	-	-	-	47005	-	-	-	-	-	-
8,0	18,0	63,0	8,0	0,5	2,79	47121	-	-	-	47006	-	-	-	47102	-	-
8,0	18,0	63,0	8,0	1,0	2,79	47122	-	-	-	47007	-	-	-	47103	-	-
8,0	18,0	63,0	8,0	1,5	2,79	48005	-	-	-	47008	-	-	-	-	-	-
8,0	18,0	63,0	8,0	2,0	2,79	48006	-	-	-	47009	-	-	-	-	-	-
8,0	24,0	75,0	8,0	0,5	2,79	47496	47497	-	-	47498	47499	-	-	-	-	-
8,0	24,0	75,0	8,0	1,0	2,79	47500	47501	-	-	47502	47503	-	-	-	-	-
8,0	24,0	75,0	8,0	1,5	2,79	47504	47505	-	-	47506	47507	-	-	-	-	-
8,0	24,0	75,0	8,0	2,0	2,79	47508	47509	-	-	47510	47511	-	-	-	-	-
10,0	13,0	66,0	10,0	1,0	3,51	48007	-	-	-	47010	-	-	-	47104	-	-
10,0	22,0	72,0	10,0	0,5	3,51	47123	-	-	-	47011	-	-	-	47105	-	-
10,0	22,0	72,0	10,0	1,0	3,51	47124	-	-	-	47012	-	-	-	47106	-	-
10,0	22,0	72,0	10,0	1,5	3,51	48008	-	-	-	47013	-	-	-	-	-	-
10,0	22,0	72,0	10,0	2,0	3,51	48009	-	-	-	47014	-	-	-	-	-	-
10,0	22,0	72,0	10,0	2,5	3,51	48010	-	-	-	47015	-	-	-	-	-	-
10,0	30,0	75,0	10,0	0,5	3,51	47512	47513	-	-	47514	47515	-	-	-	-	-
10,0	30,0	75,0	10,0	1,0	3,51	47516	47517	-	-	47518	47519	-	-	-	-	-
10,0	30,0	75,0	10,0	1,5	3,51	47520	47521	-	-	47522	47523	-	-	-	-	-
10,0	30,0	75,0	10,0	2,0	3,51	47524	47525	-	-	47526	47527	-	-	-	-	-
10,0	30,0	75,0	10,0	2,5	3,51	47528	47529	-	-	47530	47531	-	-	-	-	-
12,0	15,0	73,0	12,0	1,0	4,19	48011	-	-	48029	47016	-	-	47024	47107	-	-

continued on next page

TOLERANCES (mm)

6 DIAMETER

DC = +0,000/-0,030

DCON = h_6

RE = +0,000/-0,050

>6-10 DIAMETER

DC = +0,000/-0,040

DCON = h_6

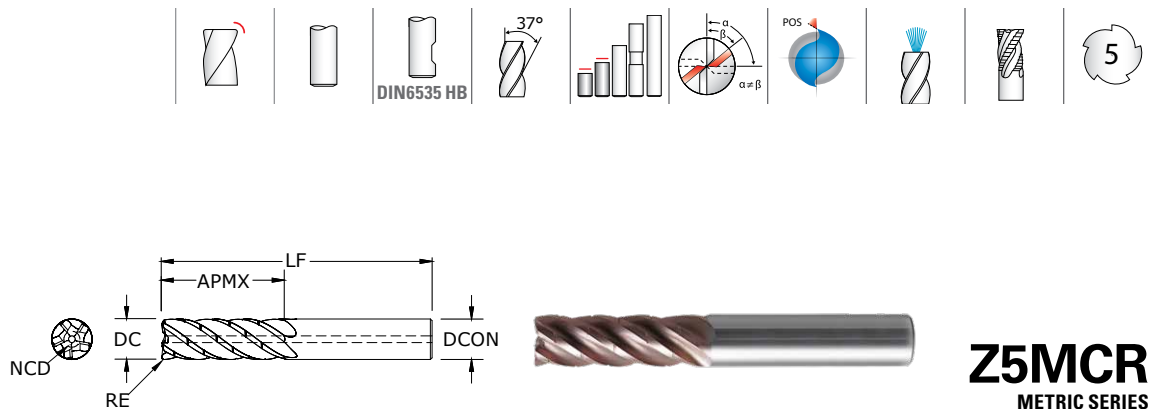
RE = +0,000/-0,050

>10-25 DIAMETER

DC = +0,000/-0,050

DCON = h_6

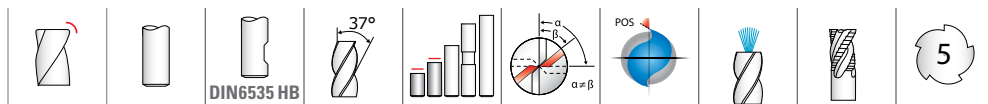
RE = +0,000/-0,050



Z5MCR
METRIC SERIES

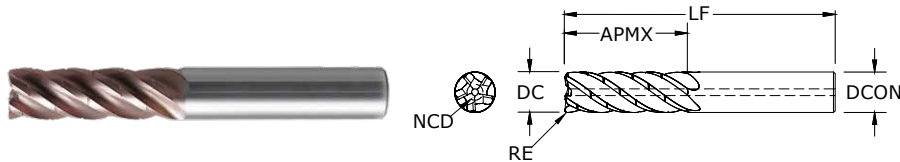
mm						EDP NO.									
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	NON-CUTTING CENTER DIAMETER NCD	TI-NAMITE-A (TA)				TI-NAMITE-M (TM)				MEGACOAT NANO (MN)	
						STANDARD	CHIPBREAKER	INTERNAL COOLANT	W/FLAT	STANDARD	CHIPBREAKER	INTERNAL COOLANT	W/FLAT	STANDARD	W/FLAT
12,0	26,0	83,0	12,0	0,5	4,19	47125	-	47160	47128	47017	-	47161	47025	47108	-
12,0	26,0	83,0	12,0	0,76	4,19	47126	-	47162	47129	47018	-	47163	47026	-	-
12,0	26,0	83,0	12,0	1,0	4,19	47127	-	47164	47130	47019	-	47165	47027	47109	-
12,0	26,0	83,0	12,0	1,5	4,19	48012	-	47166	48030	47020	-	47167	47028	-	-
12,0	26,0	83,0	12,0	2,0	4,19	48013	-	47168	48031	47021	-	47169	47029	-	-
12,0	26,0	83,0	12,0	2,5	4,19	48014	-	47170	48032	47022	-	47171	47030	-	-
12,0	26,0	83,0	12,0	3,0	4,19	48015	-	47172	48033	47023	-	47173	47031	-	-
12,0	36,0	83,0	12,0	0,5	4,19	47532	47533	-	-	47534	47535	-	-	-	-
12,0	36,0	83,0	12,0	0,76	4,19	47536	47537	-	-	47538	47539	-	-	-	-
12,0	36,0	83,0	12,0	1,0	4,19	47540	47541	-	-	47542	47543	-	-	-	-
12,0	36,0	83,0	12,0	1,5	4,19	47544	47545	-	-	47546	47547	-	-	-	-
12,0	36,0	83,0	12,0	2,0	4,19	47548	47549	-	-	47550	47551	-	-	-	-
12,0	36,0	83,0	12,0	2,5	4,19	47552	47553	-	-	47554	47555	-	-	-	-
12,0	36,0	83,0	12,0	3,0	4,19	47556	47557	-	-	47558	47559	-	-	-	-
16,0	19,0	82,0	16,0	1,0	5,59	48016	-	48056	48034	47032	-	47046	47039	47110	-
16,0	19,0	82,0	16,0	1,5	5,59	48070	-	-	-	48071	-	-	-	-	-
16,0	35,0	92,0	16,0	1,0	5,59	47131	-	47134	48035	47033	-	47047	47040	47111	-
16,0	35,0	92,0	16,0	1,5	5,59	48017	-	48057	48036	47034	-	47048	47041	-	-
16,0	35,0	92,0	16,0	2,0	5,59	47132	-	47135	48037	47035	-	47049	47042	-	-
16,0	35,0	92,0	16,0	2,5	5,59	48018	-	48058	48038	47036	-	47050	47043	-	-
16,0	35,0	92,0	16,0	3,0	5,59	47133	-	47136	48039	47037	-	47051	47044	-	-
16,0	35,0	92,0	16,0	4,0	5,59	48019	-	48059	48040	47038	-	47052	47045	-	-
16,0	48,0	100,0	16,0	1,0	5,59	47560	47561	-	-	47562	47563	-	-	-	-
16,0	48,0	100,0	16,0	1,5	5,59	47564	47565	-	-	47566	47567	-	-	-	-
16,0	48,0	100,0	16,0	2,0	5,59	47568	47569	-	-	47570	47571	-	-	-	-
16,0	48,0	100,0	16,0	2,5	5,59	47572	47573	-	-	47574	47575	-	-	-	-
16,0	48,0	100,0	16,0	3,0	5,59	47576	47577	-	-	47578	47579	-	-	-	-
16,0	48,0	100,0	16,0	4,0	5,59	47580	47581	-	-	47582	47583	-	-	-	-
20,0	23,0	92,0	20,0	1,0	7,01	48020	-	48060	48041	47053	-	47069	47061	-	-
20,0	43,0	104,0	20,0	1,0	7,01	47137	-	47140	48042	47054	-	47070	47062	-	-

continued on next page



Z5MCR

METRIC SERIES



TOLERANCES (mm)

6 DIAMETER

DC = +0,000/-0,030

DCON = h_6

RE = +0,000/-0,050

>6-10 DIAMETER

DC = +0,000/-0,040

DCON = h_6

RE = +0,000/-0,050

>10-25 DIAMETER

DC = +0,000/-0,050

DCON = h_6

RE = +0,000/-0,050

CONTINUED

mm

EDP NO.

CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	NON-CUTTING CENTER DIAMETER NCD	Ti-NAMITE-A (TA)								MEGACOAT NANO (MN)	
						STANDARD	CHIPBREAKER	INTERNAL COOLANT	W/FLAT	STANDARD	CHIPBREAKER	INTERNAL COOLANT	W/FLAT	STANDARD	W/FLAT
20,0	43,0	104,0	20,0	1,5	7,01	48021	—	48061	48043	47055	—	47071	47063	—	—
20,0	43,0	104,0	20,0	2,0	7,01	47138	—	47141	48044	47056	—	47072	47064	—	—
20,0	43,0	104,0	20,0	2,5	7,01	48022	—	48062	48045	47057	—	47073	47065	—	—
20,0	43,0	104,0	20,0	3,0	7,01	47139	—	47142	48046	47058	—	47074	47066	—	—
20,0	43,0	104,0	20,0	4,0	7,01	48023	—	48063	48047	47059	—	47075	47067	—	—
20,0	43,0	104,0	20,0	5,0	7,01	48024	—	48064	48048	47060	—	47076	47068	—	—
20,0	60,0	140,0	20,0	1,0	7,01	47584	47585	—	—	47586	47587	—	—	—	—
20,0	60,0	140,0	20,0	1,5	7,01	47588	47589	—	—	47590	47591	—	—	—	—
20,0	60,0	140,0	20,0	2,0	7,01	47592	47593	—	—	47594	47595	—	—	—	—
20,0	60,0	140,0	20,0	2,5	7,01	47596	47597	—	—	47598	47599	—	—	—	—
20,0	60,0	140,0	20,0	3,0	7,01	47600	47601	—	—	47602	47603	—	—	—	—
20,0	60,0	140,0	20,0	4,0	7,01	47604	47605	—	—	47606	47607	—	—	—	—
20,0	60,0	140,0	20,0	5,0	7,01	47608	47609	—	—	47610	47611	—	—	—	—
25,0	28,0	100,0	25,0	1,0	8,76	48025	—	48065	48049	47077	—	47091	47084	—	—
25,0	53,0	121,0	25,0	1,0	8,76	47143	—	47146	48050	47078	—	47092	47085	—	—
25,0	53,0	121,0	25,0	2,0	8,76	47144	—	47147	48051	47079	—	47093	47086	—	—
25,0	53,0	121,0	25,0	2,5	8,76	48026	—	48066	48052	47080	—	47094	47087	—	—
25,0	53,0	121,0	25,0	3,0	8,76	47145	—	47148	48053	47081	—	47095	47088	—	—
25,0	53,0	121,0	25,0	4,0	8,76	48027	—	48067	48054	47082	—	47096	47089	—	—
25,0	53,0	121,0	25,0	5,0	8,76	48028	—	48068	48055	47083	—	47097	47090	—	—
25,0	75,0	170,0	25,0	1,0	8,76	47612	47613	—	—	47614	47615	—	—	—	—
25,0	75,0	170,0	25,0	2,0	8,76	47616	47617	—	—	47618	47619	—	—	—	—
25,0	75,0	170,0	25,0	2,5	8,76	47620	47621	—	—	47622	47623	—	—	—	—
25,0	75,0	170,0	25,0	3,0	8,76	47624	47625	—	—	47626	47627	—	—	—	—
25,0	75,0	170,0	25,0	4,0	8,76	47628	47629	—	—	47630	47631	—	—	—	—
25,0	75,0	170,0	25,0	5,0	8,76	47632	47633	—	—	47634	47635	—	—	—	—

STEELS

STAINLESS STEELS

CAST IRON

HIGH TEMP ALLOYS

TOLERANCES (mm)

6 DIAMETER

DC = +0,000/-0,030

DCON = h_6

RE = +0,000/-0,050

>6-10 DIAMETER

DC = +0,000/-0,040

DCON = h_6

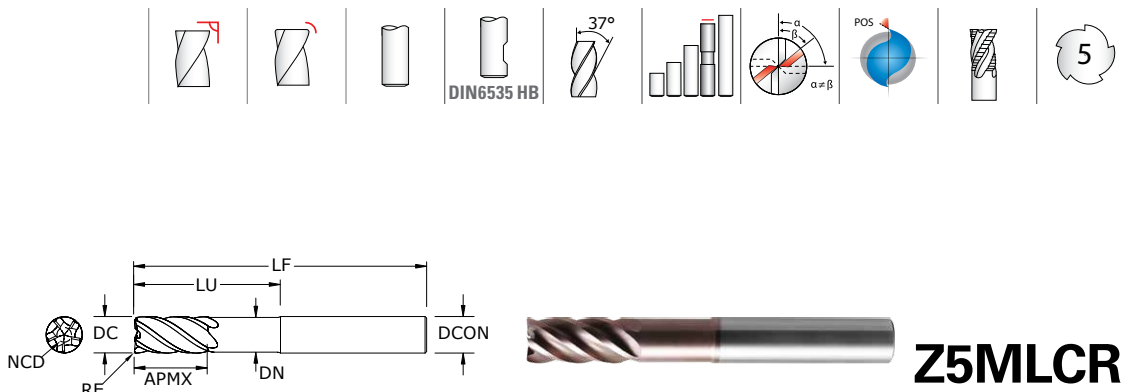
RE = +0,000/-0,050

>10-25 DIAMETER

DC = +0,000/-0,050

DCON = h_6

RE = +0,000/-0,050



Z5MLCR

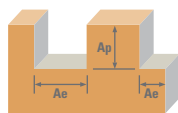
METRIC SERIES

mm								EDP NO.			
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	REACH LU	NECK DIAMETER DN	CORNER RADIUS RE	NON-CUTTING CENTER DIAMETER NCD	Ti-NAMITE-A (TA)		Ti-NAMITE-M (TM)	
								STANDARD	CHIPBREAKER	STANDARD	CHIPBREAKER
6,0	13,0	75,0	6,0	24,0	5,70	0,3	2,11	47636	47637	47638	47639
6,0	13,0	75,0	6,0	24,0	5,70	0,5	2,11	47640	47641	47642	47643
6,0	13,0	75,0	6,0	24,0	5,70	1,0	2,11	47644	47645	47646	47647
6,0	13,0	75,0	6,0	24,0	5,70	1,5	2,11	47648	47649	47650	47651
8,0	18,0	75,0	8,0	32,0	7,60	0,5	2,79	47652	47653	47654	47655
8,0	18,0	75,0	8,0	32,0	7,60	1,0	2,79	47656	47657	47658	47659
8,0	18,0	75,0	8,0	32,0	7,60	1,5	2,79	47660	47661	47662	47663
8,0	18,0	75,0	8,0	32,0	7,60	2,0	2,79	47664	47665	47666	47667
10,0	22,0	100,0	10,0	40,0	9,50	0,5	3,51	47668	47669	47670	47671
10,0	22,0	100,0	10,0	40,0	9,50	1,0	3,51	47672	47673	47674	47675
10,0	22,0	100,0	10,0	40,0	9,50	1,5	3,51	47676	47677	47678	47679
10,0	22,0	100,0	10,0	40,0	9,50	2,0	3,51	47680	47681	47682	47683
10,0	22,0	100,0	10,0	40,0	9,50	2,5	3,51	47684	47685	47686	47687
12,0	26,0	100,0	12,0	48,0	11,40	0,5	4,19	47688	47689	47690	47691
12,0	26,0	100,0	12,0	48,0	11,40	0,76	4,19	47692	47693	47694	47695
12,0	26,0	100,0	12,0	48,0	11,40	1,0	4,19	47696	47697	47698	47699
12,0	26,0	100,0	12,0	48,0	11,40	1,5	4,19	47700	47701	47702	47703
12,0	26,0	100,0	12,0	48,0	11,40	2,0	4,19	47704	47705	47706	47707
12,0	26,0	100,0	12,0	48,0	11,40	2,5	4,19	47708	47709	47710	47711
12,0	26,0	100,0	12,0	48,0	11,40	3,0	4,19	47712	47713	47714	47715
16,0	35,0	125,0	16,0	64,0	15,20	1,0	5,59	47716	47717	47718	47719
16,0	35,0	125,0	16,0	64,0	15,20	1,5	5,59	47720	47721	47722	47723
16,0	35,0	125,0	16,0	64,0	15,20	2,0	5,59	47724	47725	47726	47727
16,0	35,0	125,0	16,0	64,0	15,20	2,5	5,59	47728	47729	47730	47731
16,0	35,0	125,0	16,0	64,0	15,20	3,0	5,59	47732	47733	47734	47735
16,0	35,0	125,0	16,0	64,0	15,20	4,0	5,59	47736	47737	47738	47739
20,0	43,0	150,0	20,0	80,0	19,00	1,0	7,01	47740	47741	47742	47743
20,0	43,0	150,0	20,0	80,0	19,00	1,5	7,01	47744	47745	47746	47747
20,0	43,0	150,0	20,0	80,0	19,00	2,0	7,01	47748	47749	47750	47751
20,0	43,0	150,0	20,0	80,0	19,00	2,5	7,01	47752	47753	47754	47755
20,0	43,0	150,0	20,0	80,0	19,00	3,0	7,01	47756	47757	47758	47759
20,0	43,0	150,0	20,0	80,0	19,00	4,0	7,01	47760	47761	47762	47763
20,0	43,0	150,0	20,0	80,0	19,00	5,0	7,01	47764	47765	47766	47767
25,0	53,0	170,0	25,0	100,0	23,75	1,0	8,76	47768	47769	47770	47771
25,0	53,0	170,0	25,0	100,0	23,75	2,0	8,76	47772	47773	47774	47775
25,0	53,0	170,0	25,0	100,0	23,75	2,5	8,76	47776	47777	47778	47779
25,0	53,0	170,0	25,0	100,0	23,75	3,0	8,76	47780	47781	47782	47783
25,0	53,0	170,0	25,0	100,0	23,75	4,0	8,76	47784	47785	47786	47787
25,0	53,0	170,0	25,0	100,0	23,75	5,0	8,76	47788	47789	47790	47791

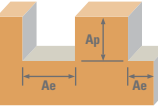
- An ideal balance of helix, indexing, flute depth, rake and relief
- Variable indexing for chatter suppression and patented edge geometry for shearing and strength
- Chatter-free geometry allows deep cutting and high speed machining
- Central coolant hole delivers coolant effectively to the cutting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

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

Z-Carb-HPR



Series Z5MCR, Z5MLCR Metric		Hardness			Vc (m/min)	DC • mm													
			Ae x DC	Ap x DC		6	8	10	12	16	20	25							
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 275 Bhn or ≤ 28 HRc	HSM ¹ 	≤ 0.1	≤ APMX	219 (176-263)	RPM	11633	8725	6980	5816	4362	3490	2792					
			Profile 	≤ 0.4	≤ APMX	169 (135-203)	Fz	0.050	0.083	0.104	0.125	0.146	0.165	0.183					
				Slot ² 	1	≤ 1	134 (107-161)	Feed (mm/min)	2931	3630	3629	3629	3183	2885	2548				
					≤ 375 Bhn or ≤ 40 HRc	Profile 	≤ 0.5	≤ APMX	96 (77-115)	RPM	8967	6725	5380	4484	3363	2690	2152		
										Fz	0.029	0.049	0.061	0.074	0.087	0.099	0.108		
										Feed (mm/min)	1291	1650	1650	1668	1463	1327	1157		
		Slot ² 								1	≤ 1	76 (61-91)	RPM	7109	5332	4265	3555	2666	2133
			Fz										0.029	0.049	0.061	0.074	0.087	0.099	0.108
			Feed (mm/min)	1024									1308	1308	1322	1160	1052	917	
			ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 375 Bhn or ≤ 40 HRc	Profile 	≤ 0.5	≤ APMX	96 (77-115)	RPM				6624	4968	3975	3312	2484	1987	1590
									Fz				0.036	0.062	0.077	0.091	0.108	0.123	0.133
									Feed (mm/min)				1192	1537	1537	1510	1335	1219	1053
	Slot ² 	1							≤ 1	76 (61-91)	RPM	5089	3817	3054	2545	1909	1527	1221	
											Fz	0.022	0.036	0.045	0.055	0.067	0.075	0.080	
											Feed (mm/min)	550	692	692	702	635	570	489	
				TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 375 Bhn or ≤ 40 HRc	Profile 	≤ 0.4	≤ APMX			56 (45-68)	RPM	4039	3029	2424	2020	1515	1212	969
												Fz	0.022	0.036	0.045	0.055	0.067	0.075	0.080
												Feed (mm/min)	436	549	549	557	504	452	388
	HSM ¹ 	≤ 0.1							≤ APMX	73 (59-88)		RPM	3878	2908	2327	1939	1454	1163	931
												Fz	0.029	0.049	0.061	0.072	0.084	0.096	0.105
												Feed (mm/min)	558	714	713	698	614	558	489
			STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F		≤ 375 Bhn or ≤ 40 HRc	Profile 	≤ 0.4	≤ APMX			56 (45-68)	RPM	2989	2242	1793	1495	1121	897	717
												Fz	0.017	0.030	0.037	0.043	0.051	0.059	0.065
												Feed (mm/min)	251	335	335	323	287	263	233
Slot ² 	1	≤ 1							44 (35-53)	RPM		2343	1757	1406	1171	879	703	562	
										Fz		0.017	0.030	0.037	0.043	0.051	0.059	0.065	
										Feed (mm/min)		197	262	262	253	225	206	183	
				STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.4	≤ APMX		149 (119-179)	RPM	10260	7695	6156	5130	3847	3078	2462	
											Fz	0.036	0.062	0.077	0.091	0.108	0.123	0.133	
											Feed (mm/min)	1847	2381	2380	2339	2068	1888	1631	
HSM ¹ 	≤ 0.1	≤ APMX							134 (107-161)		RPM	7917	5938	4750	3958	2969	2375	1900	
											Fz	0.022	0.036	0.045	0.055	0.067	0.075	0.080	
											Feed (mm/min)	855	1077	1077	1092	988	887	760	
			STAINLESS STEELS (PH) 13-8 PH, 15-5PH, 17-4 PH, CUSTOM 450		≤ 325 Bhn or ≤ 35 HRc	Profile 	≤ 0.4	≤ APMX		94 (76-113)	RPM	6301	4726	3781	3151	2363	1890	1512	
											Fz	0.022	0.036	0.045	0.055	0.067	0.075	0.080	
											Feed (mm/min)	680	857	857	869	786	706	605	
HSM ¹ 	≤ 0.1	≤ APMX							125 (100-150)		RPM	7109	5332	4265	3555	2666	2133	1706	
											Fz	0.029	0.049	0.061	0.072	0.084	0.096	0.105	
											Feed (mm/min)	1024	1308	1308	1280	1126	1024	896	
				STAINLESS STEELS (PH) 13-8 PH, 15-5PH, 17-4 PH, CUSTOM 450	≤ 325 Bhn or ≤ 35 HRc	Profile 	≤ 0.4	≤ APMX		104 (83-124)	RPM	5493	4120	3296	2747	2060	1648	1318	
											Fz	0.017	0.030	0.037	0.043	0.051	0.059	0.063	
											Feed (mm/min)	461	615	615	593	527	483	412	
Slot ² 	1	≤ 1							82 (66-99)		RPM	4362	3272	2617	2181	1636	1309	1047	
											Fz	0.017	0.030	0.037	0.043	0.051	0.059	0.063	
											Feed (mm/min)	366	489	489	471	419	384	327	
			HSM ¹ 		≤ 0.1	≤ APMX	125 (100-150)	RPM		6624	4968	3975	3312	2484	1987	1590			
								Fz		0.029	0.049	0.061	0.072	0.084	0.096	0.105			
								Feed (mm/min)		954	1219	1219	1192	1049	954	835			
HSM ¹ 	≤ 0.1	≤ APMX						94 (76-113)	RPM	5009	3756	3005	2504	1878	1503	1202			
									Fz	0.017	0.030	0.037	0.043	0.051	0.059	0.063			
									Feed (mm/min)	421	561	561	541	481	441	376			
			Slot ² 	1	≤ 1	76 (61-91)	RPM		4039	3029	2424	2020	1515	1212	969				
							Fz		0.017	0.030	0.037	0.043	0.051	0.059	0.063				
							Feed (mm/min)		339	452	452	436	388	355	303				

Series Z5MCR, Z5MLCR Metric		Hardness			Vc (m/min)	DC • mm								
			Ae x DC	Ap x DC		6	8	10	12	16	20	25		
K	CAST IRONS (LOW & MEDIUM ALLOY) Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	HSM ¹ 	≤ 0.1	≤ APMX	175 (140-210)	RPM	9290	6968	5574	4645	3484	2787	2230
			Fz	0.046	0.075	0.093	0.113	0.133	0.149	0.165				
			Feed (mm/min)	2118	2602	2601	2620	2319	2081	1840				
		≤ 260 Bhn or ≤ 26 HRc	Profile 	≤ 0.4	≤ APMX	136 (109-163)	RPM	7190	5392	4314	3595	2696	2157	1726
			Fz	0.026	0.045	0.056	0.067	0.079	0.091	0.098				
			Feed (mm/min)	949	1208	1208	1208	1070	978	841				
			Slot ² 	1	≤ 1	108 (87-130)	RPM	5736	4302	3441	2868	2151	1721	1377
			Fz	0.026	0.045	0.056	0.067	0.079	0.091	0.098				
			Feed (mm/min)	757	964	964	964	853	780	671				
	CAST IRONS (HIGH ALLOY) Gray, Malleable, Ductile	≤ 260 Bhn or ≤ 26 HRc	HSM ¹ 	≤ 0.1	≤ APMX	134 (107-161)	RPM	7109	5332	4265	3555	2666	2133	1706
			Fz	0.034	0.055	0.069	0.084	0.100	0.112	0.123				
			Feed (mm/min)	1194	1479	1479	1493	1331	1194	1045				
			Profile 	≤ 0.4	≤ APMX	104 (83-124)	RPM	5493	4120	3296	2747	2060	1648	1318
			Fz	0.020	0.034	0.043	0.050	0.059	0.067	0.073				
			Feed (mm/min)	554	703	703	692	606	549	478				
			Slot ² 	1	≤ 1	82 (66-99)	RPM	4362	3272	2617	2181	1636	1309	1047
			Fz	0.020	0.034	0.043	0.050	0.059	0.067	0.073				
			Feed (mm/min)	440	558	558	550	482	436	380				
S	SUPER ALLOYS (NICKEL , COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	≤ 300 Bhn or ≤ 32 HRc	HSM ¹ 	≤ 0.1	≤ APMX	35 (28-42)	RPM	1858	1394	1115	929	697	557	446
			Fz	0.026	0.045	0.056	0.067	0.079	0.091	0.098				
			Feed (mm/min)	245	312	312	312	276	253	217				
			Profile 	≤ 0.4	≤ APMX	24 (20-29)	RPM	1293	969	776	646	485	388	310
			Fz	0.016	0.027	0.034	0.041	0.048	0.054	0.060				
			Feed (mm/min)	105	132	132	132	116	105	92				
			Slot ² 	1	≤ 1	20 (16-24)	RPM	1050	788	630	525	394	315	252
			Fz	0.016	0.027	0.034	0.041	0.048	0.054	0.060				
			Feed (mm/min)	86	108	108	107	94	86	75				
	SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	≤ 400 Bhn or ≤ 43 HRc	HSM ¹ 	≤ 0.1	≤ APMX	30 (24-37)	RPM	1616	1212	969	808	606	485	388
			Fz	0.019	0.032	0.040	0.048	0.056	0.064	0.070				
			Feed (mm/min)	155	194	194	194	171	155	136				
			Profile 	≤ 0.4	≤ APMX	19 (15-23)	RPM	1002	751	601	501	376	301	240
			Fz	0.012	0.019	0.024	0.029	0.033	0.037	0.043				
			Feed (mm/min)	58	72	72	72	63	56	51				
			Slot ² 	1	≤ 1	15 (12-18)	RPM	808	606	485	404	303	242	194
			Fz	0.012	0.019	0.024	0.029	0.033	0.037	0.043				
			Feed (mm/min)	47	58	58	58	50	45	41				
	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Zn0.5Si	≤ 350 Bhn or ≤ 38 HRc	HSM ¹ 	≤ 0.1	≤ APMX	85 (68-102)	RPM	4524	3393	2714	2262	1696	1357	1086
			Fz	0.031	0.053	0.067	0.079	0.092	0.107	0.115				
			Feed (mm/min)	706	905	905	896	782	724	624				
			Profile 	≤ 0.4	≤ APMX	66 (52-79)	RPM	3474	2605	2084	1737	1303	1042	834
			Fz	0.019	0.032	0.040	0.048	0.056	0.064	0.070				
			Feed (mm/min)	333	417	417	417	367	333	292				
		Slot ² 	1	≤ 1	52 (41-62)	RPM	2747	2060	1648	1373	1030	824	659	
		Fz	0.019	0.032	0.040	0.048	0.056	0.064	0.070					
		Feed (mm/min)	264	330	330	330	290	264	231					
TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 440 Bhn or ≤ 47 HRc	HSM ¹ 	≤ 0.1	≤ APMX	47 (38-57)	RPM	2504	1878	1503	1252	939	751	601	
		Fz	0.031	0.053	0.067	0.079	0.092	0.107	0.115					
		Feed (mm/min)	391	501	501	496	433	401	346					
		Profile 	≤ 0.4	≤ APMX	23 (18-27)	RPM	1212	909	727	606	454	364	291	
		Fz	0.019	0.032	0.040	0.048	0.056	0.064	0.070					
		Feed (mm/min)	116	145	145	145	128	116	102					
		Slot ² 	1	≤ 1	18 (15-22)	RPM	969	727	582	485	364	291	233	
		Fz	0.019	0.032	0.040	0.048	0.056	0.064	0.070					
		Feed (mm/min)	93	116	116	116	102	93	81					

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

rpm = Vc x 1000 / (DC x 3.14)

ipm = Fz x 5 x rpm

1 HSM method strongly recommended, particularly when using 4 x DC tools

2 reduce Ap to ≤ 5 x DC when slotting with 4 x DC tools

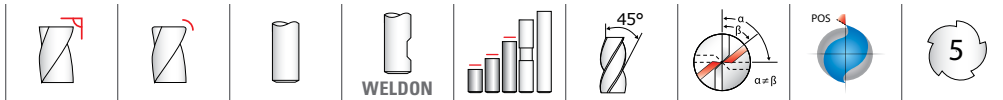
ramp up to 5 degrees using slotting speed and feed rates. Do not plunge.

reduce speed and feed for materials harder than listed

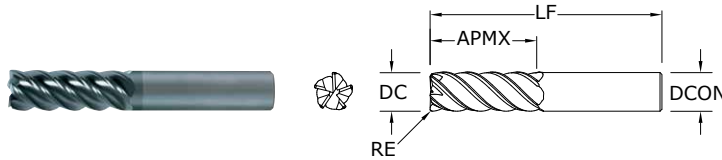
reduce feed and Ae when finish milling (.02 x DC maximum)

feed rates listed have chip thinning adjustments included where applicable

refer to the **KYOCERA SGS APEX** for complete technical information (www.kyocera-sgstool.com/apex)



**55 •
55CR**
FRACTIONAL SERIES



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

CUTTING DIAMETER DC	LENGTH OF CUT APMX	inch			EDP NO.	
		OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	Ti-NAMITE-A (AlTiN)	Ti-NAMITE-A (AlTiN) W/FLAT
1/8	1/4	1-1/2	1/8	—	32672	—
1/8	1/4	1-1/2	1/8	.010	32606	—
1/8	1/2	1-1/2	1/8	—	32655	—
1/8	1/2	1-1/2	1/8	.010	32607	—
5/32	5/16	2	3/16	.010	32608	—
5/32	9/16	2	3/16	—	32656	—
5/32	9/16	2	3/16	.010	32609	—
3/16	5/16	2	3/16	—	32673	—
3/16	5/16	2	3/16	.010	32610	—
3/16	5/8	2	3/16	—	32657	—
3/16	5/8	2	3/16	.010	32611	—
7/32	3/8	2	1/4	.015	32612	—
7/32	3/4	2-1/2	1/4	.015	32613	—
7/32	3/4	2-1/2	1/4	—	32658	—
1/4	3/8	2	1/4	.015	32614	—
1/4	3/8	2	1/4	—	32674	—
1/4	3/4	2-1/2	1/4	—	32659	—
1/4	3/4	2-1/2	1/4	.015	32615	—
1/4	1-1/4	4	1/4	.015	32616	—
5/16	7/16	2	5/16	—	32675	—
5/16	7/16	2	5/16	.015	32619	—
5/16	13/16	2-1/2	5/16	—	32660	—
5/16	13/16	2-1/2	5/16	.015	32620	—
5/16	1-1/4	4	5/16	.015	32621	—
3/8	1/2	2	3/8	—	32676	32677
3/8	1/2	2	3/8	.015	32625	32591
3/8	1/2	2	3/8	.030	32592	32593
3/8	1	2-1/2	3/8	—	32661	32662
3/8	1	2-1/2	3/8	.015	32626	32628
3/8	1	2-1/2	3/8	.030	32573	32574
3/8	1-1/2	4	3/8	.015	32627	—
3/8	1-1/2	4	3/8	.030	32569	—
7/16	1	2-3/4	7/16	—	32663	—

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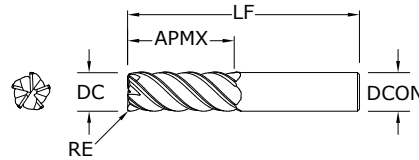
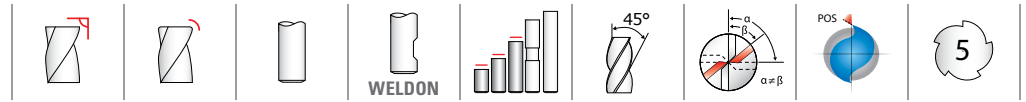
TOLERANCES (inch)

DC = +0.0000/-0.0020

DCON = h_6

RE = +0.0000/-0.0020

STEELS
STAINLESS STEELS
CAST IRON
HIGH TEMP ALLOYS



**55 •
55CR**
FRACTIONAL SERIES

TOLERANCES (inch)

DC = +0.0000/-0.0020

DCON = h_6

RE = +0.0000/-0.0020

STEELS
STAINLESS STEELS
CAST IRON
HIGHTEMP ALLOYS

inch					EDP NO.	
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	Ti-NAMITE-A (AITiN)	Ti-NAMITE-A (AITiN) W/FLAT
7/16	1	2-3/4	7/16	.015	32632	—
7/16	2	4	7/16	.015	32633	—
1/2	5/8	2-1/2	1/2	—	32678	32679
1/2	5/8	2-1/2	1/2	.030	32594	32595
1/2	5/8	2-1/2	1/2	.060	32596	32597
1/2	1-1/4	3	1/2	—	32664	32665
1/2	1-1/4	3	1/2	.030	32575	32576
1/2	1-1/4	3	1/2	.060	32577	32578
1/2	2	4	1/2	.030	32685	—
1/2	2	4	1/2	.060	32686	—
5/8	3/4	3	5/8	—	32680	32681
5/8	3/4	3	5/8	.030	32598	32599
5/8	3/4	3	5/8	.060	32600	32601
5/8	1-5/8	3-1/2	5/8	—	32666	32667
5/8	1-5/8	3-1/2	5/8	.030	32579	32580
5/8	1-5/8	3-1/2	5/8	.060	32581	32582
5/8	2-1/2	5	5/8	.030	32570	—
5/8	2-1/2	5	5/8	.060	32687	—
3/4	1	3	3/4	—	32682	32683
3/4	1	3	3/4	.030	32602	32603
3/4	1	3	3/4	.060	32604	32605
3/4	1-5/8	4	3/4	—	32668	32669
3/4	1-5/8	4	3/4	.030	32583	32584
3/4	1-5/8	4	3/4	.060	32585	32586
3/4	3-1/4	6	3/4	.030	32571	—
3/4	3-1/4	6	3/4	.060	32688	—
1	1-1/2	4	1	—	32670	32671
1	1-1/2	4	1	.030	32587	32588
1	1-1/2	4	1	.060	32589	32590
1	2-5/8	6	1	.030	32572	—
1	2-5/8	6	1	.060	32689	—

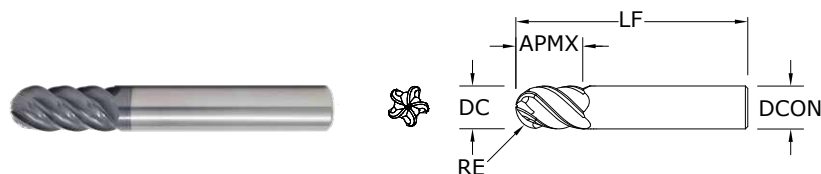
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55B

FRACTIONAL SERIES

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



inch				EDP NO.
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	Ti-NAMITE-A (AlTiN)
1/4	3/4	2-1/2	1/4	32500
5/16	13/16	2-1/2	5/16	32501
3/8	1	2-1/2	3/8	32502
1/2	1-1/4	3	1/2	32503
5/8	1-5/8	3-1/2	5/8	32504
3/4	1-5/8	4	3/4	32505
1	1-1/2	4	1	32506

RE = 1/2 Cutting Diameter (DC)

TOLERANCES (inch)

DC = +0.0000/-0.0020

DCON = h_6

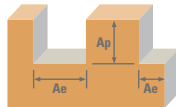
RE = +0.0005/-0.0010

STEELS

STAINLESS STEELS

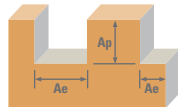
CAST IRON

HIGH TEMP ALLOYS



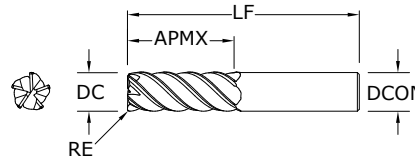
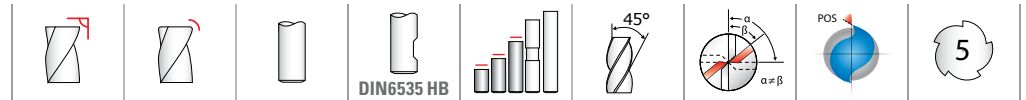
Series 55, 55CR, 55B Fractional		Hardness			Vc (sfm)		DC • in						
			1/8	1/4			3/8	1/2	5/8	3/4	1		
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 275 Bhn or ≤ 28 HRc	 Profile ≤ 0.25	≤ 1.5	385	RPM	11766	5883	3922	2941	2353	1961	1471
					(308-462)	Fz	0.0004	0.0009	0.0017	0.0023	0.0029	0.0028	0.0032
						Feed (ipm)	20.6	26.5	33.3	33.8	34.1	27.5	23.5
		≤ 275 Bhn or ≤ 28 HRc	 HSM ≤ 0.05	≤ 2	630	RPM	19253	9626	6418	4813	3851	3209	2407
					(504-756)	Fz	0.0007	0.0018	0.0034	0.0046	0.0057	0.0055	0.0064
						Feed (ipm)	67.4	86.6	109.1	110.7	109.7	88.2	77.0
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 375 Bhn or ≤ 40 HRc	 Profile ≤ 0.25	≤ 1.5	325	RPM	9932	4966	3311	2483	1986	1655	1242
					(260-390)	Fz	0.0003	0.0007	0.0013	0.0017	0.0022	0.0021	0.0024
						Feed (ipm)	12.9	17.4	21.5	21.1	21.9	17.4	14.9
		≤ 375 Bhn or ≤ 40 HRc	 HSM ≤ 0.05	≤ 2	530	RPM	16197	8098	5399	4049	3239	2699	2025
					(424-636)	Fz	0.0005	0.0014	0.0026	0.0034	0.0043	0.0041	0.0048
						Feed (ipm)	42.1	56.7	70.2	68.8	69.6	55.3	48.6
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 375 Bhn or ≤ 40 HRc	 Profile ≤ 0.25	≤ 1.5	175	RPM	5348	2674	1783	1337	1070	891	669
					(140-210)	Fz	0.0002	0.0005	0.0010	0.0013	0.0016	0.0017	0.0018
						Feed (ipm)	5.3	6.7	8.9	8.7	8.6	7.6	6.0
		≤ 375 Bhn or ≤ 40 HRc	 HSM ≤ 0.05	≤ 2	290	RPM	8862	4431	2954	2216	1772	1477	1108
					(232-348)	Fz	0.0004	0.0010	0.0019	0.0025	0.0032	0.0033	0.0035
						Feed (ipm)	17.7	22.2	28.1	27.7	28.4	24.4	19.4
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 275 Bhn or ≤ 28 HRc	 Profile ≤ 0.25	≤ 1.5	370	RPM	11307	5654	3769	2827	2261	1885	1413
					(296-444)	Fz	0.0003	0.0007	0.0013	0.0017	0.0022	0.0023	0.0024
						Feed (ipm)	14.7	19.8	24.5	24.0	24.9	21.7	17.0
		≤ 275 Bhn or ≤ 28 HRc	 HSM ≤ 0.05	≤ 2	560	RPM	17114	8557	5705	4278	3423	2852	2139
					(448-672)	Fz	0.0005	0.0014	0.0026	0.0034	0.0043	0.0044	0.0048
						Feed (ipm)	44.5	59.9	74.2	72.7	73.6	62.7	51.3
	STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L	≤ 275 Bhn or ≤ 28 HRc	 Profile ≤ 0.25	≤ 1.5	255	RPM	7793	3896	2598	1948	1559	1299	974
					(204-306)	Fz	0.0002	0.0006	0.0012	0.0016	0.0020	0.0021	0.0023
						Feed (ipm)	9.4	11.7	15.6	15.6	15.6	13.6	11.2
		≤ 275 Bhn or ≤ 28 HRc	 HSM ≤ 0.05	≤ 2	385	RPM	11766	5883	3922	2941	2353	1961	1471
					(308-462)	Fz	0.0005	0.0013	0.0024	0.0032	0.0040	0.0041	0.0045
						Feed (ipm)	28.2	38.2	47.1	47.1	47.1	40.2	33.1
	STAINLESS STEELS (PH) 13-8 PH, 15-5 PH, 17-4 PH, Custom 450	≤ 325 Bhn or ≤ 35 HRc	 Profile ≤ 0.25	≤ 1.5	235	RPM	7182	3591	2394	1795	1436	1197	898
					(188-282)	Fz	0.0002	0.0006	0.0010	0.0014	0.0017	0.0018	0.0019
						Feed (ipm)	7.5	10.8	12.0	12.6	12.2	10.8	8.5
		≤ 325 Bhn or ≤ 35 HRc	 HSM ≤ 0.05	≤ 2	355	RPM	10849	5424	3616	2712	2170	1808	1356
					(284-426)	Fz	0.0004	0.0011	0.0021	0.0028	0.0034	0.0036	0.0039
						Feed (ipm)	22.2	29.8	38.0	38.0	36.9	32.5	26.4

continued on next page



Series 55, 55CR, 55B Fractional	Hardness		Ae x DC	Ap x DC	Vc (sfm)	DC • in								
						1/8	1/4	3/8	1/2	5/8	3/4	1		
K	CAST IRONS (LOW & MEDIUM ALLOY) Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	Profile 	≤ 0.25	≤ 1.5	470	RPM	14363	7182	4788	3591	2873	2394	1795
						(376-564)	Fz	0.0004	0.0009	0.0017	0.0023	0.0029	0.0030	0.0032
							Feed (ipm)	25.1	32.3	40.7	41.3	41.7	35.9	28.7
		≤ 260 Bhn or ≤ 26 HRc	HSM 	≤ 0.05	≤ 2	705	RPM	21545	10772	7182	5386	4309	3591	2693
						(564-846)	Fz	0.0007	0.0018	0.0034	0.0046	0.0057	0.0059	0.0064
							Feed (ipm)	75.4	97.0	122.1	123.9	122.8	105.9	86.2
	CAST IRONS (HIGH ALLOY) Gray, Malleable, Ductile	≤ 260 Bhn or ≤ 26 HRc	Profile 	≤ 0.25	≤ 1.5	360	RPM	11002	5501	3667	2750	2200	1834	1375
						(288-432)	Fz	0.0003	0.0007	0.0013	0.0017	0.0022	0.0023	0.0024
							Feed (ipm)	14.3	19.3	23.8	23.4	24.2	21.1	16.5
		≤ 400 Bhn or ≤ 43 HRc	HSM 	≤ 0.05	≤ 2	540	RPM	16502	8251	5501	4126	3300	2750	2063
						(432-648)	Fz	0.0005	0.0014	0.0026	0.0034	0.0043	0.0044	0.0048
							Feed (ipm)	42.9	57.8	71.5	70.1	71.0	60.5	49.5
S	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	≤ 300 Bhn or ≤ 32 HRc	Profile 	≤ 0.25	≤ 1.5	70	RPM	2139	1070	713	535	428	357	267
						(56-84)	Fz	0.0002	0.0006	0.0010	0.0014	0.0017	0.0018	0.0019
							Feed (ipm)	2.2	3.2	3.6	3.7	3.6	3.2	2.5
		≤ 400 Bhn or ≤ 43 HRc	HSM 	≤ 0.05	≤ 2	107	RPM	3270	1635	1090	817	654	545	409
						(86-128)	Fz	0.0004	0.0011	0.0021	0.0028	0.0034	0.0036	0.0039
							Feed (ipm)	6.7	9.0	11.4	11.4	11.1	9.8	8.0
	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	≤ 400 Bhn or ≤ 43 HRc	Profile 	≤ 0.25	≤ 1.5	55	RPM	1681	840	560	420	336	280	210
						(44-66)	Fz	0.0002	0.0004	0.0008	0.0010	0.0013	0.0014	0.0015
							Feed (ipm)	1.3	1.7	2.2	2.1	2.2	2.0	1.6
		≤ 350 Bhn or ≤ 38 HRc	HSM 	≤ 0.05	≤ 2	85	RPM	2598	1299	866	649	520	433	325
						(68-102)	Fz	0.0003	0.0008	0.0015	0.0021	0.0026	0.0027	0.0029
							Feed (ipm)	4.0	5.2	6.5	6.8	6.8	5.8	4.7
	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	≤ 350 Bhn or ≤ 38 HRc	Profile 	≤ 0.25	≤ 1.5	235	RPM	7182	3591	2394	1795	1436	1197	898
						(188-282)	Fz	0.0002	0.0006	0.0012	0.0016	0.0020	0.0021	0.0023
							Feed (ipm)	7.2	10.8	14.4	14.4	14.4	12.6	10.3
		≤ 420 Bhn or ≤ 45 HRc	HSM 	≤ 0.05	≤ 2	390	RPM	11918	5959	3973	2980	2384	1986	1490
						(312-468)	Fz	0.0005	0.0013	0.0024	0.0032	0.0040	0.0041	0.0045
							Feed (ipm)	29.8	38.7	47.7	47.7	47.7	40.7	33.5
	TITANIUM ALLOYS (DIFFICULT) Ti10V2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 420 Bhn or ≤ 45 HRc	Profile 	≤ 0.25	≤ 1.5	85	RPM	2598	1299	866	649	520	433	325
						(68-102)	Fz	0.0002	0.0006	0.0012	0.0016	0.0020	0.0021	0.0023
							Feed (ipm)	2.6	3.9	5.2	5.2	5.2	4.5	3.7
		≤ 420 Bhn or ≤ 45 HRc	HSM 	≤ 0.05	≤ 2	140	RPM	4278	2139	1426	1070	856	713	535
						(112-168)	Fz	0.0005	0.0013	0.0024	0.0032	0.0040	0.0042	0.0045
							Feed (ipm)	10.7	13.9	17.1	17.1	17.1	15.0	12.0

Bhn (Brinell) HRc (Rockwell C) HSM (High Speed Machining)
 $\text{rpm} = \text{Vc} \times 3.82 / \text{DC}$
 $\text{ipm} = \text{Fz} \times 5 \times \text{rpm}$
 reduce speed and feed for materials harder than listed
 reduce feed and Ae when finish milling (.02 x DC maximum)
 reduce Ap to 1 x DC (maximum) when profile milling with long or extra long flute length tools
 feed rates listed have chip thinning adjustments included where applicable
 refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)



**55M •
55MCR**
METRIC SERIES

TOLERANCES (mm)

DC = +0,000/-0,050

DCON = h_6

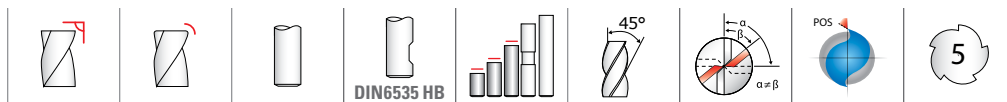
RE = +0,000/-0,050

STEELS
STAINLESS STEELS
CAST IRON
HIGHTEMP ALLOYS

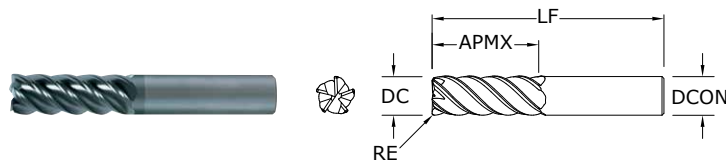
CUTTING DIAMETER DC	LENGTH OF CUT APMX	mm			EDP NO.	
		OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	Ti-NAMITE-A (AITiN)	Ti-NAMITE-A (AITiN) W/FLAT
6,0	12,0	50,0	6,0	—	42606	—
6,0	12,0	50,0	6,0	0,5	42660	—
6,0	19,0	63,0	6,0	—	42607	—
6,0	19,0	63,0	6,0	0,25	42661	—
6,0	19,0	63,0	6,0	0,5	42662	—
6,0	19,0	63,0	6,0	1,0	42663	—
6,0	19,0	63,0	6,0	1,5	42664	—
6,0	25,0	75,0	6,0	—	42608	—
6,0	25,0	75,0	6,0	0,5	42665	—
8,0	12,0	50,0	8,0	—	42609	—
8,0	12,0	50,0	8,0	0,5	42666	—
8,0	20,0	63,0	8,0	—	42610	—
8,0	20,0	63,0	8,0	0,5	42667	—
8,0	20,0	63,0	8,0	1,0	42668	—
8,0	20,0	63,0	8,0	1,5	42669	—
8,0	20,0	63,0	8,0	2,0	42670	—
8,0	25,0	75,0	8,0	—	42611	—
8,0	25,0	75,0	8,0	0,5	42671	—
10,0	16,0	50,0	10,0	—	42612	—
10,0	16,0	50,0	10,0	0,5	42672	—
10,0	22,0	75,0	10,0	—	42622	42613
10,0	22,0	75,0	10,0	0,5	42673	—
10,0	22,0	75,0	10,0	1,0	42674	—
10,0	22,0	75,0	10,0	1,5	42675	—
10,0	22,0	75,0	10,0	2,0	42676	—
10,0	22,0	75,0	10,0	2,5	42677	—
10,0	38,0	100,0	10,0	—	42614	—
10,0	38,0	100,0	10,0	0,5	42678	—
12,0	19,0	63,0	12,0	—	42615	—
12,0	19,0	63,0	12,0	0,5	42679	—
12,0	25,0	75,0	12,0	—	42616	42623
12,0	25,0	75,0	12,0	0,5	42680	—
12,0	25,0	75,0	12,0	1,0	42681	—
12,0	25,0	75,0	12,0	1,5	42682	—
12,0	25,0	75,0	12,0	2,0	42683	—
12,0	25,0	75,0	12,0	2,5	42684	—

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

continued on next page



**55M •
55MCR**
METRIC SERIES



CONTINUED

CUTTING DIAMETER DC	LENGTH OF CUT APMX	mm			EDP NO.	
		OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	Ti-NAMITE-A (AlTiN)	Ti-NAMITE-A (AlTiN) W/FLAT
12,0	25,0	75,0	12,0	3,0	42685	—
12,0	50,0	100,0	12,0	—	42617	—
12,0	50,0	100,0	12,0	0,5	42686	—
12,0	50,0	100,0	12,0	3,0	42630	—
12,0	50,0	100,0	12,0	4,0	42631	—
16,0	32,0	89,0	16,0	—	42618	42624
16,0	32,0	89,0	16,0	1,0	42687	—
16,0	32,0	89,0	16,0	1,5	42688	—
16,0	32,0	89,0	16,0	2,0	42689	—
16,0	32,0	89,0	16,0	2,5	42690	—
16,0	32,0	89,0	16,0	3,0	42691	—
16,0	32,0	89,0	16,0	4,0	42692	—
16,0	50,0	100,0	16,0	—	42626	—
16,0	50,0	100,0	16,0	2,0	42656	—
16,0	50,0	100,0	16,0	2,5	42657	—
16,0	50,0	100,0	16,0	3,0	42658	—
16,0	50,0	100,0	16,0	4,0	42659	—
16,0	50,0	100,0	16,0	5,0	42628	—
16,0	75,0	150,0	16,0	—	42619	—
16,0	75,0	150,0	16,0	1,0	42693	—
16,0	75,0	150,0	16,0	3,0	42632	—
16,0	75,0	150,0	16,0	4,0	42633	—
20,0	38,0	100,0	20,0	—	42620	42625
20,0	38,0	100,0	20,0	1,0	42694	—
20,0	38,0	100,0	20,0	1,5	42695	—
20,0	38,0	100,0	20,0	2,0	42696	—
20,0	38,0	100,0	20,0	2,5	42697	—
20,0	38,0	100,0	20,0	3,0	42698	—
20,0	38,0	100,0	20,0	4,0	42699	—
20,0	38,0	100,0	20,0	5,0	42700	—
20,0	38,0	100,0	20,0	6,0	42648	—
20,0	50,0	100,0	20,0	—	42627	—
20,0	50,0	100,0	20,0	2,0	42649	—
20,0	50,0	100,0	20,0	2,5	42650	—

TOLERANCES (inch)

DC = +0.0000/-0.0020

DCON = h_6

RE = +0.0000/-0.0020

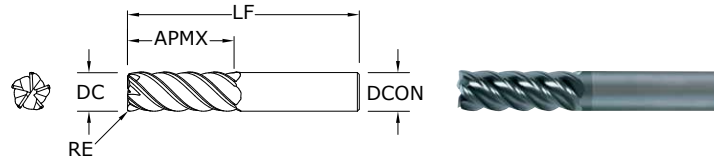
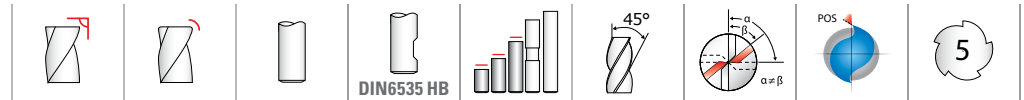
STEELS

STAINLESS STEELS

CAST IRON

HIGH TEMP ALLOYS

continued on next page



55M • 55MCR

METRIC SERIES

TOLERANCES (mm)

DC = +0,000/-0,050

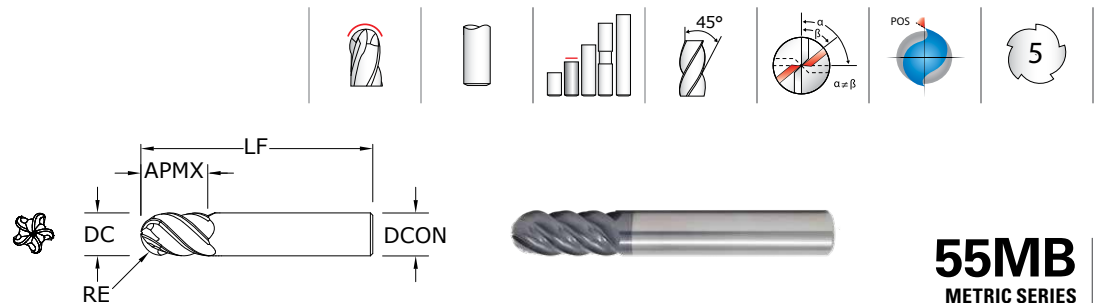
DCON = h_6

RE = +0,000/-0,050

STEELS
STAINLESS STEELS
CAST IRON
HIGH TEMP ALLOYS

CUTTING DIAMETER DC	LENGTH OF CUT APMX	mm			EDP NO.	
		OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	Ti-NAMITE-A (AlTiN)	Ti-NAMITE-A (AlTiN) W/FLAT
20,0	50,0	100,0	20,0	3,0	42651	—
20,0	50,0	100,0	20,0	4,0	42652	—
20,0	50,0	100,0	20,0	5,0	42653	—
20,0	50,0	100,0	20,0	6,0	42654	—
20,0	75,0	150,0	20,0	—	42621	—
20,0	75,0	150,0	20,0	1,0	42701	—
20,0	75,0	150,0	20,0	2,0	42702	—
20,0	75,0	150,0	20,0	3,0	42703	—
20,0	75,0	150,0	20,0	4,0	42704	—
20,0	75,0	150,0	20,0	5,0	42705	—
20,0	75,0	150,0	20,0	6,0	42655	—

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



55MB

METRIC SERIES

TOLERANCES (mm)

DC = +0,000/-0,050

DCON = h_6

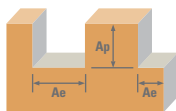
RE = +0,000/-0,050

STEELS
STAINLESS STEELS
CAST IRON
HIGH TEMP ALLOYS

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

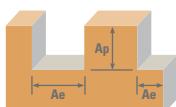
RE = 1/2 Cutting Diameter (DC)

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



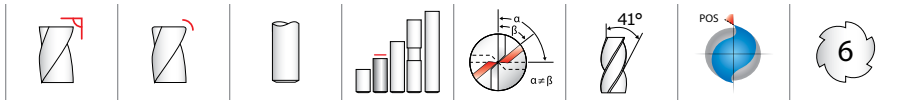
Series 55M, 55MCR, 55MB				Vc (m/min)		DC • mm								
Metric	Hardness	Ae x DC	Ap x DC			6	8	10	12	16	20			
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.25	≤ 1.5	117	RPM	6220	4665	3732	3110	2333	1866	
						(94-141)	Fz	0.022	0.036	0.061	0.070	0.072	0.085	
							Feed (mm/min)	672	846	1145	1082	836	796	
		≤ 375 Bhn or ≤ 40 HRc	HSM 	≤ 0.05	≤ 2	192	RPM	10179	7634	6107	5089	3817	3054	
						(154-230)	Fz	0.043	0.073	0.123	0.137	0.141	0.154	
							Feed (mm/min)	2198	2769	3746	3481	2687	2345	
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 375 Bhn or ≤ 40 HRc	Profile 	≤ 0.25	≤ 1.5	99	RPM	5251	3938	3151	2626	1969	1575	
						(79-119)	Fz	0.017	0.028	0.045	0.053	0.054	0.064	
							Feed (mm/min)	441	546	571	693	529	504	
		≤ 375 Bhn or ≤ 40 HRc	HSM 	≤ 0.05	≤ 2	162	RPM	8563	6422	5138	4282	3211	2569	
						(129-194)	Fz	0.034	0.055	0.091	0.103	0.105	0.128	
							Feed (mm/min)	1438	1781	2329	2209	1685	1644	
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 375 Bhn or ≤ 40 HRc	Profile 	≤ 0.25	≤ 1.5	53	RPM	2827	2121	1696	1414	1060	848	
						(43-64)	Fz	0.012	0.021	0.035	0.038	0.044	0.048	
							Feed (mm/min)	170	226	294	271	231	204	
		≤ 375 Bhn or ≤ 40 HRc	HSM 	≤ 0.05	≤ 2	88	RPM	4686	3514	2811	2343	1757	1406	
						(71-106)	Fz	0.024	0.041	0.067	0.077	0.084	0.093	
							Feed (mm/min)	562	712	937	900	742	656	
	M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.25	≤ 1.5	113	RPM	5978	4484	3587	2989	2242	1793
							(90-135)	Fz	0.017	0.028	0.045	0.053	0.059	0.064
								Feed (mm/min)	502	622	813	789	660	574
			≤ 375 Bhn or ≤ 40 HRc	HSM 	≤ 0.05	≤ 2	171	RPM	9048	6786	5429	4524	3393	2714
							(137-205)	Fz	0.034	0.055	0.091	0.103	0.113	0.128
								Feed (mm/min)	1520	1882	2461	2334	1911	1737
STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L		≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.25	≤ 1.5	78	RPM	4120	3090	2472	2060	1545	1236	
						(62-93)	Fz	0.014	0.026	0.043	0.048	0.054	0.061	
							Feed (mm/min)	297	396	527	494	415	379	
		≤ 375 Bhn or ≤ 40 HRc	HSM 	≤ 0.05	≤ 2	117	RPM	6220	4665	3732	3110	2333	1866	
						(94-141)	Fz	0.031	0.051	0.085	0.096	0.105	0.120	
							Feed (mm/min)	970	1194	1592	1493	1224	1120	
STAINLESS STEELS (PH) 13-8 PH, 15-5 PH, 17-4 PH, Custom 450		≤ 325 Bhn or ≤ 35 HRc	Profile 	≤ 0.25	≤ 1.5	72	RPM	3797	2848	2278	1898	1424	1139	
						(57-86)	Fz	0.014	0.021	0.037	0.041	0.046	0.051	
							Feed (mm/min)	273	304	425	387	328	289	
		≤ 325 Bhn or ≤ 35 HRc	HSM 	≤ 0.05	≤ 2	108	RPM	5736	4302	3441	2868	2151	1721	
						(87-130)	Fz	0.026	0.045	0.075	0.082	0.092	0.104	
							Feed (mm/min)	757	964	1285	1170	991	895	

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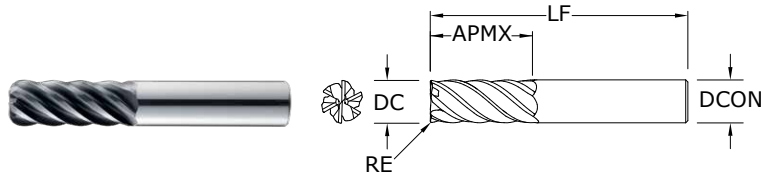
Series 55M, 55MCR, 55MB Metric		Ae x DC Ap x DC		Vc (m/min)	DC • mm								
Hardness					6	8	10	12	16	20			
K	CAST IRONS (LOW & MEDIUM ALLOY) Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	Profile 	≤ 0.25	≤ 1.5	143	RPM	7594	5695	4556	3797	2848	2278
						(115-172)	Fz	0.022	0.036	0.061	0.070	0.077	0.085
							Feed (mm/min)	820	1033	1397	1321	1093	972
		HSM 	≤ 0.05	≤ 2	215	RPM	11391	8543	6834	5695	4271	3417	
					(172-258)	Fz	0.043	0.073	0.123	0.137	0.151	0.171	
						Feed (mm/min)	2460	3099	4192	3895	3226	2916	
	CAST IRONS (HIGH ALLOY) Gray, Malleable, Ductile	≤ 260 Bhn or ≤ 26 HRc	Profile 	≤ 0.25	≤ 1.5	110	RPM	5816	4362	3490	2908	2181	1745
						(88-132)	Fz	0.017	0.028	0.045	0.053	0.059	0.064
							Feed (mm/min)	489	605	791	768	642	558
		HSM 	≤ 0.05	≤ 2	165	RPM	8725	6544	5235	4362	3272	2617	
					(132-198)	Fz	0.034	0.055	0.091	0.103	0.113	0.128	
						Feed (mm/min)	1466	1815	2373	2251	1843	1675	
S	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	≤ 300 Bhn or ≤ 32 HRc	Profile 	≤ 0.25	≤ 1.5	21	RPM	1131	848	679	565	424	339
						(17-26)	Fz	0.014	0.021	0.037	0.041	0.046	0.051
							Feed (mm/min)	81	90	127	115	98	86
		HSM 	≤ 0.05	≤ 2	33	RPM	1729	1297	1037	864	648	519	
					(26-39)	Fz	0.026	0.045	0.075	0.082	0.092	0.104	
						Feed (mm/min)	228	290	387	353	299	270	
	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	≤ 400 Bhn or ≤ 43 HRc	Profile 	≤ 0.25	≤ 1.5	17	RPM	889	666	533	444	333	267
						(13-20)	Fz	0.010	0.017	0.027	0.031	0.036	0.040
							Feed (mm/min)	43	57	71	69	60	53
		HSM 	≤ 0.05	≤ 2	26	RPM	1373	1030	824	687	515	412	
					(21-31)	Fz	0.019	0.032	0.056	0.062	0.069	0.077	
						Feed (mm/min)	132	165	231	214	178	159	
S	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	≤ 350 Bhn or ≤ 38 HRc	Profile 	≤ 0.25	≤ 1.5	72	RPM	3797	2848	2278	1898	1424	1139
						(57-86)	Fz	0.014	0.026	0.043	0.048	0.054	0.061
							Feed (mm/min)	273	365	486	456	383	349
		HSM 	≤ 0.05	≤ 2	119	RPM	6301	4726	3781	3151	2363	1890	
					(95-143)	Fz	0.031	0.051	0.085	0.096	0.105	0.120	
						Feed (mm/min)	983	1210	1613	1512	1240	1134	
	TITANIUM ALLOYS (DIFFICULT) Ti10V2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 420 Bhn or ≤ 45 HRc	Profile 	≤ 0.25	≤ 1.5	26	RPM	1373	1030	824	687	515	412
						(21-31)	Fz	0.014	0.026	0.043	0.048	0.054	0.061
							Feed (mm/min)	99	132	176	165	138	126
		HSM 	≤ 0.05	≤ 2	43	RPM	2262	1696	1357	1131	848	679	
					(34-51)	Fz	0.031	0.051	0.085	0.096	0.108	0.120	
						Feed (mm/min)	353	434	579	543	456	407	

Bhn (Brinell) HRC (Rockwell C) HSM (High Speed Machining)
 rpm = (Vc x 1000) / (DC x 3.14)
 mm/min = Fz x 5 x rpm
 reduce speed and feed for materials harder than listed
 reduce feed and Ae when finish milling (.02 x DC maximum)
 reduce Ap to 1 x DC (maximum) when profile milling with long or extra long flute length tools
 feed rates listed have chip thinning adjustments included where applicable
 refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)



51 • 51CR

FRACTIONAL SERIES



- Engineered for High Speed Milling using Trochoidal and Peel Milling techniques
- Eccentric relief provides superior strength and smoother surface finish
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials ≤ 45 HRc (≤ 420 Bhn)

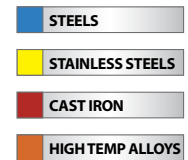
		inch			EDP NO.
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	Ti-NAMITE-X (TX)
1/4	3/4	2-1/2	1/4	—	35100
1/4	3/4	2-1/2	1/4	.015	35112
1/4	3/4	2-1/2	1/4	.030	35150
3/8	1	2-1/2	3/8	—	35101
3/8	1	2-1/2	3/8	.015	35113
3/8	1	2-1/2	3/8	.030	35114
1/2	1-1/4	3	1/2	—	35102
1/2	1-1/4	3	1/2	.015	35151
1/2	1-1/4	3	1/2	.030	35115
1/2	1-1/4	3	1/2	.060	35152
1/2	1-1/4	3	1/2	.090	35116
1/2	1-1/4	3	1/2	.120	35117
5/8	1-5/8	3-1/2	5/8	—	35103
5/8	1-5/8	3-1/2	5/8	.015	35153
5/8	1-5/8	3-1/2	5/8	.030	35118
5/8	1-5/8	3-1/2	5/8	.060	35154
5/8	1-5/8	3-1/2	5/8	.090	35119
5/8	1-5/8	3-1/2	5/8	.120	35120
5/8	1-5/8	3-1/2	5/8	.190	35155
3/4	1-5/8	4	3/4	—	35104
3/4	1-5/8	4	3/4	.030	35121
3/4	1-5/8	4	3/4	.060	35156
3/4	1-5/8	4	3/4	.090	35122
3/4	1-5/8	4	3/4	.120	35123
3/4	1-5/8	4	3/4	.190	35157
3/4	1-5/8	4	3/4	.250	35158
1	2-5/8	6	1	—	35105
1	2-5/8	6	1	.030	35124
1	2-5/8	6	1	.060	35159
1	2-5/8	6	1	.090	35125
1	2-5/8	6	1	.120	35126
1	2-5/8	6	1	.190	35160
1	2-5/8	6	1	.250	35161

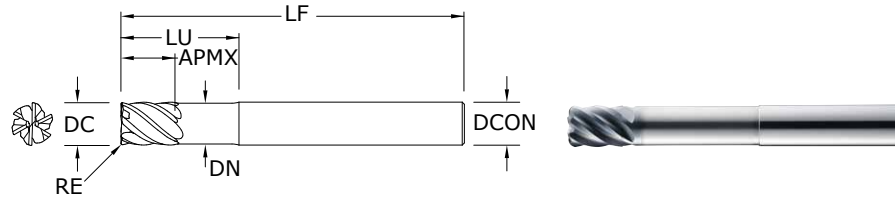
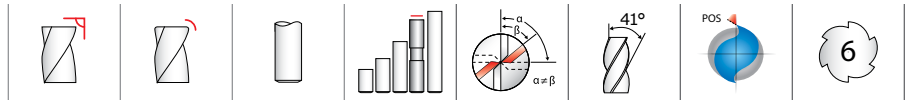
TOLERANCES (inch)

DC = $+0.0000/-0.0020$

DCON = h_6

RE = $+0.0000/-0.0020$



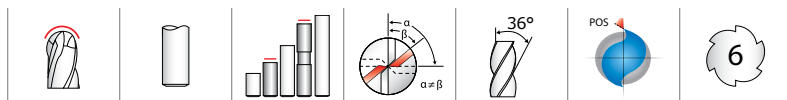

51L •
51LC
FRACTIONAL SERIES
TOLERANCES (inch)
DC = +0.0000/-0.0020

DCON = h_6
RE = +0.0000/-0.0020

STEELS
STAINLESS STEELS
CAST IRON
HIGHTEMP ALLOYS

inch							EDP NO.
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	REACH LU	NECK DIAMETER DN	CORNER RADIUS RE	Ti-NAMITE-X (TX)
1/4	3/8	4	1/4	1-1/8	.237	—	35106
1/4	3/8	4	1/4	1-1/8	.237	.015	35127
1/4	3/8	4	1/4	1-1/8	.237	.030	35180
3/8	1/2	4	3/8	2-1/8	.356	—	35107
3/8	1/2	4	3/8	2-1/8	.356	.015	35128
3/8	1/2	4	3/8	2-1/8	.356	.030	35129
1/2	5/8	4	1/2	2-1/4	.475	—	35108
1/2	5/8	4	1/2	2-1/4	.475	.015	35181
1/2	5/8	4	1/2	2-1/4	.475	.030	35130
1/2	5/8	4	1/2	2-1/4	.475	.060	35182
1/2	5/8	4	1/2	2-1/4	.475	.090	35131
1/2	5/8	4	1/2	2-1/4	.475	.120	35132
5/8	3/4	5	5/8	2-1/2	.594	—	35109
5/8	3/4	5	5/8	2-1/2	.594	.015	35183
5/8	3/4	5	5/8	2-1/2	.594	.030	35133
5/8	3/4	5	5/8	2-1/2	.594	.060	35184
5/8	3/4	5	5/8	2-1/2	.594	.090	35134
5/8	3/4	5	5/8	2-1/2	.594	.120	35135
5/8	3/4	5	5/8	2-1/2	.594	.190	35185
3/4	1	6	3/4	3-3/8	.712	—	35110
3/4	1	6	3/4	3-3/8	.712	.030	35136
3/4	1	6	3/4	3-3/8	.712	.060	35186
3/4	1	6	3/4	3-3/8	.712	.090	35137
3/4	1	6	3/4	3-3/8	.712	.120	35138
3/4	1	6	3/4	3-3/8	.712	.190	35187
3/4	1	6	3/4	3-3/8	.712	.250	35188
1	1-1/4	6	1	3-3/8	.950	—	35111
1	1-1/4	6	1	3-3/8	.950	.030	35139
1	1-1/4	6	1	3-3/8	.950	.060	35189
1	1-1/4	6	1	3-3/8	.950	.090	35140
1	1-1/4	6	1	3-3/8	.950	.120	35141
1	1-1/4	6	1	3-3/8	.950	.190	35190
1	1-1/4	6	1	3-3/8	.950	.250	35191

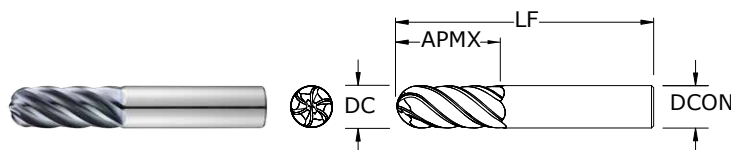
- Engineered for High Speed Milling using Trochoidal and Peel Milling techniques
- Eccentric relief provides superior strength and smoother surface finish
- Necked design with blended diameter transitions provide clearance to reach
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials ≤ 45 HRC (≤ 420 Bhn)



51B

FRACTIONAL SERIES

- Engineered for High Speed Milling using Trochoidal and Peel Milling techniques
- Faceted relief provides superior strength and smoother surface finish
- Ball end design ideal for finishing operations in complex workpieces
- Recommended for materials ≤ 45 HRC (≤ 420 Bhn)



inch				EDP NO.
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	Ti-NAMITE-X (TX)
1/4	3/4	2-1/2	1/4	35220
3/8	1	2-1/2	3/8	35222
1/2	1-1/4	3	1/2	35224
5/8	1-5/8	3-1/2	5/8	35226
3/4	1-5/8	4	3/4	35228
1	2-5/8	6	1	35230

RE=1/2 Cutting Diameter (DC)

TOLERANCES (inch)

1/4-3/8 DIAMETER

DC = +0.0000/-0.0016

DCON = h_6

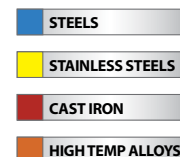
RE = +0.0000/-0.0010

1/2-1 DIAMETER

DC = +0.000/-0.0020

DCON = h_6

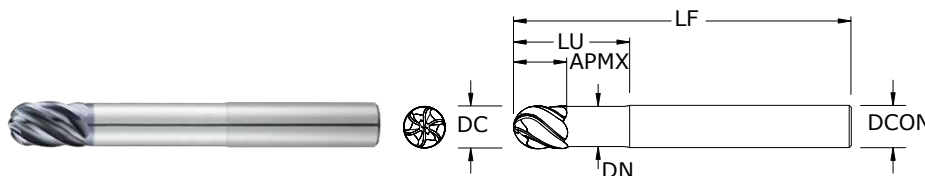
RE = +0.0000/-0.0010



51LB

FRACTIONAL SERIES

- Engineered for High Speed Milling using Trochoidal and Peel Milling techniques
- Faceted relief provides superior strength and smoother surface finish
- Ball end design ideal for finishing operations in complex workpieces
- Recommended for materials ≤ 45 HRC (≤ 420 Bhn)



inch						EDP NO.
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	REACH LU	NECK DIAMETER DN	Ti-NAMITE-X (TX)
1/4	3/8	4	1/4	1-1/8	.237	35221
3/8	1/2	4	3/8	2-1/8	.356	35223
1/2	5/8	4	1/2	2-1/4	.475	35225
5/8	3/4	5	5/8	2-1/2	.594	35227
3/4	1	6	3/4	3-3/8	.712	35229
1	1-1/4	6	1	3-3/4	.950	35231

RE=1/2 Cutting Diameter (DC)

TOLERANCES (inch)

1/4-3/8 DIAMETER

DC = +0.0000/-0.0016

DCON = h_6

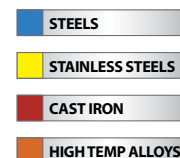
RE = +0.0000/-0.0010

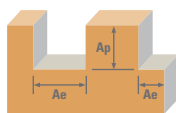
1/2-1 DIAMETER

DC = +0.000/-0.0020

DCON = h_6

RE = +0.0000/-0.0010





Series
51, 51CR, 51L,
51LC, 51B, 51LB
Fractional

Hardness

Ae x DC

Ap x DC

Vc
(sfm)

DC • in

1/4

3/8

1/2

5/8

3/4

1

CARBON STEELS
1018, 1040, 1080,
1090, 10L50, 1140,
1212, 12L15, 1525,
1536

≤ 275 Bhn
or
≤ 28 HRc

Profile



≤ 0.1

≤ 1

720

RPM

11002

7334

5501

4401

3667

2750

(576-864)

Fz

0.0020

0.0035

0.0050

0.0055

0.0061

0.0071

Feed (ipm)

132

154

165

145

134

117

HSM



≤ 0.05

≤ 2

915

RPM

13981

9321

6991

5592

4660

3495

(732-1098)

Fz

0.0028

0.0053

0.0070

0.0077

0.0085

0.0100

Feed (ipm)

235

296

294

258

238

210

ALLOY STEELS
4140, 4150, 4320,
5120, 5150, 8630,
86L20, 50100

≤ 375 Bhn
or
≤ 40 HRc

Profile



≤ 0.1

≤ 1

490

RPM

7487

4991

3744

2995

2496

1872

(392-588)

Fz

0.0015

0.0029

0.0038

0.0042

0.0046

0.0054

Feed (ipm)

67

87

85

75

69

61

HSM



≤ 0.05

≤ 2

620

RPM

9474

6316

4737

3789

3158

2368

(496-744)

Fz

0.0021

0.0039

0.0052

0.0057

0.0062

0.0073

Feed (ipm)

119

148

148

130

117

104

TOOL STEELS
A2, D2, H13, L2, M2,
P20, S7, T15, W2

≤ 375 Bhn
or
≤ 40 HRc

Profile



≤ 0.1

≤ 1

240

RPM

3667

2445

1834

1467

1222

917

(192-288)

Fz

0.0012

0.0023

0.0030

0.0034

0.0037

0.0043

Feed (ipm)

26

34

33

30

27

24

HSM



≤ 0.05

≤ 2

305

RPM

4660

3107

2330

1864

1553

1165

(244-366)

Fz

0.0017

0.0032

0.0042

0.0046

0.0050

0.0059

Feed (ipm)

48

60

59

51

47

41

**STAINLESS STEELS
(FREE MACHINING)**
303, 416, 420F,
430F, 440F

≤ 275 Bhn
or
≤ 28 HRc

Profile



≤ 0.1

≤ 1

510

RPM

7793

5195

3896

3117

2598

1948

(459-561)

Fz

0.0015

0.0028

0.0038

0.0041

0.0045

0.0053

Feed (ipm)

70

87

89

77

70

62

HSM



≤ 0.05

≤ 2

650

RPM

9932

6621

4966

3973

3311

2483

(585-715)

Fz

0.0021

0.0038

0.0051

0.0056

0.0061

0.0072

Feed (ipm)

125

151

152

133

121

107

**STAINLESS STEELS
(DIFFICULT)**
304, 304L, 316, 316L

≤ 275 Bhn
or
≤ 28 HRc

Profile



≤ 0.1

≤ 1

350

RPM

5348

3565

2674

2139

1783

1337

(315-385)

Fz

0.0012

0.0023

0.0030

0.0033

0.0036

0.0042

Feed (ipm)

39

49

48

42

39

34

HSM



≤ 0.05

≤ 2

450

RPM

6876

4584

3438

2750

2292

1719

(405-495)

Fz

0.0017

0.0032

0.0042

0.0046

0.0050

0.0059

Feed (ipm)

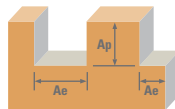
70

88

87

76

69



Series
51, 51CR, 51L,
51LC, 51B, 51LB
Fractional

Hardness

Ae x DC

Ap x DC

Vc
(sfm)

DC • in

1/4

3/8

1/2

5/8

3/4

1

K

**CAST IRONS
(LOW & MEDIUM
ALLOY)
Gray, Malleable,
Ductile**

≤ 220 Bhn
or
≤ 19 HRc



≤ 0.25
≤ 1.5

575

RPM

8786

5857

4393

3514

2929

2197

(460-690)

Fz

0.0018

0.0035

0.0045

0.0050

0.0055

0.0064

730

RPM

11154

7436

5577

4462

3718

2789

(584-876)

Fz

0.0025

0.0047

0.0064

0.0070

0.0076

0.0089

430

RPM

6570

4380

3285

2628

2190

1643

(344-516)

Fz

0.0018

0.0035

0.0045

0.0050

0.0055

0.0064

545

RPM

8328

5552

4164

3331

2776

2082

(436-654)

Fz

0.0025

0.0047

0.0064

0.0070

0.0076

0.0089

105

RPM

1604

1070

802

642

535

401

(84-126)

Fz

0.0014

0.0027

0.0036

0.0039

0.0043

0.0050

130

RPM

1986

1324

993

795

662

497

(104-156)

Fz

0.0016

0.0036

0.0048

0.0053

0.0058

0.0067

80

RPM

1222

815

611

489

407

306

(64-96)

Fz

0.0010

0.0018

0.0025

0.0027

0.0029

0.0034

100

RPM

1528

1019

764

611

509

382

(80-120)

Fz

0.0013

0.0025

0.0034

0.0037

0.0041

0.0047

280

RPM

4278

2852

2139

1711

1426

1070

(224-336)

Fz

0.0010

0.0018

0.0025

0.0027

0.0029

0.0034

355

RPM

5424

3616

2712

2170

1808

1356

(284-426)

Fz

0.0013

0.0025

0.0034

0.0037

0.0041

0.0047

155

RPM

2368

1579

1184

947

789

592

(124-186)

Fz

0.0010

0.0018

0.0025

0.0027

0.0029

0.0034

200

RPM

3056

2037

1528

1222

1019

764

(160-240)

Fz

0.0013

0.0025

0.0034

0.0037

0.0041

0.0047

24

Feed (ipm)

31

31

27

25

22

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

rpm = Vc x 3.82 / DC

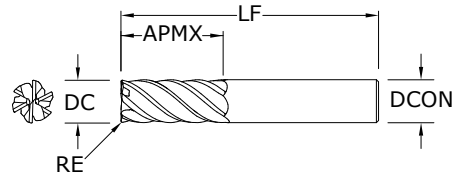
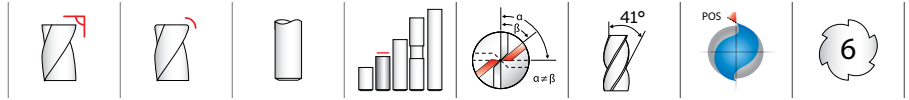
ipm = Fz x 6 x rpm

reduce speed and feed for materials harder than listed

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

feed rates listed have chip thinning adjustments included where applicable

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)



51M • 51MCR

METRIC SERIES

TOLERANCES (mm)

DC = +0,000/-0,050

DCON = h_6

RE = +0,000/-0,050

STEELS

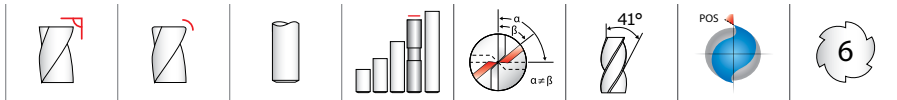
STAINLESS STEELS

CAST IRON

HIGHTEMP ALLOYS

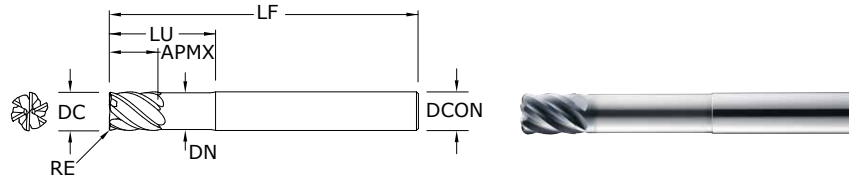
	mm				EDP NO.
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	Ti-NAMITE-X (TX)
6,0	19,0	63,0	6,0	—	45100
6,0	19,0	63,0	6,0	0,5	45112
6,0	19,0	63,0	6,0	1,0	45170
6,0	19,0	63,0	6,0	1,5	45171
8,0	20,0	63,0	8,0	—	45101
8,0	20,0	63,0	8,0	0,5	45113
8,0	20,0	63,0	8,0	1,0	45114
8,0	20,0	63,0	8,0	1,2	45150
8,0	20,0	63,0	8,0	1,5	45172
8,0	20,0	63,0	8,0	2,0	45173
10,0	22,0	75,0	10,0	—	45102
10,0	22,0	75,0	10,0	0,5	45174
10,0	22,0	75,0	10,0	1,0	45115
10,0	22,0	75,0	10,0	1,5	45116
10,0	22,0	75,0	10,0	2,0	45117
10,0	22,0	75,0	10,0	2,5	45175
12,0	26,0	83,0	12,0	—	45103
12,0	26,0	83,0	12,0	0,5	45176
12,0	26,0	83,0	12,0	0,76	45177
12,0	26,0	83,0	12,0	1,0	45118
12,0	26,0	83,0	12,0	1,5	45119
12,0	26,0	83,0	12,0	2,0	45120
12,0	26,0	83,0	12,0	2,5	45178
12,0	26,0	83,0	12,0	3,0	45179
16,0	32,0	92,0	16,0	—	45104
16,0	32,0	92,0	16,0	1,0	45121
16,0	32,0	92,0	16,0	1,5	45122
16,0	32,0	92,0	16,0	2,0	45123
16,0	32,0	92,0	16,0	2,5	45180
16,0	32,0	92,0	16,0	3,0	45181
16,0	32,0	92,0	16,0	4,0	45182
20,0	38,0	104,0	20,0	—	45105
20,0	38,0	104,0	20,0	1,0	45124
20,0	38,0	104,0	20,0	1,5	45125
20,0	38,0	104,0	20,0	2,0	45126
20,0	38,0	104,0	20,0	2,5	45183
20,0	38,0	104,0	20,0	3,0	45184
20,0	38,0	104,0	20,0	4,0	45185
20,0	38,0	104,0	20,0	5,0	45186

- Engineered for High Speed Milling using Trochoidal and Peel Milling techniques
- Eccentric relief provides superior strength and smoother surface finish
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials ≤ 45 HRC (≤ 420 Bhn)



**51ML •
51MLC**
METRIC SERIES

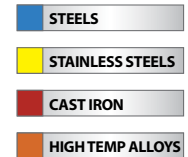
- Engineered for High Speed Milling using Trochoidal and Peel Milling techniques
- Eccentric relief provides superior strength and smoother surface finish
- Necked design with blended diameter transitions provide clearance to reach
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials ≤ 45 HRc (≤ 420 Bhn)

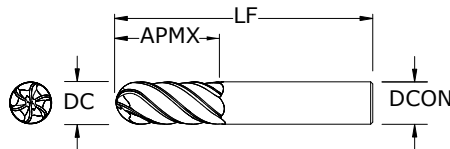
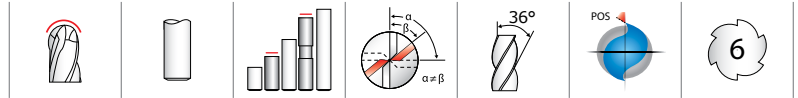


mm							EDP NO.
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	REACH LU	NECK DIAMETER DN	CORNER RADIUS RE	Ti-NAMITE-X (TX)
6,0	8,0	75,0	6,0	32,0	5,69	—	45106
6,0	8,0	75,0	6,0	32,0	5,69	0,5	45127
6,0	8,0	75,0	6,0	32,0	5,69	1,0	45187
6,0	8,0	75,0	6,0	32,0	5,69	1,5	45188
8,0	10,0	75,0	8,0	32,0	7,59	—	45107
8,0	10,0	75,0	8,0	32,0	7,59	0,5	45128
8,0	10,0	75,0	8,0	32,0	7,59	1,0	45129
8,0	10,0	75,0	8,0	32,0	7,59	1,5	45189
8,0	10,0	75,0	8,0	32,0	7,59	2,0	45190
10,0	12,0	100,0	10,0	40,0	9,50	—	45108
10,0	12,0	100,0	10,0	40,0	9,50	0,5	45191
10,0	12,0	100,0	10,0	40,0	9,50	1,0	45130
10,0	12,0	100,0	10,0	40,0	9,50	1,5	45131
10,0	12,0	100,0	10,0	40,0	9,50	2,0	45132
10,0	12,0	100,0	10,0	40,0	9,50	2,5	45192
12,0	15,0	100,0	12,0	48,0	11,38	—	45109
12,0	15,0	100,0	12,0	48,0	11,38	0,5	45193
12,0	15,0	100,0	12,0	48,0	11,38	0,76	45194
12,0	15,0	100,0	12,0	48,0	11,38	1,0	45133
12,0	15,0	100,0	12,0	48,0	11,38	1,5	45134
12,0	15,0	100,0	12,0	48,0	11,38	2,0	45135
12,0	15,0	100,0	12,0	48,0	11,38	2,5	45195
12,0	15,0	100,0	12,0	48,0	11,38	3,0	45196
16,0	20,0	115,0	16,0	65,0	15,19	—	45110
16,0	20,0	115,0	16,0	65,0	15,19	1,0	45136
16,0	20,0	115,0	16,0	65,0	15,19	1,5	45137
16,0	20,0	115,0	16,0	65,0	15,19	2,0	45138
16,0	20,0	115,0	16,0	65,0	15,19	2,5	45197
16,0	20,0	115,0	16,0	65,0	15,19	3,0	45198
16,0	20,0	115,0	16,0	65,0	15,19	4,0	45199
20,0	24,0	150,0	20,0	80,0	19,00	—	45111
20,0	24,0	150,0	20,0	80,0	19,00	1,0	45139
20,0	24,0	150,0	20,0	80,0	19,00	1,5	45140
20,0	24,0	150,0	20,0	80,0	19,00	2,0	45141
20,0	24,0	150,0	20,0	80,0	19,00	2,5	45200
20,0	24,0	150,0	20,0	80,0	19,00	3,0	45201
20,0	24,0	150,0	20,0	80,0	19,00	4,0	45202
20,0	24,0	150,0	20,0	80,0	19,00	5,0	45203

TOLERANCES (mm)

DC = $+0,000/-0,050$
DCON = h_6
RE = $+0,000/-0,050$





51MB

METRIC SERIES

TOLERANCES (mm)

6,0–10,0 DIAMETER

DC = +0,000/–0,040

DCON = h_6

RE = +0,000/–0,025

12,0–20,0 DIAMETER

DC = +0,000/–0,050

DCON = h_6

RE = +0,000/–0,025

STEELS

STAINLESS STEELS

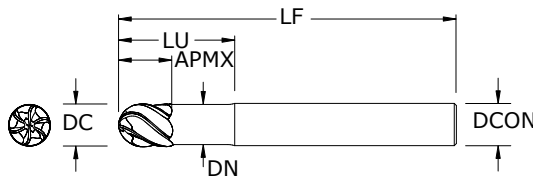
CAST IRON

HIGHTEMP ALLOYS

mm				EDP NO.
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	Ti-NAMITE-X (TX)
6,0	19,0	63,0	6,0	45204
8,0	20,0	63,0	8,0	45206
10,0	22,0	75,0	10,0	45208
12,0	26,0	83,0	12,0	45210
16,0	32,0	92,0	16,0	45212
20,0	38,0	104,0	20,0	45214

RE=1/2 Cutting Diameter (DC)

- Engineered for High Speed Milling using Trochoidal and Peel Milling techniques
- Faceted relief provides superior strength and smoother surface finish
- Ball end design ideal for finishing operations in complex workpieces
- Recommended for materials ≤ 45 HRc (≤ 420 Bhn)



51MLB

METRIC SERIES

TOLERANCES (mm)

6,0–10,0 DIAMETER

DC = +0,000/–0,040

DCON = h_6

RE = +0,000/–0,025

12,0–20,0 DIAMETER

DC = +0,000/–0,050

DCON = h_6

RE = +0,000/–0,025

STEELS

STAINLESS STEELS

CAST IRON

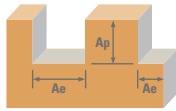
HIGHTEMP ALLOYS

mm						EDP NO.
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	REACH LU	NECK DIAMETER DN	Ti-NAMITE-X (TX)
6,0	8,0	75,0	6,0	32,0	5,68	45205
8,0	10,0	75,0	8,0	32,0	7,58	45207
10,0	12,0	100,0	10,0	40,0	9,49	45209
12,0	15,0	100,0	12,0	48,0	11,37	45211
16,0	20,0	115,0	16,0	65,0	15,18	45213
20,0	24,0	150,0	20,0	80,0	18,99	45215

RE=1/2 Cutting Diameter (DC)

- Engineered for High Speed Milling using Trochoidal and Peel Milling techniques
- Faceted relief provides superior strength and smoother surface finish
- Ball end design ideal for finishing operations in complex workpieces
- Recommended for materials ≤ 45 HRc (≤ 420 Bhn)

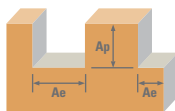
Series
51M, 51MCR,
51ML, 51MLC,
51MB, 51MLB
Metric



51ML, 51MLC, 51MB, 51MLB Metric		Hardness			Vc (m/min)		DC • mm						
			Ae x DC	Ap x DC			6	8	10	12	16	20	
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 275 Bhn or ≤ 28 HRc		≤ 0.1	≤ 1	219	RPM	11633	8725	6980	5816	4362	3490
						(176-263)	Fz	0.048	0.075	0.093	0.120	0.141	0.163
							Feed (mm/min)	3350	3909	3909	4188	3685	3406
			≤ 0.05	≤ 2	279	RPM	14784	11088	8870	7392	5544	4435	
					(223-335)	Fz	0.067	0.113	0.141	0.168	0.197	0.227	
						Feed (mm/min)	5960	7523	7522	7450	6557	6032	
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 375 Bhn or ≤ 40 HRc		≤ 0.1	≤ 1	149	RPM	7917	5938	4750	3958	2969	2375
						(119-179)	Fz	0.036	0.062	0.077	0.091	0.108	0.123
							Feed (mm/min)	1710	2204	2204	2166	1915	1748
			≤ 0.05	≤ 2	189	RPM	10017	7513	6010	5009	3756	3005	
					(151-227)	Fz	0.050	0.083	0.104	0.125	0.146	0.165	
						Feed (mm/min)	3029	3751	3750	3750	3289	2981	
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 375 Bhn or ≤ 40 HRc		≤ 0.1	≤ 1	73	RPM	3878	2908	2327	1939	1454	1163
						(59-88)	Fz	0.029	0.049	0.061	0.072	0.087	0.099
							Feed (mm/min)	670	856	856	838	759	689
			≤ 0.05	≤ 2	93	RPM	4928	3696	2957	2464	1848	1478	
					(74-112)	Fz	0.041	0.068	0.085	0.101	0.118	0.133	
						Feed (mm/min)	1206	1514	1514	1490	1306	1183	
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 275 Bhn or ≤ 28 HRc		≤ 0.1	≤ 1	155	RPM	8240	6180	4944	4120	3090	2472
						(140-171)	Fz	0.036	0.060	0.075	0.091	0.105	0.120
							Feed (mm/min)	1780	2215	2215	2254	1946	1780
			≤ 0.05	≤ 2	198	RPM	10502	7877	6301	5251	3938	3151	
					(178-218)	Fz	0.050	0.081	0.101	0.122	0.143	0.163	
						Feed (mm/min)	3176	3832	3831	3856	3387	3075	
	STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L	≤ 275 Bhn or ≤ 28 HRc		≤ 0.1	≤ 1	107	RPM	5655	4241	3393	2827	2121	1696
						(96-117)	Fz	0.029	0.049	0.061	0.072	0.084	0.096
							Feed (mm/min)	977	1249	1249	1221	1075	977
			≤ 0.05	≤ 2	137	RPM	7271	5453	4362	3635	2726	2181	
					(123-151)	Fz	0.041	0.068	0.085	0.101	0.118	0.133	
						Feed (mm/min)	1780	2234	2234	2198	1926	1745	
	STAINLESS STEELS (PH) 13-8 PH, 15-5 PH, 17-4 PH, Custom 450	≤ 325 Bhn or ≤ 35 HRc		≤ 0.1	≤ 1	99	RPM	5251	3938	3151	2626	1969	1575
						(89-109)	Fz	0.029	0.049	0.061	0.072	0.084	0.096
							Feed (mm/min)	907	1160	1159	1134	998	907
			≤ 0.05	≤ 2	125	RPM	6624	4968	3975	3312	2484	1987	
					(112-137)	Fz	0.041	0.068	0.085	0.101	0.118	0.133	
						Feed (mm/min)	1621	2035	2035	2003	1755	1590	

continued on next page

Series
51M, 51MCR,
51ML, 51MLC,
51MB, 51MLB
Metric

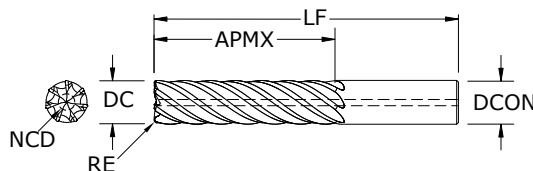


51ML, 51MLC, 51MB, 51MLB Metric		Hardness	Ae Ae x DC		Ae Ap x DC		Vc (m/min)	DC • mm					
					6	8		10	12	16	20		
K	CAST IRONS (LOW & MEDIUM ALLOY) Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	Profile 	≤ 0.25	≤ 1.5	575	RPM	9290	6968	5574	4645	3484	2787
						(460-690)	Fz	0.043	0.075	0.093	0.108	0.128	0.147
						Feed (mm/min)	2408	3122	3122	3010	2675	2453	
		HSM 	≤ 0.05	≤ 2	730	RPM	11795	8846	7077	5897	4423	3538	
					(584-876)	Fz	0.060	0.100	0.125	0.154	0.179	0.203	
					Feed (mm/min)	4246	5322	5322	5434	4755	4303		
	CAST IRONS (HIGH ALLOY) Gray, Malleable, Ductile	≤ 260 Bhn or ≤ 26 HRc	Profile 	≤ 0.25	≤ 1.5	430	RPM	6947	5211	4168	3474	2605	2084
						(344-516)	Fz	0.043	0.075	0.093	0.108	0.128	0.147
						Feed (mm/min)	1801	2335	2334	2251	2001	1834	
		HSM 	≤ 0.05	≤ 2	545	RPM	8806	6604	5283	4403	3302	2642	
					(436-654)	Fz	0.060	0.100	0.125	0.154	0.179	0.203	
					Feed (mm/min)	3170	3974	3973	4057	3550	3212		
S	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	≤ 300 Bhn or ≤ 32 HRc	Profile 	≤ 0.1	≤ 1	32	RPM	1696	1272	1018	848	636	509
						(26-38)	Fz	0.034	0.058	0.072	0.086	0.100	0.115
						Feed (mm/min)	342	440	440	440	381	350	
		HSM 	≤ 0.05	≤ 2	40	RPM	2100	1575	1260	1050	788	630	
					(32-48)	Fz	0.038	0.077	0.096	0.115	0.136	0.155	
					Feed (mm/min)	484	726	726	726	641	585		
	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	≤ 400 Bhn or ≤ 43 HRc	Profile 	≤ 0.1	≤ 1	24	RPM	1293	969	776	646	485	388
						(20-29)	Fz	0.024	0.038	0.048	0.060	0.069	0.077
						Feed (mm/min)	186	223	223	233	201	180	
		HSM 	≤ 0.05	≤ 2	30	RPM	1616	1212	969	808	606	485	
					(24-37)	Fz	0.031	0.053	0.067	0.082	0.095	0.109	
					Feed (mm/min)	302	388	388	395	344	318		
	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	≤ 350 Bhn or ≤ 38 HRc	Profile 	≤ 0.1	≤ 1	85	RPM	4524	3393	2714	2262	1696	1357
						(68-102)	Fz	0.024	0.038	0.048	0.060	0.069	0.077
						Feed (mm/min)	651	782	782	814	704	630	
		HSM 	≤ 0.05	≤ 2	108	RPM	5736	4302	3441	2868	2151	1721	
					(87-130)	Fz	0.031	0.053	0.067	0.082	0.095	0.109	
					Feed (mm/min)	1074	1377	1377	1404	1222	1129		
TITANIUM ALLOYS (DIFFICULT) Ti10V2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 420 Bhn or ≤ 45 HRc	Profile 	≤ 0.1	≤ 1	47	RPM	2504	1878	1503	1252	939	751	
					(38-57)	Fz	0.024	0.038	0.048	0.060	0.069	0.077	
					Feed (mm/min)	361	433	433	451	389	349		
	HSM 	≤ 0.05	≤ 2	61	RPM	3231	2424	1939	1616	1212	969		
				(49-73)	Fz	0.031	0.053	0.067	0.082	0.095	0.109		
				Feed (mm/min)	605	776	776	791	689	636			

Bhn (Brinell) HRc (Rockwell C) HSM (High Speed Machining)
 $\text{rpm} = (\text{Vc} \times 1000) / (\text{DC} \times 3.14)$
 $\text{mm/min} = \text{Fz} \times 6 \times \text{rpm}$
 reduce speed and feed for materials harder than listed
 reduce feed and Ae when finish milling (.02 x DC maximum)
 feed rates listed have chip thinning adjustments included where applicable
 refer to the **KYOCERA SGS APEX** for complete technical information (www.kyocera-sgstool.com/apex)



**77 •
77CR**
FRACTIONAL SERIES



TOLERANCES (inch)

1/4 DIAMETER

DC = +0.0000/-0.0012

DCON = h_6

RE = +0.000 / -0.002

>1/4-3/8 DIAMETER

DC = +0.0000/-0.0016

DCON = h_6

RE = +0.000 / -0.002

>3/8-1 DIAMETER

DC = +0.0000/-0.0020

DCON = h_6

RE = +0.000 / -0.002

- Specializes in deep axial trochoidal and high-speed milling applications
- Optimized core improves rigidity, chip flow and reduces deflection
- Chip Breaker design breaks up chips from the long flute length allowing for better chip flow and evacuation in deep pocketing operations
- Recommended for materials ≤ 45 HRc (≤ 420 Bhn)

STEELS
STAINLESS STEELS
CAST IRON
HIGH TEMP ALLOYS

inch						Ti-NAMITE-A (TA)				Ti-NAMITE-M (TM)			
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	NON-CUTTING CENTER DIAMETER NCD	EXTERNAL COOLANT		INTERNAL COOLANT		EXTERNAL COOLANT		INTERNAL COOLANT	
						EDP NO.	WITH CHIP BREAKER EDP NO.	EDP NO.	WITH CHIP BREAKER EDP NO.	EDP NO.	WITH CHIP BREAKER EDP NO.	EDP NO.	WITH CHIP BREAKER EDP NO.
1/4	5/8	2-1/2	1/4	—	.0845	77100	77102	—	—	77101	77103	—	—
1/4	5/8	2-1/2	1/4	.015	.0845	77104	77106	—	—	77105	77107	—	—
1/4	5/8	2-1/2	1/4	.030	.0845	77108	77110	—	—	77109	77111	—	—
1/4	3/4	2-1/2	1/4	—	.0845	77112	77114	—	—	77113	77115	—	—
1/4	3/4	2-1/2	1/4	.015	.0845	77116	77118	—	—	77117	77119	—	—
1/4	3/4	2-1/2	1/4	.030	.0845	77120	77122	—	—	77121	77123	—	—
1/4	1	3	1/4	—	.0845	77124	77126	—	—	77125	77127	—	—
1/4	1	3	1/4	.015	.0845	77128	77130	—	—	77129	77131	—	—
1/4	1	3	1/4	.030	.0845	77132	77134	—	—	77133	77135	—	—
3/8	15/16	3	3/8	—	.1268	77136	77138	—	—	77137	77139	—	—
3/8	15/16	3	3/8	.015	.1268	77140	77142	—	—	77141	77143	—	—
3/8	15/16	3	3/8	.030	.1268	77144	77146	—	—	77145	77147	—	—
3/8	1-1/8	3-1/4	3/8	—	.1268	77148	77150	—	—	77149	77151	—	—
3/8	1-1/8	3-1/4	3/8	.015	.1268	77152	77154	—	—	77153	77155	—	—
3/8	1-1/8	3-1/4	3/8	.030	.1268	77156	77158	—	—	77157	77159	—	—
3/8	1-1/2	3-1/2	3/8	—	.1268	77160	77162	—	—	77161	77163	—	—
3/8	1-1/2	3-1/2	3/8	.015	.1268	77164	77166	—	—	77165	77167	—	—
3/8	1-1/2	3-1/2	3/8	.030	.1268	77168	77170	—	—	77169	77171	—	—
1/2	1-1/4	3-1/4	1/2	—	.1690	77172	77174	77340	77342	77173	77175	77341	77343
1/2	1-1/4	3-1/4	1/2	.030	.1690	77176	77178	77344	77346	77177	77179	77345	77347
1/2	1-1/4	3-1/4	1/2	.060	.1690	77180	77182	77348	77350	77181	77183	77349	77351
1/2	1-1/2	3-1/2	1/2	—	.1690	77184	77186	77352	77354	77185	77187	77353	77355
1/2	1-1/2	3-1/2	1/2	.030	.1690	77188	77190	77356	77358	77189	77191	77357	77359
1/2	1-1/2	3-1/2	1/2	.060	.1690	77192	77194	77360	77362	77193	77195	77361	77363
1/2	2	4	1/2	—	.1690	77196	77198	77364	77366	77197	77199	77365	77367
1/2	2	4	1/2	.030	.1690	77200	77202	77368	77370	77201	77203	77369	77371
1/2	2	4	1/2	.060	.1690	77204	77206	77372	77374	77205	77207	77373	77375
5/8	1-9/16	3-3/4	5/8	—	.2113	77208	77210	77376	77378	77209	77211	77377	77379
5/8	1-9/16	3-3/4	5/8	.030	.2113	77212	77214	77380	77382	77213	77215	77381	77383
5/8	1-9/16	3-3/4	5/8	.060	.2113	77216	77218	77384	77386	77217	77219	77385	77387

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TOLERANCES (inch)

1/4 DIAMETER

DC = +0.0000/-0.0012

DCON = h_6

RE = +0.000 / -0.002

>1/4-3/8 DIAMETER

DC = +0.0000/-0.0016

DCON = h_6

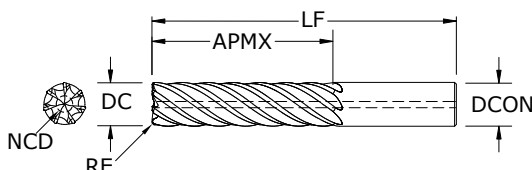
RE = +0.000 / -0.002

>3/8-1 DIAMETER

DC = +0.0000/-0.0020

DCON = h_6

RE = +0.000 / -0.002

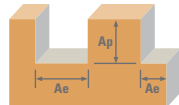


**77 •
77CR**
FRACTIONAL SERIES

CONTINUED

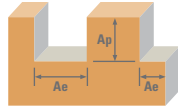
inch						Ti-NAMITE-A (TA)				Ti-NAMITE-M (TM)			
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	NON- CUTTING CENTER DIAMETER NCD	EXTERNAL COOLANT		INTERNAL COOLANT		EXTERNAL COOLANT		INTERNAL COOLANT	
						EDP NO.	WITH CHIP BREAKER EDP NO.	EDP NO.	WITH CHIP BREAKER EDP NO.	EDP NO.	WITH CHIP BREAKER EDP NO.	EDP NO.	WITH CHIP BREAKER EDP NO.
5/8	1-7/8	4	5/8	—	.2113	77220	77222	77388	77390	77221	77223	77389	77391
5/8	1-7/8	4	5/8	.030	.2113	77224	77226	77392	77394	77225	77227	77393	77395
5/8	1-7/8	4	5/8	.060	.2113	77228	77230	77396	77398	77229	77231	77397	77399
5/8	2-1/2	4-1/2	5/8	—	.2113	77232	77234	77400	77402	77233	77235	77401	77403
5/8	2-1/2	4-1/2	5/8	.030	.2113	77236	77238	77404	77406	77237	77239	77405	77407
5/8	2-1/2	4-1/2	5/8	.060	.2113	77240	77242	77408	77410	77241	77243	77409	77411
3/4	1-7/8	4	3/4	—	.2535	77244	77246	77412	77414	77245	77247	77413	77415
3/4	1-7/8	4	3/4	.030	.2535	77248	77250	77416	77418	77249	77251	77417	77419
3/4	1-7/8	4	3/4	.060	.2535	77252	77254	77420	77422	77253	77255	77421	77423
3/4	1-7/8	4	3/4	.120	.2535	77256	77258	77424	77426	77257	77259	77425	77427
3/4	2-1/4	4-1/2	3/4	—	.2535	77260	77262	77428	77430	77261	77263	77429	77431
3/4	2-1/4	4-1/2	3/4	.030	.2535	77264	77266	77432	77434	77265	77267	77433	77435
3/4	2-1/4	4-1/2	3/4	.060	.2535	77268	77270	77436	77438	77269	77271	77437	77439
3/4	2-1/4	4-1/2	3/4	.120	.2535	77272	77274	77440	77442	77273	77275	77441	77443
3/4	3	5-1/4	3/4	—	.2535	77276	77278	77444	77446	77277	77279	77445	77447
3/4	3	5-1/4	3/4	.030	.2535	77280	77282	77448	77450	77281	77283	77449	77451
3/4	3	5-1/4	3/4	.060	.2535	77284	77286	77452	77454	77285	77287	77453	77455
3/4	3	5-1/4	3/4	.120	.2535	77288	77290	77456	77458	77289	77291	77457	77459
1	2-1/2	5-1/2	1	—	.3380	77292	77294	77460	77462	77293	77295	77461	77463
1	2-1/2	5-1/2	1	.030	.3380	77296	77298	77464	77466	77297	77299	77465	77467
1	2-1/2	5-1/2	1	.060	.3380	77300	77302	77468	77470	77301	77303	77469	77471
1	2-1/2	5-1/2	1	.120	.3380	77304	77306	77472	77474	77305	77307	77473	77475
1	3	6	1	—	.3380	77308	77310	77476	77478	77309	77311	77477	77479
1	3	6	1	.030	.3380	77312	77314	77480	77482	77313	77315	77481	77483
1	3	6	1	.060	.3380	77316	77318	77484	77486	77317	77319	77485	77487
1	3	6	1	.120	.3380	77320	77322	77488	77490	77321	77323	77489	77491
1	4	7	1	—	.3380	77324	77326	77492	77494	77325	77327	77493	77495
1	4	7	1	.030	.3380	77328	77330	77496	77498	77329	77331	77497	77499
1	4	7	1	.060	.3380	77332	77334	77500	77502	77333	77335	77501	77503
1	4	7	1	.120	.3380	77336	77338	77504	77506	77337	77339	77505	77507

STEELS
STAINLESS STEELS
CAST IRON
HIGH TEMP ALLOYS



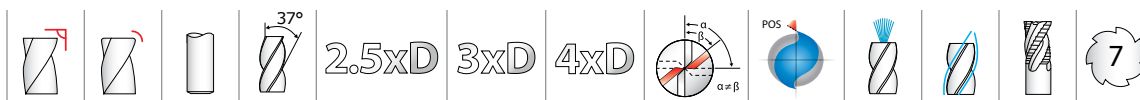
Series 77, 77CR				Vc		DC • inch								
Fractional	Hardness	Ae x DC	Ap x DC	(sfm)		1/4	3/8	1/2	5/8	3/4	1			
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 275 Bhn or ≤ 28 HRc	 HSM	2.5xD	816 (653-979)	RPM	11552	7701	5776	4621	3851	2888		
						Fz	0.0015	0.0024	0.0031	0.0035	0.0038	0.0042		
						Feed (ipm)	121	129	125	113	102	85		
			 HSM	3xD	845 (676-1014)	Fz	0.0017	0.0027	0.0035	0.0040	0.0043	0.0047		
						Feed (ipm)	136	146	140	129	116	95		
						 HSM	4xD	756 (605-907)	Fz	0.0018	0.0028	0.0036	0.0041	0.0044
		Feed (ipm)	146	151	146				133	119	99			
		≤ 375 Bhn or ≤ 40 HRc	 HSM	2.5xD	595 (476-714)				Fz	0.0009	0.0019	0.0026	0.0028	0.0031
						Feed (ipm)	53	75	77	66	61	52		
						 HSM	3xD	616 (493-739)	Fz	0.0010	0.0021	0.0030	0.0033	0.0035
			Feed (ipm)	59	83				88	78	69	57		
			 HSM	4xD	551 (441-661)				Fz	0.0011	0.0022	0.0031	0.0034	0.0036
	Feed (ipm)					65	86	91	80	71	60			
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 375 Bhn or ≤ 40 HRc				 HSM	2.5xD	272 (218-326)	RPM	3851	2567	1925	1540	1284
			Fz	0.0006	0.0011				0.0014	0.0017	0.0020	0.0024		
			Feed (ipm)	16	20				19	18	18	16		
			 HSM	3xD	282 (226-338)	Fz	0.0007	0.0012	0.0016	0.0019	0.0022	0.0027		
						Feed (ipm)	19	22	22	20	20	18		
						 HSM	4xD	252 (202-302)	Fz	0.0007	0.0013	0.0017	0.0020	0.0023
		Feed (ipm)	19	23	23				22	21	19			
		M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 275 Bhn or ≤ 28 HRc	 HSM				2.5xD	646 (517-775)	RPM	9137	6092	4569
						Fz	0.0009	0.0017			0.0023	0.0025	0.0028	0.0032
						Feed (ipm)	58	72			74	64	60	51
					 HSM	3xD	669 (535-803)	Fz	0.0010	0.0019	0.0026	0.0029	0.0031	0.0036
Feed (ipm)								64	81	83	74	66	58	
 HSM	4xD							598 (478-718)	Fz	0.0011	0.0020	0.0027	0.0030	0.0033
				Feed (ipm)	70	85	86		77	70	59			
				≤ 275 Bhn or ≤ 28 HRc	 HSM	2.5xD	425 (340-510)		RPM	6020	4014	3010	2408	2007
Fz	0.0007							0.0014	0.0019	0.0023	0.0026	0.0030		
Feed (ipm)	29							39	40	39	37	32		
 HSM	3xD				440 (352-528)	Fz	0.0008	0.0016	0.0021	0.0025	0.0029	0.0034		
						Feed (ipm)	34	45	44	42	41	36		
		 HSM	4xD			394 (315-473)	Fz	0.0008	0.0016	0.0022	0.0026	0.0030	0.0035	
Feed (ipm)	34			45	46		44	42	37					
≤ 325 Bhn or ≤ 35 HRc	 HSM			2.5xD	408 (326-490)		RPM	5776	3851	2888	2310	1925	1444	
		Fz	0.0007			0.0014	0.0019	0.0023	0.0026	0.0030				
		Feed (ipm)	28			38	38	37	35	30				
	 HSM	3xD	422 (338-506)	Fz	0.0008	0.0016	0.0021	0.0025	0.0029	0.0034				
				Feed (ipm)	32	43	42	40	39	34				
				 HSM	4xD	378 (302-454)	Fz	0.0008	0.0016	0.0022	0.0026	0.0030	0.0035	
Feed (ipm)	32	43	44				42	40	35					

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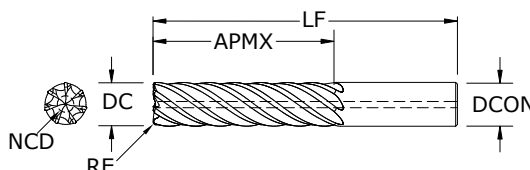


Series 77, 77CR Fractional		Hardness	Ae x DC		Vc (sfm)	DC • inch								
			Ae x DC	Ap x DC		1/4	3/8	1/2	5/8	3/4	1			
K	CAST IRONS (LOW & MEDIUM ALLOY) Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	 HSM	2.5xD		714	RPM	10100	6733	5050	4040	3367	2525	
				≤ 0.2	≤ APMX	(571-857)	Fz	0.0010	0.0018	0.0024	0.0028	0.0033	0.0037	
			 HSM	3xD		739	Fz	0.0011	0.0020	0.0027	0.0033	0.0037	0.0042	
				≤ 0.15	≤ APMX	(591-887)	Feed (ipm)	71	85	85	79	78	65	
			 HSM	4xD		661	Fz	0.0012	0.0021	0.0028	0.0034	0.0039	0.0043	
				≤ 0.1	≤ APMX	(529-793)	Feed (ipm)	78	94	95	93	87	73	
	CAST IRONS (HIGH ALLOY) Gray, Malleable, Ductile	≤ 260 Bhn or ≤ 26 HRc	 HSM	2.5xD		425	Fz	0.0007	0.0014	0.0019	0.0023	0.0026	0.0030	
				≤ 0.2	≤ APMX	(340-510)	Feed (ipm)	29	39	40	39	37	32	
			 HSM	3xD		440	Fz	0.0008	0.0016	0.0021	0.0025	0.0029	0.0037	
				≤ 0.15	≤ APMX	(352-528)	Feed (ipm)	34	45	44	42	41	39	
			 HSM	4xD		394	Fz	0.0008	0.0016	0.0022	0.0026	0.0030	0.0035	
				≤ 0.1	≤ APMX	(315-473)	Feed (ipm)	34	45	46	44	42	37	
	S	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	≤ 300 Bhn or ≤ 32 HRc	 HSM	2.5xD		136	RPM	1925	1284	963	770	642	481
					≤ 0.2	≤ APMX	(109-163)	Fz	0.0006	0.0011	0.0016	0.0018	0.0021	0.0025
				 HSM	3xD		141	Fz	0.0007	0.0012	0.0018	0.0021	0.0024	0.0028
					≤ 0.15	≤ APMX	(113-169)	Feed (ipm)	8	10	11	10	9	8
				 HSM	4xD		126	Fz	0.0007	0.0013	0.0018	0.0022	0.0025	0.0029
					≤ 0.1	≤ APMX	(101-151)	Feed (ipm)	9	11	12	11	11	9
HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene		≤ 400 Bhn or ≤ 43 HRc	 HSM	2.5xD		85	RPM	1207	805	604	483	402	302	
				≤ 0.2	≤ APMX	(68-102)	Fz	0.0005	0.0009	0.0013	0.0015	0.0018	0.0022	
			 HSM	3xD		88	Fz	0.0005	0.0010	0.0015	0.0018	0.0020	0.0025	
				≤ 0.15	≤ APMX	(70-106)	Feed (ipm)	4	5	5	5	5	5	
			 HSM	4xD		79	Fz	0.0006	0.0011	0.0015	0.0018	0.0021	0.0026	
				≤ 0.1	≤ APMX	(63-95)	Feed (ipm)	4	6	6	6	6	5	
TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si		≤ 350 Bhn or ≤ 38 HRc	 HSM	2.5xD		289	RPM	4095	2730	2048	1638	1365	1024	
				≤ 0.2	≤ APMX	(231-347)	Fz	0.0008	0.0015	0.0021	0.0024	0.0028	0.0032	
			 HSM	3xD		299	Fz	0.0009	0.0017	0.0023	0.0025	0.0028	0.0036	
				≤ 0.15	≤ APMX	(239-359)	Feed (ipm)	23	29	30	28	27	23	
			 HSM	4xD		268	Fz	0.0009	0.0018	0.0024	0.0029	0.0033	0.0037	
				≤ 0.1	≤ APMX	(214-322)	Feed (ipm)	26	32	33	29	27	26	
TITANIUM ALLOYS (DIFFICULT) Ti10V2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 420 Bhn or ≤ 45 HRc	 HSM	2.5xD		170	RPM	2399	1599	1199	960	800	600		
			≤ 0.2	≤ APMX	(136-204)	Fz	0.0008	0.0015	0.0021	0.0024	0.0028	0.0032		
		 HSM	3xD		176	Fz	0.0009	0.0017	0.0023	0.0025	0.0028	0.0036		
			≤ 0.15	≤ APMX	(141-211)	Feed (ipm)	13	17	18	16	16	13		
		 HSM	4xD		157	Fz	0.0009	0.0018	0.0024	0.0029	0.0033	0.0037		
			≤ 0.1	≤ APMX	(126-188)	Feed (ipm)	15	20	20	19	18	16		

Bhn (Brinell) HRc (Rockwell C) HSM (High Speed Machining)
 rpm = Vc x 3.82 / DC
 ipm = Fz x 7 x rpm
 reduce speed and feed for materials harder than listed
 reduce feed and Ae when finish milling (.02 x DC maximum)
 feed rates listed have chip thinning adjustments included where applicable
 refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)



**77M •
77MCR**
METRIC SERIES



TOLERANCES (mm)

6 DIAMETER

DC = +0,000/-0,030

DCON = h_6

RE = +0,000 / -0,050

>6-10 DIAMETER

DC = +0,000/-0,040

DCON = h_6

RE = +0,000 / -0,050

>10-25 DIAMETER

DC = +0,000/-0,050

DCON = h_6

RE = +0,000 / -0,050

- Specializes in deep axial trochoidal and high-speed milling applications
- Optimized core improves rigidity, chip flow and reduces deflection
- Chip Breaker design breaks up chips from the long flute length allowing for better chip flow and evacuation in deep pocketing operations
- Recommended for materials ≤ 45 HRc (≤ 420 Bhn)

STEELS
STAINLESS STEELS
CAST IRON
HIGH TEMP ALLOYS

mm						Ti-NAMITE-A (TA)				Ti-NAMITE-M (TM)			
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	NON-CUTTING CENTER DIAMETER NCD	EXTERNAL COOLANT		INTERNAL COOLANT		EXTERNAL COOLANT		INTERNAL COOLANT	
						EDP NO.	WITH CHIP BREAKER EDP NO.	EDP NO.	WITH CHIP BREAKER EDP NO.	EDP NO.	WITH CHIP BREAKER EDP NO.	EDP NO.	CHIP BREAKER EDP NO.
6,0	15,0	63,0	6,0	—	2,03	74300	74302	—	—	74301	74303	—	—
6,0	15,0	63,0	6,0	0,3	2,03	74304	74306	—	—	74305	74307	—	—
6,0	15,0	63,0	6,0	0,5	2,03	74308	74310	—	—	74309	74311	—	—
6,0	18,0	63,0	6,0	—	2,03	74316	74318	—	—	74317	74319	—	—
6,0	18,0	63,0	6,0	0,3	2,03	74320	74322	—	—	74321	74323	—	—
6,0	18,0	63,0	6,0	0,5	2,03	74324	74326	—	—	74325	74327	—	—
6,0	24,0	75,0	6,0	—	2,03	74332	74334	—	—	74333	74335	—	—
6,0	24,0	75,0	6,0	0,3	2,03	74336	74338	—	—	74337	74339	—	—
6,0	24,0	75,0	6,0	0,5	2,03	74340	74342	—	—	74341	74343	—	—
8,0	20,0	75,0	8,0	—	2,71	74348	74350	—	—	74349	74351	—	—
8,0	20,0	75,0	8,0	0,5	2,71	74352	74354	—	—	74353	74355	—	—
8,0	20,0	75,0	8,0	1,0	2,71	74356	74358	—	—	74357	74359	—	—
8,0	20,0	75,0	8,0	2,0	2,71	74360	74362	—	—	74361	74363	—	—
8,0	24,0	75,0	8,0	—	2,71	74364	74366	—	—	74365	74367	—	—
8,0	24,0	75,0	8,0	0,5	2,71	74368	74370	—	—	74369	74371	—	—
8,0	24,0	75,0	8,0	1,0	2,71	74372	74374	—	—	74373	74375	—	—
8,0	24,0	75,0	8,0	2,0	2,71	74376	74378	—	—	74377	74379	—	—
8,0	32,0	85,0	8,0	—	2,71	74380	74382	—	—	74381	74383	—	—
8,0	32,0	85,0	8,0	0,5	2,71	74384	74386	—	—	74385	74387	—	—
8,0	32,0	85,0	8,0	1,0	2,71	74388	74390	—	—	74389	74391	—	—
8,0	32,0	85,0	8,0	2,0	2,71	74392	74394	—	—	74393	74395	—	—
10,0	25,0	75,0	10,0	—	3,38	74396	74398	—	—	74397	74399	—	—
10,0	25,0	75,0	10,0	0,5	3,38	74400	74402	—	—	74401	74403	—	—
10,0	25,0	75,0	10,0	1,0	3,38	74404	74406	—	—	74405	74407	—	—
10,0	30,0	80,0	10,0	—	3,38	74408	74410	—	—	74409	74411	—	—
10,0	30,0	80,0	10,0	0,5	3,38	74412	74414	—	—	74413	74415	—	—
10,0	30,0	80,0	10,0	1,0	3,38	74416	74418	—	—	74417	74419	—	—
10,0	40,0	100,0	10,0	—	3,38	74420	74422	—	—	74421	74423	—	—
10,0	40,0	100,0	10,0	0,5	3,38	74424	74426	—	—	74425	74427	—	—
10,0	40,0	100,0	10,0	1,0	3,38	74428	74430	—	—	74429	74431	—	—
12,0	30,0	83,0	12,0	—	4,06	74432	74434	74672	74674	74433	74435	74673	74675
12,0	30,0	83,0	12,0	0,5	4,06	74436	74438	74676	74678	74437	74439	74677	74679
12,0	30,0	83,0	12,0	1,0	4,06	74440	74442	74680	74682	74441	74443	74681	74683
12,0	30,0	83,0	12,0	2,0	4,06	74600	74601	74684	74686	74602	74603	74685	74687

continued on next page

TOLERANCES (mm)

6 DIAMETER

DC = +0,000/-0,030

DCON = h_6

RE = +0,000 / -0,050

>6-10 DIAMETER

DC = +0,000/-0,040

DCON = h_6

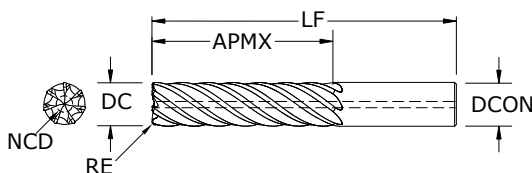
RE = +0,000 / -0,050

>10-25 DIAMETER

DC = +0,000/-0,050

DCON = h_6

RE = +0,000 / -0,050

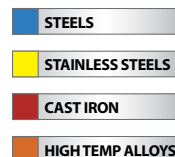


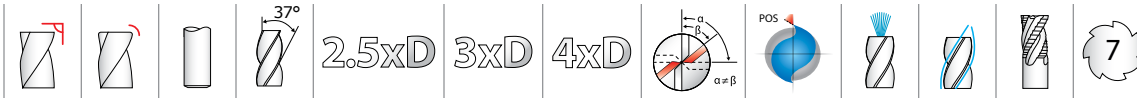
77M •
77MCR
METRIC SERIES

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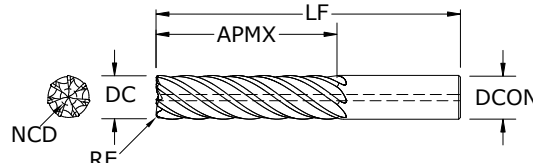
mm						Ti-NAMITE-A (TA)				Ti-NAMITE-M (TM)			
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	NON-CUTTING CENTER DIAMETER NCD	EXTERNAL COOLANT		INTERNAL COOLANT		EXTERNAL COOLANT		INTERNAL COOLANT	
						EDP NO.	WITH CHIP BREAKER EDP NO.	EDP NO.	WITH CHIP BREAKER EDP NO.	EDP NO.	WITH CHIP BREAKER EDP NO.	EDP NO.	WITH CHIP BREAKER EDP NO.
12,0	30,0	83,0	12,0	3,0	4,06	74604	74605	74688	74690	74606	74607	74689	74691
12,0	36,0	83,0	12,0	—	4,06	74444	74446	74692	74694	74445	74447	74693	74695
12,0	36,0	83,0	12,0	0,5	4,06	74448	74450	74696	74698	74449	74451	74697	74699
12,0	36,0	83,0	12,0	1,0	4,06	74452	74454	74700	74702	74453	74455	74701	74703
12,0	36,0	83,0	12,0	2,0	4,06	74608	74609	74704	74706	74610	74611	74705	74707
12,0	36,0	83,0	12,0	3,0	4,06	74612	74613	74708	74710	74614	74615	74709	74711
12,0	48,0	100,0	12,0	—	4,06	74456	74458	74712	74714	74457	74459	74713	74715
12,0	48,0	100,0	12,0	0,5	4,06	74460	74462	74716	74718	74461	74463	74717	74719
12,0	48,0	100,0	12,0	1,0	4,06	74464	74466	74720	74722	74465	74467	74721	74723
12,0	48,0	100,0	12,0	2,0	4,06	74616	74617	74724	74726	74618	74619	74725	74727
12,0	48,0	100,0	12,0	3,0	4,06	74620	74621	74728	74730	74622	74623	74729	74731
16,0	40,0	92,0	16,0	—	5,41	74468	74470	74732	74734	74469	74471	74733	74735
16,0	40,0	92,0	16,0	0,5	5,41	74472	74474	74736	74738	74473	74475	74737	74739
16,0	40,0	92,0	16,0	1,0	5,41	74476	74478	74740	74742	74477	74479	74741	74743
16,0	40,0	92,0	16,0	2,0	5,41	74624	74625	74744	74746	74626	74627	74745	74747
16,0	40,0	92,0	16,0	3,0	5,41	74628	74629	74748	74750	74630	74631	74749	74751
16,0	48,0	100,0	16,0	—	5,41	74480	74482	74752	74754	74481	74483	74753	74755
16,0	48,0	100,0	16,0	0,5	5,41	74484	74486	74756	74758	74485	74487	74757	74759
16,0	48,0	100,0	16,0	1,0	5,41	74488	74490	74760	74762	74489	74491	74761	74763
16,0	48,0	100,0	16,0	2,0	5,41	74632	74633	74764	74766	74634	74635	74765	74767
16,0	48,0	100,0	16,0	3,0	5,41	74636	74637	74768	74770	74638	74639	74769	74771
16,0	64,0	115,0	16,0	—	5,41	74492	74494	74772	74774	74493	74495	74773	74775
16,0	64,0	115,0	16,0	0,5	5,41	74496	74498	74776	74778	74497	74499	74777	74779
16,0	64,0	115,0	16,0	1,0	5,41	74500	74502	74780	74782	74501	74503	74781	74783
16,0	64,0	115,0	16,0	2,0	5,41	74640	74641	74784	74786	74642	74643	74785	74787
16,0	64,0	115,0	16,0	3,0	5,41	74644	74645	74788	74790	74646	74647	74789	74791
20,0	50,0	100,0	20,0	—	6,76	74504	74506	74792	74794	74505	74507	74793	74795
20,0	50,0	100,0	20,0	0,5	6,76	74508	74510	74796	74798	74509	74511	74797	74799
20,0	50,0	100,0	20,0	1,0	6,76	74512	74514	74800	74802	74513	74515	74801	74803
20,0	50,0	100,0	20,0	2,0	6,76	74516	74518	74804	74806	74517	74519	74805	74807
20,0	50,0	100,0	20,0	3,0	6,76	74648	74649	74808	74810	74650	74651	74809	74811
20,0	50,0	100,0	20,0	4,0	6,76	74652	74653	74812	74814	74654	74655	74813	74815
20,0	60,0	115,0	20,0	—	6,76	74520	74522	74816	74818	74521	74523	74817	74819
20,0	60,0	115,0	20,0	0,5	6,76	74524	74526	74820	74822	74525	74527	74821	74823

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77M • 77MCR
METRIC SERIES



TOLERANCES (mm)

6 DIAMETER

DC = +0,000/-0,030

DCON = h_6

RE = +0,000 / -0,050

>6-10 DIAMETER

DC = +0,000/-0,040

DCON = h_6

RE = +0,000 / -0,050

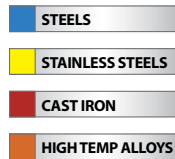
>10-25 DIAMETER

DC = +0,000/-0,050

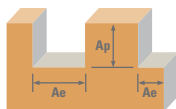
DCON = h_6

RE = +0,000 / -0,050

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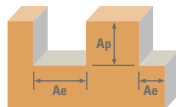


mm						Ti-NAMITE-A (TA)				Ti-NAMITE-M (TM)			
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	NON-CUTTING CENTER DIAMETER NCD	EXTERNAL COOLANT		INTERNAL COOLANT		EXTERNAL COOLANT		INTERNAL COOLANT	
						EDP NO.	WITH CHIP BREAKER EDP NO.	EDP NO.	WITH CHIP BREAKER EDP NO.	EDP NO.	WITH CHIP BREAKER EDP NO.	EDP NO.	WITH CHIP BREAKER EDP NO.
20,0	60,0	115,0	20,0	1,0	6,76	74528	74530	74824	74826	74529	74531	74825	74827
20,0	60,0	115,0	20,0	2,0	6,76	74532	74534	74828	74830	74533	74535	74829	74831
20,0	60,0	115,0	20,0	3,0	6,76	74656	74657	74832	74834	74658	74659	74833	74835
20,0	60,0	115,0	20,0	4,0	6,76	74660	74661	74836	74838	74662	74663	74837	74839
20,0	80,0	140,0	20,0	—	6,76	74536	74538	74840	74842	74537	74539	74841	74843
20,0	80,0	140,0	20,0	0,5	6,76	74540	74542	74844	74846	74541	74543	74845	74847
20,0	80,0	140,0	20,0	1,0	6,76	74544	74546	74848	74850	74545	74547	74849	74851
20,0	80,0	140,0	20,0	2,0	6,76	74548	74550	74852	74854	74549	74551	74853	74855
20,0	80,0	140,0	20,0	3,0	6,76	74664	74665	74856	74858	74666	74667	74857	74859
20,0	80,0	140,0	20,0	4,0	6,76	74668	74669	74860	74862	74670	74671	74861	74863
25,0	63,0	135,0	25,0	—	8,45	74552	74554	74864	74866	74553	74555	74865	74867
25,0	63,0	135,0	25,0	1,0	8,45	74556	74558	74868	74870	74557	74559	74869	74871
25,0	63,0	135,0	25,0	2,0	8,45	74560	74562	74872	74874	74561	74563	74873	74875
25,0	63,0	135,0	25,0	3,0	8,45	74564	74566	74876	74878	74565	74567	74877	74879
25,0	75,0	150,0	25,0	—	8,45	74568	74570	74880	74882	74569	74571	74881	74883
25,0	75,0	150,0	25,0	1,0	8,45	74572	74574	74884	74886	74573	74575	74885	74887
25,0	75,0	150,0	25,0	2,0	8,45	74576	74578	74888	74890	74577	74579	74889	74891
25,0	75,0	150,0	25,0	3,0	8,45	74580	74582	74892	74894	74581	74583	74893	74895
25,0	100,0	170,0	25,0	—	8,45	74584	74586	74896	74898	74585	74587	74897	74899
25,0	100,0	170,0	25,0	1,0	8,45	74588	74590	74900	74902	74589	74591	74901	74903
25,0	100,0	170,0	25,0	2,0	8,45	74592	74594	74904	74906	74593	74595	74905	74907
25,0	100,0	170,0	25,0	3,0	8,45	74596	74598	74908	74910	74597	74599	74909	74911



Series 77M, 77MCR			Ae x DC		Vc (m/min)		DC • mm									
Metric	Hardness		Ae x DC	Ap x DC			6	8	10	12	16	20	25			
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 275 Bhn or ≤ 28 HRc		2.5xD		284 (227-341)	RPM	12208	9156	7325	6104	4578	3662	2930		
				≤ 0.2 ≤ APMX			Fz	0.0413	0.0411	0.0640	0.0711	0.0889	0.1013	0.1050		
							Feed (mm/min)	3529	2634	3282	3038	2849	2597	2154		
				3xD		257 (206-308)	Fz	0.0347	0.0461	0.0717	0.0797	0.0996	0.1135	0.1176		
				≤ 0.15 ≤ APMX			Feed (mm/min)	2965	2955	3676	3405	3192	2910	2412		
							Fz	0.0362	0.0480	0.0747	0.0830	0.1037	0.1182	0.0919		
			4xD		230 (184-276)	Feed (mm/min)	3094	3076	3830	3546	3323	3030	1885			
			≤ 0.1 ≤ APMX													
						RPM	8068	6051	4841	4034	3025	2420	1936			
				2.5xD		132 (106-159)	Fz	0.0213	0.0285	0.0512	0.0610	0.0711	0.0827	0.0875		
				≤ 0.2 ≤ APMX			Feed (mm/min)	1203	1207	1735	1723	1506	1401	1186		
							Fz	0.0239	0.0319	0.0574	0.0683	0.0797	0.0926	0.0980		
		3xD		138 (111-166)	Feed (mm/min)	1350	1351	1945	1929	1688	1569	1328				
		≤ 0.15 ≤ APMX														
					Fz	0.0249	0.0332	0.0597	0.0711	0.0830	0.0964	0.1021				
			4xD		152 (122-182)	Feed (mm/min)	1406	1406	2023	2008	1758	1633	1384			
			≤ 0.1 ≤ APMX													
						RPM	4087	3065	2452	2044	1533	1226	981			
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 375 Bhn or ≤ 40 HRc		2.5xD		83 (66-100)	Fz	0.0140	0.0183	0.0294	0.0356	0.0457	0.0560	0.0625		
				≤ 0.2 ≤ APMX			Feed (mm/min)	401	393	505	509	490	481	429		
							Fz	0.0157	0.0205	0.0330	0.0398	0.0512	0.0627	0.0700		
				3xD		86 (69-103)	Feed (mm/min)	449	440	566	569	549	538	481		
				≤ 0.15 ≤ APMX												
							Fz	0.0163	0.0213	0.0344	0.0415	0.0533	0.0653	0.0729		
			4xD		77 (62-92)	Feed (mm/min)	466	457	590	594	572	560	501			
			≤ 0.1 ≤ APMX													
						RPM	9660	7245	5796	4830	3623	2898	2318			
			STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 275 Bhn or ≤ 28 HRc			2.5xD		197 (158-236)	Fz	0.0216	0.0285	0.0448	0.0533	0.0635	0.0747
≤ 0.2 ≤ APMX							Feed (mm/min)	1461		1445	1818	1803	1610	1515	1298	
							Fz	0.0242		0.0319	0.0502	0.0598	0.0711	0.0837	0.0896	
	3xD				204 (163-245)	Feed (mm/min)	1636	1618	2037	2022	1803	1698	1454			
	≤ 0.15 ≤ APMX															
						Fz	0.0252	0.0332	0.0523	0.0622	0.0741	0.0871	0.0933			
	4xD			182 (146-218)	Feed (mm/min)	1704	1684	2122	2104	1879	1767	1514				
	≤ 0.1 ≤ APMX															
					RPM	6369	4777	3822	3185	2389	1911	1529				
	STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L	≤ 275 Bhn or ≤ 28 HRc				2.5xD		130 (104-156)	Fz	0.0168	0.0221	0.0371	0.0432	0.0584	0.0693	0.0750
						≤ 0.2 ≤ APMX			Feed (mm/min)	749	739	993	963	976	927	803
									Fz	0.0188	0.0248	0.0416	0.0484	0.0655	0.0777	0.0840
			3xD		134 (107-161)	Feed (mm/min)	838	829	1113	1079	1095	1039	899			
			≤ 0.15 ≤ APMX													
						Fz	0.0196	0.0258	0.0433	0.0504	0.0682	0.0809	0.0875			
		4xD		120 (96-144)	Feed (mm/min)	874	863	1158	1124	1140	1082	936				
		≤ 0.1 ≤ APMX														
					RPM	6104	4578	3662	3052	2289	1831	1465				
		STAINLESS STEELS (PH) 13-8 PH, 15-5PH, 17-4 PH, CUSTOM 450	≤ 325 Bhn or ≤ 35 HRc			2.5xD		124 (99-149)	Fz	0.0168	0.0221	0.0371	0.0432	0.0584	0.0693	0.0750
						≤ 0.2 ≤ APMX			Feed (mm/min)	718	708	952	923	936	888	769
									Fz	0.0188	0.0248	0.0416	0.0484	0.0655	0.0777	0.0840
	3xD			129 (103-155)	Feed (mm/min)	803	795	1066	1034	1050	996	861				
	≤ 0.15 ≤ APMX															
					Fz	0.0196	0.0258	0.0433	0.0504	0.0682	0.0809	0.0875				
	4xD		115 (92-138)	Feed (mm/min)	837	827	1110	1077	1093	1037	897					
	≤ 0.1 ≤ APMX															

continued on next page



Series 77M, 77MCR Metric		Hardness			Vc (m/min)	DC • mm								
			Ae x DC	Ap x DC		6	8	10	12	16	20	25		
K	CAST IRONS (LOW & MEDIUM ALLOY) Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc		2.5xD		218 (174-262)	RPM	10722	8041	6433	5361	4021	3217	2573
				≤ 0.2 ≤ APMX			Fz	0.0239	0.0315	0.0474	0.0559	0.0762	0.0880	0.0925
				3xD		225 (180-270)	Fz	0.0268	0.0353	0.0531	0.0626	0.0854	0.0986	0.1036
				≤ 0.15 ≤ APMX			Feed (mm/min)	1794	1773	2135	2098	2145	1981	1666
				4xD		202 (162-242)	Fz	0.0279	0.0368	0.0553	0.0652	0.0889	0.1027	0.1079
				≤ 0.1 ≤ APMX			Feed (mm/min)	2011	1987	2391	2349	2404	2220	1866
	CAST IRONS (HIGH ALLOY) Gray, Malleable, Ductile	≤ 260 Bhn or ≤ 26 HRc		2.5xD		130 (104-156)	RPM	6369	4777	3822	3185	2389	1911	1529
				≤ 0.2 ≤ APMX			Fz	0.0168	0.0221	0.0371	0.0432	0.0584	0.0693	0.0750
				3xD		134 (107-161)	Fz	0.0188	0.0248	0.0416	0.0484	0.0655	0.0777	0.0840
				≤ 0.15 ≤ APMX			Feed (mm/min)	749	739	993	963	976	927	803
				4xD		120 (96-144)	Fz	0.0196	0.0258	0.0433	0.0504	0.0682	0.0809	0.0875
				≤ 0.1 ≤ APMX			Feed (mm/min)	838	829	1113	1079	1095	1039	899
S	HIGH TEMP ALLOYS (NICKEL , COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	≤ 300 Bhn or ≤ 32 HRc		2.5xD		41 (33-49)	RPM	2017	1513	1210	1008	756	605	484
				≤ 0.2 ≤ APMX			Fz	0.0140	0.0183	0.0294	0.0356	0.0457	0.0560	0.0625
				3xD		43 (34-52)	Fz	0.0157	0.0205	0.0330	0.0398	0.0512	0.0627	0.0700
				≤ 0.15 ≤ APMX			Feed (mm/min)	198	194	249	251	242	237	212
				4xD		38 (30-46)	Fz	0.0163	0.0213	0.0344	0.0415	0.0533	0.0653	0.0729
				≤ 0.1 ≤ APMX			Feed (mm/min)	222	217	280	281	271	266	237
	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	≤ 400 Bhn or ≤ 43 HRc		2.5xD		26 (21-31)	RPM	1274	955	764	637	478	382	306
				≤ 0.2 ≤ APMX			Fz	0.0114	0.0152	0.0243	0.0305	0.0381	0.0480	0.0550
				3xD		27 (22-32)	Fz	0.0128	0.0171	0.0273	0.0342	0.0427	0.0538	0.0616
				≤ 0.15 ≤ APMX			Feed (mm/min)	102	102	130	136	127	128	118
				4xD		24 (19-29)	Fz	0.0133	0.0178	0.0284	0.0356	0.0445	0.0560	0.0642
				≤ 0.1 ≤ APMX			Feed (mm/min)	114	114	146	152	143	144	132
TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	≤ 350 Bhn or ≤ 38 HRc		2.5xD		88 (70-106)	RPM	4352	3264	2611	2176	1632	1306	1045	
			≤ 0.2 ≤ APMX			Fz	0.0191	0.0254	0.0397	0.0483	0.0635	0.0747	0.0800	
			3xD		91 (73-109)	Fz	0.0213	0.0285	0.0445	0.0541	0.0711	0.0837	0.0896	
			≤ 0.15 ≤ APMX			Feed (mm/min)	582	580	726	736	725	683	585	
			4xD		82 (66-98)	Fz	0.0222	0.0296	0.0463	0.0563	0.0741	0.0871	0.0933	
			≤ 0.1 ≤ APMX			Feed (mm/min)	649	651	813	824	812	765	655	
TITANIUM ALLOYS (DIFFICULT) Ti10V2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 420 Bhn or ≤ 45 HRc		2.5xD		52 (42-62)	RPM	2548	1911	1529	1274	955	764	611	
			≤ 0.2 ≤ APMX			Fz	0.0163	0.0254	0.0397	0.0483	0.0635	0.0747	0.0800	
			3xD		54 (43-65)	Fz	0.0182	0.0285	0.0445	0.0541	0.0711	0.0837	0.0896	
			≤ 0.15 ≤ APMX			Feed (mm/min)	291	340	425	431	425	400	342	
			4xD		48 (38-58)	Fz	0.0190	0.0296	0.0463	0.0563	0.0741	0.0871	0.0933	
			≤ 0.1 ≤ APMX			Feed (mm/min)	325	381	476	482	476	448	384	

Bhn (Brinell) HRC (Rockwell C) HSM (High Speed Machining)

rpm = (Vc x 1000) / (DC x 3.14)

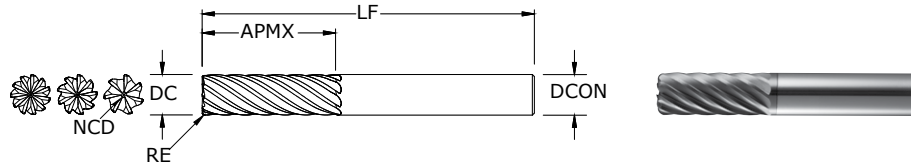
mm/min = Fz x 7 x rpm

reduce speed and feed for materials harder than listed

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

feed rates listed have chip thinning adjustments included where applicable

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)



**66 •
66CR**
FRACTIONAL SERIES

TOLERANCES (inch)

DC = +0.0000/-0.0020

DCON = h_6

RE = +0.0000/-0.0020

STEELS

STAINLESS STEELS

CAST IRON

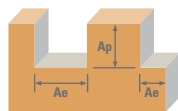
HIGH TEMP ALLOYS

inch							EDP NO.
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	NON-CUTTING DIAMETER NCD	NO. OF FLUTES	Ti-NAMITE-X (TX)
3/16	5/8	2	3/16	—	.0550	7	36620
3/16	5/8	2	3/16	.010	.0550	7	36627
1/4	3/4	2-1/2	1/4	—	.0650	7	36621
1/4	3/4	2-1/2	1/4	.015	.0650	7	36628
3/8	1	3	3/8	—	.0810	7	36622
3/8	1	3	3/8	.015	.0810	7	36629
1/2	1-1/4	3	1/2	—	.1340	9	36623
1/2	1-1/4	3	1/2	.030	.1340	9	36630
1/2	1-1/4	3	1/2	.090	.1340	9	36631
1/2	1-1/4	3	1/2	.120	.1340	9	36632
5/8	1-5/8	3-1/2	5/8	—	.1150	9	36624
5/8	1-5/8	3-1/2	5/8	.030	.1150	9	36633
5/8	1-5/8	3-1/2	5/8	.090	.1150	9	36634
5/8	1-5/8	3-1/2	5/8	.120	.1150	9	36635
3/4	1-5/8	4	3/4	—	.1750	11	36625
3/4	1-5/8	4	3/4	.030	.1750	11	36636
3/4	1-5/8	4	3/4	.090	.1750	11	36637
3/4	1-5/8	4	3/4	.120	.1750	11	36638
1	2	6	1	—	.3000	11	36626
1	2	6	1	.030	.3000	11	36639
1	2	6	1	.090	.3000	11	36640
1	2	6	1	.120	.3000	11	36641

Neck Option Available

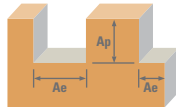
- Heavy core and rigid design allow for straight walls
- High flute count design results in smoother cutting performance and enhanced tool life in precise finishing applications
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials ≤ 45 HRc (≤ 420 Bhn)

Multi-Carb



Series 66, 66CR Fractional		Hardness	Ae Ap DC		Vc (sfm)	DC • in								
						3/16	1/4	3/8	1/2	5/8	3/4	1		
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.05	≤ 1	635	RPM	12937	9703	6469	4851	3881	3234	2426
						(508-762)	Fz	0.0008	0.0012	0.0022	0.0030	0.0037	0.0038	0.0042
							Feed (ipm)	72.4	81.5	99.6	131.0	129.2	135.2	112.1
		≤ 275 Bhn or ≤ 28 HRc	Finish 	≤ 0.02	≤ 2	762	RPM	15524	11643	7762	5822	4657	3881	2911
						(610-914)	Fz	0.0006	0.0010	0.0018	0.0024	0.0030	0.0030	0.0034
							Feed (ipm)	69.5	78.2	95.6	125.7	124.1	129.8	107.6
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 375 Bhn or ≤ 40 HRc	Profile 	≤ 0.05	≤ 1	360	RPM	7334	5501	3667	2750	2200	1834	1375
						(288-432)	Fz	0.0006	0.0009	0.0017	0.0023	0.0029	0.0030	0.0032
							Feed (ipm)	30.8	34.7	43.6	56.9	57.4	60.5	48.4
		≤ 375 Bhn or ≤ 40 HRc	Finish 	≤ 0.02	≤ 2	432	RPM	8801	6601	4401	3300	2640	2200	1650
						(346-518)	Fz	0.0005	0.0007	0.0014	0.0018	0.0023	0.0024	0.0026
							Feed (ipm)	29.6	33.3	41.9	54.7	55.1	58.1	46.5
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 375 Bhn or ≤ 40 HRc	Profile 	≤ 0.05	≤ 1	290	RPM	5908	4431	2954	2216	1772	1477	1108
						(232-348)	Fz	0.0004	0.0006	0.0012	0.0016	0.0020	0.0021	0.0022
							Feed (ipm)	16.5	18.6	24.8	31.9	31.9	34.1	26.8
		≤ 375 Bhn or ≤ 40 HRc	Finish 	≤ 0.02	≤ 2	348	RPM	7090	5317	3545	2659	2127	1772	1329
						(278-418)	Fz	0.0003	0.0005	0.0010	0.0013	0.0016	0.0017	0.0018
							Feed (ipm)	15.9	17.9	23.8	30.6	30.6	32.8	25.7
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.05	≤ 1	560	RPM	11409	8557	5705	4278	3423	2852	2139
						(448-672)	Fz	0.0006	0.0009	0.0017	0.0023	0.0029	0.0030	0.0032
							Feed (ipm)	47.9	53.9	67.9	88.6	89.3	94.1	75.3
		≤ 275 Bhn or ≤ 28 HRc	Finish 	≤ 0.02	≤ 2	448	RPM	9127	6845	4564	3423	2738	2282	1711
						(358-538)	Fz	0.0005	0.0007	0.0014	0.0018	0.0023	0.0024	0.0026
							Feed (ipm)	30.7	34.5	43.4	56.7	57.2	60.2	48.2
	STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.05	≤ 1	385	RPM	7844	5883	3922	2941	2353	1961	1471
						(308-462)	Fz	0.0005	0.0007	0.0014	0.0018	0.0023	0.0024	0.0026
							Feed (ipm)	27.5	28.8	38.4	47.7	48.7	51.8	42.1
		≤ 275 Bhn or ≤ 28 HRc	Finish 	≤ 0.02	≤ 2	462	RPM	9412	7059	4706	3530	2824	2353	1765
						(370-554)	Fz	0.0004	0.0006	0.0011	0.0014	0.0018	0.0019	0.0021
							Feed (ipm)	26.4	27.7	36.9	45.7	46.8	49.7	40.4
	STAINLESS STEELS (PH) 13-8 PH, 15-5 PH, 17-4 PH, Custom 450	≤ 325 Bhn or ≤ 35 HRc	Profile 	≤ 0.05	≤ 1	355	RPM	7233	5424	3616	2712	2170	1808	1356
						(284-426)	Fz	0.0005	0.0007	0.0014	0.0018	0.0023	0.0024	0.0026
							Feed (ipm)	25.3	26.6	35.4	43.9	44.9	47.7	38.8
		≤ 325 Bhn or ≤ 35 HRc	Finish 	≤ 0.02	≤ 2	426	RPM	8679	6509	4340	3255	2604	2170	1627
						(341-511)	Fz	0.0004	0.0006	0.0011	0.0014	0.0018	0.0019	0.0021
							Feed (ipm)	24.3	25.5	34.0	42.2	43.1	45.8	37.2

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Series 66, 66CR Fractional	Hardness		Ae x DC	Ap x DC	Vc (sfm)	DC • in								
						3/16	1/4	3/8	1/2	5/8	3/4	1		
K	CAST IRONS (LOW & MEDIUM ALLOY) Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	Profile 	≤ 0.05	≤ 1	705	RPM	14363	10772	7182	5386	4309	3591	2693
						(564-846)	Fz	0.0008	0.0012	0.0022	0.0030	0.0037	0.0038	0.0042
							Feed (ipm)	80.4	90.5	110.6	145.4	143.5	150.1	124.4
		Finish 	≤ 0.02	≤ 2	846	RPM	17236	12927	8618	6463	5171	4309	3232	
					(677-1015)	Fz	0.0006	0.0010	0.0018	0.0024	0.0030	0.0030	0.0034	
						Feed (ipm)	77.2	86.9	106.2	139.6	137.7	144.1	119.4	
	CAST IRONS (HIGH ALLOY) Gray, Malleable, Ductile	≤ 260 Bhn or ≤ 26 HRc	Profile 	≤ 0.05	≤ 1	540	RPM	11002	8251	5501	4126	3300	2750	2063
						(432-648)	Fz	0.0006	0.0009	0.0017	0.0023	0.0029	0.0030	0.0032
							Feed (ipm)	46.2	52.0	65.5	85.4	86.1	90.8	72.6
		Finish 	≤ 0.02	≤ 2	648	RPM	13202	9901	6601	4951	3961	3300	2475	
					(518-778)	Fz	0.0005	0.0007	0.0014	0.0018	0.0023	0.0024	0.0026	
						Feed (ipm)	44.4	49.9	62.8	82.0	82.7	87.1	69.7	
S	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	≤ 300 Bhn or ≤ 32 HRc	Profile 	≤ 0.05	≤ 1	105	RPM	2139	1604	1070	802	642	535	401
						(84-126)	Fz	0.0005	0.0007	0.0014	0.0018	0.0023	0.0024	0.0026
							Feed (ipm)	7.5	7.9	10.5	13.0	13.3	14.1	11.5
		Finish 	≤ 0.02	≤ 2	126	RPM	2567	1925	1284	963	770	642	481	
					(101-151)	Fz	0.0004	0.0006	0.0011	0.0014	0.0018	0.0019	0.0021	
						Feed (ipm)	7.2	7.5	10.1	12.5	12.8	13.6	11.0	
	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	≤ 400 Bhn or ≤ 43 HRc	Profile 	≤ 0.05	≤ 1	85	RPM	1732	1299	866	649	520	433	325
						(68-102)	Fz	0.0003	0.0005	0.0009	0.0011	0.0014	0.0015	0.0016
							Feed (ipm)	3.6	4.5	5.5	6.4	6.5	7.1	5.7
		Finish 	≤ 0.02	≤ 2	102	RPM	2078	1559	1039	779	623	520	390	
					(82-122)	Fz	0.0002	0.0004	0.0007	0.0009	0.0011	0.0012	0.0013	
						Feed (ipm)	3.5	4.4	5.2	6.2	6.3	6.9	5.5	
	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	≤ 350 Bhn or ≤ 38 HRc	Profile 	≤ 0.05	≤ 1	390	RPM	7946	5959	3973	2980	2384	1986	1490
						(312-468)	Fz	0.0005	0.0008	0.0015	0.0021	0.0026	0.0027	0.0029
							Feed (ipm)	27.8	33.4	41.7	56.3	55.8	59.0	47.5
		Finish 	≤ 0.02	≤ 2	468	RPM	9535	7151	4767	3576	2860	2384	1788	
					(374-562)	Fz	0.0004	0.0006	0.0012	0.0017	0.0021	0.0022	0.0023	
						Feed (ipm)	26.7	32.0	40.0	54.1	53.5	56.6	45.6	
	TITANIUM ALLOYS (DIFFICULT) Ti10V2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 420 Bhn or ≤ 45 HRc	Profile 	≤ 0.05	≤ 1	140	RPM	2852	2139	1426	1070	856	713	535
						(112-168)	Fz	0.0005	0.0008	0.0015	0.0021	0.0026	0.0027	0.0029
							Feed (ipm)	10.0	12.0	15.0	20.2	20.0	21.2	17.1
		Finish 	≤ 0.02	≤ 2	168	RPM	3423	2567	1711	1284	1027	856	642	
					(134-202)	Fz	0.0004	0.0006	0.0012	0.0017	0.0021	0.0022	0.0023	
						Feed (ipm)	9.6	11.5	14.4	19.4	19.2	20.3	16.4	

Bhn (Brinell) HRc (Rockwell C)

rpm = Vc x 3.82 / DC

ipm = Fz x number of flutes x rpm

reduce speed and feed for materials harder than listed

feed rates listed have chip thinning adjustments included where applicable

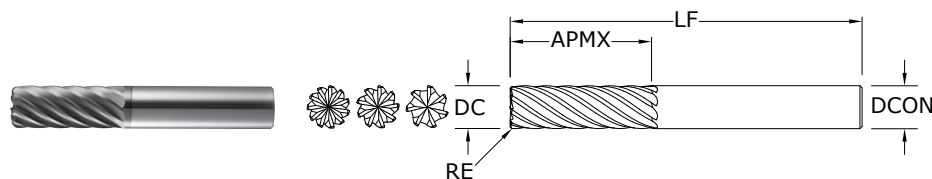
refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)



66M • 66MCR

METRIC SERIES

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



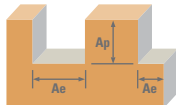
mm							EDP NO.
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	NON-CUTTING CENTER DIAMETER NCD	NO. OF FLUTES	Ti-NAMITE-X (TX)
6,0	19,0	63,0	6,0	—	1,63	7	46620
6,0	19,0	63,0	8,0	0,5	1,63	7	46627
6,0	19,0	63,0	6,0	1,0	1,63	7	46628
8,0	20,0	63,0	8,0	—	1,78	7	46621
8,0	20,0	63,0	8,0	0,5	1,78	7	46629
8,0	20,0	63,0	8,0	1,0	1,78	7	46630
8,0	20,0	63,0	8,0	1,5	1,78	7	46631
10,0	22,0	75,0	10,0	—	2,03	7	46622
10,0	22,0	75,0	10,0	0,5	2,03	7	46632
10,0	22,0	75,0	10,0	1,0	2,03	7	46633
10,0	22,0	75,0	10,0	1,5	2,03	7	46634
10,0	22,0	75,0	10,0	2,0	2,03	7	46635
12,0	26,0	83,0	12,0	—	3,45	9	46623
12,0	26,0	83,0	12,0	1,0	3,45	9	46636
12,0	26,0	83,0	12,0	1,5	3,45	9	46637
12,0	26,0	83,0	12,0	2,0	3,45	9	46638
12,0	26,0	83,0	12,0	2,5	3,45	9	46639
12,0	26,0	83,0	12,0	3,0	3,45	9	46640
16,0	32,0	92,0	16,0	—	2,92	9	46624
16,0	32,0	92,0	16,0	1,0	2,92	9	46641
16,0	32,0	92,0	16,0	1,5	2,92	9	46642
16,0	32,0	92,0	16,0	2,0	2,92	9	46643
16,0	32,0	92,0	16,0	2,5	2,92	9	46644
16,0	32,0	92,0	16,0	3,0	2,92	9	46645
16,0	32,0	92,0	16,0	4,0	2,92	9	46646
20,0	38,0	104,0	20,0	—	4,57	11	46625
20,0	38,0	104,0	20,0	1,0	4,57	11	46647
20,0	38,0	104,0	20,0	1,5	4,57	11	46648
20,0	38,0	104,0	20,0	2,0	4,57	11	46649
20,0	38,0	104,0	20,0	2,5	4,57	11	46650
20,0	38,0	104,0	20,0	3,0	4,57	11	46651
20,0	38,0	104,0	20,0	4,0	4,57	11	46652
20,0	38,0	104,0	20,0	5,0	4,57	11	46653
25,0	38,0	104,0	25,0	—	7,49	11	46626
25,0	38,0	104,0	25,0	1,0	7,49	11	46654
25,0	38,0	104,0	25,0	1,5	7,49	11	46655
25,0	38,0	104,0	25,0	2,0	7,49	11	46656
25,0	38,0	104,0	25,0	2,5	7,49	11	46657
25,0	38,0	104,0	25,0	3,0	7,49	11	46658
25,0	38,0	104,0	25,0	4,0	7,49	11	46659
25,0	38,0	104,0	25,0	5,0	7,49	11	46660

Neck Option Available

TOLERANCES (mm)

DC = $+0,000/-0,050$ DCON = h_6 RE = $+0,000/-0,050$

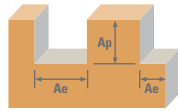
	STEELS
	STAINLESS STEELS
	CAST IRON
	HIGH TEMP ALLOYS



Series 66M, 66MCR	Metric	Hardness	Ae x DC	Ap x DC	Vc (m/min)	DC • mm								
						6	8	10	12	16	20	25		
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.05	≤ 1	194	RPM	10260	7695	6156	5130	3847	3078	2462
						(155-232)	Fz	0.029	0.047	0.059	0.072	0.095	0.101	0.105
							Feed (mm/min)	2068	2528	2528	3324	3280	3431	2844
		≤ 275 Bhn or ≤ 28 HRc	Finish 	≤ 0.02	≤ 2	232	RPM	12312	9234	7387	6156	4617	3693	2955
						(186-279)	Fz	0.023	0.038	0.047	0.058	0.076	0.081	0.084
							Feed (mm/min)	1985	2427	2427	3191	3149	3294	2730
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 375 Bhn or ≤ 40 HRc	Profile 	≤ 0.05	≤ 1	110	RPM	5816	4362	3490	2908	2181	1745	1396
						(88-132)	Fz	0.022	0.036	0.045	0.055	0.074	0.080	0.080
							Feed (mm/min)	879	1108	1107	1445	1457	1536	1229
		≤ 375 Bhn or ≤ 40 HRc	Finish 	≤ 0.02	≤ 2	132	RPM	6980	5235	4188	3490	2617	2094	1675
						(105-158)	Fz	0.017	0.029	0.036	0.044	0.059	0.064	0.064
							Feed (mm/min)	844	1063	1063	1387	1399	1474	1179
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 375 Bhn or ≤ 40 HRc	Profile 	≤ 0.05	≤ 1	88	RPM	4686	3514	2811	2343	1757	1406	1125
						(71-106)	Fz	0.014	0.026	0.032	0.038	0.051	0.056	0.055
							Feed (mm/min)	472	630	630	810	810	866	680
		≤ 375 Bhn or ≤ 40 HRc	Finish 	≤ 0.02	≤ 2	106	RPM	5623	4217	3374	2811	2108	1687	1349
						(85-127)	Fz	0.012	0.020	0.026	0.031	0.041	0.045	0.044
							Feed (mm/min)	453	605	605	777	777	831	653
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.05	≤ 1	171	RPM	9048	6786	5429	4524	3393	2714	2171
						(137-205)	Fz	0.022	0.036	0.045	0.055	0.074	0.080	0.080
							Feed (mm/min)	1368	1723	1723	2247	2267	2389	1911
		≤ 275 Bhn or ≤ 28 HRc	Finish 	≤ 0.02	≤ 2	137	RPM	7238	5429	4343	3619	2714	2171	1737
						(109-164)	Fz	0.017	0.029	0.036	0.044	0.059	0.064	0.064
							Feed (mm/min)	875	1103	1103	1438	1451	1529	1223
	STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.05	≤ 1	117	RPM	6220	4665	3732	3110	2333	1866	1493
						(94-141)	Fz	0.017	0.030	0.037	0.043	0.059	0.064	0.065
							Feed (mm/min)	731	975	975	1209	1236	1314	1067
		≤ 275 Bhn or ≤ 28 HRc	Finish 	≤ 0.02	≤ 2	141	RPM	7465	5598	4479	3732	2799	2239	1791
						(113-169)	Fz	0.013	0.024	0.030	0.035	0.047	0.051	0.052
							Feed (mm/min)	702	17	936	1161	1187	1261	1025
	STAINLESS STEELS (PH) 13-8 PH, 15-5 PH, 17-4 PH, Custom 450	≤ 325 Bhn or ≤ 35 HRc	Profile 	≤ 0.05	≤ 1	108	RPM	5736	4302	3441	2868	2151	1721	1377
						(87-130)	Fz	0.017	0.030	0.037	0.043	0.059	0.064	0.065
							Feed (mm/min)	674	899	899	1115	1140	1211	984
		≤ 325 Bhn or ≤ 35 HRc	Finish 	≤ 0.02	≤ 2	130	RPM	6883	5162	4130	3441	2581	2065	1652
						(104-156)	Fz	0.013	0.024	0.030	0.035	0.047	0.051	0.052
							Feed (mm/min)	647	863	863	1070	1094	1163	945

continued on next page

Multi-Carb



Series 66M, 66MCR	Metric	Hardness			Vc (m/min)	DC • mm								
			Ae x DC	Ap x DC		6	8	10	12	16	20	25		
K	CAST IRONS (LOW & MEDIUM ALLOY) Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc		≤ 0.05	≤ 1	215	RPM	11391	8543	6834	5695	4271	3417	2734
						(172-258)	Fz	0.029	0.047	0.059	0.072	0.095	0.101	0.105
						Feed (mm/min)	2296	2807	2807	3690	3641	3809	3158	
				≤ 0.02	≤ 2	258	RPM	13669	10252	8201	6834	5126	4101	3281
						(206-309)	Fz	0.023	0.038	0.047	0.058	0.076	0.081	0.084
						Feed (mm/min)	2204	2695	2694	3543	3496	3657	3031	
	CAST IRONS (HIGH ALLOY) Gray, Malleable, Ductile	≤ 260 Bhn or ≤ 26 HRc		≤ 0.05	≤ 1	165	RPM	8725	6544	5235	4362	3272	2617	2094
						(132-198)	Fz	0.022	0.036	0.045	0.055	0.074	0.080	0.080
						Feed (mm/min)	1319	1661	1661	2167	2186	2303	1843	
				≤ 0.02	≤ 2	198	RPM	10470	7852	6282	5235	3926	3141	2513
						(158-237)	Fz	0.017	0.029	0.036	0.044	0.059	0.064	0.064
						Feed (mm/min)	1266	1595	1595	2080	2099	2211	1769	
S	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	≤ 300 Bhn or ≤ 32 HRc		≤ 0.05	≤ 1	32	RPM	1696	1272	1018	848	636	509	407
						(26-38)	Fz	0.017	0.030	0.037	0.043	0.059	0.064	0.065
						Feed (mm/min)	199	266	213	330	337	358	291	
				≤ 0.02	≤ 2	38	RPM	2036	1527	1221	1018	763	611	489
						(31-46)	Fz	0.013	0.024	0.030	0.035	0.047	0.051	0.052
						Feed (mm/min)	192	255	255	317	324	344	279	
	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	≤ 400 Bhn or ≤ 43 HRc		≤ 0.05	≤ 1	26	RPM	1373	1030	824	687	515	412	330
						(21-31)	Fz	0.012	0.019	0.024	0.026	0.036	0.040	0.040
						Feed (mm/min)	115	138	138	163	166	181	145	
				≤ 0.02	≤ 2	31	RPM	1648	1236	989	824	618	494	396
						(25-37)	Fz	0.010	0.015	0.019	0.021	0.029	0.032	0.032
						Feed (mm/min)	111	133	133	157	159	174	139	
TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	≤ 350 Bhn or ≤ 38 HRc		≤ 0.05	≤ 1	119	RPM	6301	4726	3781	3151	2363	1890	1512	
					(95-143)	Fz	0.019	0.032	0.040	0.050	0.067	0.072	0.073	
					Feed (mm/min)	847	1059	1059	1429	1415	1497	1206		
			≤ 0.02	≤ 2	143	RPM	7561	5671	4537	3781	2836	2268	1815	
					(114-171)	Fz	0.015	0.026	0.032	0.040	0.053	0.058	0.058	
					Feed (mm/min)	813	1016	1016	1372	1359	1437	1158		
TITANIUM ALLOYS (DIFFICULT) Ti10V2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 420 Bhn or ≤ 45 HRc		≤ 0.05	≤ 1	43	RPM	2262	1696	1357	1131	848	679	543	
					(34-51)	Fz	0.019	0.032	0.040	0.050	0.067	0.072	0.073	
					Feed (mm/min)	304	380	380	513	508	537	433		
			≤ 0.02	≤ 2	51	RPM	2714	2036	1629	1357	1018	814	651	
					(41-61)	Fz	0.015	0.026	0.032	0.040	0.053	0.058	0.058	
					Feed (mm/min)	292	365	365	492	488	516	416		

Bhn (Brinell) HRc (Rockwell C)

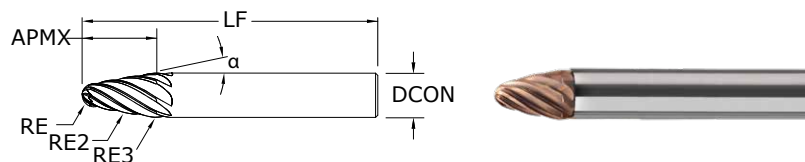
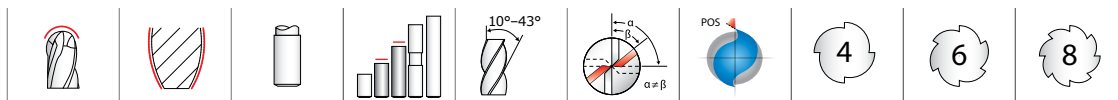
rpm = (Vc x 1000) / (DC x 3.14)

mm/min = Fz x number of flutes x rpm

reduce speed and feed for materials harder than listed

feed rates listed have chip thinning adjustments included where applicable

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)



67B
METRIC SERIES

TOLERANCES (mm)

DCON = h_6
RE = $+0,010/-0,010$

STEELS
STAINLESS STEELS
CAST IRON
HIGH TEMP ALLOYS

mm								EDP NO.
SHANK DIAMETER DCON	LENGTH OF CUT APMX	OVERALL LENGTH LF	CENTERLINE ANGLE α	TIP RADIUS RE	TAPERED RADIUS RE2	BLENDED RADIUS RE3	NO. OF FLUTES	TI-NAMITE-H (TH)
6,0	9,5	58,0	17.5°	1,0	250,0	3,0	4	45700
6,0	8,0	58,0	17.5°	1,5	250,0	3,0	4	45701
8,0	10,5	80,0	20.0°	1,5	250,0	4,0	4	45702
8,0	9,5	80,0	20.0°	2,0	250,0	4,0	4	45703
10,0	12,5	89,0	20.0°	2,0	250,0	5,0	6	45704
10,0	11,5	89,0	20.0°	2,5	250,0	5,0	6	45705
12,0	13,5	100,0	20.0°	3,0	250,0	6,0	8	45706
12,0	14,4	100,0	20.0°	2,5	250,0	6,0	8	45707
12,0	20,0	100,0	14.0°	2,0	60,0	6,0	6	45708
16,0	31,0	109,0	12.5°	2,0	1000,0	5,0	6	45709
16,0	27,5	109,0	12.5°	3,0	1000,0	5,0	8	45710
16,0	24,0	109,0	12.5°	4,0	1000,0	5,0	8	45711
16,0	21,0	109,0	15.0°	4,0	1000,0	5,0	8	45712
16,0	18,5	109,0	20.0°	4,0	1500,0	8,0	8	45713
16,0	28,5	109,0	10.0°	4,0	1000,0	5,0	8	45714
16,0	19,0	109,0	20.0°	3,0	750,0	5,0	8	45715
16,0	15,0	109,0	30.0°	2,0	750,0	3,0	6	45716
16,0	18,5	109,0	20.0°	3,0	60,0	5,0	8	45717

- Designed to significantly improve traditional ball end applications
- Highly efficient at finishing and semi-finishing profiling
- Main application areas include profiling and pocket milling
- Especially suited to machining deep pockets and hard-to-reach areas without using long-reach tools
- Their versatility also allows for machining profiles and blends with one tool
- Recommended for materials ≤ 45 HRc (≤ 420 Bhn)

Multi-Carb

			DCON	6		8		10		12		16	
			Ae max	0,20	0,45	0,25	0,55	0,30	0,60	0,35	0,65	0,40	0,70
			Diameter	3,0	6,0	4,0	8,0	5,0	10,0	6,0	12,0	8,0	16,0
													
Metric	Hardness (HRC)	Vc (m/min)	Cut Zone	RE	RE2	RE	RE2	RE	RE2	RE	RE2	RE	RE2
P Alloy Steels	≤28 (155-232)	194	RPM	20583	10292	15438	7719	12350	6175	10292	5146	7719	3859
			Fz	0,013	0,030	0,017	0,040	0,021	0,050	0,025	0,060	0,033	0,080
			Feed (mm/min)	1029	1235	1029	1235	1544	1853	1544	1853	1544	1853
	≤40 (88-132)	110	RPM	11671	5836	8753	4377	7003	3501	5836	2918	4377	2188
			Fz	0,008	0,020	0,013	0,030	0,017	0,040	0,021	0,050	0,029	0,070
			Feed (mm/min)	389	467	438	525	700	840	729	875	766	919
P Tool Steels	≤35 (69-118)	93	RPM	9867	4934	7400	3700	5920	2960	4934	2467	3700	1850
			Fz	0,013	0,030	0,017	0,040	0,021	0,050	0,025	0,060	0,033	0,080
			Feed (mm/min)	493	592	493	592	740	888	740	888	740	888
	≤45 (51-77)	64	RPM	6790	3395	5093	2546	4074	2037	3395	1698	2546	1273
			Fz	0,008	0,020	0,013	0,030	0,017	0,040	0,021	0,050	0,025	0,060
			Feed (mm/min)	226	272	255	306	407	489	424	509	382	458
M Stainless Steels	≤28 (94-141)	117	RPM	12414	6207	9310	4655	7448	3724	6207	3103	4655	2328
			Fz	0,013	0,030	0,017	0,040	0,021	0,050	0,025	0,060	0,029	0,070
			Feed (mm/min)	621	745	621	745	931	1117	931	1117	815	978
	≤35 (87-130)	108	RPM	11459	5729	8594	4297	6875	3438	5729	2865	4297	2149
			Fz	0,008	0,020	0,013	0,030	0,017	0,040	0,021	0,050	0,025	0,060
			Feed (mm/min)	382	458	430	516	688	825	716	859	645	773
S High Temperature Alloys	≤32 (26-38)	32	RPM	3395	1698	2546	1273	2037	1019	1698	849	1273	637
			Fz	0,008	0,020	0,013	0,030	0,017	0,040	0,021	0,050	0,025	0,060
			Feed (mm/min)	113	136	127	153	204	244	212	255	191	229
	≤43 (21-31)	26	RPM	2759	1379	2069	1034	1655	828	1379	690	1034	517
			Fz	0,004	0,010	0,008	0,020	0,013	0,030	0,017	0,040	0,021	0,050
			Feed (mm/min)	46	55	69	83	124	149	138	166	129	155
S Titanium Alloys	≤35 (85-133)	109	RPM	11565	5782	8674	4337	6939	3469	5782	2891	4337	2168
			Fz	0,013	0,030	0,017	0,040	0,021	0,050	0,025	0,060	0,029	0,070
			Feed (mm/min)	578	694	578	694	867	1041	867	1041	759	911
	≤45 (44-61)	53	RPM	5623	2812	4217	2109	3374	1687	2812	1406	2109	1054
			Fz	0,008	0,020	0,013	0,030	0,017	0,040	0,021	0,050	0,025	0,060
			Feed (mm/min)	187	225	211	253	337	405	351	422	316	380

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

$Feed = Fz \times \text{No. of teeth} \times rpm$

Adjust speed and feed according to material hardness

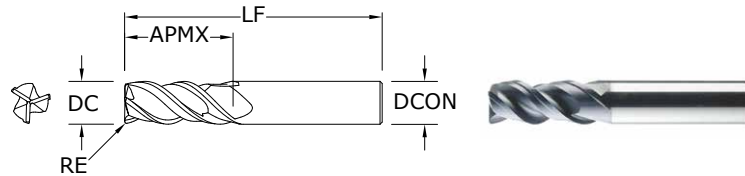
Consider rpm according to cutting area of tool being utilized

Avoid using tip of the tool where possible due to reduced chip space

Be aware of max cut Ae, especially on the lower portion of the tool

Medical applications:

- Titanium can be cut dry while keeping cut size to a minimum and providing good chip evacuation (air blast)
- For cobalt chrome applications, a surface speed of 45M/min is a guide (It can also be cut dry as per cobalt) refer to the **KYOCERA SGS APEX** for complete technical information (www.kyocera-sgstool.com/apex)



33CR

FRACTIONAL SERIES

TOLERANCES (inch)

1/8–1/4 DIAMETER

DC = +0.0000/–0.0012

DCON = h_6

RE = +0.0000/–0.0020

>1/4–3/8 DIAMETER

DC = +0.0000/–0.0016

DCON = h_6

RE = +0.0000/–0.0020

>3/8–1 DIAMETER

DC = +0.0000/–0.0020

DCON = h_6

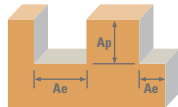
RE = +0.0000/–0.0020

STEELS
STAINLESS STEELS
CAST IRON
HIGH TEMP ALLOYS

	inch				EDP NO.
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	Ti-NAMITE-A (AlTiN)
1/8	3/8	2-1/2	1/4	.015	33345
3/16	9/16	2-1/2	1/4	.015	33346
1/4	3/4	2-1/2	1/4	.020	33347
5/16	13/16	2-1/2	5/16	.020	33348
3/8	1	2-1/2	3/8	.020	33349
7/16	1-1/8	2-3/4	7/16	.020	33350
1/2	1-1/4	3-1/4	1/2	.030	33351
5/8	1-1/2	3-1/2	5/8	.040	33352
3/4	1-3/4	4	3/4	.040	33353
1	2-1/4	5	1	.040	33354

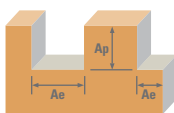
- Specially engineered step core design provides stability for aggressive ramping and rigidity when flutes are completely engaged
- Open design at axial end accommodates material flow and load reduction during machining operations
- Enhanced corner geometry with tight tolerance corner radii
- Recommended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

Series 33



Series 33CR Fractional	Hardness			Vc (sfm)	DC • in								
		Ae x DC	Ap x DC		1/8	1/4	3/8	1/2	5/8	3/4	1		
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	 Profile	≤ 0.5	≤ 1.5	550	RPM	16808	8404	5603	4202	3362	2801	2101
					(440-660)	Fz	0.0005	0.0012	0.0023	0.0031	0.0039	0.0040	0.0043
						Feed (ipm)	25.2	30.3	38.7	39.1	39.3	33.6	27.1
		 Slot	1	≤ 1	440	RPM	13446	6723	4482	3362	2689	2241	1681
					(352-528)	Fz	0.0005	0.0012	0.0023	0.0031	0.0039	0.0040	0.0043
						Feed (ipm)	20.2	24.2	30.9	31.3	31.5	26.9	21.7
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	 Profile	≤ 0.5	≤ 1.5	315	RPM	9626	4813	3209	2407	1925	1604	1203
					(252-378)	Fz	0.0004	0.0009	0.0017	0.0023	0.0029	0.0030	0.0032
						Feed (ipm)	11.6	13.0	16.4	16.6	16.7	14.4	11.6
		 Slot	1	≤ 1	250	RPM	7640	3820	2547	1910	1528	1273	955
					(200-300)	Fz	0.0004	0.0009	0.0017	0.0023	0.0029	0.0030	0.0032
						Feed (ipm)	9.2	10.3	13.0	13.2	13.3	11.5	9.2
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	 Profile	≤ 0.5	≤ 1.5	185	RPM	5654	2827	1885	1413	1131	942	707
					(148-222)	Fz	0.0003	0.0007	0.0014	0.0018	0.0023	0.0024	0.0025
						Feed (ipm)	5.1	5.9	7.9	7.6	7.8	6.8	5.3
		 Slot	1	≤ 1	145	RPM	4431	2216	1477	1108	886	739	554
					(116-174)	Fz	0.0003	0.0007	0.0014	0.0018	0.0023	0.0024	0.0025
						Feed (ipm)	4.0	4.7	6.2	6.0	6.1	5.3	4.2
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	 Profile	≤ 0.5	≤ 1.5	490	RPM	14974	7487	4991	3744	2995	2496	1872
					(392-588)	Fz	0.0004	0.0010	0.0019	0.0025	0.0031	0.0032	0.0035
						Feed (ipm)	17.1	22.5	28.5	28.1	27.9	24.0	19.7
		 Slot	1	≤ 1	390	RPM	11918	5959	3973	2980	2384	1986	1490
					(312-468)	Fz	0.0004	0.0010	0.0019	0.0025	0.0031	0.0032	0.0035
						Feed (ipm)	13.6	17.9	22.6	22.3	22.2	19.1	15.6
	STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L	 Profile	≤ 0.5	≤ 1.5	340	RPM	10390	5195	3463	2598	2078	1732	1299
					(272-408)	Fz	0.0003	0.0008	0.0015	0.0020	0.0025	0.0026	0.0028
						Feed (ipm)	9.4	12.5	15.6	15.6	15.6	13.5	10.9
		 Slot	1	≤ 1	270	RPM	8251	4126	2750	2063	1650	1375	1031
					(216-324)	Fz	0.0003	0.0008	0.0015	0.0020	0.0025	0.0026	0.0028
						Feed (ipm)	7.4	9.9	12.4	12.4	12.4	10.7	8.7
	STAINLESS STEELS (PH) 13-8 PH, 15-5 PH, 17-4 PH, Custom 450	 Profile	≤ 0.5	≤ 1.5	310	RPM	9474	4737	3158	2368	1895	1579	1184
					(248-372)	Fz	0.0003	0.0008	0.0015	0.0020	0.0025	0.0026	0.0028
						Feed (ipm)	8.5	11.4	14.2	14.2	14.2	12.3	9.9
		 Slot	1	≤ 1	250	RPM	7640	3820	2547	1910	1528	1273	955
					(200-300)	Fz	0.0003	0.0008	0.0015	0.0020	0.0025	0.0026	0.0028
						Feed (ipm)	6.9	9.2	11.5	11.5	11.5	9.9	8.0

continued on next page



Series 33CR Fractional	Hardness		Ae x DC	Ap x DC	Vc (sfm)	DC • in							
						1/8	1/4	3/8	1/2	5/8	3/4	1	
K	CAST IRONS (LOW & MEDIUM ALLOY) Gray, Malleable, Ductile	Profile 	≤ 0.5	≤ 1.5	445	RPM	13599	6800	4533	3400	2720	2267	1700
					(356-534)	Fz	0.0004	0.0011	0.0021	0.0028	0.0035	0.0036	0.0039
						Feed (ipm)	14.3	22.4	28.6	28.6	24.5	19.9	
		Slot 	1	≤ 1	355	RPM	10849	5424	3616	2712	2170	1808	1356
					(284-426)	Fz	0.0004	0.0011	0.0021	0.0028	0.0035	0.0036	0.0039
						Feed (ipm)	11.4	17.9	22.8	22.8	19.5	15.9	
	CAST IRONS (HIGH ALLOY) Gray, Malleable, Ductile	Profile 	≤ 0.5	≤ 1.5	340	RPM	10390	5195	3463	2598	2078	1732	1299
					(272-408)	Fz	0.0003	0.0008	0.0016	0.0021	0.0026	0.0027	0.0029
						Feed (ipm)	9.4	12.5	16.6	16.4	14.0	11.3	
		Slot 	1	≤ 1	270	RPM	8251	4126	2750	2063	1650	1375	1031
					(216-324)	Fz	0.0003	0.0008	0.0016	0.0021	0.0026	0.0027	0.0029
						Feed (ipm)	7.4	9.9	13.2	13.0	12.9	11.1	9.0
S	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	Profile 	≤ 0.5	≤ 1.5	80	RPM	2445	1222	815	611	489	407	306
					(64-96)	Fz	0.0003	0.0007	0.0013	0.0017	0.0021	0.0022	0.0024
						Feed (ipm)	1.9	2.6	3.2	3.1	3.1	2.7	2.2
		Slot 	1	≤ 1	65	RPM	1986	993	662	497	397	331	248
					(52-78)	Fz	0.0003	0.0007	0.0013	0.0017	0.0021	0.0022	0.0024
						Feed (ipm)	1.5	2.1	2.6	2.5	2.5	2.2	1.8
	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	Profile 	≤ 0.5	≤ 1.5	62	RPM	1895	947	632	474	379	316	237
					(50-74)	Fz	0.0002	0.0005	0.0009	0.0012	0.0015	0.0016	0.0017
						Feed (ipm)	1.1	1.4	1.7	1.7	1.7	1.5	1.2
		Slot 	1	≤ 1	49	RPM	1497	749	499	374	299	250	187
					(39-59)	Fz	0.0002	0.0005	0.0009	0.0012	0.0015	0.0016	0.0017
						Feed (ipm)	0.9	1.1	1.3	1.3	1.3	1.2	1.0
TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	Profile 	≤ 0.5	≤ 1.5	215	RPM	6570	3285	2190	1643	1314	1095	821	
				(172-258)	Fz	0.0003	0.0008	0.0015	0.0020	0.0025	0.0026	0.0028	
					Feed (ipm)	5.9	7.9	9.9	9.9	9.9	8.5	6.9	
	Slot 	1	≤ 1	170	RPM	5195	2598	1732	1299	1039	866	649	
				(136-204)	Fz	0.0003	0.0008	0.0015	0.0020	0.0025	0.0026	0.0028	
					Feed (ipm)	4.7	6.2	7.8	7.8	7.8	6.8	5.5	
TITANIUM ALLOYS (DIFFICULT) Ti10V2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	Profile 	≤ 0.5	≤ 1.5	75	RPM	2292	1146	764	573	458	382	287	
				(60-90)	Fz	0.0003	0.0008	0.0015	0.0020	0.0025	0.0026	0.0028	
					Feed (ipm)	2.1	2.8	3.4	3.4	3.4	3.0	2.4	
	Slot 	1	≤ 1	60	RPM	1834	917	611	458	367	306	229	
				(48-72)	Fz	0.0003	0.0008	0.0015	0.0020	0.0025	0.0026	0.0028	
					Feed (ipm)	1.7	2.2	2.8	2.8	2.8	2.4	1.9	

Bhn (Brinell) HRC (Rockwell C)

rpm = Vc x 3.82 / DC

ipm = Fz x 3 x rpm

reduce speed and feed for materials harder than listed

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

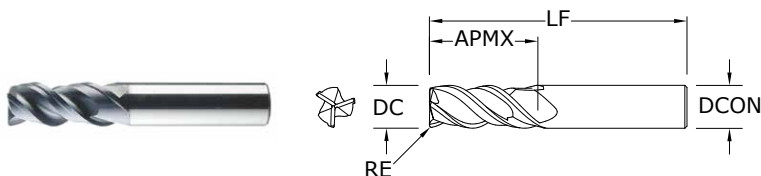
feed rates listed have chip thinning adjustments included where applicable

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)



33MCR

METRIC SERIES



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

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

TOLERANCES (mm)

3-6 DIAMETER

DC = $+0,000/-0,030$ DCON = h_6 RE = $+0,000/-0,050$

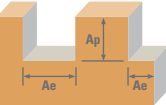
>6-10 DIAMETER

DC = $+0,000/-0,040$ DCON = h_6 RE = $+0,000/-0,050$

>10-20 DIAMETER

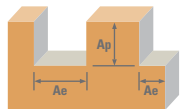
DC = $+0,000/-0,050$ DCON = h_6 RE = $+0,000/-0,050$

	STEELS
	STAINLESS STEELS
	CAST IRON
	HIGH TEMP ALLOYS

Series 33MCR Metric				Vc (m/min)	DC • mm									
					3	6	8	10	12	16	20			
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 275 Bhn or ≤ 28 HRc		≤ 0.5	≤ 1.5	168	RPM	17773	8886	6665	5332	4443	3332	2666
						(134-201)	Fz	0.012	0.029	0.049	0.061	0.074	0.100	0.107
							Feed (mm/min)	640	768	981	981	992	998	853
			1	≤ 1	134	RPM	14218	7109	5332	4265	3555	2666	2133	
					(107-161)	Fz	0.012	0.029	0.049	0.061	0.074	0.100	0.107	
						Feed (mm/min)	512	614	785	785	793	798	682	
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 375 Bhn or ≤ 40 HRc		≤ 0.5	≤ 1.5	96	RPM	10179	5089	3817	3054	2545	1909	1527
						(77-115)	Fz	0.010	0.022	0.036	0.045	0.055	0.074	0.080
							Feed (mm/min)	293	330	415	415	421	425	366
			1	≤ 1	76	RPM	8078	4039	3029	2424	2020	1515	1212	
					(61-91)	Fz	0.010	0.022	0.036	0.045	0.055	0.074	0.080	
						Feed (mm/min)	233	262	330	330	334	337	291	
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 375 Bhn or ≤ 40 HRc		≤ 0.5	≤ 1.5	56	RPM	5978	2989	2242	1793	1495	1121	897
						(45-68)	Fz	0.007	0.017	0.030	0.037	0.043	0.059	0.064
							Feed (mm/min)	129	151	201	201	194	198	172
			1	≤ 1	44	RPM	4686	2343	1757	1406	1171	879	703	
					(35-53)	Fz	0.007	0.017	0.030	0.037	0.043	0.059	0.064	
						Feed (mm/min)	101	118	157	157	152	155	135	
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 275 Bhn or ≤ 28 HRc		≤ 0.5	≤ 1.5	149	RPM	15834	7917	5938	4750	3958	2969	2375
						(119-179)	Fz	0.009	0.024	0.041	0.051	0.060	0.079	0.085
							Feed (mm/min)	433	570	722	722	712	707	608
			1	≤ 1	119	RPM	12602	6301	4726	3781	3151	2363	1890	
					(95-143)	Fz	0.009	0.024	0.041	0.051	0.060	0.079	0.085	
						Feed (mm/min)	345	454	575	575	567	563	484	
	STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L	≤ 275 Bhn or ≤ 28 HRc		≤ 0.5	≤ 1.5	104	RPM	10987	5493	4120	3296	2747	2060	1648
						(83-124)	Fz	0.007	0.019	0.032	0.040	0.048	0.064	0.069
							Feed (mm/min)	237	316	396	396	395	396	343
			1	≤ 1	82	RPM	8725	4362	3272	2617	2181	1636	1309	
					(66-99)	Fz	0.007	0.019	0.032	0.040	0.048	0.064	0.069	
						Feed (mm/min)	188	251	314	314	314	314	272	
	STAINLESS STEELS (PH) 13-8 PH, 15-5 PH, 17-4 PH, Custom 450	≤ 325 Bhn or ≤ 35 HRc		≤ 0.5	≤ 1.5	94	RPM	10017	5009	3756	3005	2504	1878	1503
						(76-113)	Fz	0.007	0.019	0.032	0.040	0.048	0.064	0.069
							Feed (mm/min)	216	288	361	361	361	361	313
			1	≤ 1	76	RPM	8078	4039	3029	2424	2020	1515	1212	
					(61-91)	Fz	0.007	0.019	0.032	0.040	0.048	0.064	0.069	
						Feed (mm/min)	174	233	291	291	291	291	252	

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Series 33



Series 33MCR Metric	Hardness			Vc (m/min)	DC • mm									
		Ae x DC	Ap x DC		3	6	8	10	12	16	20			
K	CAST IRONS (LOW & MEDIUM ALLOY) Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	Profile 	≤ 0.5	≤ 1.5	136	RPM	14380	7190	5392	4314	3595	2696	2157
						(109-163)	Fz	0.008	0.026	0.045	0.056	0.067	0.090	0.096
						Feed (mm/min)	362	569	725	725	725	725	621	
		≤ 260 Bhn or ≤ 26 HRc	Slot 	1	≤ 1	108	RPM	11471	5736	4302	3441	2868	2151	1721
						(87-130)	Fz	0.008	0.026	0.045	0.056	0.067	0.090	0.096
						Feed (mm/min)	289	454	578	578	578	578	496	
	CAST IRONS (HIGH ALLOY) Gray, Malleable, Ductile	≤ 260 Bhn or ≤ 26 HRc	Profile 	≤ 0.5	≤ 1.5	104	RPM	10987	5493	4120	3296	2747	2060	1648
						(83-124)	Fz	0.007	0.019	0.034	0.043	0.050	0.067	0.072
						Feed (mm/min)	237	316	422	422	415	411	356	
		≤ 400 Bhn or ≤ 43 HRc	Slot 	1	≤ 1	82	RPM	8725	4362	3272	2617	2181	1636	1309
						(66-99)	Fz	0.007	0.019	0.034	0.043	0.050	0.067	0.072
						Feed (mm/min)	188	251	335	335	330	327	283	
S	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	≤ 300 Bhn or ≤ 32 HRc	Profile 	≤ 0.5	≤ 1.5	24	RPM	2585	1293	969	776	646	485	388
						(20-29)	Fz	0.006	0.017	0.028	0.035	0.041	0.054	0.059
						Feed (mm/min)	48	65	81	65	79	78	68	
		≤ 400 Bhn or ≤ 43 HRc	Slot 	1	≤ 1	20	RPM	2100	1050	788	630	525	394	315
						(16-24)	Fz	0.006	0.017	0.028	0.035	0.041	0.054	0.059
						Feed (mm/min)	39	53	66	66	64	64	55	
	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	≤ 400 Bhn or ≤ 43 HRc	Profile 	≤ 0.5	≤ 1.5	19	RPM	2003	1002	751	601	501	376	301
						(15-23)	Fz	0.005	0.012	0.019	0.024	0.029	0.038	0.043
						Feed (mm/min)	29	36	43	43	43	43	38	
		≤ 350 Bhn or ≤ 38 HRc	Slot 	1	≤ 1	15	RPM	1583	792	594	475	396	297	238
						(12-18)	Fz	0.005	0.012	0.019	0.024	0.029	0.038	0.043
						Feed (mm/min)	23	28	34	34	34	34	30	
	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	≤ 350 Bhn or ≤ 38 HRc	Profile 	≤ 0.5	≤ 1.5	66	RPM	6947	3474	2605	2084	1737	1303	1042
						(52-79)	Fz	0.007	0.019	0.032	0.040	0.048	0.064	0.069
						Feed (mm/min)	150	200	250	250	250	250	217	
		≤ 420 Bhn or ≤ 45 HRc	Slot 	1	≤ 1	52	RPM	5493	2747	2060	1648	1373	1030	824
						(41-62)	Fz	0.007	0.019	0.032	0.040	0.048	0.064	0.069
						Feed (mm/min)	119	158	198	198	198	198	171	
	TITANIUM ALLOYS (DIFFICULT) Ti10V2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 420 Bhn or ≤ 45 HRc	Profile 	≤ 0.5	≤ 1.5	23	RPM	2424	1212	909	727	606	454	364
						(18-27)	Fz	0.007	0.019	0.032	0.040	0.048	0.064	0.069
						Feed (mm/min)	52	70	87	87	87	87	76	
		≤ 420 Bhn or ≤ 45 HRc	Slot 	1	≤ 1	18	RPM	1939	969	727	582	485	364	291
						(15-22)	Fz	0.007	0.019	0.032	0.040	0.048	0.064	0.069
						Feed (mm/min)	42	56	70	70	70	70	60	

Bhn (Brinell) HRc (Rockwell C)

rpm = (Vc x 1000) / (DC x 3.14)

mm/min = Fz x 3 x rpm

reduce speed and feed for materials harder than listed

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

feed rates listed have chip thinning adjustments included where applicable

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)



7
FRACTIONAL SERIES

TOLERANCES (inch)

DC = +0.0000/-0.0020

DCON = h_6

STEELS

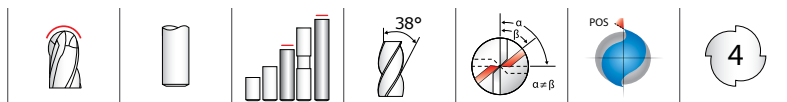
STAINLESS STEELS

CAST IRON

HIGHTEMP ALLOYS

inch				EDP NO.
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	Ti-NAMITE-X (TX)
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

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



7B

FRACTIONAL SERIES

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



inch				EDP NO.
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	Ti-NAMITE-X (TX)
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

RE = 1/2 Cutting Diameter (DC)

TOLERANCES (inch)

DC = $+0.0000/-0.0020$

DCON = h_6

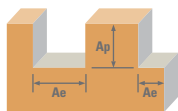
RE = $+0.0000/-0.0010$

STEELS

STAINLESS STEELS

CAST IRON

HIGH TEMP ALLOYS



Series 7, 7B	Fractional	Hardness	Ae x DC	Ap x DC	Vc (sfm)	DC • in								
						1/8	1/4	3/8	1/2	5/8	3/4	1		
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 275 Bhn or ≤ 28 HRc	Finish 	≤ 0.02	≤ 2	480	RPM	14669	7334	4890	3667	2934	2445	1834
						(384-576)	Fz	0.0004	0.0010	0.0019	0.0025	0.0032	0.0033	0.0035
							Feed (ipm)	23.5	29.3	37.2	36.7	37.6	32.3	25.7
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 375 Bhn or ≤ 40 HRc	Finish 	≤ 0.02	≤ 2	275	RPM	8404	4202	2801	2101	1681	1401	1051
						(220-330)	Fz	0.0003	0.0007	0.0014	0.0018	0.0023	0.0024	0.0026
							Feed (ipm)	10.1	11.8	15.7	15.1	15.5	13.4	10.9
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 375 Bhn or ≤ 40 HRc	Finish 	≤ 0.02	≤ 2	230	RPM	7029	3514	2343	1757	1406	1171	879
						(184-276)	Fz	0.0002	0.0006	0.0012	0.0016	0.0020	0.0021	0.0022
							Feed (ipm)	5.6	8.4	11.2	11.2	11.2	9.8	7.7
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 275 Bhn or ≤ 28 HRc	Finish 	≤ 0.02	≤ 2	420	RPM	12835	6418	4278	3209	2567	2139	1604
						(336-504)	Fz	0.0004	0.0010	0.0019	0.0025	0.0032	0.0033	0.0035
							Feed (ipm)	20.5	25.7	32.5	32.1	32.9	28.2	22.5
	STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L	≤ 275 Bhn or ≤ 28 HRc	Finish 	≤ 0.02	≤ 2	290	RPM	8862	4431	2954	2216	1772	1477	1108
						(232-348)	Fz	0.0003	0.0007	0.0014	0.0018	0.0023	0.0024	0.0026
							Feed (ipm)	10.6	12.4	16.5	16.0	16.3	14.2	11.5
	STAINLESS STEELS (PH) 13-8 PH, 15-5 PH, 17-4 PH, Custom 450	≤ 325 Bhn or ≤ 35 HRc	Finish 	≤ 0.02	≤ 2	265	RPM	8098	4049	2699	2025	1620	1350	1012
						(212-318)	Fz	0.0003	0.0007	0.0014	0.0018	0.0023	0.0024	0.0026
							Feed (ipm)	9.7	11.3	15.1	14.6	14.9	13.0	10.5
K	CAST IRONS (LOW & MEDIUM ALLOY) Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	Finish 	≤ 0.02	≤ 2	605	RPM	18489	9244	6163	4622	3698	3081	2311
						(484-726)	Fz	0.0006	0.0015	0.0028	0.0037	0.0046	0.0047	0.0051
							Feed (ipm)	44.4	55.5	69.0	68.4	68.0	57.9	47.1
	CAST IRONS (HIGH ALLOY) Gray, Malleable, Ductile	≤ 260 Bhn or ≤ 26 HRc	Finish 	≤ 0.02	≤ 2	465	RPM	14210	7105	4737	3553	2842	2368	1776
						(372-558)	Fz	0.0004	0.0011	0.0021	0.0028	0.0034	0.0036	0.0039
							Feed (ipm)	22.7	31.3	39.8	39.8	38.7	34.1	27.7
S	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	≤ 300 Bhn or ≤ 32 HRc	Finish 	≤ 0.02	≤ 2	80	RPM	2445	1222	815	611	489	407	306
						(64-96)	Fz	0.0003	0.0007	0.0014	0.0018	0.0023	0.0024	0.0026
							Feed (ipm)	2.9	3.4	4.6	4.4	4.5	3.9	3.2
	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	≤ 400 Bhn or ≤ 43 HRc	Finish 	≤ 0.02	≤ 2	65	RPM	1986	993	662	497	397	331	248
						(52-78)	Fz	0.0002	0.0006	0.0010	0.0014	0.0017	0.0018	0.0019
							Feed (ipm)	1.6	2.4	2.6	2.8	2.7	2.4	1.9
	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	≤ 350 Bhn or ≤ 38 HRc	Finish 	≤ 0.02	≤ 2	300	RPM	9168	4584	3056	2292	1834	1528	1146
						(240-360)	Fz	0.0004	0.0011	0.0021	0.0028	0.0034	0.0036	0.0039
							Feed (ipm)	14.7	20.2	25.7	25.7	24.9	22.0	17.9
TITANIUM ALLOYS (DIFFICULT) Ti10V2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 420 Bhn or ≤ 45 HRc	Finish 	≤ 0.02	≤ 2	105	RPM	3209	1604	1070	802	642	535	401	
					(84-126)	Fz	0.0004	0.0011	0.0021	0.0028	0.0034	0.0036	0.0039	
						Feed (ipm)	5.1	7.1	9.0	9.0	8.7	7.7	6.3	

Bhn (Brinell) HRc (Rockwell C)

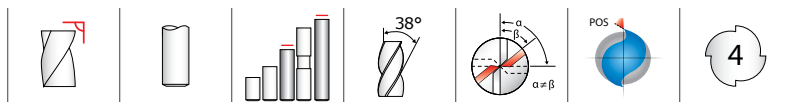
rpm = Vc x 3.82 / DC

ipm = Fz x 4 x rpm

reduce speed and feed for materials harder than listed

feed rates listed have chip thinning adjustments included where applicable

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)



7M

METRIC SERIES

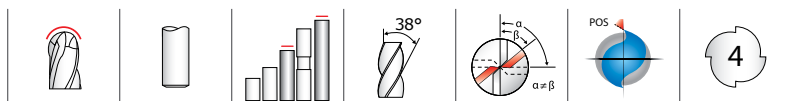
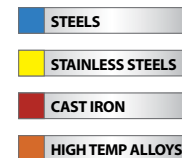
- Variable pitch allows for improved chatter suppression along with improved surface finish and enhanced tool life
- Raised land and increased core diameter designed to enhance tool life and decrease tool deflection
- Recommended for materials ≤ 45 HRc (≤ 420 Bhn)



mm				EDP NO.
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	Ti-NAMITE-X (TX)
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

TOLERANCES (mm)

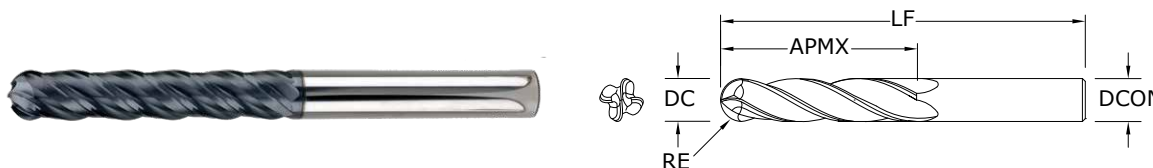
DC = $+0,000/+0,050$
DCON = h_6



7MB

METRIC SERIES

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

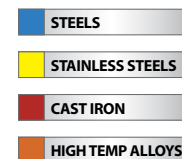


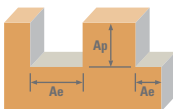
mm				EDP NO.
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	Ti-NAMITE-X (TX)
3,0	25,0	75,0	3,0	70527
4,0	25,0	75,0	4,0	70529
5,0	25,0	75,0	5,0	70531
6,0	25,0	75,0	6,0	70533
8,0	25,0	75,0	8,0	70535
10,0	38,0	100,0	10,0	70537
12,0	50,0	100,0	12,0	70539
12,0	75,0	150,0	12,0	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

RE = 1/2 Cutting Diameter (DC)

TOLERANCES (mm)

DC = $+0,000/+0,050$
DCON = h_6
RE = $+0,000/-0,025$





Series 7M, 7MB Metric	Hardness				Vc (m/min)	DC • mm									
			Ae x DC	Ap x DC		3	6	8	10	12	16	20	25		
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 275 Bhn or ≤ 28 HRc	Finish 	≤ 0.02	≤ 2	146	RPM	15511	7755	5816	4653	3878	2908	2327	1861
						(117-176)	Fz	0.0166	0.043	0.075	0.093	0.110	0.125	0.147	0.160
							Feed (mm/min)	1030	1334	1745	1731	1706	1454	1368	1191
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 375 Bhn or ≤ 40 HRc	Finish 	≤ 0.02	≤ 2	84	RPM	8886	4443	3332	2666	2222	1666	1333	1066
						(67-101)	Fz	0.0122	0.034	0.051	0.069	0.082	0.091	0.109	0.120
							Feed (mm/min)	434	604	680	736	729	606	581	512
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 375 Bhn or ≤ 40 HRc	Finish 	≤ 0.02	≤ 2	70	RPM	7432	3716	2787	2230	1858	1394	1115	892
						(56-84)	Fz	0.0070	0.019	0.040	0.043	0.048	0.057	0.064	0.070
							Feed (mm/min)	208	282	446	384	357	318	285	250
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 275 Bhn or ≤ 28 HRc	Finish 	≤ 0.02	≤ 2	128	RPM	13572	6786	5089	4072	3393	2545	2036	1629
						(102-154)	Fz	0.0086	0.024	0.040	0.048	0.058	0.065	0.077	0.087
							Feed (mm/min)	467	651	814	782	787	662	627	567
	STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L	≤ 275 Bhn or ≤ 28 HRc	Finish 	≤ 0.02	≤ 2	88	RPM	9371	4686	3514	2811	2343	1757	1406	1125
						(71-106)	Fz	0.0082	0.022	0.037	0.045	0.048	0.060	0.072	0.078
							Feed (mm/min)	307	412	520	506	450	422	405	351
	STAINLESS STEELS (PH) 13-8 PH, 15-5 PH, 17-4 PH, Custom 450	≤ 325 Bhn or ≤ 35 HRc	Finish 	≤ 0.02	≤ 2	81	RPM	8563	4282	3211	2569	2141	1606	1284	1028
						(65-97)	Fz	0.0070	0.019	0.029	0.040	0.048	0.055	0.064	0.070
							Feed (mm/min)	240	325	372	411	411	353	329	288
K	CAST IRONS (LOW & MEDIUM ALLOY) Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	Finish 	≤ 0.02	≤ 2	184	RPM	19550	9775	7331	5865	4887	3666	2932	2346
						(148-221)	Fz	0.0132	0.036	0.052	0.075	0.089	0.099	0.117	0.130
							Feed (mm/min)	1032	1408	1525	1759	1740	1452	1372	1220
	CAST IRONS (HIGH ALLOY) Gray, Malleable, Ductile	≤ 260 Bhn or ≤ 26 HRc	Finish 	≤ 0.02	≤ 2	142	RPM	15026	7513	5635	4508	3756	2817	2254	1803
						(113-170)	Fz	0.0132	0.036	0.052	0.075	0.089	0.099	0.117	0.130
							Feed (mm/min)	793	1082	1172	1352	1337	1116	1055	938
S	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	≤ 300 Bhn or ≤ 32 HRc	Finish 	≤ 0.02	≤ 2	24	RPM	2585	1293	969	776	646	485	388	310
						(20-29)	Fz	0.0072	0.019	0.029	0.037	0.046	0.053	0.061	0.085
							Feed (mm/min)	74	98	112	90	119	103	95	105
	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	≤ 400 Bhn or ≤ 43 HRc	Finish 	≤ 0.02	≤ 2	20	RPM	2100	1050	788	630	525	394	315	252
						(16-24)	Fz	0.0075	0.016	0.021	0.030	0.038	0.044	0.051	0.070
							Feed (mm/min)	63	67	66	76	80	69	64	71
	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	≤ 350 Bhn or ≤ 38 HRc	Finish 	≤ 0.02	≤ 2	91	RPM	9694	4847	3635	2908	2424	1818	1454	1163
						(73-110)	Fz	0.0091	0.024	0.040	0.050	0.060	0.070	0.080	0.088
							Feed (mm/min)	353	465	51	59	582	509	465	409
TITANIUM ALLOYS (DIFFICULT) Ti10V2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 420 Bhn or ≤ 45 HRc	Finish 	≤ 0.02	≤ 2	32	RPM	3393	1696	1272	1018	848	636	509	407	
					(26-38)	Fz	0.0082	0.019	0.029	0.037	0.046	0.053	0.061	0.085	
						Feed (mm/min)	111	129	148	151	156	135	124	138	

Bhn (Brinell) HRc (Rockwell C)

rpm = (Vc x 1000) / (DC x 3.14)

mm/min = Fz x 4 x rpm

reduce speed and feed for materials harder than listed

feed rates listed have chip thinning adjustments included where applicable

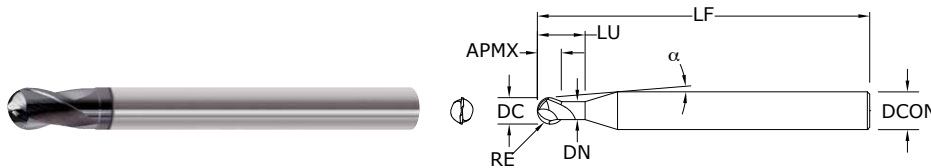
refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)



56B

FRACTIONAL SERIES

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



CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	inch				EDP NO.
			SHANK DIAMETER DCON	CENTER LINE ANGLE α	REACH LU	NECK DIAMETER DN	
1/32	1/32	3	1/4	8°20'	1/16	.025	93272
1/16	1/16	3	1/4	7°40'	1/8	.055	93273
3/32	3/32	3	1/4	6°50'	3/16	.085	93274
1/8	1/8	3	1/4	6°	1/4	.114	93275
3/16	3/16	3	1/4	3°35'	3/8	.171	93276
1/4	1/4	3-1/2	1/4	—	1/2	.230	93277
5/16	5/16	4	5/16	—	5/8	.292	93278
3/8	3/8	4	3/8	—	3/4	.355	93279
1/2	1/2	4-1/2	1/2	—	1	.480	93280
5/8	5/8	5-1/2	5/8	—	1-1/4	.610	93281
3/4	3/4	6-1/2	3/4	—	1-1/2	.735	93282

Extended Neck Option Available, contact your local KSPT representative for more information.
 RE = 1/2 Cutting Diameter (DC)

TOLERANCES (inch)

1/32–3/32 DIAMETER

DC = +0.0000/–0.0010

DCON = h_6

RE = +0.0000/–0.0005

>3/32–1/4 DIAMETER

DC = +0.0000/–0.0012

DCON = h_6

RE = +0.0000/–0.0006

>1/4–3/8 DIAMETER

DC = +0.0000/–0.0016

DCON = h_6

RE = +0.0000/–0.0008

>3/8–3/4 DIAMETER

DC = +0.0000/–0.0020

DCON = h_6

RE = +0.0000/–0.0010

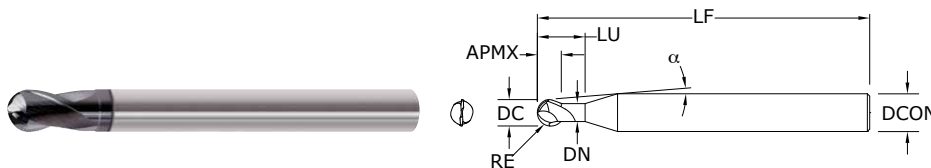
STEELS

HARDENED STEELS

56MB

METRIC SERIES

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



CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	mm				EDP NO.
			SHANK DIAMETER DCON	CENTER LINE ANGLE α	REACH LU	NECK DIAMETER DN	
1,0	1,0	76,0	6,0	8°10'	2,0	0,91	91349
1,5	1,5	76,0	6,0	7°45'	3,0	1,37	91350
2,0	2,0	76,0	6,0	7°10'	4,0	1,83	91351
2,5	2,5	76,0	6,0	6°35'	5,0	2,29	91352
3,0	3,0	76,0	6,0	6°	6,0	2,72	91353
4,0	4,0	76,0	6,0	4°30'	8,0	3,63	91354
5,0	5,0	89,0	6,0	2°30'	10,0	4,55	91355
6,0	6,0	89,0	6,0	—	12,0	5,49	91356
8,0	8,0	102,0	8,0	—	16,0	7,49	91357
10,0	10,0	102,0	10,0	—	20,0	9,47	91358
12,0	12,0	114,0	12,0	—	24,0	11,48	91359
16,0	16,0	140,0	16,0	—	32,0	15,62	91360
20,0	20,0	165,0	20,0	—	40,0	19,61	91361

Extended Neck Option Available, contact your local KSPT representative for more information.
 RE = 1/2 Cutting Diameter (DC)

TOLERANCES (mm)

1–2,5 DIAMETER

DC = +0,000/–0,025

DCON = h_6

RE = +0,000/–0,0013

>2,5–6 DIAMETER

DC = +0,000/–0,030

DCON = h_6

RE = +0,000/–0,0013

>6–10 DIAMETER

DC = +0,000/–0,040

DCON = h_6

RE = +0,000/–0,0020

>10–20 DIAMETER

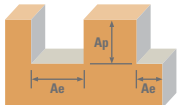
DC = +0,000/–0,050

DCON = h_6

RE = +0,000/–0,0025

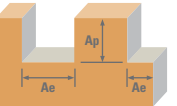
STEELS

HARDENED STEELS



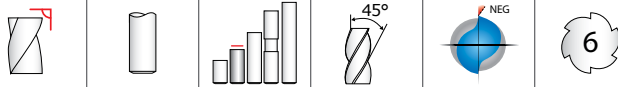
Series 56B	Fractional	Hardness	Ae x DC	Ap x DC	Vc (sfm)	DC • in									
						1/32	1/16	1/8	3/16	1/4	3/8	1/2	3/4		
P	TOOL STEELS MOLD AND DIE STEEL 300M, 4340, 52100, HP-9-4-20, M50, A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 375 Bhn or ≤ 40 HRc	Rough 	≤ 0.4	≤ 0.1	625	RPM	76400	38200	19100	12733	9550	6367	4775	3183
						(500-750)	Fz	0.0006	0.0015	0.0030	0.0040	0.0050	0.0080	0.0100	0.0120
							Feed (ipm)	92	115	115	102	96	102	96	76
		≤ 40 HRc	HSM 	≤ 0.4	≤ 0.03	950	RPM	116128	58064	29032	19355	14516	9677	7258	4839
						(760-1140)	Fz	0.0007	0.0017	0.0033	0.0044	0.0060	0.0088	0.0110	0.0130
							Feed (ipm)	163	197	192	170	174	170	160	126
H	TOOL STEELS MOLD AND DIE STEEL 300M, 4340, 52100, HP-9-4-20, M50, A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 475 Bhn or ≤ 50 HRc	Rough 	≤ 0.4	≤ 0.05	750	RPM	91680	45840	22920	15280	11460	7640	5730	3820
						(600-900)	Fz	0.0005	0.0011	0.0023	0.0030	0.0038	0.0060	0.0075	0.0085
							Feed (ipm)	92	101	105	92	87	92	86	65
		≤ 50 HRc	HSM 	≤ 0.4	≤ 0.02	1150	RPM	140576	70288	35144	23429	17572	11715	8786	5857
						(920-1380)	Fz	0.0006	0.0012	0.0025	0.0033	0.0042	0.0066	0.0082	0.0100
							Feed (ipm)	169	169	176	155	148	155	144	117
	TOOL STEELS MOLD AND DIE STEEL 300M, 4340, 52100, HP-9-4-20, M50, A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 655 Bhn or ≤ 60 HRc	Rough 	≤ 0.4	≤ 0.04	500	RPM	61120	30560	15280	10187	7640	5093	3820	2547
						(400-600)	Fz	0.0004	0.0008	0.0017	0.0023	0.0029	0.0045	0.0057	0.0063
							Feed (ipm)	49	49	52	47	44	46	44	32
		≤ 60 HRc	HSM 	≤ 0.4	≤ 0.01	1000	RPM	122240	61120	30560	20373	15280	10187	7640	5093
						(800-1200)	Fz	0.0005	0.0009	0.0019	0.0025	0.0032	0.0050	0.0063	0.0071
							Feed (ipm)	122	110	116	102	98	102	96	72

Bhn (Brinell) HRc (Rockwell C) HSM (High Speed Machining)
 $\text{rpm} = \text{Vc} \times 3.82 / \text{DC}$
 $\text{ipm} = \text{Fz} \times 2 \times \text{rpm}$
 reduce speed and feed for materials harder than listed
 reduce feed and Ae when finish milling (.02 x DC maximum)
 feed rates listed have chip thinning adjustments included where applicable
 refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)



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

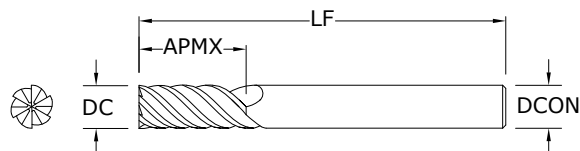
Bhn (Brinell) HRc (Rockwell C) HSM (High Speed Machining)
 $\text{rpm} = (\text{Vc} \times 1000) / (\text{DC} \times 3.14)$
 $\text{mm/min} = \text{Fz} \times 2 \times \text{rpm}$
 reduce speed and feed for materials harder than listed
 reduce feed and Ae when finish milling (.02 x DC maximum)
 feed rates listed have chip thinning adjustments included where applicable
 refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)



57

FRACTIONAL SERIES

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



inch				EDP NO.
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	Ti-NAMITE-X (TX)
1/4	17/32	3-1/2	1/4	36140
5/16	11/16	4	5/16	36141
3/8	13/16	4	3/8	36142
1/2	1-3/32	4-1/2	1/2	36143

Neck Option Available

TOLERANCES (inch)

1/4 DIAMETER

DC = +0.0000/-0.0012

DCON = h₆

5/16 DIAMETER

DC = +0.0000/-0.0016

DCON = h₆

3/8 DIAMETER

DC = +0.0000/-0.0016

DCON = h₆

1/2 DIAMETER

DC = +0.0000/-0.0020

DCON = h₆

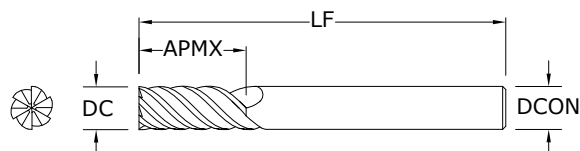
STEELS

HARDENED STEELS

57M

METRIC SERIES

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



mm				EDP NO.
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	Ti-NAMITE-X (TX)
6,0	13,0	89,0	6,0	46140
8,0	18,0	102,0	8,0	46141
10,0	22,0	102,0	10,0	46142
12,0	26,0	114,0	12,0	46143
16,0	32,0	140,0	16,0	46145
20,0	38,0	165,0	20,0	46147

Neck Option Available

TOLERANCES (mm)

6 DIAMETER

DC = +0,000/-0,030

DCON = h₆

8 DIAMETER

DC = +0,000/-0,040

DCON = h₆

10 DIAMETER

DC = +0,000/-0,040

DCON = h₆

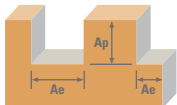
12-20 DIAMETER

DC = +0,000/-0,050

DCON = h₆

STEELS

HARDENED STEELS



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

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

rpm = Vc x 3.82 / DC

ipm = Fz x 6 x rpm

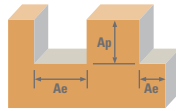
reduce speed and feed for materials harder than listed

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

feed rates listed have chip thinning adjustments included where applicable

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)

Power-Carb



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

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

rpm = (Vc x 1000) / (DC x 3.14)

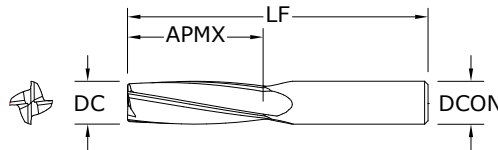
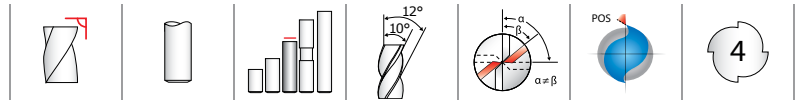
mm/min = Fz x 6 x rpm

reduce speed and feed for materials harder than listed

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

feed rates listed have chip thinning adjustments included where applicable

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)



27
FRACTIONAL SERIES

TOLERANCES (inch)

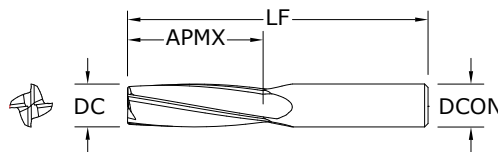
DC = +0.0000/-0.0030

DCON = h_6

NON-FERROUS

CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	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

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



27M
METRIC SERIES

TOLERANCES (mm)

DC = +0,000/-0,080

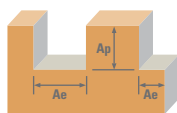
DCON = h_6

NON-FERROUS

CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	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

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

Series 27



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

HSM (High Speed Machining)

rpm = Vc x 3.82 / DC

ipm = Fz x 4 x rpm

adjust parameters based on resin type and fiber structure

reduce speed when overheating causes melting or damage to resin

reduce feed if delamination or fraying occur

finish cuts typically required reduced feed and cutting depths

rates shown are for use without coolant; rates may be increased with coolant

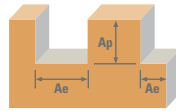
dust collection is vital when machining dry

diamond coating will increase tool life in graphite and composite materials

feed rates listed have chip thinning adjustments included where applicable

refer to the KYOCERA SGS APEX for complete technical information

www.kyocera-sgstool.com/apex



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

HSM (High Speed Machining)

rpm = Vc x 3.82 / DC

mm/min = Fz x 4 x rpm

adjust parameters based on resin type and fiber structure

reduce speed when overheating causes melting or damage to resin

reduce feed if delamination or fraying occur

finish cuts typically required reduced feed and cutting depths

rates shown are for use without coolant; rates may be increased with coolant

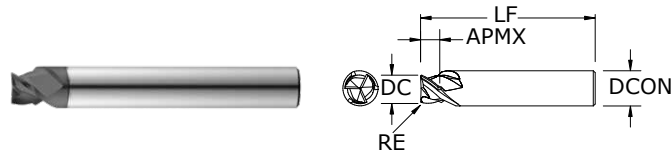
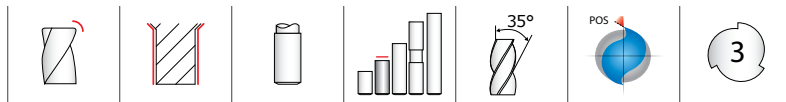
dust collection is vital when machining dry

diamond coating will increase tool life in graphite and composite materials

feed rates listed have chip thinning adjustments included where applicable

refer to the KYOCERA SGS APEX for complete technical information

www.kyocera-sgstool.com/apex



Ferrous Recoil Groove Tool

FRACTIONAL SERIES

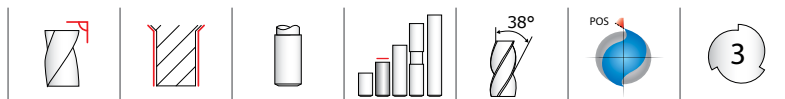
- Open Flute design improves chip removal at high feed rates
- Specially engineered flute shape for improved chip control
- Circular land improves surface finish and chatter suppression
- Symmetrical end gashing improves balance in high speed operations
- Meets US MIL-STD 1913 & NATO STANAG 4694

CUTTING DIAMETER DC	SHANK DIAMETER DCON	inch		CORNER RADIUS RE	EDP NO.	
		LENGTH OF CUT APMX	OVERALL LENGTH LF		Ti-NAMITE-A (TA)	Ti-NAMITE-M (TM)
0.2100	1/4	0.118	1-3/4	.010	33360	33361

TOLERANCES (inch)

DC = +0.0080/-0.0000
 APMX = +0.0060/-0.0000
 DCON = h_6
 RE = +0.0000/-0.0005

	STEELS
	STAINLESS STEELS
	CAST IRON
	HIGH TEMP ALLOYS



Non-Ferrous Recoil Groove Tool

FRACTIONAL SERIES

- Open Flute design improves chip removal at high feed rates
- Circular land improves surface finish and chatter suppression
- Symmetrical end gashing improves balance in high speed operations
- 45 degree chamfer enables slot and deburr in one operation
- Meets US MIL-STD 1913 & NATO STANAG 4694

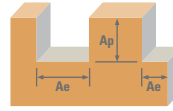
CUTTING DIAMETER DC	SHANK DIAMETER DCON	inch		OVERALL LENGTH LF	EDP NO.	
		LENGTH OF CUT APMX			UNCOATED	Ti-NAMITE-B (TiB ₂)
0.2100	1/4	0.118		1-3/4	34760	34761

TOLERANCES (inch)

DC = +0.0080/-0.0000
 APMX = +0.0060/-0.0000
 DCON = h_6

	NON-FERROUS

Picatinny Rail Ferrous Recoil Groove Tool



Picatinny Rail Recoil Groove Tool 3 Flute Made to MIL-STD-1913						Vc (sfm)	DC • in	
Hardness				Ae x DC	Ap x DC		0.2100	
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 275 Bhn or ≤ 28 HRc	Slot 	0.210	0.118	440 (352-528)	RPM	8004
							Fz	0.0009
							Feed (ipm)	22.99
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 375 Bhn or ≤ 40 HRc	Slot 	0.210	0.118	250 (200-300)	RPM	4548
							Fz	0.0006
							Feed (ipm)	9.79
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 375 Bhn or ≤ 40 HRc	Slot 	0.210	0.118	145 (116-174)	RPM	2638
							Fz	0.0005
							Feed (ipm)	4.47
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 275 Bhn or ≤ 28 HRc	Slot 	0.210	0.118	390 (312-468)	RPM	7094
							Fz	0.0007
							Feed (ipm)	17.01
	STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L	≤ 275 Bhn or ≤ 28 HRc	Slot 	0.210	0.118	270 (216-324)	RPM	4911
							Fz	0.0006
							Feed (ipm)	9.41
	STAINLESS STEELS (PH) 13-8 PH, 15-5 PH, 17-4 PH, Custom 450	≤ 325 Bhn or ≤ 35 HRc	Slot 	0.210	0.118	250 (200-300)	RPM	4548
							Fz	0.0006
							Feed (ipm)	8.74
K	CAST IRONS (LOW & MEDIUM ALLOY) Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	Slot 	0.210	0.118	270 (216-324)	RPM	4911
							Fz	0.0006
							Feed (ipm)	9.41
S	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	≤ 300 Bhn or ≤ 32 HRc	Slot 	0.210	0.118	65 (52-78)	RPM	1182
							Fz	0.0005
							Feed (ipm)	2.00
	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	≤ 400 Bhn or ≤ 43 HRc	Slot 	0.210	0.118	49 (39-59)	RPM	891
							Fz	0.0004
							Feed (ipm)	1.05
	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	≤ 350 Bhn or ≤ 38 HRc	Slot 	0.210	0.118	170 (136-204)	RPM	3092
							Fz	0.0006
							Feed (ipm)	5.89
TITANIUM ALLOYS (DIFFICULT) Ti10V2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 420 Bhn or ≤ 45 HRc	Slot 	0.210	0.118	60 (48-72)	RPM	1091	
						Fz	0.0006	
						Feed (ipm)	2.09	

Bhn (Brinell) HRc (Rockwell C)

when recommended speed exceeds your capability, use maximum available and recalculate ipm

$\text{rpm} = \text{Vc} \times 3.82 / \text{DC}$

$\text{ipm} = \text{Fz} \times 3 \times \text{rpm}$

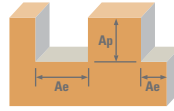
reduce speed and feed for materials harder than listed

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

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)

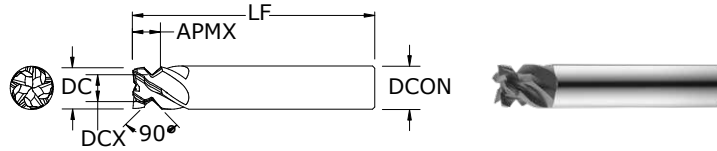
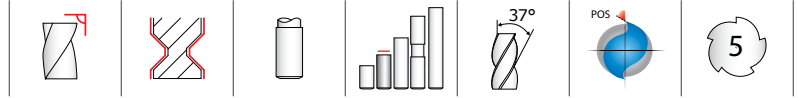
Picatinny Rail Non-Ferrous Recoil Groove Tool

Picatinny Rail
Non-Ferrous Recoil
Groove Tool
3 Flute
Made to MIL-STD-1913



Groove Tool 3 Flute Made to MIL-STD-1913						Vc (sfm)	DC • in	
Hardness				Ae x DC	Ap x DC		0.2100	
N	ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075	≤ 150 Bhn or ≤ 88 HRb	Slot 	0.210	0.118	1600 (1280-1920)	RPM	29105
							Fz	0.0026
							Feed (ipm)	227.89
	ALUMINUM DIE CAST ALLOYS (HIGH SILICONE) A-390, A-392, B-390	≤ 125 Bhn or ≤ 77 HRb	Slot 	0.210	0.118	600 (480-720)	RPM	10914
							Fz	0.0026
							Feed (ipm)	85.46
	COPPER ALLOYS Alum Bronze, C110, Muntz Brass	≤ 140 Bhn or ≤ 3 HRc	Slot 	0.210	0.118	345 (276-414)	RPM	6276
							Fz	0.0022
							Feed (ipm)	40.79
	PLASTICS Polycarbonate, PVC, Polypropylene		Slot 	0.210	0.118	1600 (1280-1920)	RPM	29105
							Fz	0.0044
							Feed (ipm)	380.58

Bhn (Brinell) HRC (Rockwell C) HRB (Rockwell B)
when recommended speed exceeds your capability, use maximum available and recalculate ipm
rpm = Vc x 3.82 / DC
ipm = Fz x 3 x rpm
reduce speed and feed for materials harder than listed
reduce feed and Ae when finish milling (.02 x DC maximum)
refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)



Ferrous Dovetail Form Tool

FRACTIONAL SERIES

TOLERANCES (inch)

DC = +0.0010/-0.0010

DCON = h₆

STEELS

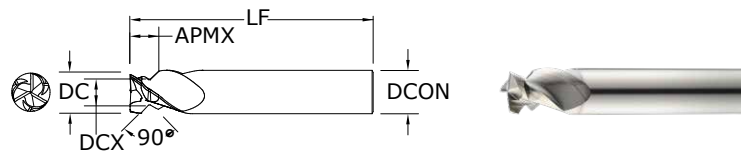
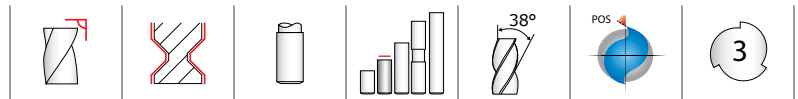
STAINLESS STEELS

CAST IRON

HIGH TEMP ALLOYS

CUTTING DIAMETER DC	INNER CUTTING DIAMETER DCX	inch			EDP NO.	
		SHANK DIAMETER DCON	LENGTH OF CUT APMX	OVERALL LENGTH LF	Ti-NAMITE-A (TA)	Ti-NAMITE-M (TM)
0.6050	0.384	5/8	0.410	3-1/2	37391	37390

- Five-flute design allows for higher machining parameters
- Open end work design allows for increased chip space
- Square end configuration with enhanced corner strength to improve corner durability
- Meets US MIL-STD 1913 & NATO STANAG 4694



Non-Ferrous Dovetail Form Tool

FRACTIONAL SERIES

TOLERANCES (inch)

DC = +0.0010/-0.0010

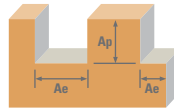
DCON = h₆

NON-FERROUS

CUTTING DIAMETER DC	INNER CUTTING DIAMETER DCX	inch			EDP NO.	
		SHANK DIAMETER DCON	LENGTH OF CUT APMX	OVERALL LENGTH LF	UNCOATED	Ti-NAMITE-B (TiB ₂)
0.6050	0.384	5/8	0.410	3-1/2	34762	34763

- Open Flute design improves chip removal at high feed rates
- Specially engineered flute shape for improved chip control
- Circular land improves surface finish and chatter suppression
- Symmetrical end gashing improves balance in high speed operations
- Meets US MIL-STD 1913 & NATO STANAG 4694

Picatinny Rail Ferrous Dovetail Form Tool



Picatinny Rail Dovetail Form Tool 5 Flute Made to MIL-STD-1913			Hardness		Ae x DC	Ap x DC	Vc (sfm)	DC • in 0.6050	
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ .50	APMX	450 (360-540)	RPM	2841	
							Fz	0.0032	
							Feed (ipm)	46.03	
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 375 Bhn or ≤ 40 HRc	Profile 	≤ .50	APMX	260 (208-312)	RPM	1642	
							Fz	0.0024	
							Feed (ipm)	19.68	
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 375 Bhn or ≤ 40 HRc	Profile 	≤ .50	APMX	145 (116-174)	RPM	916	
							Fz	0.0019	
							Feed (ipm)	8.60	
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ .50	APMX	400 (320-480)	RPM	2526	
							Fz	0.0024	
							Feed (ipm)	30.28	
	STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ .50	APMX	280 (224-336)	RPM	1768	
							Fz	0.0019	
							Feed (ipm)	16.61	
K	STAINLESS STEELS (PH) 13-8 PH, 15-5 PH, 17-4 PH, Custom 450	≤ 325 Bhn or ≤ 35 HRc	Profile 	≤ .50	APMX	260 (208-312)	RPM	1642	
							Fz	0.0019	
							Feed (ipm)	15.42	
	CAST IRONS (LOW & MEDIUM ALLOY) Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	Profile 	≤ .50	APMX	280 (224-336)	RPM	1768	
							Fz	0.0029	
							Feed (ipm)	25.78	
	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	≤ 300 Bhn or ≤ 32 HRc	Profile 	≤ .50	APMX	75 (60-90)	RPM	474	
							Fz	0.0018	
							Feed (ipm)	4.22	
	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	≤ 400 Bhn or ≤ 43 HRc	Profile 	≤ .50	APMX	60 (48-72)	RPM	379	
							Fz	0.0013	
							Feed (ipm)	2.39	
S	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	≤ 350 Bhn or ≤ 38 HRc	Profile 	≤ .50	APMX	180 (144-216)	RPM	1137	
							Fz	0.0021	
							Feed (ipm)	11.97	
	TITANIUM ALLOYS (DIFFICULT) Ti10V2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 420 Bhn or ≤ 45 HRc	Profile 	≤ .50	APMX	70 (56-84)	RPM	442	
							Fz	0.0021	
							Feed (ipm)	4.65	

Bhn (Brinell) HRc (Rockwell C)

when recommended speed exceeds your capability, use maximum available and recalculate ipm

rpm = Vc x 3.82 / DC

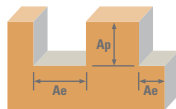
ipm = Fz x 5 x rpm

reduce speed and feed for materials harder than listed

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

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)

Picatinny Rail Non-Ferrous Dovetail Form Tool



Picatinny Rail Dovetail Form Tool 3 Flute Made to MIL-STD-1913						Vc (sfm)		DC • in	
Hardness				Ae x DC		Ap x DC		0.6050	
N	ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075	≤ 150 Bhn or ≤ 88 HRb	Profile 	≤ .50	APMX	2000 (1600-2400)	RPM	12628	
							Fz	0.0056	
							Feed (ipm)	211.39	
	ALUMINUM DIE CAST ALLOYS (HIGH SILICONE) A-390, A-392, B-390	≤ 125 Bhn or ≤ 77 HRb	Profile 	≤ .50	APMX	750 (600-900)	RPM	4736	
							Fz	0.0056	
							Feed (ipm)	79.27	
	COPPER ALLOYS Alum Bronze, C110, Muntz Brass	≤ 140 Bhn or ≤ 3 HRc	Profile 	≤ .50	APMX	430 (344-516)	RPM	2715	
							Fz	0.0046	
							Feed (ipm)	37.72	
	PLASTICS Polycarbonate, PVC, Polypropylene		Profile 	≤ .50	APMX	2000 (1600-2400)	RPM	12628	
							Fz	0.0093	
							Feed (ipm)	353.03	

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)

when recommended speed exceeds your capability, use maximum available and recalculate ipm

$\text{rpm} = \text{Vc} \times 3.82 / \text{DC}$

$\text{ipm} = \text{Fz} \times 3 \times \text{rpm}$

reduce speed and feed for materials harder than listed

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

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)

High Performance Aluminum End Mills



Milling

HIGH PERFORMANCE ALUMINUM END MILLS	SERIES	DESCRIPTION	PAGE	S&F PAGE
S-Carb APR & APF	43APR-3	3 Flute Advanced Productivity Rougher Fractional	141	142
	43APR-3	3 Flute Advanced Productivity Rougher Metric	143	145
	43APR-4	4 Flute Advanced Productivity Rougher Metric	144	145
	43APF	4 Flute Advanced Productivity Finisher Fractional	146	147
	43MAPF	4 Flute Advanced Productivity Finisher Metric	148	149
S-Carb APF-B	43APF-B	Multi-Flute Tapered (Circle Segment) Form Tools Metric	150	151
S-Carb (3 Flute)	43	3 Flute Non-Ferrous Square End Fractional	152	164
	43CR	3 Flute Non-Ferrous Corner Radius Fractional	152	164
	43L	3 Flute Non-Ferrous Square End Long Reach Fractional	156	164
	43LC	3 Flute Non-Ferrous Corner Radius End Long Reach Fractional	156	164
	43EC	3 Flute Non-Ferrous Square End Extra Long Reach Fractional	159	164
	43B	3 Flute Non-Ferrous Ball End Fractional	160	164
	43LB	3 Flute Non-Ferrous Ball End Long Reach Fractional	161	164
	43EB	3 Flute Non-Ferrous Ball End Extra Long Reach Fractional	161	164
	43M	3 Flute Non-Ferrous Square End Metric	165	173
	43MCR	3 Flute Non-Ferrous Corner Radius Metric	165	173
	43ML	3 Flute Non-Ferrous Square End Long Reach Metric	168	173
	43MLC	3 Flute Non-Ferrous Long Reach Corner Radius Metric	168	173
	43MB	3 Flute Non-Ferrous Ball End Metric	170	173
	43MLB	3 Flute Non-Ferrous Ball End Long Reach Metric	171	173
	43CB	3 Flute Rougher Non-Ferrous Chip Breaker Fractional	162	164
	43LCB	3 Flute Rougher Non-Ferrous Chip Breaker Long Reach Fractional	163	164
	43MCB	3 Flute Rougher Non-Ferrous Chip Breaker Metric	172	173
S-Carb (2 Flute)	47	2 Flute Non-Ferrous Square End Fractional	174	177
	47L	2 Flute Non-Ferrous Square End Long Reach Fractional	175	177
	47B	2 Flute Non-Ferrous Ball End Fractional	176	177
	47LB	2 Flute Non-Ferrous Ball End Long Reach Fractional	176	177
	47M	2 Flute Non-Ferrous Square End Metric	178	180
	47ML	2 Flute Non-Ferrous Square End Long Reach Metric	178	180
	47MB	2 Flute Non-Ferrous Ball End Metric	179	180
Ski-Carb	47MLB	2 Flute Non-Ferrous Ball End Long Reach Metric	179	180
	44	2 Flute Non-Ferrous Materials Square End Fractional	181	182
	44M	2 Flute Non-Ferrous Materials Square End Metric	181	183
	45	2 Flute Non-Ferrous Materials Long Reach Corner Radius Fractional	184	185

Speed & Feed Recommendations listed after each series



Fresado

FRESAS DE ALTO RENDIMIENTO PARA ALUMINIO	SERIE	DESCRIPCIÓN	PÁGINA	S&F PÁGINA
S-Carb APR y APF	43APR-3	3 filos, productividad avanzada, desbastador, fraccional	141	142
	43APR-3	3 filos, productividad avanzada, desbastador, métrico	143	145
	43APR-4	4 filos, productividad avanzada, desbastador, métrico	144	145
	43APF	4 filos, productividad avanzada, acabador, fraccional	146	147
	43MAPF	4 filos, productividad avanzada, acabador, métrico	148	149
S-Carb APF-B	43APF-B	Fresas de forma cónica de segmento circular de múltiples filos, métrico	150	151
S-Carb (3 filos)	43	3 filos, no férrico, punta cuadrada, fraccional	152	164
	43CR	3 filos, no férrico, radio angulado, fraccional	152	164
	43L	3 filos, no férrico, punta cuadrada, largo alcance, fraccional	156	164
	43LC	3 filos, no férricos, largo alcance, radio angulado, fraccional	156	164
	43EC	3 filos, no férrico, punta cuadrada, alcance extralargo, fraccional	159	164
	43B	3 filos, no férrico, punta esférica, fraccional	160	164
	43LB	3 filos, no férrico, punta esférica, largo alcance, fraccional	161	164
	43EB	3 filos, no férrico, punta esférica, alcance extralargo, fraccional	161	164
	43M	3 filos, no férrico, punta cuadrada, métrico	165	173
	43MCR	3 filos, no férrico, radio angulado, métrico	165	173
	43ML	3 filos, no férrico, punta cuadrada, largo alcance, métrico	168	173
	43MLC	3 filos, no férrico, largo alcance, radio angulado, métrico	168	173
	43MB	3 filos, no férrico, punta esférica, métrico	170	173
	43MLB	3 filos, no férrico, punta esférica, largo alcance, métrico	171	173
	43CB	3 filos, desbastador, no férrico, rompevirutas, fraccional	162	164
Desbastador S-Carb (3 filos)	43LCB	3 filos, desbastador, no férrico, rompevirutas, largo alcance, fraccional	163	164
	43MCB	3 filos, desbastador, no férrico, rompevirutas, métrico	172	173
	47	2 filos, no férrico, punta cuadrada, fraccional	174	177
S-Carb (2 filos)	47L	2 filos, no férrico, punta cuadrada, largo alcance, fraccional	175	177
	47B	2 filos, no férrico, punta esférica, fraccional	176	177
	47LB	2 filos, no férrico, punta esférica, largo alcance, fraccional	176	177
	47M	2 filos, no férrico, punta cuadrada, métrico	178	180
	47ML	2 filos, no férrico, punta cuadrada, largo alcance, métrico	178	180
	47MB	2 filos, no férrico, punta esférica, métrico	179	180
	47MLB	2 filos, no férrico, punta esférica, largo alcance, métrico	179	180
Ski-Carb	44	2 filos, materiales no férricos, punta cuadrada, fraccional	181	182
	44M	2 filos, materiales no férricos, punta cuadrada, métrico	181	183
	45	2 filos, materiales no férricos, largo alcance, radio angulado, fraccional	184	185

Recomendaciones de velocidades y avances mostradas tras cada serie

FRAISE HAUTE PERFORMANCE POUR ALUMINIUM	SÉRIES	DESCRIPTION	PAGE	S&F PAGE
S-Carb APR/APF	43APR-3	3 dents productivité avancée d'ébauche (fractionnel)	141	142
	43APR-3	3 dents productivité avancée d'ébauche (métrique)	143	145
	43APR-4	4 dents productivité avancée d'ébauche (métrique)	144	145
	43APF	4 dents productivité avancée de finition (fractionnel)	146	147
	43MAPF	4 dents productivité avancée de finition (métrique)	148	149
S-Carb APF-B	43APF-B	Fraises de forme segmentaire conique à dents multiples (métrique)	150	151
S-Carb (3 dents)	43	3 dents non-ferreux non rayonné (fractionnel)	152	164
	43CR	3 dents non-ferreux rayonné (fractionnel)	152	164
	43L	3 dents non-ferreux non rayonné longue portée (fractionnel)	156	164
	43LC	3 dents non-ferreux longue portée rayonné (fractionnel)	156	164
	43EC	3 dents non-ferreux non rayonné portée extra-longue (fractionnel)	159	164
	43B	3 dents non-ferreux à bout hémisphérique (fractionnel)	160	164
	43LB	3 dents non-ferreux à bout hémisphérique longue portée (fractionnel)	161	164
	43EB	3 dents non-ferreux à bout hémisphérique portée extra-longue (fractionnel)	161	164
	43M	3 dents non-ferreux non rayonné (métrique)	165	173
	43MCR	3 dents matériaux non-ferreux rayonné (métrique)	165	173
	43ML	3 dents non-ferreux non rayonné longue portée (métrique)	168	173
	43MLC	3 dents non-ferreux longue portée rayonné (métrique)	168	173
	43MB	3 dents non-ferreux à bout hémisphérique (métrique)	170	173
	43MLB	3 dents non-ferreux à bout hémisphérique longue portée (métrique)	171	173
	43CB	3 dents d'ébauche non-ferreux brise-copeaux (fractionnel)	162	164
	43LCB	3 dents d'ébauche non-ferreux brise-copeaux longue portée (fractionnel)	163	164
S-Carb d'ébauche (3 dents)	43MCB	3 dents d'ébauche non-ferreux brise-copeaux (métrique)	172	173
	47	2 dents non-ferreux non rayonné (fractionnel)	174	177
	47L	2 dents non-ferreux non rayonné longue portée (fractionnel)	175	177
S-Carb (2 dents)	47B	2 dents non-ferreux à bout hémisphérique (fractionnel)	176	177
	47LB	2 dents non-ferreux à bout hémisphérique longue portée (fractionnel)	176	177
	47M	2 dents non-ferreux non rayonné (métrique)	178	180
	47ML	2 dents non-ferreux non rayonné longue portée (métrique)	178	180
	47MB	2 dents non-ferreux à bout hémisphérique (métrique)	179	180
	47MLB	2 dents non-ferreux à bout hémisphérique longue portée (métrique)	179	180
	44	2 dents matériaux non-ferreux non rayonné (fractionnel)	181	182
Ski-Carb	44M	2 dents matériaux non-ferreux non rayonné (métrique)	181	183
	45	2 dents matériaux non-ferreux longue portée rayonné (fractionnel)	184	185

Recommandations de vitesse et avance indiquées après chaque série

HOCHLEISTUNGSSCHAFTFRÄSER FÜR ALUMINIUM	SERIE	BESCHREIBUNG	SEITE	S&F SEITE
S-Carb APR & APF	43APR-3	Hochleistungs-Schruppfräser mit 3 Schneiden	141	142
	43APR-3	Hochleistungs-Schruppfräser mit 3 Schneiden (Erweiterung)	143	145
	43APR-4	Hochleistungs-Schruppfräser mit 4 Schneiden	144	145
	43APF	Zölliger Hochleistungs-Schlichtfräser mit 4 Schneiden	146	147
	43MAPF	Hochleistungs-Schlichtfräser mit 4 Schneiden	148	149
S-Carb APF-B	43APF-B	Mehrschneidige konische Kreissegment-Formfräser	150	151
S-Carb (3 Schneiden)	43	Zölliger NE-Schaftfräser mit 3 Schneiden ohne Eckenradien	152	164
	43CR	Zölliger NE-Fräser mit 3 Schneiden und Eckenradien	152	164
	43L	Zölliger NE-Langloch-Schaftfräser mit 3 Schneiden ohne Eckenradien	156	164
	43LC	Zölliger Langlochfräser mit 3 Schneiden und Eckenradien	156	164
	43EC	Zölliger NE-Superlangloch-Schaftfräser mit 3 Schneiden ohne Eckenradien	159	164
	43B	Zölliger NE-Radiusschaftfräser mit 3 Schneiden	160	164
	43LB	Zölliger NE-Langloch-Radiusschaftfräser mit 3 Schneiden	161	164
	43EB	Zölliger NE-Superlangloch-Radiusschaftfräser mit 3 Schneiden	161	164
	43M	NE-Schaftfräser mit 3 Schneiden ohne Eckenradien	165	173
	43MCR	NE-Fräser mit 3 Schneiden und Eckenradien	165	173
	43ML	NE-Langloch-Schaftfräser mit 3 Schneiden ohne Eckenradien	168	173
	43MLC	NE-Langlochfräser mit 3 Schneiden und Eckenradien	168	173
	43MB	NE-Radiusschaftfräser mit 3 Schneiden	170	173
	43MLB	NE-Langloch-Radiusschaftfräser mit 3 Schneiden	171	173
	43CB	Zölliger NE-Schruppfräser mit 3 Schneiden und Spanbrechern	162	164
	43LCB	Zölliger NE-Langloch-Schruppfräser mit 3 Spanteilernuten	163	164
	43MCB	NE-Schruppfräser mit 3 Schneiden und Spanbrechern	172	173
S-Carb (2 Schneiden)	47	Zölliger NE-Schaftfräser mit 2 Schneiden ohne Eckenradien	174	177
	47L	Zölliger NE-Langloch-Schaftfräser mit 2 Schneiden ohne Eckenradien	175	177
	47B	Zölliger NE-Radiusschaftfräser mit 2 Schneiden	176	177
	47LB	Zölliger NE-Langloch-Radiusschaftfräser mit 2 Schneiden	176	177
	47M	NE-Schaftfräser mit 2 Schneiden ohne Eckenradien	178	180
	47ML	NE-Langloch-Schaftfräser mit 2 Schneiden ohne Eckenradien	178	180
	47MB	NE-Radiusschaftfräser mit 2 Schneiden	179	180
	47MLB	NE-Langloch-Radiusschaftfräser mit 2 Schneiden	179	180
Ski-Carb	44	Zölliger NE-Schaftfräser mit 2 Schneiden ohne Eckenradien	181	182
	44M	NE-Schaftfräser mit 2 Schneiden ohne Eckenradien	181	183
	45	Zölliger Langlochfräser mit 2 Schneidenn und Eckenradien für Nichteisenmetalle	184	185

Empfehlungen für Drehzahl & Vorschub im Anhang zu jeder Serie

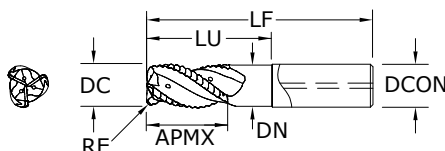
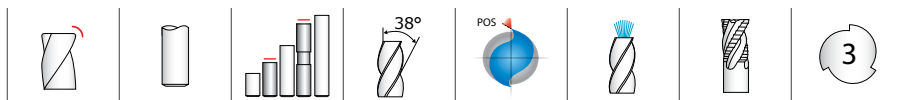


APR-3

ADVANCED PRODUCTIVITY ROUGHER

FRACTIONAL

S-Carb APR



43APR-3
FRACTIONAL SERIES

TOLERANCES (inch)

1/2-1 DIAMETER

DC = -0.0004/-0.004

DCON = h_6

RE = +/-0.002

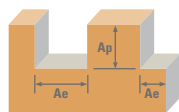
NON-FERROUS

inch							EDP NO.
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	REACH LU	NECK DIAMETER DN	CORNER RADIUS RE	Ti-NAMITE-B (TiB ₂)
1/2	1	3-1/4	1/2	1-1/2	.474	.030	34100
1/2	1	3-1/4	1/2	1-1/2	.474	.060	34101
1/2	1	3-1/4	1/2	1-1/2	.474	.090	34102
1/2	1	3-1/4	1/2	1-1/2	.474	.120	34103
5/8	1-3/8	3-5/8	5/8	2	.594	.030	34104*
5/8	1-3/8	3-5/8	5/8	2	.594	.060	34105*
5/8	1-3/8	3-5/8	5/8	2	.594	.090	34106*
5/8	1-3/8	3-5/8	5/8	2	.594	.120	34107*
5/8	1-3/8	4-1/4	5/8	2-5/8	.594	.030	34108*
5/8	1-3/8	4-1/4	5/8	2-5/8	.594	.060	34109*
5/8	1-3/8	4-1/4	5/8	2-5/8	.594	.090	34110*
5/8	1-3/8	4-1/4	5/8	2-5/8	.594	.120	34111*
3/4	1-3/8	3-5/8	3/4	1-3/4	.713	.030	34112
3/4	1-3/8	3-5/8	3/4	1-3/4	.713	.060	34113
3/4	1-3/8	3-5/8	3/4	1-3/4	.713	.090	34114
3/4	1-3/8	3-5/8	3/4	1-3/4	.713	.120	34115
3/4	1-3/8	4-3/8	3/4	2-1/2	.713	.030	34116*
3/4	1-3/8	4-3/8	3/4	2-1/2	.713	.060	34117*
3/4	1-3/8	4-3/8	3/4	2-1/2	.713	.090	34118*
3/4	1-3/8	4-3/8	3/4	2-1/2	.713	.120	34119*
3/4	1-3/8	5-1/8	3/4	3-1/4	.713	.030	34120*
3/4	1-3/8	5-1/8	3/4	3-1/4	.713	.060	34121*
3/4	1-3/8	5-1/8	3/4	3-1/4	.713	.090	34122*
3/4	1-3/8	5-1/8	3/4	3-1/4	.713	.120	34123*
1	1-3/4	4-1/2	1	2-1/2	.949	.030	34124
1	1-3/4	4-1/2	1	2-1/2	.949	.060	34125
1	1-3/4	4-1/2	1	2-1/2	.949	.090	34126
1	1-3/4	4-1/2	1	2-1/2	.949	.120	34127
1	1-3/8	5-1/4	1	3-1/4	.949	.030	34128*
1	1-3/8	5-1/4	1	3-1/4	.949	.060	34129*
1	1-3/8	5-1/4	1	3-1/4	.949	.090	34130*
1	1-3/8	5-1/4	1	3-1/4	.949	.120	34131*
1	1-3/8	6-1/4	1	4-1/4	.949	.030	34132*
1	1-3/8	6-1/4	1	4-1/4	.949	.060	34133*
1	1-3/8	6-1/4	1	4-1/4	.949	.090	34134*
1	1-3/8	6-1/4	1	4-1/4	.949	.120	34135*

*Variable Helix

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- Open fluting for deep slotting and profiling
- Recommended for materials ≤ 150 Bhn (≤ 7 HRC)

S-Carb APR



Series 43APR-3 Fractional		Ae x DC		Vc (sfm)		DC • inch	
						APR-3	
						0.75	1
N	ALUMINIUM ALLOYS 6068, 7075	Slot 	1	5250 (980-6900)	RPM	26740	20055
					Fz	0.0055	0.0059
					Feed (ipm)	441	355
		Profile 	≤ 0.5	5900 (980-6900)	RPM	30051	22538
					Fz	0.0063	0.0067
					Feed (ipm)	568	453
		HSM 	≤ 0.1	6900 (980-6900)	RPM	35144	26358
					Fz	0.0075	0.0079
					Feed (ipm)	791	625

Series 43APR-3L Fractional		Ae x DC		Vc (sfm)		DC • inch			
						APR-3 LONG			
						0.5	0.625	0.75	1
N	ALUMINIUM ALLOYS 6068, 7075	Slot 	1	3280 (980-6900)	RPM	25059	20047	16706	12530
					Fz	0.0039	0.0043	0.0047	0.0051
					Feed (ipm)	293	259	236	192
		Profile 	≤ 0.5	3950 (980-6900)	RPM	30178	24142	20119	15089
					Fz	0.0047	0.0051	0.0055	0.0059
					Feed (ipm)	426	369	332	267
		HSM 	≤ 0.1	4600 (980-6900)	RPM	35144	28115	23429	17572
					Fz	0.0055	0.0059	0.0063	0.0067
					Feed (ipm)	580	498	443	353

RPM stated may be outside of most machine tools in the smaller sizes, adjust the surface speed but maintain the Fz

For best results use the peak power of the specific machine torque chart.

Typically 10hp is required to remove 45 cubic inches of material (MRR).

Eg. >> (Ae x Ap x Feed) >> Therefore Full slotting 1" dia: 1 x 1 x 355 = 355 cubic inches, so it needs a min of 78hp.

Larger cuts and chip load consume more power.

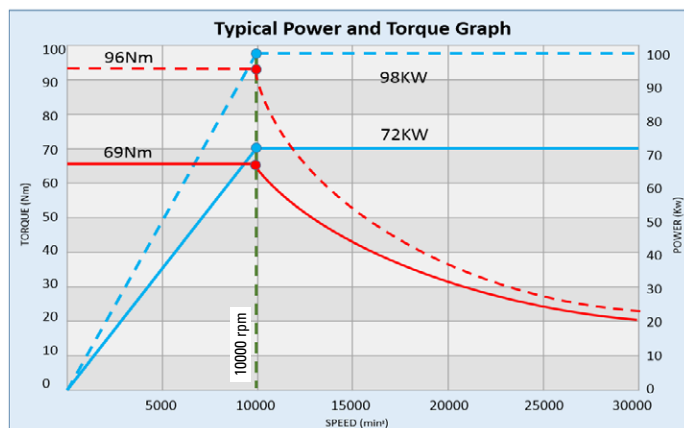
Review the power chart of each machine to determine MAX power for ultimate performance.

Example below shows peak power @ 10,000 rpm.

The new coolant supply is designed for MQL as well as normal emulsion coolant on the same data.

Ensure max MQL flow prior to cutting.

refer to the **KYOCERA SGS APEX** for complete technical information (www.kyocera-sgstool.com/apex)



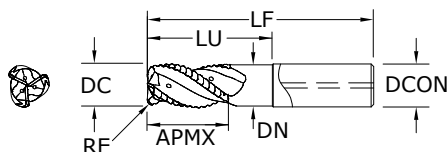
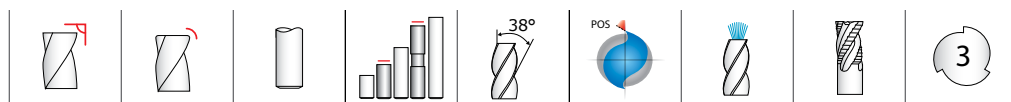


APR-3

ADVANCED PRODUCTIVITY ROUGHER

METRIC

S-Carb APR



43APR-3
METRIC SERIES

TOLERANCES (mm)

12-25 DIAMETER

DC = -0,010/-0,100

DCON = h₆

RE = +/-0,05

NON-FERROUS

mm							EDP NO.
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	REACH LU	NECK DIAMETER DN	CORNER RADIUS RE	Ti-NAMITE-B (TiB ₂)
12,0	26,0	83,0	12,0	39,0	11,40	1,0	44976
12,0	26,0	83,0	12,0	39,0	11,40	2,0	44977
12,0	26,0	83,0	12,0	39,0	11,40	3,0	44978
12,0	26,0	83,0	12,0	39,0	11,40	4,0	44979
12,0	26,0	95,0	12,0	—	—	—	44975
16,0	35,0	92,0	16,0	—	—	—	44980*
16,0	35,0	92,0	16,0	51,0	15,20	2,0	44981*
16,0	35,0	92,0	16,0	51,0	15,20	3,0	44982*
16,0	35,0	92,0	16,0	51,0	15,20	4,0	44983*
16,0	35,0	108,0	16,0	67,0	15,20	2,0	44985*
16,0	35,0	108,0	16,0	67,0	15,20	3,0	44986*
16,0	35,0	108,0	16,0	67,0	15,20	4,0	44987*
16,0	35,0	124,0	16,0	—	—	—	44984*
20,0	35,0	86,0	20,0	—	—	—	44990
20,0	35,0	86,0	20,0	45,0	19,00	3,0	44991
20,0	35,0	86,0	20,0	45,0	19,00	4,0	44992
20,0	35,0	106,0	20,0	—	—	—	44993*
20,0	35,0	106,0	20,0	65,0	19,00	2,0	44994*
20,0	35,0	106,0	20,0	65,0	19,00	3,0	44995*
20,0	35,0	106,0	20,0	65,0	19,00	4,0	44996*
20,0	35,0	106,0	20,0	65,0	19,00	5,0	44997*
20,0	35,0	145,0	20,0	—	—	—	45020*
20,0	35,0	125,0	20,0	84,0	19,00	2,0	45021*
20,0	35,0	125,0	20,0	84,0	19,00	3,0	45022*
20,0	35,0	125,0	20,0	84,0	19,00	4,0	45023*
25,0	43,0	108,0	25,0	—	—	—	44998
25,0	43,0	108,0	25,0	60,0	23,75	2,0	44999
25,0	43,0	108,0	25,0	60,0	23,75	3,0	45000
25,0	43,0	108,0	25,0	60,0	23,75	4,0	45001
25,0	35,0	140,0	25,0	—	—	—	45002*
25,0	35,0	140,0	25,0	80,0	23,75	3,0	45003*
25,0	35,0	140,0	25,0	90,0	23,75	3,0	45004*
25,0	35,0	151,0	25,0	105,0	23,75	3,0	45025*
25,0	35,0	176,0	25,0	—	—	—	45024*

*Variable Helix

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- Open fluting for deep slotting and profiling
- Recommended for materials ≤ 150 Bhn (≤ 7 HRC)

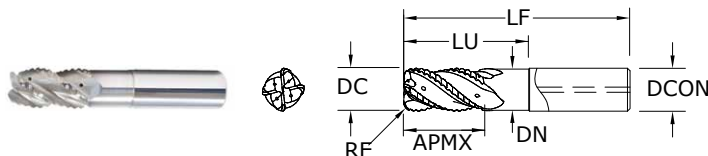
S-Carb APR

**APR-4**

ADVANCED PRODUCTIVITY ROUGHER

**43APR-4**

METRIC SERIES

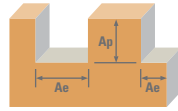


- Ultra high-productivity rougher for Aluminum alloys, specifically for aircraft components
- Designed for high material removal rates (MRR)
- 4 flute variable geometry with side exit coolant holes
- Open fluting for deep slotting and profiling
- Recommended for materials ≤ 150 Bhn (≤ 7 HRC)

mm							EDP NO.
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	REACH LU	NECK DIAMETER DN	CORNER RADIUS RE	Ti-NAMITE-B (TiB ₂)
20,0	35,0	86,0	20,0	—	—	—	45005
20,0	35,0	86,0	20,0	45,0	19,00	3,0	45006
20,0	35,0	86,0	20,0	45,0	19,00	4,0	45007
20,0	35,0	106,0	20,0	—	—	—	45008
20,0	35,0	106,0	20,0	65,0	19,00	2,0	45009
20,0	35,0	106,0	20,0	65,0	19,00	3,0	45010
20,0	35,0	106,0	20,0	65,0	19,00	4,0	45011
20,0	35,0	106,0	20,0	65,0	19,00	5,0	45012
25,0	43,0	108,0	25,0	—	—	—	45013
25,0	43,0	108,0	25,0	60,0	23,75	2,0	45014
25,0	43,0	108,0	25,0	60,0	23,75	3,0	45015
25,0	43,0	108,0	25,0	60,0	23,75	4,0	45016
25,0	35,0	140,0	25,0	—	—	—	45017
25,0	35,0	140,0	25,0	80,0	23,75	3,0	45018
25,0	35,0	140,0	25,0	90,0	23,75	3,0	45019

TOLERANCES (mm)**20–25 DIAMETER**DC = $-0,010/-0,100$ DCON = h_6 RE = $\pm 0,050$

NON-FERROUS



Series 43APR-3 43APR-4 Metric		Ae x DC		Ap x DC		Vc (m/min)		DC • mm			
								APR-3		APR-4	
								20	25	20	25
N	ALUMINIUM ALLOYS 6068, 7075		Slot	1	≤ 1	1600	RPM	25461	20369	25461	20369
						(300-2100)	Fz	0.14	0.15	0.12	0.13
							Feed (mm/min)	10694	9166	12222	10592
			Profile	≤ 0.5	≤ 1.5	1800	RPM	28644	22915	28644	22915
						(300-2100)	Fz	0.16	0.17	0.14	0.15
							Feed (mm/min)	13749	11687	16041	13749
			HSM	≤ 0.25	≤ 2	2100	RPM	33418	26735	33418	26735
						(300-2100)	Fz	0.19	0.20	0.16	0.17
							Feed (mm/min)	19048	16041	21388	18180

Series 43APR-3 43APR-4 Metric		DC • mm								
		Ae x DC	Ap x DC	Vc (m/min)	APR-3 LONG					
					12	16	20	25		
N	ALUMINIUM ALLOYS 6068, 7075		1	≤ 1	1600	RPM	26522	19892	15913	12731
					(300-2100)	Fz	0.10	0.11	0.12	0.13
						Feed (mm/min)	7957	6564	5729	4965
			≤ 0.5	≤ 1.5	1800	RPM	31827	23870	19096	15277
					(300-2100)	Fz	0.12	0.13	0.14	0.15
						Feed (mm/min)	11458	9309	8020	6875
			≤ 0.25	≤ 2	2100	RPM	37131	27849	22279	17823
					(300-2100)	Fz	0.14	0.15	0.16	0.17
						Feed (mm/min)	15595	12532	10694	9090

RPM stated may be outside of most machine tools in the smaller sizes, adjust the surface speed but maintain the Fz

For best results use the peak power of the specific machine torque chart.

Typically 10kw is required to remove 1 litre of material (MMR).

Eg. >> (Ae x Ap x Feed) / 1000000 >> Therefore Full slotting Ø25: 25 x 25 x 7333 = 4.58 Litres so it needs a min of 46Kw.

Larger cuts and chip load consume more power.

Review the power chart of each machine to determine MAX power for ultimate performance.

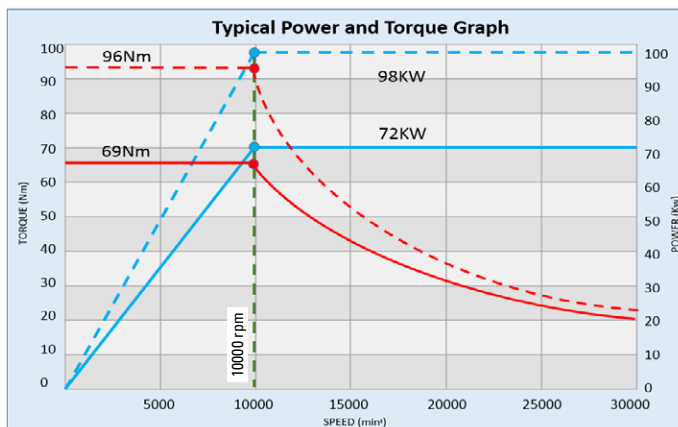
Example below shows peak power @ 10,000 rpm.

The APR-4 design is for ultimate metal removal but typically requires more power, and is also better suited to horizontal machines.

The new coolant supply is designed for MQL as well as normal emulsion coolant on the same data.

Ensure max MQL flow prior to cutting.

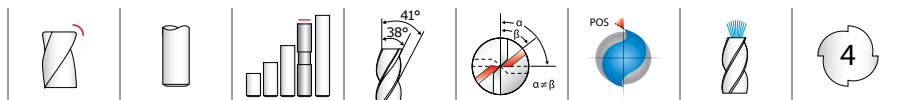
refer to the **KYOCERA SGS APEX** for complete technical information (www.kyocera-sgstool.com/apex)





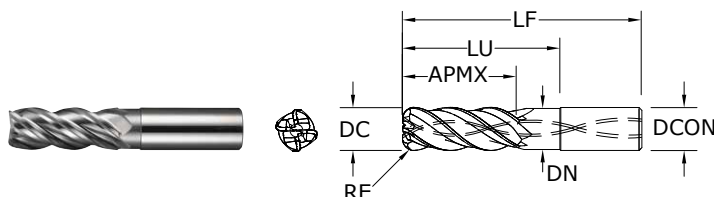
APF

ADVANCED PRODUCTIVITY FINISHER



43APF

FRACTIONAL SERIES



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

CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	inch				EDP NO.
			SHANK DIAMETER DCON	REACH LU	NECK DIAMETER DN	CORNER RADIUS RE	
1/2	1-1/4	3-1/4	1/2	1-5/8	.478	.030	34016
1/2	1-1/4	3-1/4	1/2	1-5/8	.478	.060	34017
1/2	1-1/4	3-1/4	1/2	1-5/8	.478	.090	34018
1/2	1-1/4	3-1/4	1/2	1-5/8	.478	.120	34019
1/2	2	4	1/2	2-3/8	.478	.030	34020
1/2	2	4	1/2	2-3/8	.478	.060	34021
1/2	2	4	1/2	2-3/8	.478	.090	34022
1/2	2	4	1/2	2-3/8	.478	.120	34023
3/4	1-7/8	4-1/4	3/4	2-3/8	.728	.030	34024
3/4	1-7/8	4-1/4	3/4	2-3/8	.728	.060	34025
3/4	1-7/8	4-1/4	3/4	2-3/8	.728	.090	34026
3/4	1-7/8	4-1/4	3/4	2-3/8	.728	.120	34027
3/4	3	5-3/8	3/4	3-1/2	.728	.030	34028
3/4	3	5-3/8	3/4	3-1/2	.728	.060	34029
3/4	3	5-3/8	3/4	3-1/2	.728	.090	34030
3/4	3	5-3/8	3/4	3-1/2	.728	.120	34031

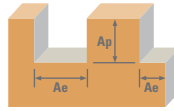
Available on request: • JetStream Technology

TOLERANCES (inch)

1/2-3/4 DIAMETER

DC = $-0.0004/-0.0020$ DCON = h_6 RE = $+0.0012/-0.0012$

NON-FERROUS



Series 43APF Fractional	Hardness		Ae x DC	Ap x DC	Vc (sfm)	DC • in	
						1/2	3/4
N	ALUMINUM ALLOYS 2024, 5052, 5086, 6061, 6063, 7075	Profile 	≤ 0.1	≤ 2.5	2625	RPM	20055
					(2100-3150)	Fz	0.0030
						Feed (in/min)	241
		Profile 	≤ 0.1	≤ 4	2625	RPM	20055
					(2100-3150)	Fz	0.0020
						Feed (in/min)	160
	ALUMINUM ALLOYS (LITHIUM)* 2090, 2091, 2099, 2195, 2199, 2297, 8090	Profile 	≤ 0.1	≤ 2.5	1970	RPM	15051
					(1576-2364)	Fz	0.0030
						Feed (in/min)	181
		Profile 	≤ 0.1	≤ 4	1970	RPM	15051
					(1576-2364)	Fz	0.0020
						Feed (in/min)	120

Bhn (Brinell) HRb (Rockwell B)

surface speed is dependent on machine spindle and fixturing

balancing is recommended at ultra high surface speeds

tool life may be reduced when machining Lithium Alloys

$rpm = Vc \times 3.82 / DC$

$ipm = Fz \times 4 \times rpm$

maximum recommended depths shown

reduce speed and feed for materials harder than listed

finish cuts typically require reduced feed and cutting depths of 0.02 X DC maximum

ramp angle = 6° (feed rate = 50%)

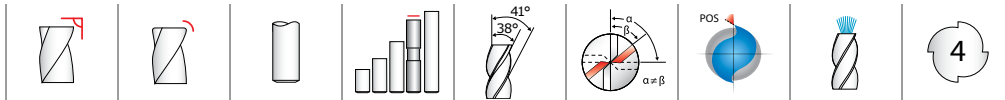
plunging not recommended

refer to the **KYOCERA SGS APEX** for complete technical information (www.kyocera-sgstool.com/apex)



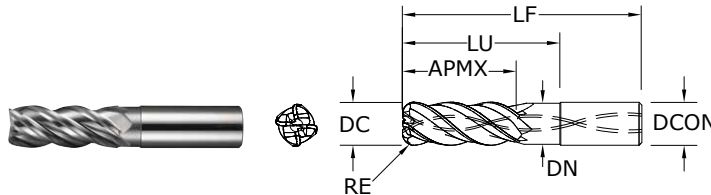
APF

ADVANCED PRODUCTIVITY FINISHER



43MAPF

METRIC SERIES



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

mm							EDP NO.
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	REACH LU	NECK DIAMETER DN	CORNER RADIUS RE	Ti-NAMITE-B (TiB ₂)
6,0	24,0	66,0	6,0	30,0	5,70	—	44627
8,0	32,0	78,0	8,0	40,0	7,60	—	44628
10,0	40,0	90,0	10,0	50,0	9,50	—	44629
12,0	30,0	83,0	12,0	40,0	11,40	—	44630
12,0	30,0	83,0	12,0	40,0	11,40	2,0	44745
12,0	30,0	83,0	12,0	40,0	11,40	3,0	44746
12,0	30,0	83,0	12,0	40,0	11,40	4,0	44747
12,0	30,0	83,0	12,0	50,0	11,40	0,5	44641
12,0	30,0	83,0	12,0	50,0	11,40	5,0	44642
12,0	48,0	100,0	12,0	62,0	11,40	—	44631
12,0	48,0	100,0	12,0	62,0	11,40	2,0	44748
12,0	48,0	100,0	12,0	62,0	11,40	3,0	44749
12,0	48,0	100,0	12,0	62,0	11,40	4,0	44750
16,0	40,0	92,0	16,0	51,0	15,20	—	44634
16,0	40,0	92,0	16,0	51,0	15,20	2,0	44751
16,0	40,0	92,0	16,0	51,0	15,20	3,0	44752
16,0	40,0	92,0	16,0	51,0	15,20	4,0	44753
16,0	42,0	93,0	16,0	51,0	15,20	5,0	44643
16,0	64,0	125,0	16,0	82,0	15,20	—	44635
16,0	64,0	125,0	16,0	82,0	15,20	2,0	44754
16,0	64,0	125,0	16,0	82,0	15,20	3,0	44755
16,0	64,0	125,0	16,0	82,0	15,20	4,0	44756
20,0	50,0	108,0	20,0	63,0	19,00	—	44636
20,0	50,0	108,0	20,0	63,0	19,00	3,0	44757
20,0	50,0	108,0	20,0	63,0	19,00	4,0	44758
20,0	50,0	108,0	20,0	63,0	19,00	5,0	44759
20,0	80,0	150,0	20,0	102,0	19,00	—	44637
20,0	80,0	150,0	20,0	102,0	19,00	3,0	44760
20,0	80,0	150,0	20,0	102,0	19,00	4,0	44761
20,0	80,0	150,0	20,0	102,0	19,00	5,0	44762
25,0	63,0	130,0	25,0	79,0	23,75	—	44638
25,0	63,0	130,0	25,0	79,0	23,75	3,0	44763
25,0	63,0	130,0	25,0	79,0	23,75	4,0	44764
25,0	63,0	130,0	25,0	79,0	23,75	5,0	44765
25,0	100,0	175,0	25,0	120,0	23,75	—	44639
25,0	100,0	175,0	25,0	120,0	23,75	3,0	44766
25,0	100,0	175,0	25,0	120,0	23,75	4,0	44767
25,0	100,0	175,0	25,0	120,0	23,75	5,0	44768

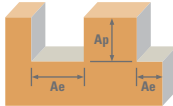
Available on request: • JetStream Technology

TOLERANCES (mm)

6–25 DIAMETER

DC = $-0,010/-0,050$ DCON = h_6 RE = $+0,03/-0,03$

NON-FERROUS

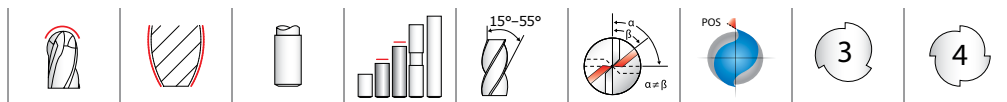
Series 43MAPF Metric		Hardness			Vc (m/min)	DC • mm								
			Ae x DC	Ap x DC		6	8	10	12	16	20	25		
N	ALUMINUM ALLOYS 2024, 5052, 5086, 6061, 6063, 7075	≤ 150 Bhn or ≤ 88 HRb	Profile	≤ 0.1	≤ 2.5	800	RPM	42440	31830	25464	21220	15915	12732	10186
						(640-960)	Fz	0.050	0.055	0.060	0.070	0.100	0.140	0.170
						Feed (mm/min)	8488	7003	6111	5942	6366	7130	6926	
		≤ 150 Bhn or ≤ 88 HRb	Profile	≤ 0.1	≤ 4	800	RPM	42440	31830	25464	21220	15915	12732	10186
						(640-960)	Fz	0.040	0.045	0.050	0.050	0.070	0.100	0.120
						Feed (mm/min)	6790	5729	5093	4244	4456	5093	4889	
	ALUMINUM ALLOYS (LITHIUM)* 2090, 2091, 2099, 2195, 2199, 2297, 8090	≤ 150 Bhn or ≤ 88 HRb	Profile	≤ 0.1	≤ 2.5	600	RPM	31830	23873	19098	15915	11936	9549	7639
						(480-720)	Fz	0.050	0.055	0.060	0.070	0.100	0.140	0.170
						Feed (mm/min)	6366	5252	4584	4456	4774	5347	5195	
		≤ 150 Bhn or ≤ 88 HRb	Profile	≤ 0.1	≤ 4	600	RPM	31830	23873	19098	15915	11936	9549	7639
						(480-720)	Fz	0.040	0.045	0.050	0.050	0.070	0.100	0.120
						Feed (mm/min)	5093	4297	3820	3183	3342	3820	3667	

Bhn (Brinell) HRb (Rockwell B)
 surface speed is dependent on machine spindle and fixturing
 balancing is recommended at ultra high surface speeds
 *tool life may be reduced when machining Lithium Alloys
 $\text{rpm} = (\text{Vc} \times 1000) / (\text{DC} \times 3.14)$
 $\text{mm/min} = \text{Fz} \times 4 \times \text{rpm}$
 maximum recommended depths shown
 reduce speed and feed for materials harder than listed
 finish cuts typically require reduced feed and cutting depths of 0.02 X DC maximum
 ramp angle = 6° (feed rate = 50%)
 plunging not recommended
 refer to the **KYOCERA SGS APEX** for complete technical information (www.kyocera-sgstool.com/apex)

S-Carb APF-B

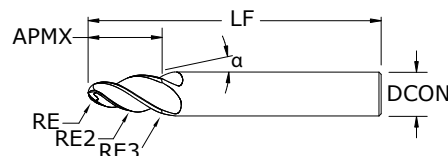


APF-B



43APF-B

METRIC SERIES



- Designed to significantly improve traditional ball end applications
- Highly efficient at finishing and semi-finishing profiling
- Main application areas include profiling and pocket milling
- Especially suited to machining deep pockets and hard-to-reach areas without using long-reach tools
- Their versatility also allows for machining profiles and blends with one tool
- Recommended for materials ≤ 150 Bhn (≤ 7 HRC)

SHANK DIAMETER DCON	LENGTH OF CUT APMX	OVERALL LENGTH LF	mm				NO. OF FLUTES	EDP NO. Ti-NAMITE-B (TiB ₂)
			CENTERLINE ANGLE α	TIP RADIUS RE	TAPERED RADIUS RE2	BLENDED RADIUS RE3		
6,0	9,5	58,0	17.5°	1,0	250,0	3,0	3	45718
6,0	8,0	58,0	17.5°	1,5	250,0	3,0	3	45719
8,0	10,5	80,0	20°	1,5	250,0	4,0	3	45720
8,0	9,5	80,0	20°	2,0	250,0	4,0	3	45721
10,0	12,5	89,0	20°	2,0	250,0	5,0	3	45722
10,0	11,5	89,0	20°	2,5	250,0	5,0	3	45723
12,0	13,5	100,0	20°	3,0	250,0	6,0	4	45724
12,0	14,4	100,0	20°	2,5	250,0	6,0	4	45725
12,0	20,0	100,0	14°	2,0	60,0	6,0	4	45726
16,0	31,0	109,0	12.5°	2,0	1000,0	5,0	4	45727
16,0	27,5	109,0	12.5°	3,0	1000,0	5,0	4	45728
16,0	24,0	109,0	12.5°	4,0	1000,0	5,0	4	45729
16,0	21,0	109,0	15°	4,0	1000,0	5,0	4	45730
16,0	18,5	109,0	20°	4,0	1500,0	8,0	4	45731
16,0	28,5	109,0	10°	4,0	1000,0	5,0	4	45732
16,0	19,0	109,0	20°	3,0	750,0	5,0	4	45733
16,0	15,0	109,0	30°	2,0	750,0	3,0	4	45734
16,0	18,5	109,0	20°	3,0	60,0	5,0	4	45735

TOLERANCES (mm)

DCON = h_6 RE = $-0,010/-0,010$

NON-FERROUS

			DCON	6		8		10		12		16	
			Ae max	0,20	0,45	0,25	0,55	0,30	0,60	0,35	0,65	0,40	0,70
			Diameter	3,0	6,0	4,0	8,0	5,0	10,0	6,0	12,0	8,0	16,0
													
Metric	Hardness (HRb)	Vc (m/min)	Cut Zone	RE	RE2	RE	RE2	RE	RE2	RE	RE2	RE	RE2
N Aluminum	≤88	510	RPM	54111	27056	40583	20292	32467	16233	27056	13528	20292	10146
		(388-632)	Fz	0,017	0,040	0,021	0,050	0,025	0,060	0,033	0,080	0,042	0,100
			Feed (mm/min)	2706	3247	2536	3044	2435	2922	3607	4329	3382	4058
	≥88	330	RPM	35013	17507	26260	13130	21008	10504	17507	8753	13130	6565
		(284-376)	Fz	0,013	0,030	0,017	0,040	0,021	0,050	0,025	0,060	0,033	0,080
			Feed (mm/min)	1313	1576	1313	1576	1313	1576	1751	2101	1751	2101

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

Feed= Fz x No. of flutes x rpm

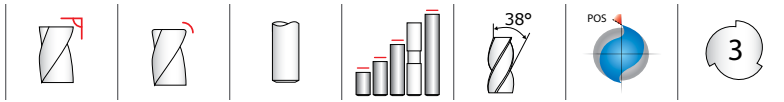
Adjust speed and feed cutting

Adjust rates according to cutting area of tool being used

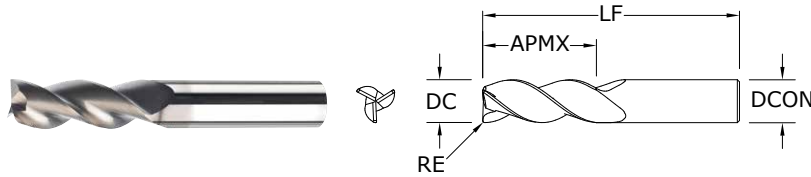
Avoid using tip of the tool where possible due to reduced chip space

Be aware of max cut Ae, especially on the lower portion of the tool

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)



43 •
43CR
FRACTIONAL SERIES



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

CUTTING DIAMETER DC	LENGTH OF CUT APMX	inch			EDP NO.	
		OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	UNCOATED	Ti-NAMITE-B (TiB ₂)
1/8	3/8	1-1/2	1/8	—	34701	34728
1/8	3/8	1-1/2	1/8	.010	34771	34793
3/16	5/16	2-1/2	3/16	—	34822	34857
3/16	9/16	2	3/16	—	34702	34729
3/16	9/16	2	3/16	.010	34772	34794
3/16	3/4	2-1/2	3/16	—	34823	34858
1/4	3/8	2	1/4	—	34703	34730
1/4	3/8	2-1/2	1/4	.010	35575	35665
1/4	3/8	2-1/2	1/4	.015	35576	35666
1/4	3/8	2-1/2	1/4	.030	35577	35667
1/4	3/8	2-1/2	1/4	.060	35578	35668
1/4	1/2	2-1/2	1/4	—	34824	34859
1/4	3/4	2-1/2	1/4	—	34704	34731
1/4	3/4	2-1/2	1/4	.010	34773	34795
1/4	3/4	2-1/2	1/4	.015	35579	35669
1/4	3/4	2-1/2	1/4	.030	34774	34796
1/4	3/4	2-1/2	1/4	.060	35580	35670
1/4	1	3	1/4	—	34825	34860
1/4	1	3	1/4	.010	35581	35671
1/4	1	3	1/4	.015	35582	35672
1/4	1	3	1/4	.030	35583	35673
1/4	1	3	1/4	.060	35584	35674
1/4	1-1/4	3-1/2	1/4	—	34705	34732
1/4	1-3/4	4	1/4	—	34826	34861
5/16	7/16	2	5/16	—	34706	34733
5/16	5/8	2-1/2	5/16	—	34707	34734
5/16	5/8	2-1/2	5/16	.030	34775	34797
5/16	1-1/4	4	5/16	—	34708	34735
3/8	1/2	2	3/8	—	34709	34736
3/8	1/2	3	3/8	.010	35585	35675
3/8	1/2	3	3/8	.015	35586	35676
3/8	1/2	3	3/8	.030	35587	35677
3/8	1/2	3	3/8	.060	35588	35678
3/8	1/2	3	3/8	.090	35589	35679
3/8	1	2-1/2	3/8	—	34710	34737
3/8	1	2-1/2	3/8	.010	34776	34798

TOLERANCES (inch)

1/8–3/16 DIAMETER

DC = +0.0000/–0.00032

DCON = h₆

RE = +0.0000/–0.0020

1/4–3/8 DIAMETER

DC = +0.0000/–0.00035

DCON = h₆

RE = +0.0000/–0.0020

1/2–5/8 DIAMETER

DC = +0.0000/–0.00043

DCON = h₆

RE = +0.0000/–0.0020

3/4–1 DIAMETER

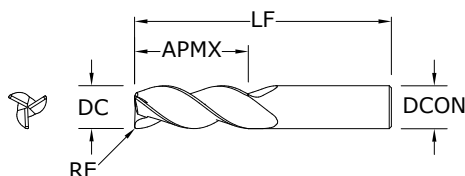
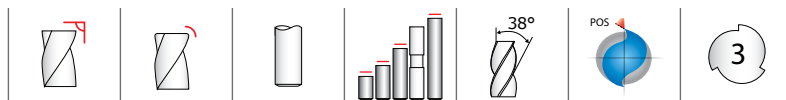
DC = +0.0000/–0.00051

DCON = h₆

RE = +0.0000/–0.0020

NON-FERROUS

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43 •
43CR
FRACTIONAL SERIES

CONTINUED

TOLERANCES (inch)

1/8–3/16 DIAMETER

DC = +0.0000/–0.00032

DCON = h_6

RE = +0.0000/–0.0020

1/4–3/8 DIAMETER

DC = +0.0000/–0.00035

DCON = h_6

RE = +0.0000/–0.0020

1/2–5/8 DIAMETER

DC = +0.0000/–0.00043

DCON = h_6

RE = +0.0000/–0.0020

3/4–1 DIAMETER

DC = +0.0000/–0.00051

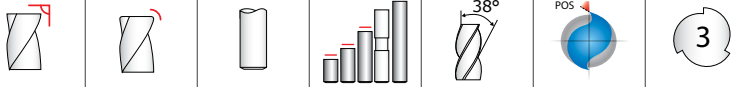
DCON = h_6

RE = +0.0000/–0.0020

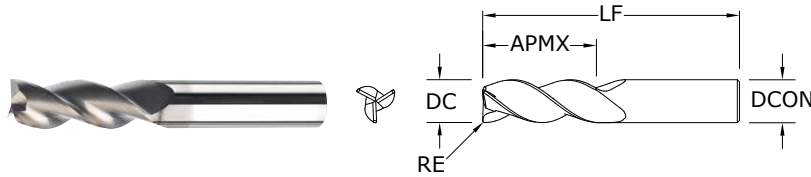
NON-FERROUS

CUTTING DIAMETER DC	LENGTH OF CUT APMX	inch			EDP NO.	
		OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	UNCOATED	TI-NAMITE-B (TiB ₂)
3/8	1	2-1/2	3/8	.030	34777	34799
3/8	1	2-1/2	3/8	.060	32761	32825
3/8	1	3	3/8	.015	35590	35680
3/8	1	3	3/8	.090	35591	35681
3/8	1-1/4	3-1/2	3/8	—	34827	34862
3/8	1-1/2	3-1/2	3/8	—	34711	34738
3/8	1-1/2	4	3/8	.010	35592	35682
3/8	1-1/2	4	3/8	.015	35593	35683
3/8	1-1/2	4	3/8	.030	35594	35684
3/8	1-1/2	4	3/8	.060	35595	35685
3/8	1-1/2	4	3/8	.090	35596	35686
3/8	2	4	3/8	—	34828	34863
1/2	5/8	2-1/2	1/2	—	34712	34739
1/2	5/8	3	1/2	.010	35597	35687
1/2	5/8	3	1/2	.015	35598	35688
1/2	5/8	3	1/2	.030	35599	35689
1/2	5/8	3	1/2	.060	35600	35690
1/2	5/8	3	1/2	.090	35601	35691
1/2	5/8	3	1/2	.120	35602	35692
1/2	1	3	1/2	—	34830	34865
1/2	1	3	1/2	.010	35603	35693
1/2	1	3	1/2	.015	35604	35694
1/2	1	3	1/2	.030	35605	35695
1/2	1	3	1/2	.060	35606	35696
1/2	1	3	1/2	.090	35607	35697
1/2	1	3	1/2	.120	35608	35698
1/2	1-1/4	3	1/2	.015	35609	35699
1/2	1-1/4	3-1/4	1/2	—	34713	34740
1/2	1-1/4	3-1/4	1/2	.010	34778	34800
1/2	1-1/4	3-1/4	1/2	.030	34779	34801
1/2	1-1/4	3-1/4	1/2	.060	34780	34802
1/2	1-1/4	3-1/4	1/2	.090	34781	34803
1/2	1-1/4	3-1/4	1/2	.120	32766	32830
1/2	1-5/8	4	1/2	—	34831	34866
1/2	1-5/8	4	1/2	.010	35610	35700
1/2	1-5/8	4	1/2	.015	35611	35701

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**43 •
43CR**
FRACTIONAL SERIES



CONTINUED

CUTTING DIAMETER DC	LENGTH OF CUT APMX	inch			EDP NO.	
		OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	UNCOATED	Ti-NAMITE-B (TiB ₂)
1/2	1-5/8	4	1/2	.030	35612	35702
1/2	1-5/8	4	1/2	.060	35613	35703
1/2	1-5/8	4	1/2	.090	35614	35704
1/2	1-5/8	4	1/2	.120	35615	35705
1/2	2	4	1/2	—	34714	34741
1/2	2	4	1/2	.010	35616	35706
1/2	2	4	1/2	.015	35617	35707
1/2	2	4	1/2	.030	35618	35708
1/2	2	4	1/2	.060	35619	35709
1/2	2	4	1/2	.090	35620	35710
1/2	2	4	1/2	.120	35621	35711
1/2	2-1/2	5	1/2	—	34832	34867
1/2	3-1/8	6	1/2	—	34715	34742
5/8	3/4	3	5/8	—	34716	34743
5/8	3/4	3-1/2	5/8	.030	35622	35712
5/8	3/4	3-1/2	5/8	.060	35623	35713
5/8	3/4	3-1/2	5/8	.090	35624	35714
5/8	3/4	3-1/2	5/8	.120	35625	35715
5/8	1-5/8	3-3/4	5/8	—	34717	34744
5/8	1-5/8	3-3/4	5/8	.030	34782	34804
5/8	1-5/8	3-3/4	5/8	.060	34783	34805
5/8	1-5/8	3-3/4	5/8	.090	34784	34806
5/8	1-5/8	3-3/4	5/8	.120	35626	35716
5/8	2-1/8	4	5/8	—	34833	34868
5/8	2-1/2	5	5/8	—	34718	34745
5/8	3-1/4	6	5/8	—	34834	34869
5/8	3-3/4	6	5/8	—	34719	34746
3/4	1	3	3/4	—	34720	34747
3/4	1	4	3/4	.030	35627	35717
3/4	1	4	3/4	.060	35628	35718
3/4	1	4	3/4	.090	35629	35719
3/4	1	4	3/4	.120	35630	35720
3/4	1	4	3/4	.190	35631	35721
3/4	1	4	3/4	.250	35632	35722
3/4	1-5/8	4	3/4	—	34721	34748
3/4	1-5/8	4	3/4	.030	34785	34807

continued on next page

TOLERANCES (inch)

1/8–3/16 DIAMETER

DC = +0.0000/–0.00032

DCON = h₆

RE = +0.0000/–0.0020

1/4–3/8 DIAMETER

DC = +0.0000/–0.00035

DCON = h₆

RE = +0.0000/–0.0020

1/2–5/8 DIAMETER

DC = +0.0000/–0.00043

DCON = h₆

RE = +0.0000/–0.0020

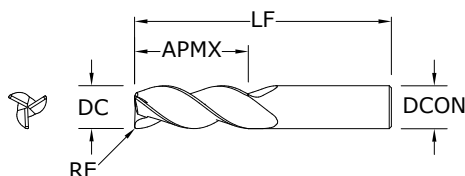
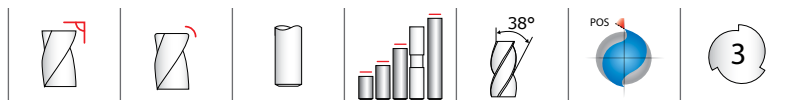
3/4–1 DIAMETER

DC = +0.0000/–0.00051

DCON = h₆

RE = +0.0000/–0.0020

NON-FERROUS



43 •
43CR
FRACTIONAL SERIES

CONTINUED

TOLERANCES (inch)

1/8–3/16 DIAMETER

DC = +0.0000/–0.00032

DCON = h₆

RE = +0.0000/–0.0020

1/4–3/8 DIAMETER

DC = +0.0000/–0.00035

DCON = h₆

RE = +0.0000/–0.0020

1/2–5/8 DIAMETER

DC = +0.0000/–0.00043

DCON = h₆

RE = +0.0000/–0.0020

3/4–1 DIAMETER

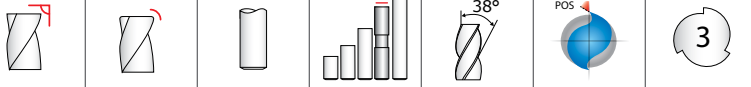
DC = +0.0000/–0.00051

DCON = h₆

RE = +0.0000/–0.0020

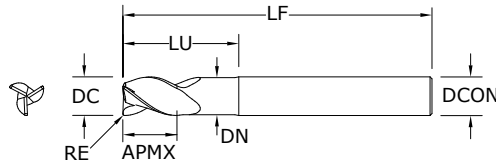
NON-FERROUS

CUTTING DIAMETER DC	LENGTH OF CUT APMX	inch			EDP NO.	
		OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	UNCOATED	Ti-NAMITE-B (TiB ₂)
3/4	1-5/8	4	3/4	.060	34786	34808
3/4	1-5/8	4	3/4	.090	34787	34809
3/4	1-5/8	4	3/4	.120	34815	34817
3/4	1-5/8	4	3/4	.190	35633	35723
3/4	1-5/8	4	3/4	.250	35634	35724
3/4	2-1/4	5	3/4	—	34722	34749
3/4	2-1/4	5	3/4	.030	35635	35725
3/4	2-1/4	5	3/4	.060	35636	35726
3/4	2-1/4	5	3/4	.090	35637	35727
3/4	2-1/4	5	3/4	.120	35638	35728
3/4	2-1/4	5	3/4	.190	35639	35729
3/4	2-1/4	5	3/4	.250	35640	35730
3/4	2-1/2	5	3/4	—	34758	34765
3/4	3-1/4	6	3/4	—	34723	34750
1	1-1/4	4	1	—	34724	34751
1	1-1/4	5	1	.030	35641	35731
1	1-1/4	5	1	.060	35642	35732
1	1-1/4	5	1	.090	35643	35733
1	1-1/4	5	1	.120	35644	35734
1	1-1/4	5	1	.190	35645	35735
1	1-1/4	5	1	.250	35646	35736
1	2	4-1/2	1	—	34725	34752
1	2	4-1/2	1	.030	34789	34811
1	2	4-1/2	1	.060	34790	34812
1	2	4-1/2	1	.090	34791	34813
1	2	4-1/2	1	.120	34816	34818
1	2	5	1	.190	35647	35737
1	2	5	1	.250	35648	35738
1	2-5/8	6	1	—	34726	34753
1	3-1/4	6	1	—	34727	34754
1	3-1/4	6	1	.030	35649	35739
1	3-1/4	6	1	.060	35650	35740
1	3-1/4	6	1	.090	35651	35741
1	3-1/4	6	1	.120	35652	35742
1	3-1/4	6	1	.190	35653	35743
1	3-1/4	6	1	.250	35654	35744
1	4-1/8	7	1	—	34835	34870



43L • 43LC

FRACTIONAL SERIES



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

CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	inch				EDP NO.	
			SHANK DIAMETER DCON	REACH LU	NECK DIAMETER DN	CORNER RADIUS RE	UNCOATED	Ti-NAMITE-B (TiB ₂)
1/8	5/32	3	1/8	1/2	.105	—	32700	32725
1/8	5/32	3	1/8	1/2	.105	.010	32751	32815
1/8	5/32	3	1/8	3/4	.105	—	32691	34888
3/16	7/32	3	3/16	1/2	.167	—	32701	32726
3/16	7/32	3	3/16	1/2	.167	.010	32752	32816
3/16	7/32	3	3/16	3/4	.167	—	32692	34889
1/4	3/8	2-1/2	1/4	3/4	.230	.015	35787	36235
1/4	3/8	2-1/2	1/4	3/4	.230	.060	35788	36236
1/4	3/8	4	1/4	3/4	.230	—	32702	32727
1/4	3/8	4	1/4	3/4	.230	.010	32753	32817
1/4	3/8	4	1/4	3/4	.230	.030	32754	32818
1/4	3/8	4	1/4	1-1/2	.230	—	32703	32728
1/4	3/8	4	1/4	1-1/2	.230	.010	32755	32819
1/4	3/8	4	1/4	1-1/2	.230	.030	32756	32820
1/4	3/8	4	1/4	2-1/8	.230	—	32704	32729
1/4	3/8	4	1/4	2-1/8	.230	.010	32757	32821
1/4	3/8	4	1/4	2-1/8	.230	.030	32758	32822
5/16	7/16	4	5/16	1-1/8	.292	—	32705	32730
5/16	7/16	4	5/16	1-1/8	.292	.030	32759	32823
5/16	7/16	4	5/16	2-1/8	.292	—	32706	32731
5/16	7/16	4	5/16	2-1/8	.292	.030	32760	32824
3/8	1/2	3	3/8	1-1/8	.355	.015	35791	36239
3/8	1/2	3	3/8	1-1/8	.355	.090	35792	36240
3/8	1/2	4	3/8	1-1/8	.355	—	32707	32732
3/8	1/2	4	3/8	1-1/8	.355	.030	32762	32826
3/8	1/2	4	3/8	1-1/8	.355	.060	32763	32827
3/8	1/2	4	3/8	2-1/8	.355	—	32708	32733
3/8	1/2	4	3/8	2-1/8	.355	.030	32764	32828
3/8	1/2	4	3/8	2-1/8	.355	.060	32765	32829
1/2	5/8	3	1/2	1-3/8	.480	.015	35795	36243
1/2	5/8	4	1/2	1-3/8	.480	—	32709	32734
1/2	5/8	4	1/2	1-3/8	.480	.030	32767	32831
1/2	5/8	4	1/2	1-3/8	.480	.060	32768	32832
1/2	5/8	4	1/2	1-3/8	.480	.090	32769	32833
1/2	5/8	4	1/2	1-3/8	.480	.120	32770	32834
1/2	5/8	4	1/2	2-1/4	.480	.015	35796	36244

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TOLERANCES (inch)

1/8–3/16 DIAMETER

DC = +0.0000/–0.00032

DCON = h₆

RE = +0.0000/–0.0020

1/4–3/8 DIAMETER

DC = +0.0000/–0.00035

DCON = h₆

RE = +0.0000/–0.0020

1/2–5/8 DIAMETER

DC = +0.0000/–0.00043

DCON = h₆

RE = +0.0000/–0.0020

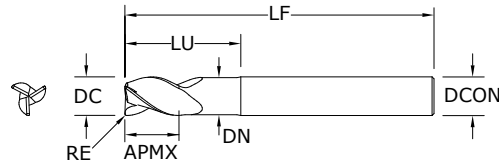
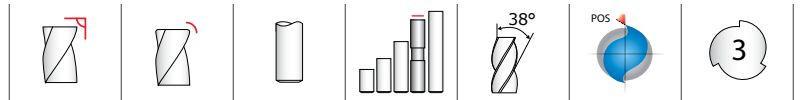
3/4–1 DIAMETER

DC = +0.0000/–0.00051

DCON = h₆

RE = +0.0000/–0.0020

NON-FERROUS



43L •
43LC
FRACTIONAL SERIES

TOLERANCES (inch)

1/8–3/16 DIAMETER

DC = +0.0000/–0.00032

DCON = h_6

RE = +0.0000/–0.0020

1/4–3/8 DIAMETER

DC = +0.0000/–0.00035

DCON = h_6

RE = +0.0000/–0.0020

1/2–5/8 DIAMETER

DC = +0.0000/–0.00043

DCON = h_6

RE = +0.0000/–0.0020

3/4–1 DIAMETER

DC = +0.0000/–0.00051

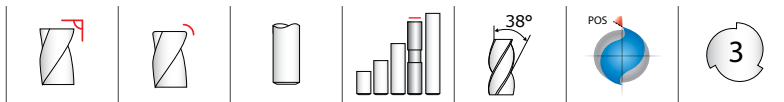
DCON = h_6

RE = +0.0000/–0.0020

NON-FERROUS

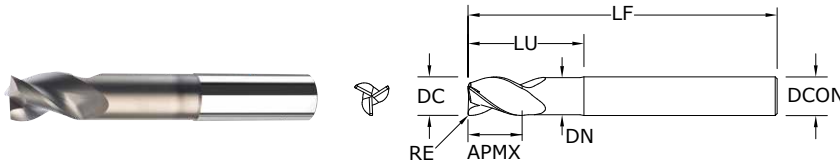
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	inch				CORNER RADIUS RE	EDP NO.	
			SHANK DIAMETER DCON	REACH LU	NECK DIAMETER DN			UNCOATED	Ti-NAMITE-B (TiB ₂)
1/2	5/8	6	1/2	2-1/8	.480	—	—	32710	32735
1/2	5/8	6	1/2	2-1/8	.480	.030	.030	32771	32835
1/2	5/8	6	1/2	2-1/8	.480	.060	.060	32772	32836
1/2	5/8	6	1/2	2-1/8	.480	.090	.090	32773	32837
1/2	5/8	6	1/2	2-1/8	.480	.120	.120	32774	32838
1/2	5/8	6	1/2	3-3/8	.480	—	—	32711	32736
1/2	5/8	6	1/2	3-3/8	.480	.030	.030	32775	32839
1/2	5/8	6	1/2	3-3/8	.480	.060	.060	32776	32840
1/2	5/8	6	1/2	3-3/8	.480	.090	.090	32777	32841
1/2	5/8	6	1/2	3-3/8	.480	.120	.120	32778	32842
1/2	5/8	6	1/2	4-1/4	.480	—	—	32697	34894
5/8	3/4	4	5/8	1-3/4	.605	—	—	32712	32737
5/8	3/4	4	5/8	1-3/4	.605	.030	.030	32779	32843
5/8	3/4	4	5/8	1-3/4	.605	.060	.060	32780	32844
5/8	3/4	4	5/8	1-3/4	.605	.090	.090	32781	32845
5/8	3/4	4	5/8	1-3/4	.605	.120	.120	32782	32846
5/8	3/4	4	5/8	2-3/8	.605	—	—	32713	32738
5/8	3/4	4	5/8	2-3/8	.605	.030	.030	32783	32847
5/8	3/4	4	5/8	2-3/8	.605	.060	.060	32784	32848
5/8	3/4	4	5/8	2-3/8	.605	.090	.090	32785	32849
5/8	3/4	4	5/8	2-3/8	.605	.120	.120	32786	32850
5/8	3/4	6	5/8	3-3/8	.605	—	—	32714	32739
5/8	3/4	6	5/8	3-3/8	.605	.030	.030	32787	32851
5/8	3/4	6	5/8	3-3/8	.605	.060	.060	32788	32852
5/8	3/4	6	5/8	3-3/8	.605	.090	.090	32789	32853
5/8	3/4	6	5/8	3-3/8	.605	.120	.120	32790	32854
5/8	3/4	6	5/8	4-3/8	.605	—	—	32698	34895
3/4	1	4	3/4	1-3/4	.730	—	—	32715	32740
3/4	1	4	3/4	1-3/4	.730	.030	.030	32791	32855
3/4	1	4	3/4	1-3/4	.730	.060	.060	32792	32856
3/4	1	4	3/4	1-3/4	.730	.090	.090	32793	32857
3/4	1	4	3/4	1-3/4	.730	.120	.120	32794	32858
3/4	1	4	3/4	2	.730	.190	.190	35803	36251
3/4	1	4	3/4	2	.730	.250	.250	35804	36252
3/4	1	6	3/4	2-3/8	.730	—	—	32716	32741
3/4	1	6	3/4	2-3/8	.730	.030	.030	32795	32859

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43L • 43LC

FRACTIONAL SERIES



CONTINUED

CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	inch				EDP NO.	
			SHANK DIAMETER DCON	REACH LU	NECK DIAMETER DN	CORNER RADIUS RE	UNCOATED	Ti-NAMITE-B (TiB ₂)
3/4	1	6	3/4	2-3/8	.730	.060	32796	32860
3/4	1	6	3/4	2-3/8	.730	.090	32797	32861
3/4	1	6	3/4	2-3/8	.730	.120	32798	32862
3/4	1	6	3/4	3-3/8	.730	—	32717	32742
3/4	1	6	3/4	3-3/8	.730	.030	32799	32863
3/4	1	6	3/4	3-3/8	.730	.060	32800	32864
3/4	1	6	3/4	3-3/8	.730	.090	32801	32865
3/4	1	6	3/4	3-3/8	.730	.120	32802	32866
3/4	1	6	3/4	4-3/8	.730	—	32699	34896
1	1-1/4	5	1	2-5/8	.980	.190	35809	36257
1	1-1/4	5	1	2-5/8	.980	.250	35810	36258
1	1-1/4	6	1	2-3/8	.980	—	32718	32743
1	1-1/4	6	1	2-3/8	.980	.030	32803	32867
1	1-1/4	6	1	2-3/8	.980	.060	32804	32868
1	1-1/4	6	1	2-3/8	.980	.090	32805	32869
1	1-1/4	6	1	2-3/8	.980	.120	32806	32870
1	1-1/4	6	1	3-3/8	.980	—	32719	32744
1	1-1/4	6	1	3-3/8	.980	.030	32807	32871
1	1-1/4	6	1	3-3/8	.980	.060	32808	32872
1	1-1/4	6	1	3-3/8	.980	.090	32809	32873
1	1-1/4	6	1	3-3/8	.980	.120	32810	32874
1	1-1/4	6	1	3-3/8	.980	.190	35811	36259
1	1-1/4	6	1	3-3/8	.980	.250	35812	36260
1	1-1/4	7	1	4-3/8	.980	—	32720	32745

TOLERANCES (inch)

1/8–3/16 DIAMETER

DC = +0.0000/–0.00032

DCON = h₆

RE = +0.0000/–0.0020

1/4–3/8 DIAMETER

DC = +0.0000/–0.00035

DCON = h₆

RE = +0.0000/–0.0020

1/2–5/8 DIAMETER

DC = +0.0000/–0.00043

DCON = h₆

RE = +0.0000/–0.0020

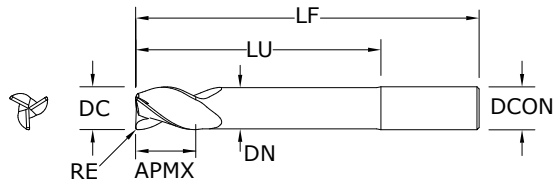
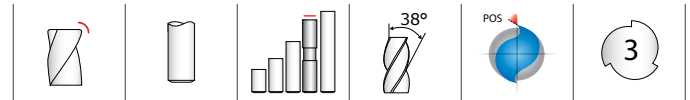
3/4–1 DIAMETER

DC = +0.0000/–0.00051

DCON = h₆

RE = +0.0000/–0.0020

NON-FERROUS



43EC
FRACTIONAL SERIES

TOLERANCES (inch)

1/4–3/8 DIAMETER

DC = +0.0000/–0.00035

DCON = h_6

RE = +0.0000/–0.0020

1/2–5/8 DIAMETER

DC = +0.0000/–0.00043

DCON = h_6

RE = +0.0000/–0.0020

3/4–1 DIAMETER

DC = +0.0000/–0.00051

DCON = h_6

RE = +0.0000/–0.0020

NON-FERROUS

CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	inch				CORNER RADIUS RE	EDP NO.	
			SHANK DIAMETER DCON	REACH LU	NECK DIAMETER DN			UNCOATED	Ti-NAMITE-B (TiB ₂)
1/4	3/8	3	1/4	1-1/8	.230	.015		35789	36237
1/4	3/8	3	1/4	1-1/8	.230	.060		35790	36238
3/8	1/2	4	3/8	2-1/8	.355	.015		35793	36241
3/8	1/2	4	3/8	2-1/8	.355	.090		35794	36242
1/2	5/8	5	1/2	3-3/8	.480	.015		35797	36245
1/2	5/8	6	1/2	4-1/4	.480	.015		35798	36246
1/2	5/8	6	1/2	4-1/4	.480	.030		35799	36247
1/2	5/8	6	1/2	4-1/4	.480	.060		35800	36248
1/2	5/8	6	1/2	4-1/4	.480	.090		35801	36249
1/2	5/8	6	1/2	4-1/4	.480	.120		35802	36250
3/4	1	6	3/4	3-3/8	.730	.190		35805	36253
3/4	1	6	3/4	3-3/8	.730	.250		35806	36254
1	1-1/4	7	1	4-3/8	.980	.030		35813	36261
1	1-1/4	7	1	4-3/8	.980	.060		35814	36262
1	1-1/4	7	1	4-3/8	.980	.090		35815	36263
1	1-1/4	7	1	4-3/8	.980	.120		35816	36264
1	1-1/4	7	1	4-3/8	.980	.190		35817	36265
1	1-1/4	7	1	4-3/8	.980	.250		35818	36266

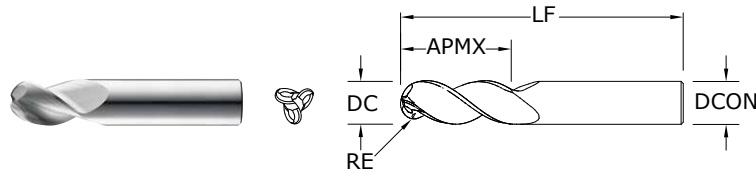
- Circular land allows for increased control at various speed and feed rates and reduces chatter
- Symmetrical end gashing for excellent balance at high speeds and aggressive plunging capability
- Open fluting for deep slotting and profiling
- Necked design with blended diameter transitions provide clearance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



43B

FRACTIONAL SERIES

- Circular land allows for increased control at various speed and feed rates and reduces chatter
- Open fluting for deep slotting and profiling
- Ball end design ideal for finishing operations in complex workpieces
- Recommended for materials ≤ 150 Bhn (≤ 7 HRC)



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

RE = 1/2 Cutting Diameter (DC)

TOLERANCES (inch)

1/4–3/8 DIAMETER

DC = +0.0000/–0.00035

DCON = h_6

RE = +0.0005/–0.0005

1/2–5/8 DIAMETER

DC = +0.0000/–0.00043

DCON = h_6

RE = +0.0005/–0.0005

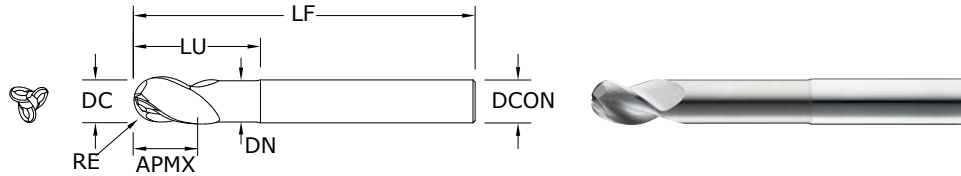
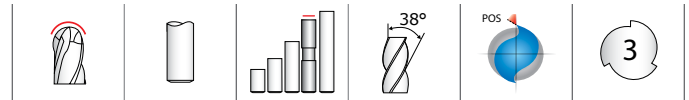
3/4–1 DIAMETER

DC = +0.0000/–0.00051

DCON = h_6

RE = +0.0005/–0.0005

NON-FERROUS



43LB
FRACTIONAL SERIES

TOLERANCES (inch)

1/4–3/8 DIAMETER

DC = +0.0000/–0.00035

DCON = h_6

RE = +0.0005/–0.0005

1/2–5/8 DIAMETER

DC = +0.0000/–0.00043

DCON = h_6

RE = +0.0005/–0.0005

3/4–1 DIAMETER

DC = +0.0000/–0.00051

DCON = h_6

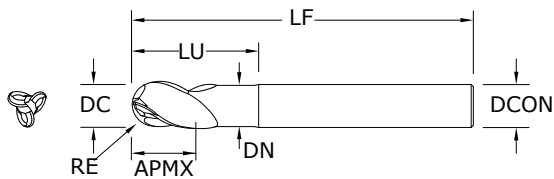
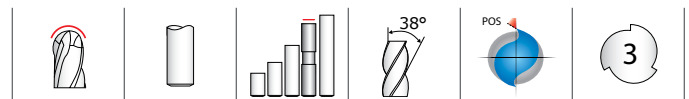
RE = +0.0005/–0.0005

inch						EDP NO.	
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	REACH LU	NECK DIAMETER DN	UNCOATED	Ti-NAMITE-B (TiB ₂)
1/4	3/8	2-1/2	1/4	3/4	.230	34941	35005
3/8	1/2	3	3/8	1-1/8	.355	34943	35007
1/2	5/8	3	1/2	1-3/8	.480	34945	35009
1/2	5/8	4	1/2	2-1/4	.480	34946	35010
5/8	3/4	4	5/8	1-5/8	.605	34949	35013
3/4	1	4	3/4	2	.730	34951	35015
1	1-1/4	5	1	2-5/8	.980	34954	35018
1	1-1/4	6	1	3-3/8	.980	34955	35019

RE = 1/2 Cutting Diameter (DC)

- Circular land allows for increased control at various speed and feed rates and reduces chatter
- Open fluting for deep slotting and profiling
- Necked design with blended diameter transitions provide clearance to reach
- Ball end design ideal for finishing operations in complex workpieces
- Recommended for materials ≤ 150 Bhn (≤ 7 HRC)

NON-FERROUS



43EB
FRACTIONAL SERIES

TOLERANCES (inch)

1/4–3/8 DIAMETER

DC = +0.0000/–0.00035

DCON = h_6

RE = +0.0005/–0.0005

1/2–5/8 DIAMETER

DC = +0.0000/–0.00043

DCON = h_6

RE = +0.0005/–0.0005

3/4–1 DIAMETER

DC = +0.0000/–0.00051

DCON = h_6

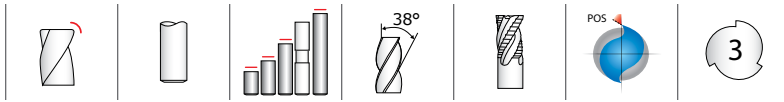
RE = +0.0005/–0.0005

inch						EDP NO.	
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	REACH LU	NECK DIAMETER DN	UNCOATED	Ti-NAMITE-B (TiB ₂)
1/4	3/8	3	1/4	1-1/8	.230	34942	35006
3/8	1/2	4	3/8	2-1/8	.355	34944	35008
1/2	5/8	5	1/2	3-3/8	.480	34947	35011
1/2	5/8	6	1/2	4-1/4	.480	34948	35012
5/8	3/4	6	5/8	3-3/8	.605	34950	35014
3/4	1	6	3/4	3-3/8	.730	34952	35016
1	1-1/4	7	1	4-3/8	.980	34956	35020

RE = 1/2 Cutting Diameter (DC)

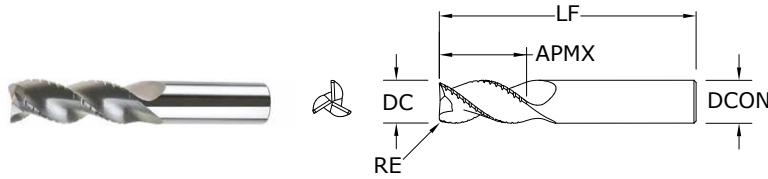
- Circular land allows for increased control at various speed and feed rates and reduces chatter
- Open fluting for deep slotting and profiling
- Necked design with blended diameter transitions provide clearance to reach
- Ball end design ideal for finishing operations in complex workpieces
- Recommended for materials ≤ 150 Bhn (≤ 7 HRC)

NON-FERROUS



43CB

FRACTIONAL SERIES



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

CUTTING DIAMETER DC	LENGTH OF CUT APMX	inch			EDP NO.	
		OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	UNCOATED	Ti-NAMITE-B (TiB ₂)
1/4	3/8	2-1/2	1/4	.020	33390	33450
1/4	1/2	2-1/2	1/4	.020	33391	33451
1/4	3/4	2-1/2	1/4	.020	33392	33452
1/4	1	3	1/4	.020	33393	33453
1/4	1-1/4	3-1/2	1/4	.020	33394	33454
1/4	1-3/4	4	1/4	.020	33395	33455
5/16	7/16	2-1/2	5/16	.020	33396	33456
5/16	11/16	2-1/2	5/16	.020	33397	33457
5/16	1	3	5/16	.020	33398	33458
5/16	2-1/8	4	5/16	.020	33400	33460
3/8	1/2	3	3/8	.020	33401	33461
3/8	1	2-1/2	3/8	.020	33400	33405
3/8	1-1/4	3-1/2	3/8	.020	33402	33462
3/8	1-1/2	4	3/8	.020	33403	33463
3/8	2	4	3/8	.020	33404	33464
1/2	5/8	3	1/2	.030	33406	33466
1/2	1	3	1/2	.030	33407	33467
1/2	1-1/4	3-1/4	1/2	.030	33401	33406
1/2	1-5/8	4	1/2	.030	33408	33468
1/2	2	4	1/2	.030	33409	33469
1/2	2-1/2	5	1/2	.030	33410	33470
1/2	3-1/8	6	1/2	.030	33411	33471
5/8	3/4	3-1/2	5/8	.030	33412	33472
5/8	1-5/8	3-3/4	5/8	.030	33402	33407
5/8	2-1/8	4	5/8	.030	33413	33473
5/8	3-1/4	6	5/8	.030	33415	33475
5/8	3-3/4	6	5/8	.030	33416	33476
3/4	1	4	3/4	.030	33417	33477
3/4	1-5/8	4	3/4	.030	33403	33408
3/4	2-1/4	5	3/4	.030	33418	33478
3/4	3-1/4	6	3/4	.030	33419	33479
3/4	4	6	3/4	.030	33420	33480
1	1-1/4	5	1	.030	33421	33481
1	2	4-1/2	1	.030	33404	33409
1	2-5/8	6	1	.030	33422	33482
1	3-1/4	6	1	.030	33423	33483
1	4-1/8	7	1	.030	33424	33484

TOLERANCES (inch)

1/4-3/8 DIAMETER

DC = +0.0000/-0.00035

DCON = h_6

RE = +0.0000/-0.0020

1/2-5/8 DIAMETER

DC = +0.0000/-0.00043

DCON = h_6

RE = +0.0000/-0.0020

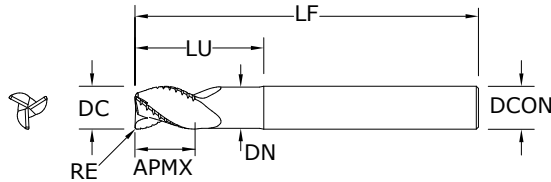
3/4-1 DIAMETER

DC = +0.0000/-0.00051

DCON = h_6

RE = +0.0000/-0.0020

NON-FERROUS



43LCB
FRACTIONAL SERIES

TOLERANCES (inch)

1/4–3/8 DIAMETER

DC = +0.0000/–0.00035

DCON = h_6

RE = +0.0000/–0.0020

1/2–5/8 DIAMETER

DC = +0.0000/–0.00043

DCON = h_6

RE = +0.0000/–0.0020

3/4–1 DIAMETER

DC = +0.0000/–0.00051

DCON = h_6

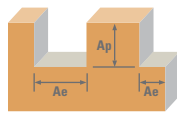
RE = +0.0000/–0.0020

NON-FERROUS

inch							EDP NO.	
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	REACH LU	NECK DIAMETER DN	CORNER RADIUS RE	UNCOATED	Ti-NAMITE-B (TiB ₂)
1/4	3/8	4	1/4	3/4	.230	.020	33500	33540
1/4	3/8	4	1/4	1-1/8	.230	.020	33501	33541
1/4	3/8	4	1/4	2-1/8	.230	.020	33502	33542
5/16	7/16	4	5/16	1-1/8	.292	.020	33503	33543
5/16	7/16	4	5/16	2-1/8	.292	.020	33504	33544
3/8	1/2	4	3/8	1-1/8	.355	.020	33507	33547
3/8	1/2	4	3/8	2-1/8	.355	.020	33508	33548
1/2	5/8	4	1/2	1-3/8	.480	.030	33511	33551
1/2	5/8	4	1/2	2-1/4	.480	.030	33512	33552
1/2	5/8	6	1/2	3-3/8	.480	.030	33513	33553
1/2	5/8	6	1/2	4-1/4	.480	.030	33514	33554
5/8	3/4	4	5/8	1-5/8	.605	.030	33515	33555
5/8	3/4	6	5/8	2-3/8	.605	.030	33516	33556
5/8	3/4	6	5/8	3-3/8	.605	.030	33517	33557
5/8	3/4	6	5/8	4-3/8	.605	.030	33518	33558
3/4	1	4	3/4	2	.730	.030	33519	33559
3/4	1	6	3/4	2-1/2	.730	.030	33520	33560
3/4	1	6	3/4	3-3/8	.730	.030	33521	33561
3/4	1	6	3/4	4-3/8	.730	.030	33522	33562
1	1-1/4	6	1	2-5/8	.980	.030	33523	33563
1	1-1/4	6	1	3-3/8	.980	.030	33524	33564
1	1-1/4	7	1	4-3/8	.980	.030	33525	33565

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

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



	Hardness	Ae x DC	Ap x DC	Vc (sfm)		DC • in						
						1/8	1/4	3/8	1/2	5/8	3/4	1
ALUMINUM ALLOYS 2024, 5052, 5086, 6061, 6073, 7075	≤ 150 Bhn or ≤ 88 HRb	Slot 1	≤ 1	1600	RPM	48896	24448	16299	12224	9779	8149	6112
				(1280-1920)	Fz	0.0009	0.0025	0.0045	0.0060	0.0065	0.0070	0.0085
					Feed (ipm)	132	183	220	220	191	171	156
		Profile ≤ 0.5	≤ 1.5	2000	RPM	61120	30560	20373	15280	12224	10187	7640
				(1600-2400)	Fz	0.0009	0.0025	0.0045	0.0060	0.0065	0.0070	0.0085
					Feed (ipm)	165	229	275	275	238	214	195
		HSM ≤ 0.05	≤ 2	3300	RPM	100848	50424	33616	25212	20170	16808	12606
				(2640-3960)	Fz	0.0021	0.0055	0.0105	0.0140	0.0150	0.0165	0.0195
					Feed (ipm)	635	832	1059	1059	908	832	737
ALUMINUM DIE CAST ALLOYS (HIGH SILICONE) A-390, A-392, B-390	≤ 125 Bhn or ≤ 77 HRb	Slot 1	≤ 1	600	RPM	18336	9168	6112	4584	3667	3056	2292
				(480-720)	Fz	0.0009	0.0025	0.0045	0.0060	0.0065	0.0070	0.0085
					Feed (ipm)	50	69	83	83	72	64	58
		Profile ≤ 0.5	≤ 1.5	750	RPM	22920	11460	7640	5730	4584	3820	2865
				(600-900)	Fz	0.0009	0.0025	0.0045	0.0060	0.0065	0.0070	0.0085
					Feed (ipm)	62	86	103	103	89	80	73
		HSM ≤ 0.05	≤ 2	1240	RPM	37894	18947	12631	9474	7579	6316	4737
				(992-1488)	Fz	0.0021	0.0055	0.0105	0.0140	0.0150	0.0165	0.0195
					Feed (ipm)	239	313	398	398	341	313	277
COPPER ALLOYS Aluminum Bronze Brass Naval Brass Red Brass	≤ 140 Bhn or ≤ 3 HRC	Slot 1	≤ 1	865	RPM	26434	13217	8811	6609	5287	4406	3304
				(692-1038)	Fz	0.0008	0.0020	0.0040	0.0050	0.0055	0.0060	0.0070
					Feed (ipm)	63	79	106	99	87	79	69
		Profile ≤ 0.5	≤ 1.5	1080	RPM	33005	16502	11002	8251	6601	5501	4126
				(864-1296)	Fz	0.0008	0.0020	0.0040	0.0050	0.0055	0.0060	0.0070
					Feed (ipm)	79	99	132	124	109	99	87
		HSM ≤ 0.05	≤ 2	1780	RPM	54397	27198	18132	13599	10879	9066	6800
				(1424-2136)	Fz	0.0017	0.0045	0.0085	0.0115	0.0125	0.0140	0.0160
					Feed (ipm)	277	367	462	469	408	381	326
COPPER ALLOYS Beryllium Copper C110, Malleable Bronze, Tin Bronze	≤ 200 Bhn or ≤ 23 HRC	Slot 1	≤ 1	345	RPM	10543	5272	3514	2636	2109	1757	1318
				(276-414)	Fz	0.0008	0.0020	0.0040	0.0050	0.0055	0.0060	0.0070
					Feed (ipm)	25	32	42	40	35	32	28
		Profile ≤ 0.5	≤ 1.5	430	RPM	13141	6570	4380	3285	2628	2190	1643
				(344-516)	Fz	0.0008	0.0020	0.0040	0.0050	0.0055	0.0060	0.0070
					Feed (ipm)	32	39	53	49	43	39	34
		HSM ≤ 0.05	≤ 2	710	RPM	21698	10849	7233	5424	4340	3616	2712
				(568-852)	Fz	0.0017	0.0045	0.0085	0.0115	0.0125	0.0140	0.0160
					Feed (ipm)	111	146	184	187	163	152	130
PLASTICS ABS, Polycarbonate, PVC, Polypropylene		Slot 1	≤ 1	1600	RPM	48896	24448	16299	12224	9779	8149	6112
				(1280-1920)	Fz	0.0015	0.0040	0.0075	0.0100	0.0110	0.0120	0.0140
					Feed (ipm)	220	293	367	367	323	293	257
		Profile ≤ 0.5	≤ 1.5	2000	RPM	61120	30560	20373	15280	12224	10187	7640
				(1600-2400)	Fz	0.0015	0.0040	0.0075	0.0100	0.0110	0.0120	0.0140
					Feed (ipm)	275	367	458	458	403	367	321
		HSM ≤ 0.05	≤ 2	3300	RPM	100848	50424	33616	25212	20170	16808	12606
				(2640-3960)	Fz	0.0034	0.0090	0.0170	0.0230	0.0250	0.0275	0.0320
					Feed (ipm)	1029	1361	1714	1740	1513	1387	1210

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

rpm = Vc x 3.82 / DC

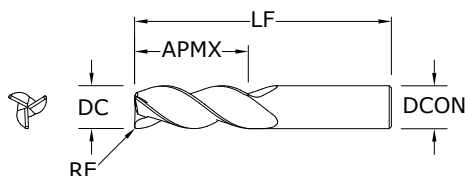
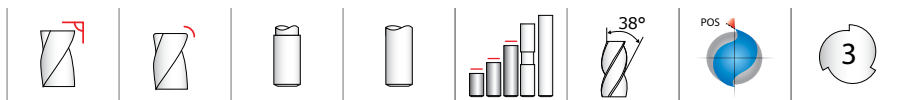
ipm = Fz x 3 x rpm

reduce speed and feed for materials harder than listed

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

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

refer to the **KYOCERA SGS APEX** for complete technical information (www.kyocera-sgstool.com/apex)



43M •
43MCR
METRIC SERIES

TOLERANCES (mm)

≤6 DIAMETER

DC = +0,000/-0,008

DCON = h₆

RE = +0,000/-0,050

>6-10 DIAMETER

DC = +0,000/-0,009

DCON = h₆

RE = +0,000/-0,050

>10-18 DIAMETER

DC = +0,000/-0,011

DCON = h₆

RE = +0,000/-0,050

>18-20 DIAMETER

DC = +0,000/-0,013

DCON = h₆

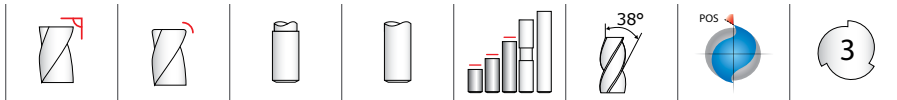
RE = +0,000/-0,050

NON-FERROUS

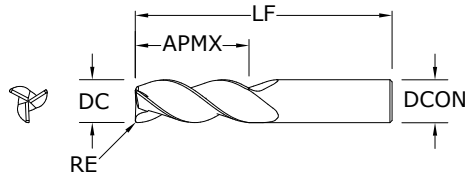
CUTTING DIAMETER DC	LENGTH OF CUT APMX	mm			CORNER RADIUS RE	POLISHED FLUTES	EDP NO.	
		OVERALL LENGTH LF	SHANK DIAMETER DCON				UNCOATED	Ti-NAMITE-B (TiB ₂)
3,0	8,0	52,0	6,0	—	—	•	—	44890
4,0	11,0	55,0	6,0	—	—	•	—	44891
5,0	13,0	57,0	6,0	—	—	•	—	44892
6,0	13,0	57,0	6,0	—	—	•	44701	44715
6,0	13,0	57,0	6,0	1,5	—	•	—	44732
6,0	13,0	57,0	6,0	0,5	—	•	—	44902
6,0	13,0	57,0	6,0	1,0	—	•	—	44894
6,0	13,0	72,0	6,0	—	—	•	44702	44716
6,0	13,0	72,0	6,0	0,8	—	•	—	44842
6,0	13,0	72,0	6,0	1,2	—	•	—	44843
6,0	24,0	75,0	6,0	—	—	•	—	44893
6,0	24,0	75,0	6,0	0,5	—	•	—	44844
6,0	24,0	75,0	6,0	1,0	—	•	—	44845
8,0	19,0	63,0	8,0	—	—	•	44703	44717
8,0	19,0	63,0	8,0	0,3	—	•	—	44846
8,0	19,0	63,0	8,0	0,5	—	•	—	44847
8,0	19,0	63,0	8,0	1,0	—	•	—	44848
8,0	19,0	63,0	8,0	1,5	—	•	—	44849
8,0	32,0	75,0	8,0	—	—	•	—	44895
8,0	32,0	75,0	8,0	0,5	—	•	—	44850
8,0	32,0	75,0	8,0	1,0	—	•	—	44851
8,0	32,0	75,0	8,0	1,5	—	•	—	44852
8,0	32,0	75,0	8,0	2,0	—	•	—	44853
10,0	22,0	72,0	10,0	—	—	•	44705	44719
10,0	22,0	72,0	10,0	0,3	—	•	—	44854
10,0	22,0	72,0	10,0	0,5	—	•	—	44855
10,0	22,0	72,0	10,0	1,0	—	•	—	44856
10,0	22,0	72,0	10,0	1,5	—	•	—	44857
10,0	40,0	100,0	10,0	—	—	•	—	44896
10,0	40,0	100,0	10,0	0,5	—	•	—	44858

continued on next page

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



43M •
43MCR
METRIC SERIES



CONTINUED

CUTTING DIAMETER DC	LENGTH OF CUT APMX	mm			CORNER RADIUS RE	POLISHED FLUTES	EDP NO.	
		OVERALL LENGTH LF	SHANK DIAMETER DCON				UNCOATED	Ti-NAMITE-B (TiB ₂)
10,0	40,0	100,0	10,0	1,0	•	•	—	44859
10,0	40,0	100,0	10,0	1,5	•	•	—	44860
10,0	40,0	100,0	10,0	2,0	•	•	—	44861
12,0	26,0	83,0	12,0	—			44708	44722
12,0	26,0	83,0	12,0	1,5			44814	44733
12,0	26,0	83,0	12,0	2,0			44815	44826
12,0	26,0	83,0	12,0	2,5			44816	44827
12,0	26,0	83,0	12,0	3,0			44817	44734
12,0	48,0	100,0	12,0	—	•	•	—	44897
12,0	48,0	100,0	12,0	0,5	•	•	—	44862
12,0	48,0	100,0	12,0	1,0	•	•	—	44863
12,0	48,0	100,0	12,0	1,5	•	•	—	44864
12,0	48,0	100,0	12,0	2,0	•	•	—	44865
12,0	48,0	100,0	12,0	2,5	•	•	—	44866
12,0	48,0	100,0	12,0	3,0	•	•	—	44867
14,0	30,0	89,0	14,0	—	•	•	—	44898
14,0	30,0	89,0	14,0	1,0	•	•	—	44868
14,0	30,0	89,0	14,0	2,0	•	•	—	44869
14,0	30,0	89,0	14,0	3,0	•	•	—	44870
16,0	32,0	92,0	16,0	—			44711	44725
16,0	32,0	92,0	16,0	1,5			44818	44735
16,0	32,0	92,0	16,0	2,0			44819	44828
16,0	32,0	92,0	16,0	2,5			44820	44829
16,0	32,0	92,0	16,0	3,0			44821	44736
16,0	32,0	92,0	16,0	4,0	•	•	—	44871
16,0	64,0	125,0	16,0	—	•	•	—	44900
16,0	64,0	125,0	16,0	0,5	•	•	—	44872
16,0	64,0	125,0	16,0	1,0	•	•	—	44873
16,0	64,0	125,0	16,0	1,5	•	•	—	44874
16,0	64,0	125,0	16,0	2,0	•	•	—	44875
16,0	64,0	125,0	16,0	2,5	•	•	—	44876
16,0	64,0	125,0	16,0	3,0	•	•	—	44877

continued on next page

TOLERANCES (mm)

≤6 DIAMETER

DC = +0,000/−0,008

DCON = h₆

RE = +0,000/−0,050

>6–10 DIAMETER

DC = +0,000/−0,009

DCON = h₆

RE = +0,000/−0,050

>10–18 DIAMETER

DC = +0,000/−0,011

DCON = h₆

RE = +0,000/−0,050

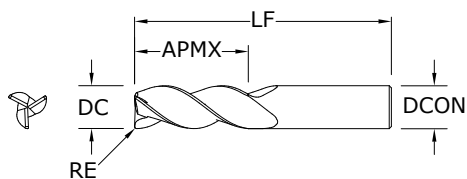
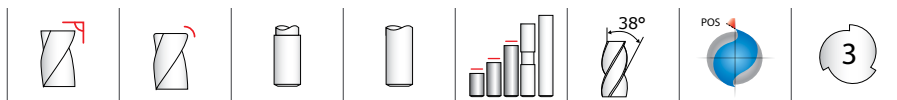
>18–20 DIAMETER

DC = +0,000/−0,013

DCON = h₆

RE = +0,000/−0,050

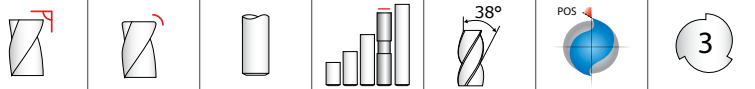
NON-FERROUS



43M •
43MCR
METRIC SERIES

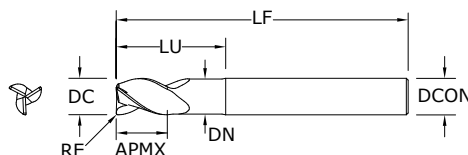
CUTTING DIAMETER DC	LENGTH OF CUT APMX	mm			POLISHED FLUTES	EDP NO.	
		OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE		UNCOATED	Ti-NAMITE-B (TiB ₂)
16,0	64,0	125,0	16,0	4,0	•	—	44878
20,0	38,0	104,0	20,0	—		44714	44728
20,0	38,0	104,0	20,0	2,0		44822	44830
20,0	38,0	104,0	20,0	2,5		44823	44831
20,0	38,0	104,0	20,0	3,0		44824	44737
20,0	38,0	104,0	20,0	4,0	•	—	44879
20,0	80,0	150,0	20,0	—	•	—	44901
20,0	80,0	150,0	20,0	0,5	•	—	44880
20,0	80,0	150,0	20,0	1,0	•	—	44881
20,0	80,0	150,0	20,0	1,5	•	—	44882
20,0	80,0	150,0	20,0	2,0	•	—	44883
20,0	80,0	150,0	20,0	2,5	•	—	44884
20,0	80,0	150,0	20,0	3,0	•	—	44885
20,0	80,0	150,0	20,0	4,0	•	—	44886
25,0	50,0	125,0	25,0	—	•	—	44731

CONTINUED



43ML • 43MLC

METRIC SERIES



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

CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	REACH LU	NECK DIAMETER DN	CORNER RADIUS RE	POLISHED FLUTES	EDP NO.	
								UNCOATED	Ti-NAMITE-B (TiB ₂)
6,0	10,0	63,0	6,0	20,0	5,49	0,5		44769	44789
6,0	10,0	63,0	6,0	20,0	5,49	1,0		44770	44790
6,0	10,0	75,0	6,0	20,0	5,49	—		—	42706
6,0	13,0	72,0	6,0	30,0	5,49	0,5		44771	44791
6,0	13,0	72,0	6,0	30,0	5,49	1,0		44772	44792
8,0	12,0	75,0	8,0	25,0	7,49	—		—	42707
8,0	12,0	75,0	8,0	25,0	7,49	0,3		44773	44793
8,0	12,0	75,0	8,0	25,0	7,49	0,5		44774	44794
8,0	12,0	75,0	8,0	25,0	7,49	0,8	•	—	44950
8,0	12,0	75,0	8,0	25,0	7,49	1,0		44775	44795
8,0	12,0	75,0	8,0	25,0	7,49	1,2	•	—	44951
8,0	12,0	75,0	8,0	25,0	7,49	1,5		44776	44796
8,0	12,0	75,0	8,0	25,0	7,49	1,6	•	—	44952
10,0	14,0	100,0	10,0	35,0	9,48	—		—	42708
10,0	14,0	100,0	10,0	35,0	9,48	0,3		44777	44797
10,0	14,0	100,0	10,0	35,0	9,48	0,5		44778	44798
10,0	14,0	100,0	10,0	35,0	9,48	1,0		44779	44799
10,0	14,0	100,0	10,0	35,0	9,48	1,5		44780	44800
10,0	14,0	100,0	10,0	35,0	9,50	0,8	•	—	44953
10,0	14,0	100,0	10,0	35,0	9,50	1,2	•	—	44954
10,0	14,0	100,0	10,0	35,0	9,50	1,6	•	—	44955
10,0	14,0	100,0	10,0	35,0	9,50	2,4	•	—	44956
12,0	16,0	100,0	12,0	40,0	11,48	—		—	42709
12,0	16,0	100,0	12,0	40,0	11,48	0,5		44781	44801
12,0	16,0	100,0	12,0	40,0	11,48	0,8	•	—	44957
12,0	16,0	100,0	12,0	40,0	11,48	1,0		44782	44802
12,0	16,0	100,0	12,0	40,0	11,48	1,2	•	—	44958
12,0	16,0	100,0	12,0	40,0	11,48	1,5		44783	44803
12,0	16,0	100,0	12,0	40,0	11,48	1,6	•	—	44959
12,0	16,0	100,0	12,0	40,0	11,48	2,0		44784	44804
12,0	16,0	100,0	12,0	40,0	11,48	2,4	•	—	44960
12,0	16,0	100,0	12,0	40,0	11,48	2,5		44832	44839
12,0	16,0	100,0	12,0	40,0	11,48	3,0		44833	44738
12,0	16,0	100,0	12,0	40,0	11,48	4,0		44834	44741

continued on next page

TOLERANCES (mm)

6 DIAMETER

DC = +0,000/−0,008

DCON = h₆

>6–10 DIAMETER

DC = +0,000/−0,009

DCON = h₆

RE = +0,000/−0,050

>10–18 DIAMETER

DC = +0,000/−0,011

DCON = h₆

RE = +0,000/−0,050

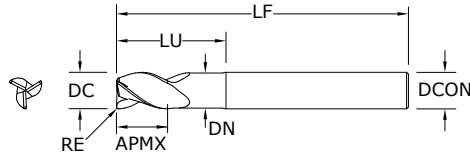
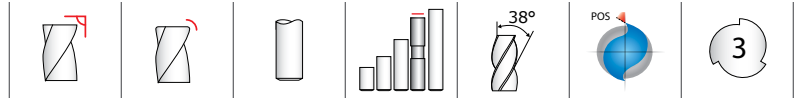
>18–20 DIAMETER

DC = +0,000/−0,013

DCON = h₆

RE = +0,000/−0,050

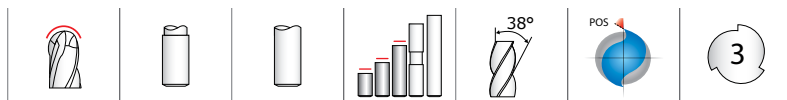
NON-FERROUS



43ML •
43MLC
METRIC SERIES

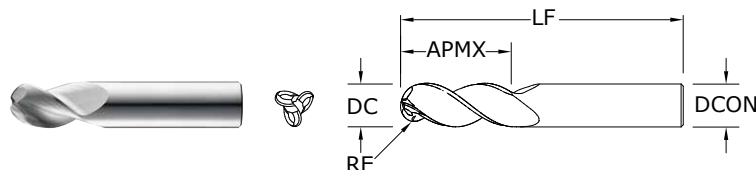
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	REACH LU	NECK DIAMETER DN	CORNER RADIUS RE	POLISHED FLUTES	EDP NO.	
								UNCOATED	Ti-NAMITE-B (TiB ₂)
14,0	18,0	125,0	14,0	45,0	13,49	—	•	—	44899
14,0	18,0	125,0	14,0	45,0	13,49	1,0	•	—	44961
14,0	18,0	125,0	14,0	45,0	13,49	2,0	•	—	44962
14,0	18,0	125,0	14,0	45,0	13,49	3,0	•	—	44963
14,0	18,0	125,0	14,0	45,0	13,49	4,0	•	—	44964
16,0	20,0	125,0	16,0	50,0	15,47	—		—	42710
16,0	20,0	125,0	16,0	50,0	15,47	2,0		44785	44805
16,0	20,0	125,0	16,0	50,0	15,47	2,5		44835	44840
16,0	20,0	125,0	16,0	50,0	15,47	3,0		44836	44739
16,0	20,0	125,0	16,0	50,0	15,47	4,0		44786	44806
16,0	20,0	125,0	16,0	50,0	15,49	0,8	•	—	44965
16,0	20,0	125,0	16,0	50,0	15,49	1,2	•	—	44966
16,0	20,0	125,0	16,0	50,0	15,49	1,6	•	—	44967
16,0	20,0	125,0	16,0	50,0	15,49	2,4	•	—	44968
16,0	20,0	125,0	16,0	50,0	15,49	3,2	•	—	44969
20,0	25,0	150,0	20,0	65,0	19,46	—		—	42711
20,0	25,0	150,0	20,0	65,0	19,46	2,0		44787	44807
20,0	25,0	150,0	20,0	65,0	19,46	2,4	•	—	44973
20,0	25,0	150,0	20,0	65,0	19,46	2,5		44837	44841
20,0	25,0	150,0	20,0	65,0	19,46	3,0		44838	44740
20,0	25,0	150,0	20,0	65,0	19,46	4,0		44788	44808
20,0	25,0	150,0	20,0	65,0	19,48	0,8	•	—	44970
20,0	25,0	150,0	20,0	65,0	19,48	1,2	•	—	44971
20,0	25,0	150,0	20,0	65,0	19,48	1,6	•	—	44972
20,0	25,0	150,0	20,0	65,0	19,48	3,2	•	—	44974

CONTINUED



43MB

METRIC SERIES



- Circular land allows for increased control at various speed and feed rates and reduces chatter
- Open fluting for deep slotting and profiling
- Ball end design ideal for finishing operations in complex workpieces
- Recommended for materials ≤ 150 Bhn (≤ 7 HRC)

mm				POLISHED FLUTES	EDP NO.
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON		Ti-NAMITE-B (TiB ₂)
3,0	4,5	57,0	6,0	•	44916
4,0	6,0	57,0	6,0	•	44919
5,0	7,5	57,0	6,0	•	44922
6,0	9,0	57,0	6,0	•	44925
8,0	12,0	63,0	8,0	•	44928
10,0	15,0	75,0	10,0	•	44931
12,0	18,0	83,0	12,0	•	44934
16,0	24,0	100,0	16,0	•	44937
20,0	30,0	108,0	20,0	•	44940
25,0	37,5	127,0	25,0	•	44943

RE = 1/2 Cutting Diameter (DC)

TOLERANCES (mm)

3 DIAMETER

DC = +0,000/-0,006

DCON = h₆

RE = +0,0127/-0,0127

>3-6 DIAMETER

DC = +0,000/-0,008

DCON = h₆

RE = +0,0127/-0,0127

>6-10 DIAMETER

DC = +0,000/-0,009

DCON = h₆

RE = +0,0127/-0,0127

>10-18 DIAMETER

DC = +0,000/-0,011

DCON = h₆

RE = +0,0127/-0,0127

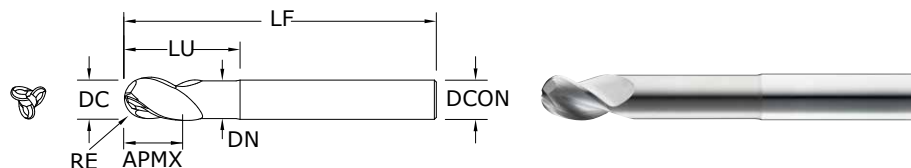
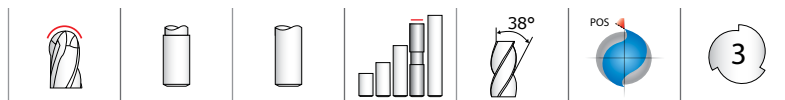
>18-25 DIAMETER

DC = +0,000/-0,013

DCON = h₆

RE = +0,0127/-0,0127

NON-FERROUS



43MLB

METRIC SERIES

TOLERANCES (mm)

3 DIAMETER

DC = +0,000/-0,006

DCON = h_6

RE = +0,0127/-0,0127

>3-6 DIAMETER

DC = +0,000/-0,008

DCON = h_6

RE = +0,0127/-0,0127

>6-10 DIAMETER

DC = +0,000/-0,009

DCON = h_6

RE = +0,0127/-0,0127

>10-18 DIAMETER

DC = +0,000/-0,011

DCON = h_6

RE = +0,0127/-0,0127

>18-25 DIAMETER

DC = +0,000/-0,013

DCON = h_6

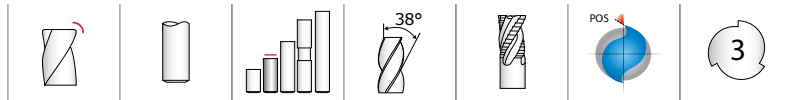
RE = +0,0127/-0,0127

NON-FERROUS

mm						POLISHED FLUTES	EDP NO. Ti-NAMITE-B (TiB ₂)
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	REACH LU	NECK DIAMETER DN		
3,0	6,0	57,0	6,0	10,0	2,74	•	44917
3,0	9,0	57,0	6,0	16,0	2,74	•	44918
4,0	8,0	57,0	6,0	13,0	3,73	•	44920
4,0	12,0	57,0	6,0	21,0	3,73	•	44921
5,0	10,0	63,0	6,0	16,0	4,50	•	44923
5,0	15,0	63,0	6,0	26,0	4,50	•	44924
6,0	12,0	63,0	6,0	19,0	5,49	•	44926
6,0	18,0	75,0	6,0	31,0	5,49	•	44927
8,0	16,0	75,0	8,0	25,0	7,49	•	44929
8,0	24,0	83,0	8,0	41,0	7,49	•	44930
10,0	20,0	83,0	10,0	31,0	9,50	•	44932
10,0	30,0	100,0	10,0	51,0	9,50	•	44933
12,0	24,0	100,0	12,0	37,0	11,48	•	44935
12,0	36,0	130,0	12,0	61,0	11,48	•	44936
16,0	32,0	130,0	16,0	49,0	15,49	•	44938
16,0	48,0	150,0	16,0	81,0	15,49	•	44939
20,0	40,0	130,0	20,0	61,0	19,48	•	44941
20,0	60,0	150,0	20,0	101,0	19,48	•	44942
25,0	50,0	152,0	25,0	76,0	24,49	•	44944
25,0	75,0	170,0	25,0	126,0	24,49	•	44945

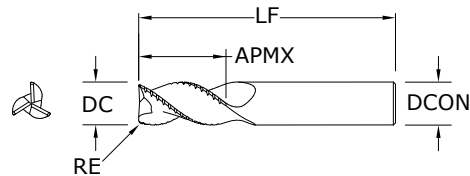
RE = 1/2 Cutting Diameter (DC)

- Circular land allows for increased control at various speed and feed rates and reduces chatter
- Open fluting for deep slotting and profiling
- Ball end design ideal for finishing operations in complex workpieces
- Recommended for materials ≤ 150 Bhn (≤ 7 HRC)



43MCB

METRIC SERIES



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

CUTTING DIAMETER DC	LENGTH OF CUT APMX	mm			EDP NO.	
		OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	UNCOATED	Ti-NAMITE-B (TiB ₂)
6,0	19,0	63,0	6,0	0,5	44298	44299
8,0	19,0	63,0	8,0	0,3	44300	44305
10,0	22,0	72,0	10,0	0,3	44301	44306
12,0	26,0	83,0	12,0	1,0	44302	44307
16,0	32,0	92,0	16,0	1,0	44303	44308
20,0	38,0	104,0	20,0	1,0	44304	44309

TOLERANCES (mm)

>6–10 DIAMETER

DC = +0,000/–0,009

DCON = h₆

RE = +0,000/–0,050

>10–18 DIAMETER

DC = +0,000/–0,011

DCON = h₆

RE = +0,000/–0,050

>18–20 DIAMETER

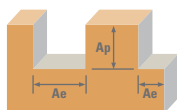
DC = +0,000/–0,013

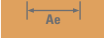
DCON = h₆

RE = +0,000/–0,050

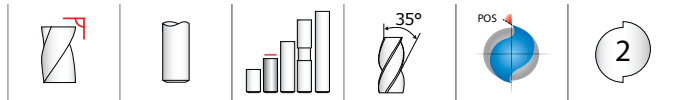
NON-FERROUS

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



43MCR, 43ML, 43MLC, 43MCB		 Ae x DC		 Ap x DC		Vc (m/min)	DC • mm								
Metric	Hardness						3	6	10	12	16	20	25		
ALUMINUM ALLOYS 2024, 5052, 5086, 6061, 6073, 7075	≤ 150 Bhn or ≤ 88 HRb		1	≤ 1	490	RPM	52022	26011	15607	13005	9754	7803	6243		
					(392-588)	Fz	0.022	0.060	0.120	0.144	0.166	0.187	0.213		
					Feed (mm/min)	3371	4682	5618	5618	4869	4370	3980			
			≤ 0.5	≤ 1.5	610	RPM	64762	32381	19429	16190	12143	9714	7771		
					(488-732)	Fz	0.022	0.060	0.120	0.144	0.166	0.187	0.213		
					Feed (mm/min)	4196	5828	6994	6994	6061	5440	4955			
	≤ 125 Bhn or ≤ 77 HRb		≤ 0.05	≤ 2	1005	RPM	106698	53349	32009	26674	20006	16005	12804		
					(804-1206)	Fz	0.050	0.132	0.280	0.336	0.384	0.440	0.488		
					Feed (mm/min)	16131	21124	26888	26885	23046	21126	18726			
		ALUMINUM DIE CAST ALLOYS (HIGH SILICONE) A-390, A-392, B- 390	≤ 125 Bhn or ≤ 77 HRb		1	≤ 1	185	RPM	19641	9820	5892	4910	3683	2946	2357
							(148-222)	Fz	0.022	0.060	0.120	0.144	0.166	0.187	0.213
							Feed (mm/min)	1273	1768	2121	2121	1838	1650	1503	
	≤ 0.5			≤ 1.5	230	RPM	24418	12209	7326	6105	4578	3663	2930		
					(184-276)	Fz	0.022	0.060	0.120	0.144	0.166	0.187	0.213		
					Feed (mm/min)	1582	2197	2637	2637	2285	2051	1868			
≤ 140 Bhn or ≤ 3 HRc			≤ 0.05	≤ 2	380	RPM	40343	20172	12103	10086	7564	6052	4841		
					(304-456)	Fz	0.050	0.132	0.280	0.336	0.384	0.440	0.488		
					Feed (mm/min)	6099	7987	10166	10166	8714	7988	7081			
	COPPER ALLOYS Aluminum Bronze Brass Naval Brass Red Brass		≤ 140 Bhn or ≤ 3 HRc		1	≤ 1	265	RPM	28134	14067	8440	7034	5275	4220	3376
							(212-318)	Fz	0.019	0.048	0.107	0.120	0.141	0.160	0.175
							Feed (mm/min)	1620	2025	2701	2532	2228	2026	1773	
		≤ 0.5		≤ 1.5	330	RPM	35035	17518	10511	8759	6569	5255	4204		
					(264-396)	Fz	0.019	0.048	0.107	0.120	0.141	0.160	0.175		
					Feed (mm/min)	2018	2522	3363	3153	2775	2523	2207			
≤ 200 Bhn or ≤ 23 HRc			≤ 0.05	≤ 2	545	RPM	57861	28930	17358	14465	10849	8679	6943		
					(436-654)	Fz	0.041	0.108	0.227	0.276	0.320	0.373	0.400		
					Feed (mm/min)	7082	9373	11804	11976	10415	9721	8332			
		COPPER ALLOYS Beryllium Copper C110, Manganese Bronze, Tin Bronze	≤ 200 Bhn or ≤ 23 HRc		1	≤ 1	105	RPM	11148	5574	3344	2787	2090	1672	1338
							(84-126)	Fz	0.019	0.048	0.107	0.120	0.141	0.160	0.175
							Feed (mm/min)	642	803	1070	1003	883	803	702	
	≤ 0.5			≤ 1.5	130	RPM	13802	6901	4141	3450	2588	2070	1656		
					(104-156)	Fz	0.019	0.048	0.107	0.120	0.141	0.160	0.175		
					Feed (mm/min)	795	994	1325	1242	1093	994	870			
≤ 200 Bhn or ≤ 23 HRc			≤ 0.05	≤ 2	215	RPM	22826	11413	6848	5706	4280	3424	2739		
					(172-258)	Fz	0.041	0.108	0.227	0.276	0.320	0.373	0.400		
					Feed (mm/min)	2794	3697	4656	4725	4109	3835	3287			
	PLASTICS ABS, Polycarbonate, PVC, Polypropylene				1	≤ 1	490	RPM	52022	26011	15607	13005	9754	7803	6243
							(392-588)	Fz	0.036	0.096	0.200	0.240	0.282	0.320	0.350
							Feed (mm/min)	5618	7490	9364	9363	8240	7491	6555	
		≤ 0.5		≤ 1.5	610	RPM	64762	32381	19429	16190	12143	9714	7771		
					(488-732)	Fz	0.036	0.096	0.200	0.240	0.282	0.320	0.350		
					Feed (mm/min)	6994	9325	11657	11656	10258	9326	8160			
			≤ 0.05	≤ 2	1005	RPM	106698	53349	32009	26674	20006	16005	12804		
					(804-1206)	Fz	0.082	0.216	0.453	0.552	0.640	0.733	0.800		
					Feed (mm/min)	26117	34567	43532	44169	38410	35210	30730			

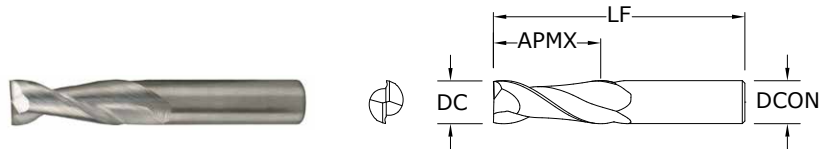
Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B) HSM (High Speed Machining)
 $\text{rpm} = (\text{Vc} \times 1000) / (\text{DC} \times 3.14)$
 $\text{mm/min} = \text{Fz} \times 3 \times \text{rpm}$
 reduce speed and feed for materials harder than listed
 reduce cut depth and feed by 50% for long flute and long reach tools
 reduce feed and Ae when finish milling (.02 x DC maximum)
 refer to the **KYOCERA SGS APEX** for complete technical information (www.kyocera-sgstool.com/apex)



47

FRACTIONAL SERIES

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



CUTTING DIAMETER DC	inch			EDP NO.	
	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	UNCOATED	Ti-NAMITE-B (TiB ₂)
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)

1/8–3/16 DIAMETER

DC = +0.0000/–0.00032

DCON = h₆

1/4–3/8 DIAMETER

DC = +0.0000/–0.00035

DCON = h₆

1/2–5/8 DIAMETER

DC = +0.0000/–0.00043

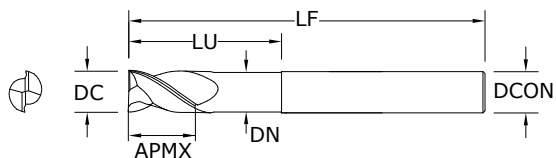
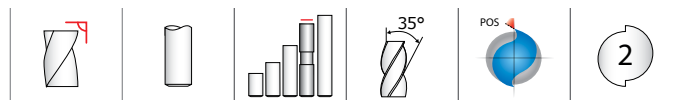
DCON = h₆

3/4–1 DIAMETER

DC = +0.0000/–0.00051

DCON = h₆

NON-FERROUS



47L
FRACTIONAL SERIES

TOLERANCES (inch)

1/4–3/8 DIAMETER

DC = +0.0000/–0.00035

DCON = h_6

1/2–5/8 DIAMETER

DC = +0.0000/–0.00043

DCON = h_6

3/4–1 DIAMETER

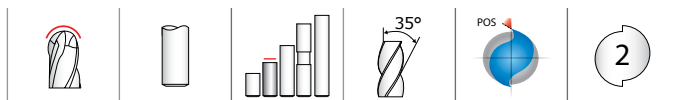
DC = +0.0000/–0.00051

DCON = h_6

NON-FERROUS

CUTTING DIAMETER DC	LENGTH OF CUT APMX	inch				EDP NO.	
		OVERALL LENGTH LF	SHANK DIAMETER DCON	REACH LU	NECK DIAMETER DN	UNCOATED	Ti-NAMITE-B (TiB ₂)
1/4	3/8	4	1/4	2-1/8	.235	34640	34678
3/8	1/2	4	3/8	2-1/8	.360	34641	34679
1/2	5/8	6	1/2	2-1/8	.485	34642	34680
1/2	5/8	6	1/2	3-3/8	.485	34643	34681
5/8	3/4	6	5/8	2-3/8	.610	34644	34682
5/8	3/4	6	5/8	3-3/8	.610	34645	34683
3/4	1	6	3/4	2-1/2	.735	34646	34684
3/4	1	6	3/4	3-3/8	.735	34647	34685

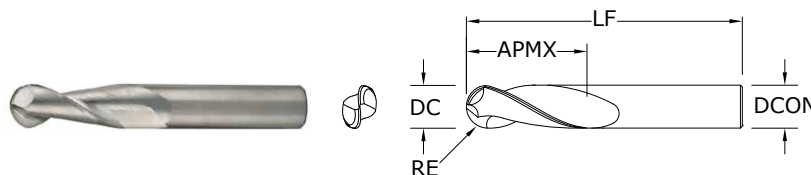
- Circular land reduces edge aggressiveness for varied speed and feed rates
- 2 Flutes effectively manage the large size and volume of chips produced during the aggressive machining process
- Excellent balance at high speeds and aggressive plunging capability
- Necked design with blended diameter transitions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



47B

FRACTIONAL SERIES

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



inch				EDP NO.	
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	UNCOATED	TI-NAMITE-B (TiB ₂)
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

RE = 1/2 Cutting Diameter (DC)

TOLERANCES (inch)

1/8–3/16 DIAMETER
 DC = +0.0000/–0.00032
 DCON = h₆
 RE = +.0005/–.0005

1/4–3/8 DIAMETER
 DC = +0.0000/–0.00035
 DCON = h₆
 RE = +.0005/–.0005

1/2–5/8 DIAMETER
 DC = +0.0000/–0.00043
 DCON = h₆
 RE = +.0005/–.0005

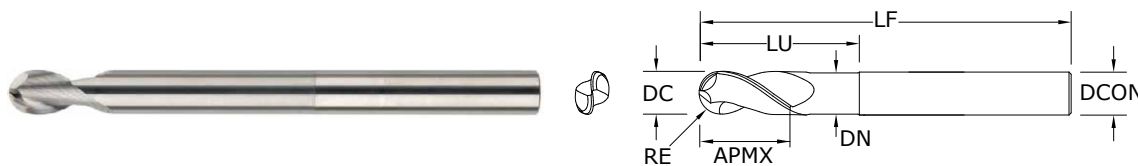
3/4–1 DIAMETER
 DC = +0.0000/–0.00051
 DCON = h₆
 RE = +.0005/–.0005

NON-FERROUS

47LB

FRACTIONAL SERIES

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



inch						EDP NO.	
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	REACH LU	NECK DIAMETER DN	UNCOATED	TI-NAMITE-B (TiB ₂)
1/4	3/8	4	1/4	2-1/8	.235	34650	34686
3/8	1/2	4	3/8	2-1/8	.360	34651	34687
1/2	5/8	6	1/2	2-1/8	.485	34652	34688
1/2	5/8	6	1/2	3-3/8	.485	34653	34689
5/8	3/4	6	5/8	2-3/8	.610	34655	34691
5/8	3/4	6	5/8	3-3/8	.610	34654	34690
3/4	1	6	3/4	2-1/2	.735	34656	34693
3/4	1	6	3/4	3-3/8	.735	34657	34692

RE = 1/2 Cutting Diameter (DC)

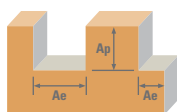
TOLERANCES (inch)

1/4–3/8 DIAMETER
 DC = +0.0000/–0.00035
 DCON = h₆
 RE = +.0005/–.0005

1/2–5/8 DIAMETER
 DC = +0.0000/–0.00043
 DCON = h₆
 RE = +.0005/–.0005

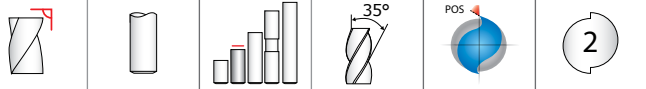
3/4–1 DIAMETER
 DC = +0.0000/–0.00051
 DCON = h₆
 RE = +.0005/–.0005

NON-FERROUS



Series 47, 47B, 47L, 47LB Fractional	Hardness			Vc (sfm)	DC • in									
		Ae x DC	Ap x DC		1/8	1/4	3/8	1/2	5/8	3/4	1			
ALUMINUM ALLOYS 2024, 5052, 5086, 6061, 6073, 7075	≤ 150 Bhn or ≤ 88 HRb		1	≤ 1	1600	RPM	48896	24448	16299	12224	9779	8149	6112	
					(1280-1920)	Fz	0.0009	0.0025	0.0045	0.0060	0.0065	0.0070	0.0085	
					Feed (ipm)	88	122	147	147	127	114	104		
			≤ 0.5	≤ 1.5	2000	RPM	61120	30560	20373	15280	12224	10187	7640	
					(1600-2400)	Fz	0.0009	0.0025	0.0045	0.0060	0.0065	0.0070	0.0085	
					Feed (ipm)	110	153	183	183	159	143	130		
		≤ 0.05	≤ 2	3300	RPM	100848	50424	33616	25212	20170	16808	12606		
				(2640-3960)	Fz	0.0021	0.0055	0.0105	0.0140	0.0150	0.0165	0.0195		
				Feed (ipm)	424	555	706	706	605	555	492			
	ALUMINUM DIE CAST ALLOYS (HIGH SILICONE) A-390, A-392, B- 390	≤ 125 Bhn or ≤ 77 HRb		1	≤ 1	600	RPM	18336	9168	6112	4584	3667	3056	2292
						(480-720)	Fz	0.0009	0.0025	0.0045	0.0060	0.0065	0.0070	0.0085
						Feed (ipm)	33	46	55	55	48	43	39	
			≤ 0.5	≤ 1.5	750	RPM	22920	11460	7640	5730	4584	3820	2865	
					(600-900)	Fz	0.0009	0.0025	0.0045	0.0060	0.0065	0.0070	0.0085	
					Feed (ipm)	41	57	69	69	60	53	49		
		≤ 0.05	≤ 2	1240	RPM	37894	18947	12631	9474	7579	6316	4737		
				(992-1488)	Fz	0.0021	0.0055	0.0105	0.0140	0.0150	0.0165	0.0195		
				Feed (ipm)	159	208	265	265	227	208	185			
COPPER ALLOYS Aluminum Bronze Brass Naval Brass Red Brass		≤ 140 Bhn or ≤ 3 HRc		1	≤ 1	865	RPM	26434	13217	8811	6609	5287	4406	3304
						(692-1038)	Fz	0.0008	0.0020	0.0040	0.0050	0.0055	0.0060	0.0070
						Feed (ipm)	42	53	70	66	58	53	46	
			≤ 0.5	≤ 1.5	1080	RPM	33005	16502	11002	8251	6601	5501	4126	
					(864-1296)	Fz	0.0008	0.0020	0.0040	0.0050	0.0055	0.0060	0.0070	
					Feed (ipm)	53	66	88	83	73	66	58		
		≤ 0.05	≤ 2	1780	RPM	54397	27198	18132	13599	10879	9066	6800		
				(1424-2136)	Fz	0.0017	0.0045	0.0085	0.0115	0.0125	0.0140	0.0160		
				Feed (ipm)	185	245	308	313	272	254	218			
	COPPER ALLOYS Beryllium Copper C110, Manganese Bronze, Tin Bronze	≤ 200 Bhn or ≤ 23 HRc		1	≤ 1	345	RPM	10543	5272	3514	2636	2109	1757	1318
						(276-414)	Fz	0.0008	0.0020	0.0040	0.0050	0.0055	0.0060	0.0070
						Feed (ipm)	17	21	28	26	23	21	18	
			≤ 0.5	≤ 1.5	430	RPM	13141	6570	4380	3285	2628	2190	1643	
					(344-516)	Fz	0.0008	0.0020	0.0040	0.0050	0.0055	0.0060	0.0070	
					Feed (ipm)	21	26	35	33	29	26	23		
		≤ 0.05	≤ 2	710	RPM	21698	10849	7233	5424	4340	3616	2712		
				(568-852)	Fz	0.0017	0.0045	0.0085	0.0115	0.0125	0.0140	0.0160		
				Feed (ipm)	74	98	123	125	108	101	87			
PLASTICS ABS, Polycarbonate, PVC, Polypropylene				1	≤ 1	1600	RPM	48896	24448	16299	12224	9779	8149	6112
						(1280-1920)	Fz	0.0015	0.0040	0.0075	0.0100	0.0110	0.0120	0.0140
						Feed (ipm)	147	196	244	244	215	196	171	
			≤ 0.5	≤ 1.5	2000	RPM	61120	30560	20373	15280	12224	10187	7640	
					(1600-2400)	Fz	0.0015	0.0040	0.0075	0.0100	0.0110	0.0120	0.0140	
					Feed (ipm)	183	244	306	306	269	244	214		
		≤ 0.05	≤ 2	3300	RPM	100848	50424	33616	25212	20170	16808	12606		
				(2640-3960)	Fz	0.0034	0.0090	0.0170	0.0230	0.0250	0.0275	0.0320		
				Feed (ipm)	686	908	1143	1160	1008	924	807			

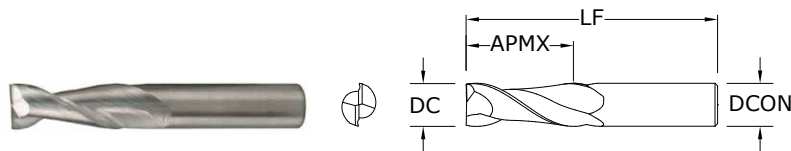
Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B) HSM (High Speed Machining)
 rpm = Vc x 3.82 / DC
 ipm = Fz x 2 x rpm
 reduce speed and feed for materials harder than listed
 reduce cut depth and feed by 50% for long flute and long reach tools
 reduce feed and Ae when finish milling (.02 x DC maximum)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



47M

METRIC SERIES

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



mm				EDP NO.	
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	UNCOATED	Ti-NAMITE-B (TiB ₂)
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	38,0	104,0	25,0	44560	44597

TOLERANCES (mm)

3 DIAMETER

DC = $+0,000/-0,006$
DCON = h_6

>3-6 DIAMETER

DC = $+0,000/-0,008$
DCON = h_6

>6-10 DIAMETER

DC = $+0,000/-0,009$
DCON = h_6

>10-18 DIAMETER

DC = $+0,000/-0,012$
DCON = h_6

>18-25 DIAMETER

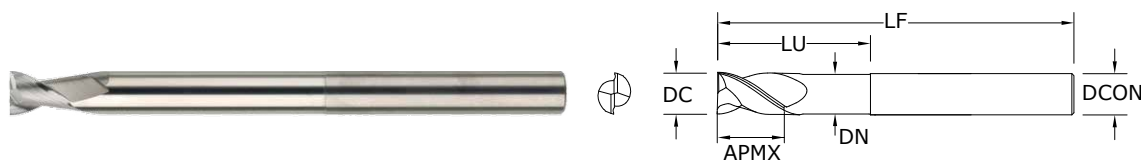
DC = $+0,000/-0,013$
DCON = h_6

NON-FERROUS

47ML

METRIC SERIES

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



mm						EDP NO.	
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	REACH LU	NECK DIAMETER DN	UNCOATED	Ti-NAMITE-B (TiB ₂)
6,0	10,0	100,0	6,0	54,0	5,62	44561	44609
8,0	12,0	100,0	8,0	54,0	7,62	44562	44610
10,0	12,0	100,0	10,0	54,0	9,62	44563	44611
12,0	16,0	150,0	12,0	80,0	11,62	44564	44612
16,0	20,0	150,0	16,0	80,0	15,62	44565	44613
20,0	25,0	150,0	20,0	80,0	19,62	44566	44614

TOLERANCES (mm)

6 DIAMETER

DC = $+0,000/-0,008$
DCON = h_6

>6-10 DIAMETER

DC = $+0,000/-0,009$
DCON = h_6

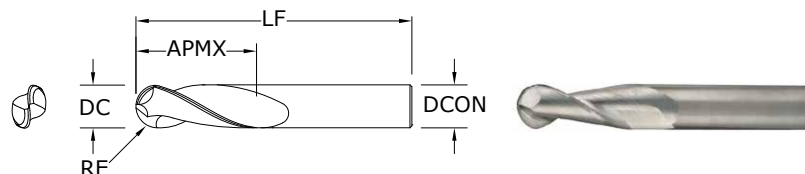
>10-18 DIAMETER

DC = $+0,000/-0,011$
DCON = h_6

>18-20 DIAMETER

DC = $+0,000/-0,013$
DCON = h_6

NON-FERROUS



47MB
METRIC SERIES

TOLERANCES (mm)

3 DIAMETER

DC = +0,000/-0,006
DCON = h_6
RE = +0,0127/-0,0127

>3-6 DIAMETER

DC = +0,000/-0,008
DCON = h_6
RE = +0,0127/-0,0127

>6-10 DIAMETER

DC = +0,000/-0,009
DCON = h_6
RE = +0,0127/-0,0127

>10-18 DIAMETER

DC = +0,000/-0,012
DCON = h_6
RE = +0,0127/-0,0127

>18-25 DIAMETER

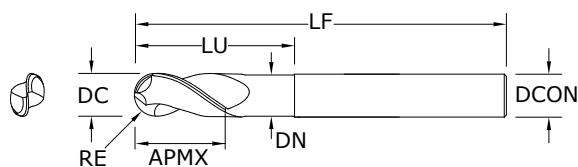
DC = +0,000/-0,013
DCON = h_6
RE = +0,0127/-0,0127

NON-FERROUS

mm				EDP NO.	
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	UNCOATED	Ti-NAMITE-B (TiB ₂)
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	37,3	104,0	20,0	44579	44607
25,0	38,0	104,0	25,0	44580	44608

RE = 1/2 Cutting Diameter (DC)

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



47MLB
METRIC SERIES

TOLERANCES (mm)

6 DIAMETER

DC = +0,000/-0,008
DCON = h_6
RE = +0,0127/-0,0127

>6-10 DIAMETER

DC = +0,000/-0,009
DCON = h_6
RE = +0,0127/-0,0127

>10-18 DIAMETER

DC = +0,000/-0,011
DCON = h_6
RE = +0,0127/-0,0127

>18-20 DIAMETER

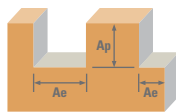
DC = +0,000/-0,013
DCON = h_6
RE = +0,0127/-0,0127

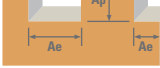
NON-FERROUS

mm						EDP NO.	
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	REACH LU	NECK DIAMETER DN	UNCOATED	Ti-NAMITE-B (TiB ₂)
6,0	10,0	100,0	6,0	54,0	5,62	44581	44615
8,0	12,0	100,0	8,0	54,0	7,62	44582	44616
10,0	12,0	100,0	10,0	54,0	9,62	44583	44617
12,0	16,0	150,0	12,0	80,0	11,62	44584	44618
16,0	20,0	150,0	16,0	80,0	15,62	44585	44619
20,0	25,0	150,0	20,0	80,0	19,62	44586	44620

RE = 1/2 Cutting Diameter (DC)

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



Series 47M, 47MB, 47ML, 47MLB Metric	Hardness			Vc (m/min)	DC • mm								
		Ae x DC	Ap x DC		3	6	10	12	16	20	25		
ALUMINUM ALLOYS 2024, 5052, 5086, 6061, 6073, 7075	≤ 150 Bhn or ≤ 88 HRb		1	≤ 1	490	RPM	52022	26011	15607	13005	9754	7803	6243
					(392-588)	Fz	0.022	0.060	0.120	0.144	0.166	0.187	0.213
					Feed (mm/min)	2247	3121	3746	3745	3246	2913	2653	
			≤ 0.5	≤ 1.5	610	RPM	64762	32381	19429	16190	12143	9714	7771
					(488-732)	Fz	0.022	0.060	0.120	0.144	0.166	0.187	0.213
					Feed (mm/min)	2797	3885	4663	4662	4041	3627	3303	
		≤ 0.05	≤ 2	1005	RPM	106698	53349	32009	26674	20006	16005	12804	
				(804-1206)	Fz	0.050	0.132	0.280	0.336	0.384	0.440	0.488	
				Feed (mm/min)	10754	14083	17925	17924	15364	14084	12484		
ALUMINUM DIE CAST ALLOYS (HIGH SILICONE) A-390, A-392, B- 390	≤ 125 Bhn or ≤ 77 HRb		1	≤ 1	185	RPM	19641	9820	5892	4910	3683	2946	2357
					(148-222)	Fz	0.022	0.060	0.120	0.144	0.166	0.187	0.213
					Feed (mm/min)	848	1178	1414	1414	1226	1100	1002	
			≤ 0.5	≤ 1.5	230	RPM	24418	12209	7326	6105	4578	3663	2930
					(184-276)	Fz	0.022	0.060	0.120	0.144	0.166	0.187	0.213
					Feed (mm/min)	1055	1465	1758	1758	1524	1367	1245	
		≤ 0.05	≤ 2	380	RPM	40343	20172	12103	10086	7564	6052	4841	
				(304-456)	Fz	0.050	0.132	0.280	0.336	0.384	0.440	0.488	
				Feed (mm/min)	4066	5325	6778	6777	5809	5325	4720		
COPPER ALLOYS Aluminum Bronze Brass Naval Brass Red Brass	≤ 140 Bhn or ≤ 3 HRc		1	≤ 1	265	RPM	28134	14067	8440	7034	5275	4220	3376
					(212-318)	Fz	0.019	0.048	0.107	0.120	0.141	0.160	0.175
					Feed (mm/min)	1080	1350	1801	1688	1485	1350	1182	
			≤ 0.5	≤ 1.5	330	RPM	35035	17518	10511	8759	6569	5255	4204
					(264-396)	Fz	0.019	0.048	0.107	0.120	0.141	0.160	0.175
					Feed (mm/min)	1345	1682	2242	2102	1850	1682	1472	
		≤ 0.05	≤ 2	545	RPM	57861	28930	17358	14465	10849	8679	6943	
				(436-654)	Fz	0.041	0.108	0.227	0.276	0.320	0.373	0.400	
				Feed (mm/min)	4721	6248	7869	7984	6943	6480	5555		
COPPER ALLOYS Beryllium Copper C110, Manganese Bronze, Tin Bronze	≤ 200 Bhn or ≤ 23 HRc		1	≤ 1	105	RPM	11148	5574	3344	2787	2090	1672	1338
					(84-126)	Fz	0.019	0.048	0.107	0.120	0.141	0.160	0.175
					Feed (mm/min)	428	535	713	669	589	535	468	
			≤ 0.5	≤ 1.5	130	RPM	13802	6901	4141	3450	2588	2070	1656
					(104-156)	Fz	0.019	0.048	0.107	0.120	0.141	0.160	0.175
					Feed (mm/min)	530	662	883	828	729	662	580	
		≤ 0.05	≤ 2	215	RPM	22826	11413	6848	5706	4280	3424	2739	
				(172-258)	Fz	0.041	0.108	0.227	0.276	0.320	0.373	0.400	
				Feed (mm/min)	1862	2465	3104	3150	2739	2556	2191		
PLASTICS ABS, Polycarbonate, PVC, Polypropylene			1	≤ 1	490	RPM	52022	26011	15607	13005	9754	7803	6243
					(392-588)	Fz	0.036	0.096	0.200	0.240	0.282	0.320	0.350
					Feed (mm/min)	3745	4994	6243	6242	5493	4994	4370	
			≤ 0.5	≤ 1.5	610	RPM	64762	32381	19429	16190	12143	9714	7771
					(488-732)	Fz	0.036	0.096	0.200	0.240	0.282	0.320	0.350
					Feed (mm/min)	4662	6217	7771	7771	6839	6217	5440	
			≤ 0.05	≤ 2	1005	RPM	106698	53349	32009	26674	20006	16005	12804
					(804-1206)	Fz	0.082	0.216	0.453	0.552	0.640	0.733	0.800
					Feed (mm/min)	17412	23045	29022	29446	25607	23473	20487	

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

rpm = (Vc x 1000) / (DC x 3.14)

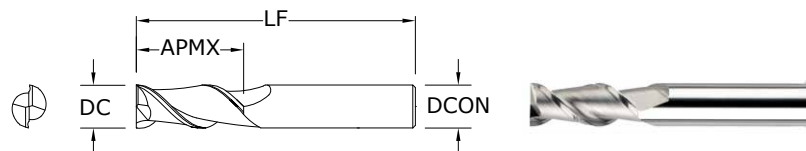
mm/min = Fz x 2 x rpm

reduce speed and feed for materials harder than listed

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

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

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)



TOLERANCES (inch)

1/4–3/8 DIAMETER

 $DC = +0.0000/-0.00035$
 $DCON = h_6$

1/2–5/8 DIAMETER

 $DC = +0.0000/-0.00043$
 $DCON = h_6$

3/4–1 DIAMETER

 $DC = +0.0000/-0.00051$
 $DCON = h_6$

NON-FERROUS

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

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

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

44

FRACTIONAL SERIES

TOLERANCES (mm)

≤ 3 DIAMETER

 $DC = +0.000/-0.006$
 $DCON = h_6$

>3–6 DIAMETER

 $DC = +0.000/-0.008$
 $DCON = h_6$

>6–10 DIAMETER

 $DC = +0.000/-0.009$
 $DCON = h_6$

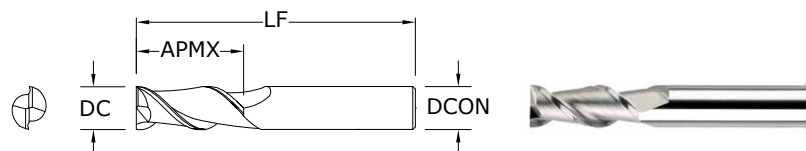
>10–18 DIAMETER

 $DC = +0.000/-0.011$
 $DCON = h_6$

>18–20 DIAMETER

 $DC = +0.000/-0.013$
 $DCON = h_6$

NON-FERROUS



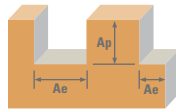
mm				EDP NO.			
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	UNCOATED W/FLAT	UNCOATED	Ti-NAMITE-B (TiB ₂) W/FLAT	Ti-NAMITE-B (TiB ₂)
3,0	8,0	52,0	6,0	44505	49663	44506	49674
4,0	11,0	55,0	6,0	44509	49664	44510	49675
5,0	13,0	57,0	6,0	44513	49665	44514	49676
6,0	13,0	57,0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

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

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

44M

METRIC SERIES



Series 44	Fractional	Hardness			Vc (sfm)	DC • in									
			Ae x DC	Ap x DC		1/8	1/4	3/8	1/2	5/8	3/4	1			
ALUMINUM ALLOYS 2024, 5052, 5086, 6061, 6073, 7075	≤ 150 Bhn or ≤ 88 HRb		1	≤ 1	1600 (1280-1920)	RPM	48896	24448	16299	12224	9779	8149	6112		
						Fz	0.0009	0.0025	0.0045	0.0060	0.0065	0.0070	0.0085		
						Feed (ipm)	88	122	147	147	127	114	104		
			≤ 0.5	≤ 1.5	2000 (1600-2400)	RPM	61120	30560	20373	15280	12224	10187	7640		
						Fz	0.0009	0.0025	0.0045	0.0060	0.0065	0.0070	0.0085		
						Feed (ipm)	110	153	183	183	159	143	130		
			≤ 0.05	≤ 2	3300 (2640-3960)	RPM	100848	50424	33616	25212	20170	16808	12606		
						Fz	0.0021	0.0055	0.0105	0.0140	0.0150	0.0165	0.0195		
						Feed (ipm)	424	555	706	706	605	555	492		
		ALUMINUM DIE CAST ALLOYS (HIGH SILICONE) A-390, A-392, B- 390	≤ 125 Bhn or ≤ 77 HRb		1	≤ 1	600 (480-720)	RPM	18336	9168	6112	4584	3667	3056	2292
								Fz	0.0009	0.0025	0.0045	0.0060	0.0065	0.0070	0.0085
								Feed (ipm)	33	46	55	55	48	43	39
	≤ 0.5			≤ 1.5	750 (600-900)	RPM	22920	11460	7640	5730	4584	3820	2865		
						Fz	0.0009	0.0025	0.0045	0.0060	0.0065	0.0070	0.0085		
						Feed (ipm)	41	57	69	69	60	53	49		
	≤ 0.05			≤ 2	1240 (992-1488)	RPM	37894	18947	12631	9474	7579	6316	4737		
						Fz	0.0021	0.0055	0.0105	0.0140	0.0150	0.0165	0.0195		
						Feed (ipm)	159	208	265	265	227	208	185		
COPPER ALLOYS Aluminum Bronze Brass Naval Brass Red Brass	≤ 140 Bhn or ≤ 3 HRc				1	≤ 1	865 (692-1038)	RPM	26434	13217	8811	6609	5287	4406	3304
								Fz	0.0008	0.0020	0.0040	0.0050	0.0055	0.0060	0.0070
								Feed (ipm)	42	53	70	66	58	53	46
			≤ 0.5	≤ 1.5	1080 (864-1296)	RPM	33005	16502	11002	8251	6601	5501	4126		
						Fz	0.0008	0.0020	0.0040	0.0050	0.0055	0.0060	0.0070		
						Feed (ipm)	53	66	88	83	73	66	58		
			≤ 0.05	≤ 2	1780 (1424-2136)	RPM	54397	27198	18132	13599	10879	9066	6800		
						Fz	0.0017	0.0045	0.0085	0.0115	0.0125	0.0140	0.0160		
						Feed (ipm)	185	245	308	313	272	254	218		
		COPPER ALLOYS Beryllium Copper C110, Manganese Bronze, Tin Bronze	≤ 200 Bhn or ≤ 23 HRc		1	≤ 1	345 (276-414)	RPM	10543	5272	3514	2636	2109	1757	1318
								Fz	0.0008	0.0020	0.0040	0.0050	0.0055	0.0060	0.0070
								Feed (ipm)	17	21	28	26	23	21	18
	≤ 0.5			≤ 1.5	430 (344-516)	RPM	13141	6570	4380	3285	2628	2190	1643		
						Fz	0.0008	0.0020	0.0040	0.0050	0.0055	0.0060	0.0070		
						Feed (ipm)	21	26	35	33	29	26	23		
	≤ 0.05			≤ 2	710 (568-852)	RPM	21698	10849	7233	5424	4340	3616	2712		
						Fz	0.0017	0.0045	0.0085	0.0115	0.0125	0.0140	0.0160		
						Feed (ipm)	74	98	123	125	108	101	87		
PLASTICS ABS, Polycarbonate, PVC, Polypropylene					1	≤ 1	1600 (1280-1920)	RPM	48896	24448	16299	12224	9779	8149	6112
								Fz	0.0015	0.0040	0.0075	0.0100	0.0110	0.0120	0.0140
								Feed (ipm)	147	196	244	244	215	196	171
			≤ 0.5	≤ 1.5	2000 (1600-2400)	RPM	61120	30560	20373	15280	12224	10187	7640		
						Fz	0.0015	0.0040	0.0075	0.0100	0.0110	0.0120	0.0140		
						Feed (ipm)	183	244	306	306	269	244	214		
			≤ 0.05	≤ 2	3300 (2640-3960)	RPM	100848	50424	33616	25212	20170	16808	12606		
						Fz	0.0034	0.0090	0.0170	0.0230	0.0250	0.0275	0.0320		
						Feed (ipm)	686	908	1143	1160	1008	924	807		

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

rpm = Vc x 3.82 / DC

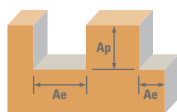
ipm = Fz x 2 x rpm

reduce speed and feed for materials harder than listed

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

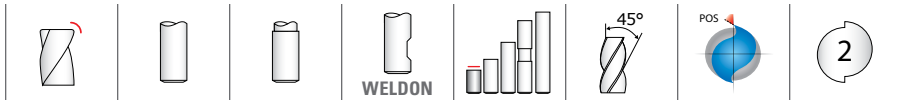
reduce feed and Ae when finish milling (.02 x DC maximum)

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)



Series 44M Metric	Hardness			Vc (m/min)	DC • mm									
		Ae x DC	Ap x DC		3	6	10	12	16	20	25			
ALUMINUM ALLOYS 2024, 5052, 5086, 6061, 6073, 7075	≤ 150 Bhn or ≤ 88 HRb		1	≤ 1	490 (392-588)	RPM	52022	26011	15607	13005	9754	7803	6243	
						Fz	0.022	0.060	0.120	0.144	0.166	0.187	0.213	
						Feed (mm/min)	2247	3121	3746	3745	3246	2913	2653	
			≤ 0.5	≤ 1.5	610 (488-732)	RPM	64762	32381	19429	16190	12143	9714	7771	
						Fz	0.022	0.060	0.120	0.144	0.166	0.187	0.213	
						Feed (mm/min)	2797	3885	4663	4662	4041	3627	3303	
		≤ 0.05	≤ 2	1005 (804-1206)	RPM	106698	53349	32009	26674	20006	16005	12804		
					Fz	0.050	0.132	0.280	0.336	0.384	0.440	0.488		
					Feed (mm/min)	10754	14083	17925	17924	15364	14084	12484		
	ALUMINUM DIE CAST ALLOYS (HIGH SILICONE) A-390, A-392, B- 390	≤ 125 Bhn or ≤ 77 HRb		1	≤ 1	185 (148-222)	RPM	19641	9820	5892	4910	3683	2946	2357
							Fz	0.022	0.060	0.120	0.144	0.166	0.187	0.213
							Feed (mm/min)	848	1178	1414	1414	1226	1100	1002
			≤ 0.5	≤ 1.5	230 (184-276)	RPM	24418	12209	7326	6105	4578	3663	2930	
						Fz	0.022	0.060	0.120	0.144	0.166	0.187	0.213	
						Feed (mm/min)	1055	1465	1758	1758	1524	1367	1245	
		≤ 0.05	≤ 2	380 (304-456)	RPM	40343	20172	12103	10086	7564	6052	4841		
					Fz	0.050	0.132	0.280	0.336	0.384	0.440	0.488		
					Feed (mm/min)	4066	5325	6778	6777	5809	5325	4720		
COPPER ALLOYS Aluminum Bronze Brass Naval Brass Red Brass		≤ 140 Bhn or ≤ 3 HRc		1	≤ 1	265 (212-318)	RPM	28134	14067	8440	7034	5275	4220	3376
							Fz	0.019	0.048	0.107	0.120	0.141	0.160	0.175
							Feed (mm/min)	1080	1350	1801	1688	1485	1350	1182
			≤ 0.5	≤ 1.5	330 (264-396)	RPM	35035	17518	10511	8759	6569	5255	4204	
						Fz	0.019	0.048	0.107	0.120	0.141	0.160	0.175	
						Feed (mm/min)	1345	1682	2242	2102	1850	1682	1472	
		≤ 0.05	≤ 2	545 (436-654)	RPM	57861	28930	17358	14465	10849	8679	6943		
					Fz	0.041	0.108	0.227	0.276	0.320	0.373	0.400		
					Feed (mm/min)	4721	6248	7869	7984	6943	6480	5555		
	COPPER ALLOYS Beryllium Copper C110, Manganese Bronze, Tin Bronze	≤ 200 Bhn or ≤ 23 HRc		1	≤ 1	105 (84-126)	RPM	11148	5574	3344	2787	2090	1672	1338
							Fz	0.019	0.048	0.107	0.120	0.141	0.160	0.175
							Feed (mm/min)	428	535	713	669	589	535	468
			≤ 0.5	≤ 1.5	130 (104-156)	RPM	13802	6901	4141	3450	2588	2070	1656	
						Fz	0.019	0.048	0.107	0.120	0.141	0.160	0.175	
						Feed (mm/min)	530	662	883	828	729	662	580	
		≤ 0.05	≤ 2	215 (172-258)	RPM	22826	11413	6848	5706	4280	3424	2739		
					Fz	0.041	0.108	0.227	0.276	0.320	0.373	0.400		
					Feed (mm/min)	1862	2465	3104	3150	2739	2556	2191		
PLASTICS ABS, Polycarbonate, PVC, Polypropylene				1	≤ 1	490 (392-588)	RPM	52022	26011	15607	13005	9754	7803	6243
							Fz	0.036	0.096	0.200	0.240	0.282	0.320	0.350
							Feed (mm/min)	3745	4994	6243	6242	5493	4994	4370
			≤ 0.5	≤ 1.5	610 (488-732)	RPM	64762	32381	19429	16190	12143	9714	7771	
						Fz	0.036	0.096	0.200	0.240	0.282	0.320	0.350	
						Feed (mm/min)	4662	6217	7771	7771	6839	6217	5440	
		≤ 0.05	≤ 2	1005 (804-1206)	RPM	106698	53349	32009	26674	20006	16005	12804		
					Fz	0.082	0.216	0.453	0.552	0.640	0.733	0.800		
					Feed (mm/min)	17412	23045	29022	29446	25607	23473	20487		

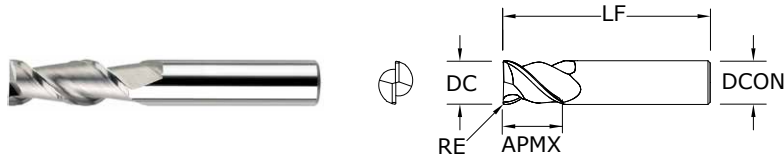
Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B) HSM (High Speed Machining)
 $\text{rpm} = (\text{Vc} \times 1000) / (\text{DC} \times 3.14)$
 $\text{mm/min} = \text{Fz} \times 2 \times \text{rpm}$
 reduce speed and feed for materials harder than listed
 reduce cut depth and feed by 50% for long flute and long reach tools
 reduce feed and Ae when finish milling (.02 x DC maximum)
 refer to the **KYOCERA SGS APEX** for complete technical information (www.kyocera-sgstool.com/apex)



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FRACTIONAL SERIES

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



CUTTING DIAMETER DC	LENGTH OF CUT APMX	inch			EDP NO.			
		OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	UNCOATED W/FLAT	UNCOATED	Ti-NAMITE-B (TiB ₂) W/FLAT	Ti-NAMITE-B (TiB ₂)
1/4	3/8	2-1/2	3/8	.010	91257	91250	91242	91235
5/16	7/16	2-1/2	3/8	.012	91258	91251	91243	91236
3/8	9/16	2-1/2	3/8	.015	91259	91252	91244	91237
1/2	3/4	3	1/2	.020	91260	91253	91245	91238
5/8	7/8	3-1/2	5/8	.025	91261	91254	91246	91239
3/4	1	4	3/4	.030	91262	91255	91247	91240
1	1-1/4	4	1	.040	91263	91256	91248	91241

Contact your KSPT representative for reach options.

TOLERANCES (inch)

1/4–3/8 DIAMETER

DC = +0.0000/–0.00035

DCON = h₆

RE = +0.0000/–0.0020

1/2–5/8 DIAMETER

DC = +0.0000/–0.00043

DCON = h₆

RE = +0.0000/–0.0020

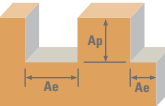
3/4–1 DIAMETER

DC = +0.0000/–0.00051

DCON = h₆

RE = +0.0000/–0.0020

NON-FERROUS

Series 45 Fractional	Hardness			Vc (sfm)	DC • in							
		Ae x DC	Ap x DC		1/4	3/8	1/2	5/8	3/4	1		
ALUMINUM ALLOYS 2024, 5052, 5086, 6061, 6073, 7075	≤ 150 Bhn or ≤ 88 HRb		1	≤ 1	1600	RPM	24448	16299	12224	9779	8149	6112
					(1280-1920)	Fz	0.0025	0.0045	0.0060	0.0065	0.0070	0.0085
						Feed (ipm)	122	147	147	127	114	104
			≤ 0.5	≤ 1.5	2000	RPM	30560	20373	15280	12224	10187	7640
					(1600-2400)	Fz	0.0025	0.0045	0.0060	0.0065	0.0070	0.0085
						Feed (ipm)	153	183	183	159	143	130
			≤ 0.05	≤ 2	3300	RPM	50424	33616	25212	20170	16808	12606
					(2640-3960)	Fz	0.0055	0.0105	0.0140	0.0150	0.0165	0.0195
						Feed (ipm)	555	706	706	605	555	492
ALUMINUM DIE CAST ALLOYS (HIGH SILICONE) A-390, A-392, B- 390	≤ 125 Bhn or ≤ 77 HRb		1	≤ 1	600	RPM	9168	6112	4584	3667	3056	2292
					(480-720)	Fz	0.0025	0.0045	0.0060	0.0065	0.0070	0.0085
						Feed (ipm)	46	55	55	48	43	39
			≤ 0.5	≤ 1.5	750	RPM	11460	7640	5730	4584	3820	2865
					(600-900)	Fz	0.0025	0.0045	0.0060	0.0065	0.0070	0.0085
						Feed (ipm)	57	69	69	60	53	49
			≤ 0.05	≤ 2	1240	RPM	18947	12631	9474	7579	6316	4737
					(992-1488)	Fz	0.0055	0.0105	0.0140	0.0150	0.0165	0.0195
						Feed (ipm)	208	265	265	227	208	185
COPPER ALLOYS Aluminum Bronze Brass Naval Brass Red Brass	≤ 140 Bhn or ≤ 3 HRc		1	≤ 1	865	RPM	13217	8811	6609	5287	4406	3304
					(692-1038)	Fz	0.0020	0.0040	0.0050	0.0055	0.0060	0.0070
						Feed (ipm)	53	70	66	58	53	46
			≤ 0.5	≤ 1.5	1080	RPM	16502	11002	8251	6601	5501	4126
					(864-1296)	Fz	0.0020	0.0040	0.0050	0.0055	0.0060	0.0070
						Feed (ipm)	66	88	83	73	66	58
			≤ 0.05	≤ 2	1780	RPM	27198	18132	13599	10879	9066	6800
					(1424-2136)	Fz	0.0045	0.0085	0.0115	0.0125	0.0140	0.0160
						Feed (ipm)	245	308	313	272	254	218
COPPER ALLOYS Beryllium Copper C110, Manganese Bronze, Tin Bronze	≤ 200 Bhn or ≤ 23 HRc		1	≤ 1	345	RPM	5272	3514	2636	2109	1757	1318
					(276-414)	Fz	0.0020	0.0040	0.0050	0.0055	0.0060	0.0070
						Feed (ipm)	21	28	26	23	21	18
			≤ 0.5	≤ 1.5	430	RPM	6570	4380	3285	2628	2190	1643
					(344-516)	Fz	0.0020	0.0040	0.0050	0.0055	0.0060	0.0070
						Feed (ipm)	26	35	33	29	26	23
			≤ 0.05	≤ 2	710	RPM	10849	7233	5424	4340	3616	2712
					(568-852)	Fz	0.0045	0.0085	0.0115	0.0125	0.0140	0.0160
						Feed (ipm)	98	123	125	108	101	87
PLASTICS ABS, Polycarbonate, PVC, Polypropylene			1	≤ 1	1600	RPM	24448	16299	12224	9779	8149	6112
					(1280-1920)	Fz	0.0040	0.0075	0.0100	0.0110	0.0120	0.0140
						Feed (ipm)	196	244	244	215	196	171
			≤ 0.5	≤ 1.5	2000	RPM	30560	20373	15280	12224	10187	7640
					(1600-2400)	Fz	0.0040	0.0075	0.0100	0.0110	0.0120	0.0140
						Feed (ipm)	244	306	306	269	244	214
			≤ 0.05	≤ 2	3300	RPM	50424	33616	25212	20170	16808	12606
					(2640-3960)	Fz	0.0090	0.0170	0.0230	0.0250	0.0275	0.0320
						Feed (ipm)	908	1143	1160	1008	924	807

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

High Performance Drills



Hole Making

HIGH PERFORMANCE DRILLS	SERIES	DESCRIPTION	APPLICATION		PAGE	S&F PAGE
			★ PREFERRED	★ ALTERNATE		
Hi-PerCarb	142P (3XD)	2 Flute Internal Coolant 4 Margin 3XD	★		196	210
	142P (5XD)	2 Flute Internal Coolant 4 Margin 5XD	★		199	210
	142P (8XD)	2 Flute Internal Coolant 4 Margin 8XD	★		202	210
	142P (12XD)	2 Flute Internal Coolant 4 Margin 12XD	★		206	210
	143M-S (3XD)	2 Flute Internal Coolant 2 Margin 3XD	★	★	214	222
	143M-S (5XD)	2 Flute Internal Coolant 2 Margin 5XD	★	★	218	222
	141K (5xD)	3 Flute Internal Coolant 3 Margin 5xD		★	226	230
	131N (3xD)	3 Flute External Coolant 3 Margin 3xD		★	231	239
	131N (5xD)	3 Flute External Coolant 3 Margin 5xD		★	235	239
	135 (3xD)	2 Flute External Coolant 4 Margin 3xD	★ ★ ☆ ☆ ★ ★		242	248
	135 (5xD)	2 Flute External Coolant 4 Margin 5xD	★ ★ ☆ ☆ ★ ★		252	258
	146U (3xD)	2 Flute Internal Coolant 4 Margin 3xD	★ ★ ★ ★ ★ ★		262	276
	146U (5xD)	2 Flute Internal Coolant 4 Margin 5xD	★ ★ ★ ★ ★ ★		267	276
	136U (2xD)	2 Flute External Coolant 4 Margin 2xD	★ ★ ★ ★ ★ ★		271	276
				★		
CFRP 8 Facet	120	2 Flute External Coolant 4 Margin CFRP		★	240	241

Speed & Feed Recommendations listed after each series

Taladrado

BROCAS DE ALTO RENDIMIENTO	SERIE	DESCRIPCIÓN	APLICACIÓN		PÁGINA	S&F PÁGINA
			★ PREFERIDO	★ ALTERNATIVO		
Hi-PerCarb	142P (3XD)	2 filos, refrigeración interna, 4 margen, 3XD	★		196	210
	142P (5XD)	2 filos, refrigeración interna, 4 margen, 5XD	★		199	210
	142P (8XD)	2 filos, refrigeración interna, 4 margen, 8XD	★		202	210
	142P (12XD)	2 filos, refrigeración interna, 4 margen, 12XD	★		206	210
	143M-S (3XD)	2 filos, refrigeración interna, 2 margen, 3XD	★	★	214	222
	143M-S (5XD)	2 filos, refrigeración interna, 2 margen, 5XD	★	★	218	222
	141K (5xD)	3 filos, refrigeración interna, 3 margen, 5xD		★	226	230
	131N (3xD)	3 filos, refrigeración externa, 3 margen, 3xD		★	231	239
	131N (5xD)	3 filos, refrigeración externa, 3 margen, 5xD		★	235	239
	135 (3xD)	2 filos, refrigeración externa, 4 margen, 3xD	★ ★ ☆ ☆ ★ ★		242	248
	135 (5xD)	2 filos, refrigeración externa, 4 margen, 5xD	★ ★ ☆ ☆ ★ ★		252	258
	146U (3xD)	2 filos, refrigeración interna, 4 margen, 3xD	★ ★ ★ ★ ★ ★		262	276
	146U (5xD)	2 filos, refrigeración interna, 4 margen, 5xD	★ ★ ★ ★ ★ ★		267	276
	136U (2xD)	2 filos, refrigeración externa, 4 margen, 2xD	★ ★ ★ ★ ★ ★		271	276
	De 8 caras CFRP 120	2 filos, refrigeración externa, 4 margen, CFRP		★	240	241

Recomendaciones de velocidades y avances mostradas tras cada serie

Outils de perçage

FORETS HAUTE PERFORMANCE	SÉRIES	DESCRIPTION	APPLICATION		PAGE	S&F PAGE
			★ PRÉFÉRÉ	★ ALTERNER		
Hi-PerCarb	142P (3XD)	2 dents trou d'huile 4 listel 3XD	★		196	210
	142P (5XD)	2 dents trou d'huile 4 listel 5XD	★		199	210
	142P (8XD)	2 dents trou d'huile 4 listel 8XD	★		202	210
	142P (12XD)	2 dents trou d'huile 4 listel 12XD	★		206	210
	143M-S (3XD)	2 dents trou d'huile 2 listel 3XD	★	★	214	222
	143M-S (5XD)	2 dents trou d'huile 2 listel 5XD	★	★	218	222
	141K (5xD)	3 dents refroidissement interne à 3 listel 5xD		★	226	230
	131N (3xD)	3 dents refroidissement externe à 3 listel 3xD		★	231	239
	131N (5xD)	3 dents refroidissement externe à 3 listel 5xD		★	235	239
	135 (3xD)	2 dents refroidissement externe à 4 listel 3xD	★ ★ ☆ ☆ ★ ★		242	248
	135 (5xD)	2 dents refroidissement externe à 4 listel 5xD	★ ★ ☆ ☆ ★ ★		252	258
	146U (3xD)	2 dents refroidissement interne à 4 listel 3xD	★ ★ ★ ★ ★ ★		262	276
	146U (5xD)	2 dents refroidissement interne à 4 listel 5xD	★ ★ ★ ★ ★ ★		267	276
	136U (2xD)	2 dents refroidissement externe à 4 listel 2xD	★ ★ ★ ★ ★ ★		271	276
	CFRP à 8 facettes 120	2 dents refroidissement externe à 4 listel CFRP		★	240	241

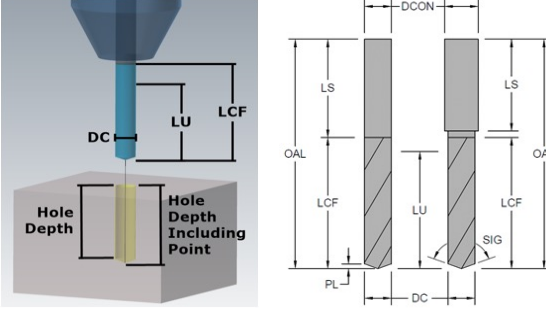
Recommandations de vitesse et avance indiquées après chaque série

Bohren

HOCHLEISTUNGS- BOHRER	SERIE	BESCHREIBUNG	ANWENDUNG		SEITE	S&F SEITE
			★ BEVORZUGT	★ WECHSELN		
Hi-PerCarb	142P (3XD)	Doppelfasenbohrer mit 4 Schneiden und Innenkühlung, 3xD	★		196	210
	142P (3XD)	Doppelfasenbohrer mit 4 Schneiden und Innenkühlung, 5xD	★		199	210
	142P (3XD)	Doppelfasenbohrer mit 4 Schneiden und Innenkühlung, 8xD	★		202	210
	142P (12XD)	Doppelfasenbohrer mit 4 Schneiden und Innenkühlung, 12xD	★		206	210
	143M-S (3XD)	2 Einfasenbohrer mit 2 Schneiden und Innenkühlung, 3xD	★	★	214	222
	143M-S (5XD)	2 Einfasenbohrer mit 2 Schneiden und Innenkühlung, 5xD	★	★	218	222
	141K (5xD)	Dreifasenbohrer 5xD mit 3 Schneiden und Innenkühlung		★	226	230
	131N (3xD)	Dreifasenbohrer 3xD mit 3 Schneiden und Außenkühlung		★	231	239
	131N (5xD)	Dreifasenbohrer 5xD mit 3 Schneiden und Außenkühlung		★	235	239
	135 (3xD)	Doppelfasenbohrer 3xD mit 4 Schneiden und Außenkühlung	★ ★ ☆ ☆ ★ ★		242	248
	135 (5xD)	Doppelfasenbohrer 5xD mit 4 Schneiden und Außenkühlung	★ ★ ☆ ☆ ★ ★		252	258
	146U (3xD)	Doppelfasenbohrer 3xD mit 4 Schneiden und Innenkühlung	★ ★ ★ ★ ★ ★		262	276
	146U (5xD)	Doppelfasenbohrer 5xD mit 4 Schneiden und Innenkühlung	★ ★ ★ ★ ★ ★		267	276
	136U (2xD)	Doppelfasenbohrer 2xD mit 4 Schneiden und Außenkühlung	★ ★ ★ ★ ★ ★		271	276
CFRP 8 Facet	120	Doppelfasenbohrer CFRP mit 4 Schneiden und Außenkühlung		★	240	241

Empfehlungen für Drehzahl & Vorschub im Anhang zu jeder Serie

Drill Matrix

Item				Preferred Cut Type for Series ★ Best ☆ Better ○ Good (blank) Not Recommended																	
				Material																	
				Low Carbon ≤ 20 HRC	Medium Carbon, Alloy 20 to 35 HRC	High Carbon, Alloy 35 to 45 HRC	Ferritic & Martensitic ≤ 45 HRC	Austenitic & Duplex ≤ 25 HRC	Precipitation Hardened ≤ 45 HRC	Low Alloy, Grey, Ductile ≤ 25 HRC	Med-High Alloy, Nodular 25 to 35 HRC	High Alloy, Nodular ≥ 35 HRC	Aluminum Alloys	Copper Alloys	Plastics, Composites	Titanium Alloys ≤ 45 HRC	Iron, Nickel, Cobalt Alloys ≤ 45 HRC	Refractory Alloys, Mo, Ta, W ≤ 35 HRC	High Carbon, Med Alloy 45 to 50 HRC	Tool, Mold & Die 45 to 55 HRC	Tool, Mold & Die 55 to 65 HRC
Name / Series	Tool Type	Coolant Delivery	Page	Steel			Stainless Steel			Cast Iron			Non Ferrous		HRSA			Hard Steel			
Hi-PerCarb 142P	High Performance Drill	Internal	196	★	★	★	☆	☆	☆	☆	☆	☆	★		☆	☆	☆	★	☆	☆	
Hi-PerCarb 143M-S	High Performance Drill	Internal	214	☆			★	★	★	☆	☆	☆	○	★		★	★	★			
Hi-PerCarb 141K	High Performance Drill	Internal	226	☆	☆	☆	○		○	★	★	★	☆	☆		○		○			
Hi-PerCarb 131N	High Performance Drill	External	231						○			★	★	☆	○						
Series 120	High Performance Drill	External	240											★							
Hi-PerCarb 135	High Performance Drill	External	242	★	★	★	★	☆	★	☆	☆	☆	○	○		☆	☆	☆	★	☆	☆
Hi-PerCarb 146U	High Performance Drill	Internal	262	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★
Hi-PerCarb 136U	High Performance Drill	External	271	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★
Series 106	General Application Drill	External	352	○	○	○						☆							★	★	☆
Series 101	General Application Drill	External	340	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○			
Series 103	General Application Drill	External	356	○	○	○	○	○	○	○	☆	☆	○			○	○	○			
Series 108	General Application Drill	External	345	★	☆	☆	☆	☆	☆	☆	☆	☆		○	○	☆	☆	☆			
Series 301, 301M	Drill & Countersink	External	362	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	○	○	☆	○	○
Series 601	Countersink	External	368	○	○	○	○	★	○	☆	☆	☆	★	☆	○	○	○	○			
Series 603	Countersink	External	371	☆	☆	☆	☆	★	☆	★	☆	☆	★	★	☆	☆	☆	☆	○		
Series 606	Countersink	External	374	★	★	★	★	★	★	★	★	★	○	★	★	★	★	★	☆	☆	○
Series 200	Reamer	External	378	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	○
Series 201M	Reamer	External	382	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	○

Drill Matrix

Attributes

Material hardness and machinability affect speed, feed, and cut depths.

For dimensional and finish quality, a low TIR of the tool-holder assembly in the machine is critical: less than 0.1% drill diameter is preferred.

Spot drilling is not necessary in most situations if the drilling surface is machined flat ; spot drill point angle should be greater than drill point angle.

Liquid coolant (internal or external) such as oil based or synthetic is highly recommended for all drilling applications.

For proper cooling, lubrication and chip evacuation, ensure the coolant is supplied throughout the entire depth of the hole.

When liquid coolant cannot be applied for applications such as plastics or composites, clear the swarf with air or vacuum.

Depending on material machinability, a peck cycle may be necessary for external coolant drills beyond 2x or 3x depths.

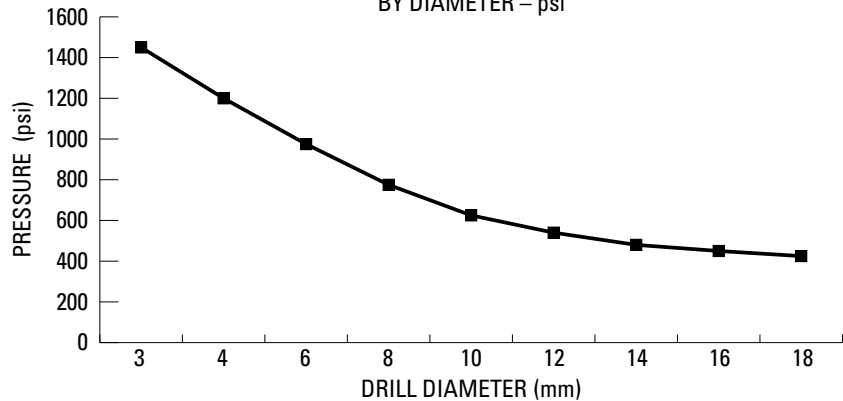
Diameter Range inch	Diameter Range mm	Tolerance	Length	Point Angle °	Self Centering	Flute Count	Margins	Helix Angle °	Shank	Coating
0.1250 0.7500	3,00 16,00	DC + / +	3x, 5x, 8x, 12x	137	yes	2	4	30	Common	Ti-NAMITE-X
0.1250 0.7500	3,00 16,00	DC + / +	3x, 5x	136	yes	2	2	30	Common	Ti-NAMITE-A
0.1250 0.7500	3,00 16,00	DC + / +	5x	124	yes	3	3	30	Common	Ti-NAMITE-X
0.1250 0.7500	3,00 16,00	DC + / +	3x, 5x	124	yes	3	3	30	Common	Ti-NAMITE-B
0.0980 0.5000	2,70 12,00	DC 0 / -	3x	145, 90	yes	2	4	20	Common	Di-NAMITE
0.0156 0.9219	1,25 22,00	DC + / +	3x, 5x	145	yes	2	4	32	Common	Ti-NAMITE-A
0.1250 0.8125	3,00 20,50	DC + / +	3x, 5x	180	yes	2	4	15	Common	Ti-NAMITE-X
0.0625 0.8125	1,50 20,50	DC + / +	2x	180	yes	2	4	15	Common	Ti-NAMITE-X
0.0400 0.5000	1,00 12,00	DC 0 / -	3x	140	yes	2	2	0	Straight	Ti-NAMITE-A or uncoated
0.0135 0.5000	0,70 12,00	DC 0 / -	5x	118	no	2	2	20	Straight	Ti-NAMITE-A or uncoated
0.1065 0.7500	3,00 20,00	DC 0 / -	3x	150	yes	3	3	30	Straight	Ti-NAMITE-A or uncoated
-	0,50 16,00	DC 0 / -	3x	118	yes	2	2	20	Straight	Ti-NAMITE-A or uncoated
0.0250 0.2188	0,50 5,00	DC + / 0	spot	118, 60	yes	2	2	0	Straight	Ti-NAMITE-A or uncoated
0.1250 1.0000	-	DC + / -	spot	60, 82, or 90	yes	1	-	0	Common	uncoated
0.1250 1.0000	-	DC + / -	spot	60, 82, or 90	yes	3	-	0	Common	uncoated
0.1250 1.0000	-	DC + / -	spot	60, 82, or 90	yes	6	6	0	Common	uncoated
0.0469 0.5000	-	DC + / 0	varies	-	-	4 or 6	4 or 6	0	Straight	uncoated
-	1,00 10,00	DC + / 0	varies	-	-	4 or 6	4 or 6	0	Straight	uncoated

Drilling Operations

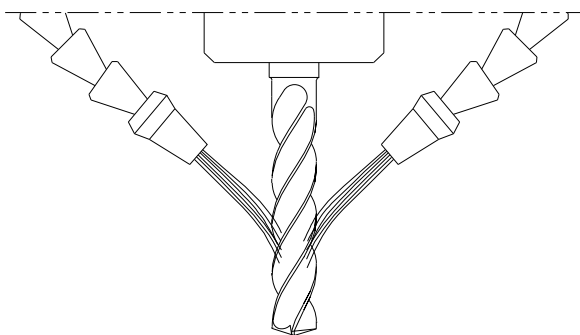
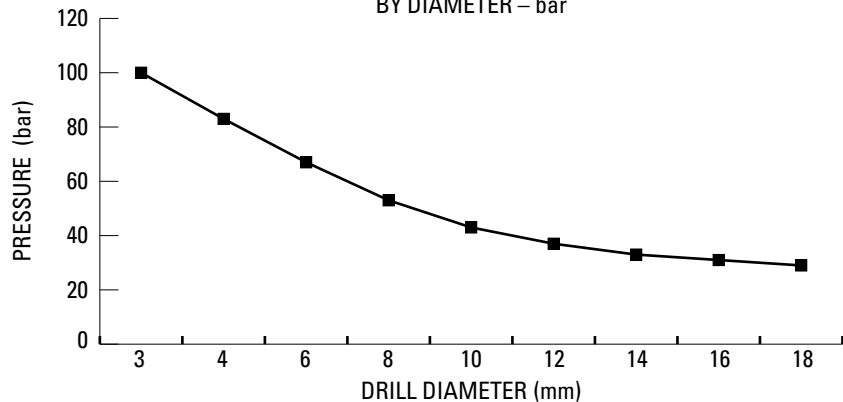
Coolant Recommendations

- Coolant works to mobilize chips away from the cut zone, reduce the heat created during the cutting process and minimize friction.
- It is important to optimize the coolant pressure and position in order to gain the full benefits coolant offers the cutting process.
- Proper coolant application promotes greater operating parameters, greater material removal rates, improved surface finishes, predictable tool life, reduced power consumption and reduced cycle times.
- Pressure is important, but more importantly is consistency of the pressure and application onto the tool; intermittent cooling of carbide leads to thermal stressing of the material and the formation of "microcracks."
- Proper cleanliness and filtration of coolants is important in order for the coolant to maintain its beneficial properties, and also to avoid a reduction in coolant pressure or the possibility of clogging the coolant channels in coolant through drills.

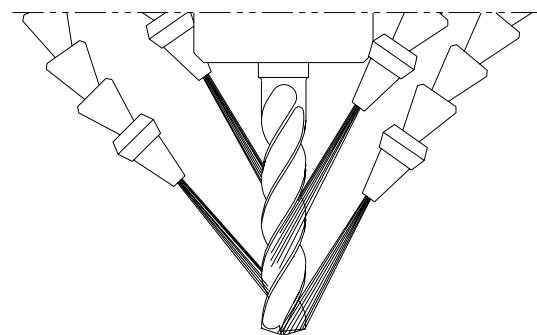
RECOMMENDED COOLANT PRESSURE
BY DIAMETER – psi



RECOMMENDED COOLANT PRESSURE
BY DIAMETER – bar



LARGE TIP – LOW VELOCITY
NO COVERAGE AT MAXIMUM DEPTH

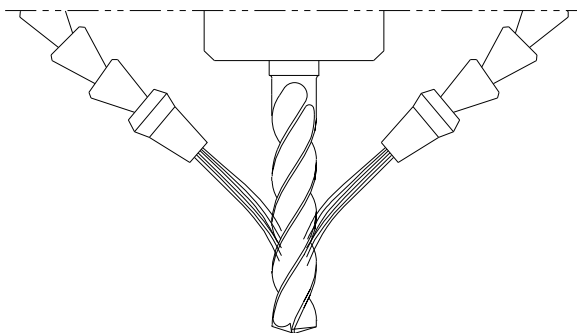
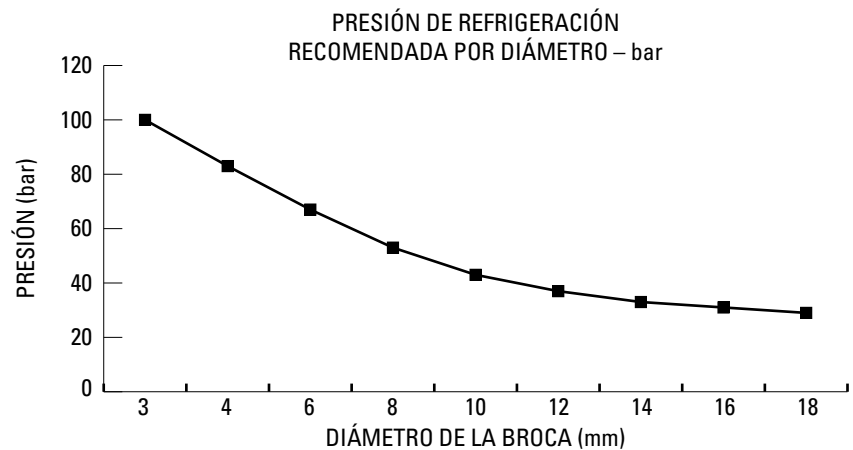
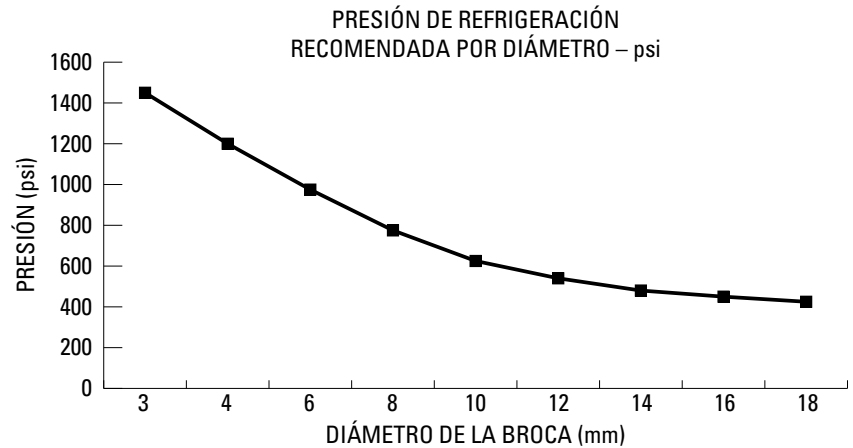


SMALL TIP – HIGH VELOCITY
COMPLETE COVERAGE

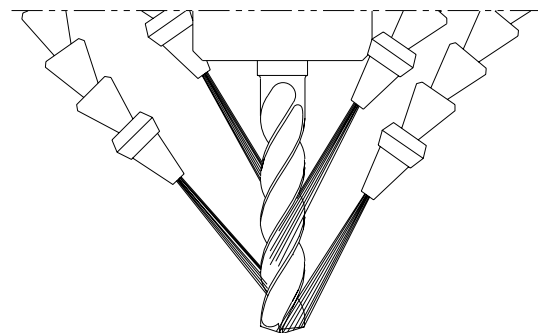
- Reducing the nozzle size helps maximize the cooling benefits of the unique double margin design on the Hi-PerCarb drill by increasing velocity. Aim the nozzles in line with the secondary flute located between the two margins as well as the flute for best results.

Recomendaciones en operacion de taladrado

- El líquido de refrigeración actúa movilizandando las virutas fuera de la zona de corte, disminuyendo el calor generado durante el proceso de corte y minimizando la fricción.
- Es importante optimizar la presión de la refrigeración y la posición para poder obtener todos los beneficios del refrigerante durante el proceso de corte.
- Una aplicación apropiada de la refrigeración fomenta mayores parámetros de operación, mayores índices de eliminación de material, acabados de superficie mejorados, una duración de la herramienta más predecible, bajo consumo de energía y un tiempo de ciclo reducido.
- La presión del refrigerante es importante, pero lo es más el flujo continuo aplicado a la herramienta; una refrigeración intermitente en el carburo puede ocasionar un estrés térmico en el material y la formación de "micro-fisuras".
- Una limpieza y filtración adecuadas son importantes para que el refrigerante mantenga sus propiedades y beneficios; por otra parte, se evita la reducción de la presión o la posibilidad de obstruir los canales de refrigeración de la broca.



PUNTA GRANDE – BAJA VELOCIDAD
SIN ALCANCE A PROFUNDIDAD MÁXIMA



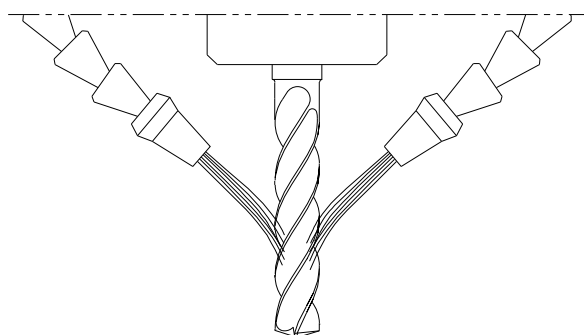
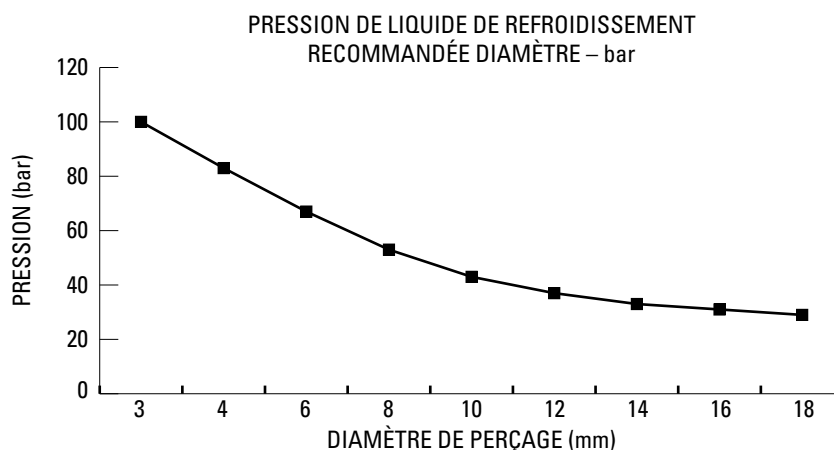
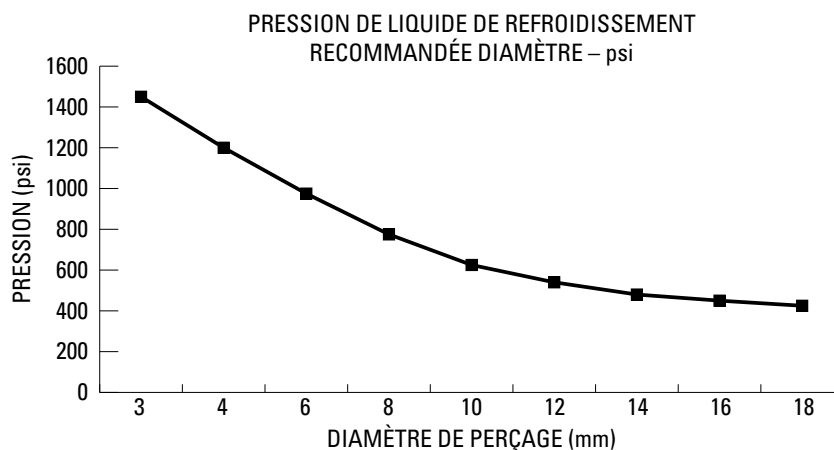
PUNTA PEQUEÑA – ALTA VELOCIDAD
COMPLETO ALCANCE

- Reducir el tamaño de la boquilla ayuda a maximizar los beneficios de refrigeración del exclusivo diseño de doble margen de la broca. Hi-PerCarb aumentando la velocidad. Coloque las boquillas en línea con el segundo filo que se encuentra entre los dos márgenes y también el filo para obtener mejores resultados.

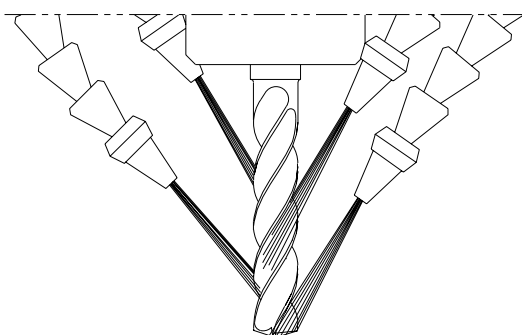
Opérations de perçage

Recommandations en matière de refroidissement

- Le liquide de refroidissement sert à éloigner les copeaux de la zone de coupe, à réduire la chaleur dégagée durant la coupe et à minimiser la friction.
- Il est important d'optimiser la pression et la position du réfrigérant pour en retirer les bénéfices maximums durant la coupe.
- L'application adéquate de réfrigérant se traduit par des paramètres opératoires supérieurs, des taux d'élimination supérieurs des matériaux, de plus belles finitions des surfaces, une durée de vie des outils prévisible, moins de consommation d'énergie et des temps de cycle réduits.
- La pression est importante, mais une pression régulière et l'application sur l'outil sont des facteurs encore plus importants ; le refroidissement intermittent du carbure se traduit par des contraintes thermiques pour le matériau et la formation de microfissures.
- La propreté et le filtrage adéquats des réfrigérants sont importants pour qu'ils conservent leur propriétés, mais aussi pour éviter la réduction de pression du réfrigérant ou le risque d'obturation des conduits à réfrigérant dans les perceuses à réfrigérant intégré.



POINTE LARGE – BASSE VITESSE
PAS DE COUVERTURE À LA PROFONDEUR MAXIMUM

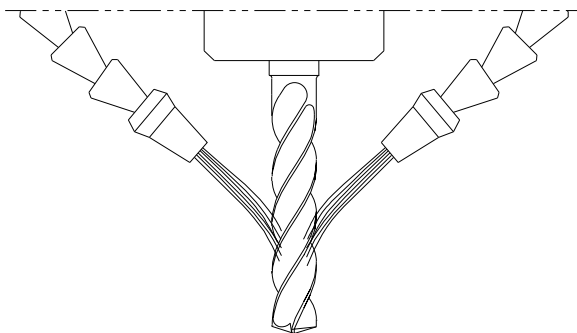
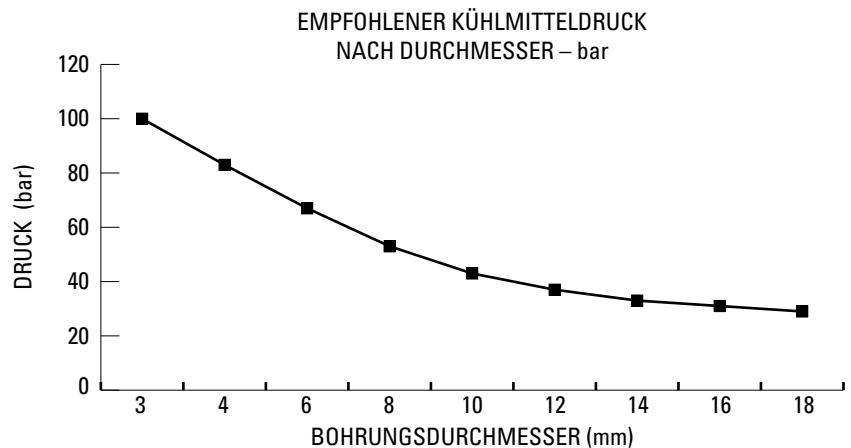
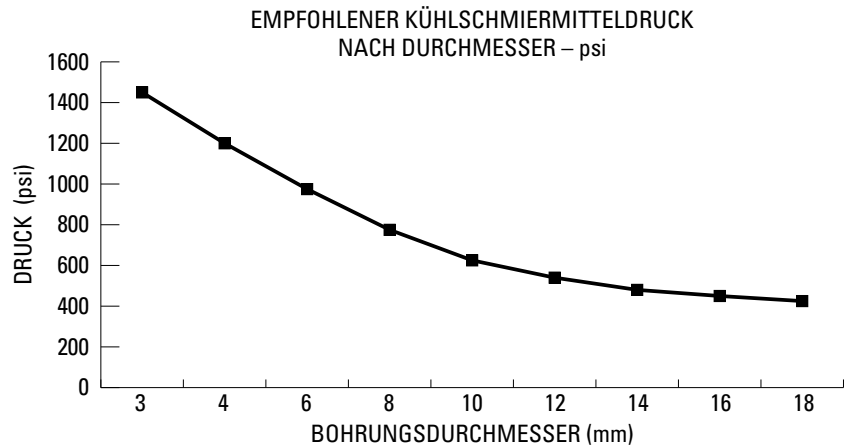


POINTE FINE – GRANDE VITESSE
COUVERTURE COMPLÈTE

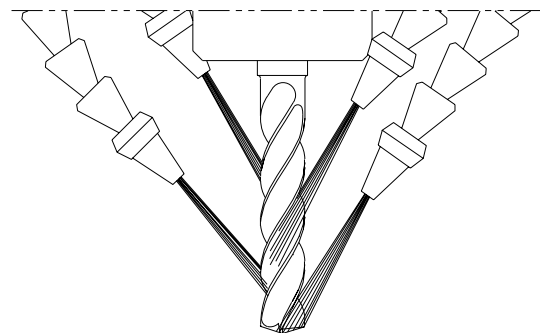
- La réduction de la taille de l'embout permet de maximiser les bienfaits du refroidissement du concept à double listel original de la perceuse Hi-PerCarb en augmentant la vitesse. Pour les meilleurs résultats, orientez les embouts dans l'axe de la goujure secondaire située entre les deux listels, de même que la goujure primaire.

Bohrarbeiten **Kühlmittelempfehlungen**

- Kühlmittel dienen dazu, die Späne aus dem Schneidenbereich zu entfernen, die beim Schneiden erzeugte Wärme abzutransportieren und die Reibung zu verringern.
- Es kommt darauf an, den Kühlschmiermitteldruck und die Zufuhr zu optimieren, um alle Vorteile beim Bohren nutzen zu können.
- Der richtige Kühlschmiermitteleinsatz ermöglicht höhere Schnittparameter, höheren Materialabtrag, bessere Oberflächengüte, vorhersehbare Standzeiten und geringere Leistungsaufnahme und Laufzeiten.
- Der Druck ist wichtig, aber wichtiger ist dessen Konstanz und die Zufuhr zum Werkzeug. Unterbrochene Kühlung des Hartmetalls führt zur thermischen Belastung und Bildung von "Mikrorissen".
- Kühlmittel sind sauber zu halten und zu filtern, damit die Qualität des Kühlmittels erhalten bleibt und der Kühlmitteldruck durch Verstopfung der Kühlmittelkanäle im Bohrer nicht absinkt.



BREITE QUERSCHNEIDE – GERINGE DREHZAHL
KEINE VOLLSTÄNDIGE BENETZUNG BEI MAX. BOHRUNGSTIEFE



SCHMALE QUERSCHNEIDE – HOHE DREHZAHL
VOLLSTÄNDIGE BENETZUNG

- Durch Verringern der Düsengröße können die vorteilhaften Eigenschaften der Doppelfase genutzt werden, um die Drehzahl des Hi-PerCarb-Bohrers zu steigern. Richten Sie die Düsen auf die Nebennut zwischen beiden Fasen sowie auf die Schneiden aus, um beste Ergebnisse zu erzielen.

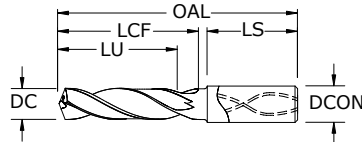


3xD



142P 3xD

FRACTIONAL & METRIC SERIES



- High-performance point design stabilizes on entry for exceptional hole size and cylindricity while also allowing for low thrust force and extended tool life
- Internal coolant hole improves coolant flow to extend tool life and aid in chip evacuation
- 4-margin design improves hole straightness and roundness while providing improved stability for difficult applications like cross holes and when exiting on angle
- Proprietary Ti-NAMITE-X coating and industry leading carbide substrate provides exceptional wear resistance and toughness for demanding applications
- Recommended for materials $\leq 50\text{HRC}$ (475 Bhn)

		inch & mm								EDP NO.
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	Ti-NAMITE-X (TX)		
0.1181	3,000 mm		6,0	62,0	20,0	15,0	36,0	66400		
0.1220	3,100 mm		6,0	62,0	20,0	15,0	36,0	66401		
0.1250	3,175 mm	1/8	6,0	62,0	20,0	15,0	36,0	56400		
0.1260	3,200 mm		6,0	62,0	20,0	15,0	36,0	66402		
0.1299	3,300 mm		6,0	62,0	20,0	15,0	36,0	66403		
0.1339	3,400 mm		6,0	62,0	20,0	15,0	36,0	66404		
0.1360	3,454 mm	#29	6,0	62,0	20,0	15,0	36,0	56401		
0.1378	3,500 mm		6,0	62,0	20,0	15,0	36,0	66405		
0.1406	3,571 mm	9/64	6,0	62,0	20,0	15,0	36,0	56402		
0.1417	3,600 mm		6,0	62,0	20,0	15,0	36,0	66406		
0.1457	3,700 mm		6,0	62,0	20,0	15,0	36,0	66407		
0.1496	3,800 mm		6,0	66,0	24,0	18,0	36,0	66408		
0.1535	3,900 mm		6,0	66,0	24,0	18,0	36,0	66409		
0.1562	3,967 mm	5/32	6,0	66,0	24,0	18,0	36,0	56403		
0.1575	4,000 mm		6,0	66,0	24,0	18,0	36,0	66410		
0.1590	4,039 mm	#21	6,0	66,0	24,0	18,0	36,0	56404		
0.1614	4,100 mm		6,0	66,0	24,0	18,0	36,0	66411		
0.1654	4,200 mm		6,0	66,0	24,0	18,0	36,0	66412		
0.1693	4,300 mm		6,0	66,0	24,0	18,0	36,0	66413		
0.1719	4,366 mm	11/64	6,0	66,0	24,0	17,0	36,0	56405		
0.1732	4,400 mm		6,0	66,0	24,0	17,0	36,0	66414		
0.1772	4,500 mm		6,0	66,0	24,0	17,0	36,0	66415		
0.1811	4,600 mm		6,0	66,0	24,0	17,0	36,0	66416		
0.1850	4,699 mm	#13	6,0	66,0	24,0	17,0	36,0	66417		
0.1875	4,763 mm	3/16	6,0	66,0	28,0	21,0	36,0	56406		
0.1890	4,801 mm	#12	6,0	66,0	28,0	21,0	36,0	66418		
0.1929	4,900 mm		6,0	66,0	28,0	21,0	36,0	66419		
0.1969	5,000 mm		6,0	66,0	28,0	20,0	36,0	66420		
0.2008	5,100 mm		6,0	66,0	28,0	20,0	36,0	66421		
0.2031	5,159 mm	13/64	6,0	66,0	28,0	20,0	36,0	56407		
0.2047	5,200 mm		6,0	66,0	28,0	20,0	36,0	66422		
0.2087	5,300 mm		6,0	66,0	28,0	20,0	36,0	66423		
0.2126	5,400 mm		6,0	66,0	28,0	20,0	36,0	66424		
0.2165	5,500 mm		6,0	66,0	28,0	20,0	36,0	66425		
0.2188	5,558 mm	7/32	6,0	66,0	28,0	20,0	36,0	56408		
0.2205	5,600 mm		6,0	66,0	28,0	20,0	36,0	66426		
0.2244	5,700 mm		6,0	66,0	28,0	19,0	36,0	66427		
0.2283	5,800 mm		6,0	66,0	28,0	19,0	36,0	66428		
0.2323	5,900 mm		6,0	66,0	28,0	19,0	36,0	66429		
0.2344	5,954 mm	15/64	6,0	66,0	28,0	19,0	36,0	56409		
0.2362	6,000 mm		6,0	66,0	28,0	19,0	36,0	66430		
0.2402	6,100 mm		8,0	79,0	34,0	25,0	36,0	66431		
0.2441	6,200 mm		8,0	79,0	34,0	25,0	36,0	66432		
0.2480	6,300 mm		8,0	79,0	34,0	25,0	36,0	66433		

TOLERANCES (inch)

 $\leq .1181$ DIAMETERDC = $\pm .00008/\pm .00047$ DCON = h_6 $> .1181 - .2362$ DIAMETERDC = $\pm .00016/\pm .00063$ DCON = h_6 $> .2362 - .3937$ DIAMETERDC = $\pm .00024/\pm .00083$ DCON = h_6 $> .3937 - .7087$ DIAMETERDC = $\pm .00028/\pm .00098$ DCON = h_6 $> .7087 - 1.1811$ DIAMETERDC = $\pm .00031/\pm .00114$ DCON = h_6

TOLERANCES (mm)

 ≤ 3 DIAMETERDC = $\pm 0,002/\pm 0,012$ DCON = h_6 $> 3 - 6$ DIAMETERDC = $\pm 0,004/\pm 0,016$ DCON = h_6 $> 6 - 10$ DIAMETERDC = $\pm 0,006/\pm 0,021$ DCON = h_6 $> 10 - 18$ DIAMETERDC = $\pm 0,007/\pm 0,025$ DCON = h_6 $> 18 - 30$ DIAMETERDC = $\pm 0,008/\pm 0,029$ DCON = h_6

STEELS

STAINLESS STEELS

CAST IRON

NON-FERROUS

HIGH TEMP ALLOYS

HARDENED STEELS

continued on next page

142P 3xD

FRACTIONAL & METRIC SERIES

DECIMAL DC	METRIC DC	inch & mm		OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	EDP NO. Ti-NAMITE-X (TX)
		FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON					
0.2500	6,350 mm	1/4 E	8,0	79,0	34,0	24,0	36,0	56410
0.2520	6,400 mm		8,0	79,0	34,0	24,0	36,0	66434
0.2559	6,500 mm		8,0	79,0	34,0	24,0	36,0	66435
0.2570	6,528 mm	F	8,0	79,0	34,0	24,0	36,0	56411
0.2598	6,600 mm		8,0	79,0	34,0	24,0	36,0	66436
0.2638	6,700 mm		8,0	79,0	34,0	24,0	36,0	66437
0.2656	6,746 mm	17/64	8,0	79,0	34,0	24,0	36,0	56412
0.2677	6,800 mm		8,0	79,0	34,0	24,0	36,0	66438
0.2717	6,900 mm		8,0	79,0	34,0	24,0	36,0	66439
0.2756	7,000 mm		8,0	79,0	34,0	24,0	36,0	66440
0.2795	7,100 mm		8,0	79,0	41,0	30,0	36,0	66441
0.2812	7,142 mm	9/32	8,0	79,0	41,0	30,0	36,0	56413
0.2835	7,200 mm		8,0	79,0	41,0	30,0	36,0	66442
0.2874	7,300 mm		8,0	79,0	41,0	30,0	36,0	66443
0.2913	7,400 mm		8,0	79,0	41,0	30,0	36,0	66444
0.2953	7,500 mm		8,0	79,0	41,0	30,0	36,0	66445
0.2969	7,541 mm	19/64	8,0	79,0	41,0	30,0	36,0	56414
0.2992	7,600 mm		8,0	79,0	41,0	30,0	36,0	66446
0.3031	7,700 mm		8,0	79,0	41,0	29,0	36,0	66447
0.3071	7,800 mm		8,0	79,0	41,0	29,0	36,0	66448
0.3110	7,900 mm		8,0	79,0	41,0	29,0	36,0	66449
0.3125	7,938 mm	5/16	8,0	79,0	41,0	29,0	36,0	56415
0.3150	8,000 mm		8,0	79,0	41,0	29,0	36,0	66450
0.3189	8,100 mm		10,0	89,0	47,0	35,0	40,0	66451
0.3228	8,200 mm		10,0	89,0	47,0	35,0	40,0	66452
0.3268	8,300 mm		10,0	89,0	47,0	35,0	40,0	66453
0.3281	8,334 mm	21/64	10,0	89,0	47,0	34,0	40,0	56416
0.3307	8,400 mm		10,0	89,0	47,0	34,0	40,0	66454
0.3320	8,433 mm	Q	10,0	89,0	47,0	34,0	40,0	56417
0.3346	8,500 mm		10,0	89,0	47,0	34,0	40,0	66455
0.3386	8,600 mm		10,0	89,0	47,0	34,0	40,0	66456
0.3425	8,700 mm		10,0	89,0	47,0	34,0	40,0	66457
0.3438	8,733 mm	11/32	10,0	89,0	47,0	34,0	40,0	56418
0.3465	8,800 mm		10,0	89,0	47,0	34,0	40,0	66458
0.3504	8,900 mm		10,0	89,0	47,0	34,0	40,0	66459
0.3543	9,000 mm		10,0	89,0	47,0	34,0	40,0	66460
0.3583	9,100 mm		10,0	89,0	47,0	33,0	40,0	66461
0.3594	9,129 mm	23/64	10,0	89,0	47,0	33,0	40,0	56419
0.3622	9,200 mm		10,0	89,0	47,0	33,0	40,0	66462
0.3661	9,300 mm		10,0	89,0	47,0	33,0	40,0	66463
0.3680	9,347 mm	U	10,0	89,0	47,0	33,0	40,0	56420
0.3701	9,400 mm		10,0	89,0	47,0	33,0	40,0	66464
0.3740	9,500 mm		10,0	89,0	47,0	33,0	40,0	66465
0.3750	9,525 mm	3/8	10,0	89,0	47,0	33,0	40,0	56421
0.3780	9,600 mm		10,0	89,0	47,0	33,0	40,0	66466
0.3819	9,700 mm		10,0	89,0	47,0	32,0	40,0	66467
0.3858	9,800 mm		10,0	89,0	47,0	32,0	40,0	66468
0.3898	9,900 mm		10,0	89,0	47,0	32,0	40,0	66469
0.3906	9,921 mm	25/64	10,0	89,0	47,0	32,0	40,0	56422
0.3937	10,000 mm		10,0	89,0	47,0	32,0	40,0	66470
0.3976	10,100 mm		12,0	102,0	55,0	40,0	45,0	66471
0.4016	10,200 mm		12,0	102,0	55,0	40,0	45,0	66472
0.4055	10,300 mm		12,0	102,0	55,0	40,0	45,0	66473
0.4062	10,317 mm	13/32	12,0	102,0	55,0	40,0	45,0	56423

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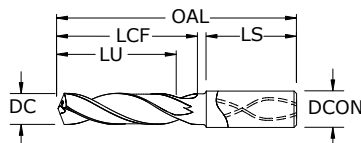


3xD



142P 3xD

FRACTIONAL & METRIC SERIES



CONTINUED

- High-performance point design stabilizes on entry for exceptional hole size and cylindricity while also allowing for low thrust force and extended tool life
- Internal coolant hole improves coolant flow to extend tool life and aid in chip evacuation
- 4-margin design improves hole straightness and roundness while providing improved stability for difficult applications like cross holes and when exiting on angle
- Proprietary Ti-NAMITE-X coating and industry leading carbide substrate provides exceptional wear resistance and toughness for demanding applications
- Recommended for materials $\leq 50\text{HRc}$ (475 Bhn)

		inch & mm								EDP NO.
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	Ti-NAMITE-X (TX)		
0.4095	10,400 mm		12,0	102,0	55,0	39,0	45,0	66474		
0.4134	10,500 mm		12,0	102,0	55,0	39,0	45,0	66475		
0.4173	10,600 mm		12,0	102,0	55,0	39,0	45,0	66476		
0.4213	10,700 mm		12,0	102,0	55,0	39,0	45,0	66477		
0.4219	10,716 mm	27/64	12,0	102,0	55,0	39,0	45,0	56424		
0.4252	10,800 mm		12,0	102,0	55,0	39,0	45,0	66478		
0.4291	10,900 mm		12,0	102,0	55,0	39,0	45,0	66479		
0.4331	11,000 mm		12,0	102,0	55,0	39,0	45,0	66480		
0.4370	11,100 mm		12,0	102,0	55,0	38,0	45,0	66481		
0.4375	11,113 mm	7/16	12,0	102,0	55,0	38,0	45,0	56425		
0.4409	11,200 mm		12,0	102,0	55,0	38,0	45,0	66482		
0.4449	11,300 mm		12,0	102,0	55,0	38,0	45,0	66483		
0.4488	11,400 mm		12,0	102,0	55,0	38,0	45,0	66484		
0.4528	11,500 mm		12,0	102,0	55,0	38,0	45,0	66485		
0.4567	11,600 mm		12,0	102,0	55,0	38,0	45,0	66486		
0.4606	11,700 mm		12,0	102,0	55,0	37,0	45,0	66487		
0.4646	11,800 mm		12,0	102,0	55,0	37,0	45,0	66488		
0.4685	11,900 mm		12,0	102,0	55,0	37,0	45,0	66489		
0.4688	11,908 mm	15/32	12,0	102,0	55,0	37,0	45,0	56426		
0.4724	12,000 mm		12,0	102,0	55,0	37,0	45,0	66490		
0.4844	12,304 mm	31/64	14,0	107,0	60,0	41,0	45,0	56427		
0.4921	12,500 mm		14,0	107,0	60,0	41,0	45,0	66491		
0.5000	12,700 mm	1/2	14,0	107,0	60,0	41,0	45,0	56428		
0.5039	12,800 mm		14,0	107,0	60,0	41,0	45,0	66492		
0.5118	13,000 mm		14,0	107,0	60,0	41,0	45,0	66493		
0.5156	13,096 mm	33/64	14,0	107,0	60,0	40,0	45,0	56429		
0.5315	13,500 mm		14,0	107,0	60,0	40,0	45,0	66494		
0.5433	13,800 mm		14,0	107,0	60,0	39,0	45,0	66495		
0.5512	14,000 mm		14,0	107,0	60,0	39,0	45,0	66496		
0.5625	14,288 mm	9/16	16,0	115,0	65,0	43,0	48,0	56430		
0.5709	14,500 mm		16,0	115,0	65,0	43,0	48,0	66497		
0.5781	14,684 mm	37/64	16,0	115,0	65,0	43,0	48,0	56431		
0.5827	14,800 mm		16,0	115,0	65,0	43,0	48,0	66498		
0.5906	15,000 mm		16,0	115,0	65,0	42,0	48,0	66499		
0.6102	15,500 mm		16,0	115,0	65,0	42,0	48,0	66500		
0.6221	15,800 mm		16,0	115,0	65,0	41,0	48,0	66501		
0.6250	15,875 mm	5/8	16,0	115,0	65,0	41,0	48,0	56432		
0.6299	16,000 mm		16,0	115,0	65,0	41,0	48,0	66502		
0.6562	16,667 mm	21/32	18,0	123,0	73,0	47,0	48,0	56433		
0.6875	17,463 mm	11/16	18,0	123,0	73,0	47,0	48,0	56434		
0.7500	19,050 mm	3/4	20,0	131,0	79,0	50,0	50,0	56435		

TOLERANCES (inch)

 $\leq .1181$ DIAMETERDC = $\pm .00008/\pm .00047$ DCON = h_6 $> .1181 - .2362$ DIAMETERDC = $\pm .00016/\pm .00063$ DCON = h_6 $> .2362 - .3937$ DIAMETERDC = $\pm .00028/\pm .00083$ DCON = h_6 $> .3937 - .7087$ DIAMETERDC = $\pm .00028/\pm .00098$ DCON = h_6 $> .7087 - 1.1811$ DIAMETERDC = $\pm .00031/\pm .00114$ DCON = h_6

TOLERANCES (mm)

 ≤ 3 DIAMETERDC = $\pm 0,002/\pm 0,012$ DCON = h_6 $> 3 - 6$ DIAMETERDC = $\pm 0,004/\pm 0,016$ DCON = h_6 $> 6 - 10$ DIAMETERDC = $\pm 0,006/\pm 0,021$ DCON = h_6 $> 10 - 18$ DIAMETERDC = $\pm 0,007/\pm 0,025$ DCON = h_6 $> 18 - 30$ DIAMETERDC = $\pm 0,008/\pm 0,029$ DCON = h_6

STEELS

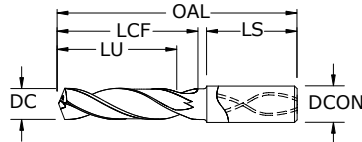
STAINLESS STEELS

CAST IRON

NON-FERROUS

HIGH TEMP ALLOYS

HARDENED STEELS



142P 5xD

FRACTIONAL & METRIC SERIES

TOLERANCES (inch)

≤.1181 DIAMETER

DC = +.00008/+0.00047

DCON = h₆

>.1181-.2362 DIAMETER

DC = +.00016/+0.00063

DCON = h₆

>.2362-.3937 DIAMETER

DC = +.00024/+0.00083

DCON = h₆

>.3937-.7087 DIAMETER

DC = +.00028/+0.00098

DCON = h₆

>.7087-1.1811 DIAMETER

DC = +.00031/+0.00114

DCON = h₆

TOLERANCES (mm)

≤3 DIAMETER

DC = +0.002/+0.012

DCON = h₆

>3-6 DIAMETER

DC = +0.004/+0.016

DCON = h₆

>6-10 DIAMETER

DC = +0.006/+0.021

DCON = h₆

>10-18 DIAMETER

DC = +0.007/+0.025

DCON = h₆

>18-30 DIAMETER

DC = +0.008/+0.029

DCON = h₆

STEELS

STAINLESS STEELS

CAST IRON

NON-FERROUS

HIGH TEMP ALLOYS

HARDENED STEELS

		inch & mm							EDP NO.
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS		Ti-NAMITE-X (TX)
0.1181	3,000 mm		6,0	66,0	28,0	23,0	36,0		66503
0.1220	3,100 mm		6,0	66,0	28,0	23,0	36,0		66504
0.1250	3,175 mm	1/8	6,0	66,0	28,0	23,0	36,0		56436
0.1260	3,200 mm		6,0	66,0	28,0	23,0	36,0		66505
0.1299	3,300 mm		6,0	66,0	28,0	23,0	36,0		66506
0.1339	3,400 mm		6,0	66,0	28,0	23,0	36,0		66507
0.1360	3,454 mm	#29	6,0	66,0	28,0	23,0	36,0		56437
0.1378	3,500 mm		6,0	66,0	28,0	23,0	36,0		66508
0.1406	3,571 mm	9/64	6,0	66,0	28,0	23,0	36,0		56438
0.1417	3,600 mm		6,0	66,0	28,0	23,0	36,0		66509
0.1457	3,700 mm		6,0	66,0	28,0	23,0	36,0		66510
0.1496	3,800 mm		6,0	74,0	36,0	29,0	36,0		66511
0.1535	3,900 mm		6,0	74,0	36,0	29,0	36,0		66512
0.1562	3,967 mm	5/32	6,0	74,0	36,0	29,0	36,0		56439
0.1575	4,000 mm		6,0	74,0	36,0	29,0	36,0		66513
0.1590	4,039 mm	#21	6,0	74,0	36,0	29,0	36,0		56440
0.1614	4,100 mm		6,0	74,0	36,0	29,0	36,0		66514
0.1654	4,200 mm		6,0	74,0	36,0	29,0	36,0		66515
0.1693	4,300 mm		6,0	74,0	36,0	29,0	36,0		66516
0.1719	4,366 mm	11/64	6,0	74,0	36,0	29,0	36,0		56441
0.1732	4,400 mm		6,0	74,0	36,0	29,0	36,0		66517
0.1772	4,500 mm		6,0	74,0	36,0	29,0	36,0		66518
0.1811	4,600 mm		6,0	74,0	36,0	29,0	36,0		66519
0.1850	4,699 mm	#13	6,0	74,0	36,0	29,0	36,0		66520
0.1875	4,763 mm	3/16	6,0	82,0	44,0	37,0	36,0		56442
0.1890	4,801 mm	#12	6,0	82,0	44,0	37,0	36,0		66521
0.1929	4,900 mm		6,0	82,0	44,0	37,0	36,0		66522
0.1969	5,000 mm		6,0	82,0	44,0	36,0	36,0		66523
0.2008	5,100 mm		6,0	82,0	44,0	36,0	36,0		66524
0.2031	5,159 mm	13/64	6,0	82,0	44,0	36,0	36,0		56443
0.2047	5,200 mm		6,0	82,0	44,0	36,0	36,0		66525
0.2087	5,300 mm		6,0	82,0	44,0	36,0	36,0		66526
0.2126	5,400 mm		6,0	82,0	44,0	36,0	36,0		66527
0.2165	5,500 mm		6,0	82,0	44,0	36,0	36,0		66528
0.2188	5,558 mm	7/32	6,0	82,0	44,0	36,0	36,0		56444
0.2205	5,600 mm		6,0	82,0	44,0	36,0	36,0		66529
0.2244	5,700 mm		6,0	82,0	44,0	35,0	36,0		66530
0.2283	5,800 mm		6,0	82,0	44,0	35,0	36,0		66531
0.2323	5,900 mm		6,0	82,0	44,0	35,0	36,0		66532
0.2344	5,954 mm	15/64	6,0	82,0	44,0	35,0	36,0		56445
0.2362	6,000 mm		6,0	82,0	44,0	35,0	36,0		66533
0.2402	6,100 mm		8,0	91,0	53,0	44,0	36,0		66534
0.2441	6,200 mm		8,0	91,0	53,0	44,0	36,0		66535

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- High-performance point design stabilizes on entry for exceptional hole size and cylindricity while also allowing for low thrust force and extended tool life
- Internal coolant hole improves coolant flow to extend tool life and aid in chip evacuation
- 4 margin design improves hole straightness and roundness while providing improved stability for difficult applications like cross holes and when exiting on angle
- Proprietary Ti-NAMITE-X coating and industry leading carbide substrate provides exceptional wear resistance and toughness for demanding applications
- Recommended for materials ≤50HRc (475 Bhn)

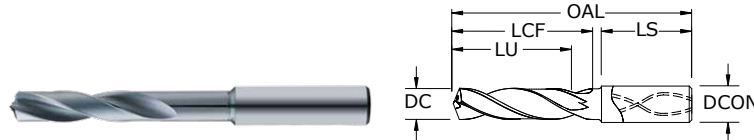


5xD



142P 5xD

FRACTIONAL & METRIC SERIES



CONTINUED

- High-performance point design stabilizes on entry for exceptional hole size and cylindricity while also allowing for low thrust force and extended tool life
- Internal coolant hole improves coolant flow to extend tool life and aid in chip evacuation
- 4-margin design improves hole straightness and roundness while providing improved stability for difficult applications like cross holes and when exiting on angle
- Proprietary Ti-NAMITE-X coating and industry leading carbide substrate provides exceptional wear resistance and toughness for demanding applications
- Recommended for materials $\leq 50\text{HRC}$ (475 Bhn)

		inch & mm								EDP NO.
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	Ti-NAMITE-X (TX)		
0.2480	6,300 mm		8,0	91,0	53,0	44,0	36,0			66536
0.2500	6,350 mm	1/4 E	8,0	91,0	53,0	43,0	36,0			56446
0.2520	6,400 mm		8,0	91,0	53,0	43,0	36,0			66537
0.2559	6,500 mm		8,0	91,0	53,0	43,0	36,0			66538
0.2570	6,528 mm	F	8,0	91,0	53,0	43,0	36,0			56447
0.2598	6,600 mm		8,0	91,0	53,0	43,0	36,0			66539
0.2638	6,700 mm		8,0	91,0	53,0	43,0	36,0			66540
0.2656	6,746 mm	17/64	8,0	91,0	53,0	43,0	36,0			56448
0.2677	6,800 mm		8,0	91,0	53,0	43,0	36,0			66541
0.2717	6,900 mm		8,0	91,0	53,0	43,0	36,0			66542
0.2756	7,000 mm		8,0	91,0	53,0	42,0	36,0			66543
0.2795	7,100 mm		8,0	91,0	53,0	42,0	36,0			66544
0.2812	7,142 mm	9/32	8,0	91,0	53,0	42,0	36,0			56449
0.2835	7,200 mm		8,0	91,0	53,0	42,0	36,0			66545
0.2874	7,300 mm		8,0	91,0	53,0	42,0	36,0			66546
0.2913	7,400 mm		8,0	91,0	53,0	42,0	36,0			66547
0.2953	7,500 mm		8,0	91,0	53,0	42,0	36,0			66548
0.2969	7,541 mm	19/64	8,0	91,0	53,0	42,0	36,0			56450
0.2992	7,600 mm		8,0	91,0	53,0	42,0	36,0			66549
0.3031	7,700 mm		8,0	91,0	53,0	41,0	36,0			66550
0.3071	7,800 mm		8,0	91,0	53,0	41,0	36,0			66551
0.3110	7,900 mm		8,0	91,0	53,0	41,0	36,0			66552
0.3125	7,938 mm	5/16	8,0	91,0	53,0	41,0	36,0			56451
0.3150	8,000 mm		8,0	91,0	53,0	41,0	36,0			66553
0.3189	8,100 mm		10,0	103,0	61,0	49,0	40,0			66554
0.3228	8,200 mm		10,0	103,0	61,0	49,0	40,0			66555
0.3268	8,300 mm		10,0	103,0	61,0	49,0	40,0			66556
0.3281	8,334 mm	21/64	10,0	103,0	61,0	48,0	40,0			56452
0.3307	8,400 mm		10,0	103,0	61,0	48,0	40,0			66557
0.3320	8,433 mm	Q	10,0	103,0	61,0	48,0	40,0			56453
0.3346	8,500 mm		10,0	103,0	61,0	48,0	40,0			66558
0.3386	8,600 mm		10,0	103,0	61,0	48,0	40,0			66559
0.3425	8,700 mm		10,0	103,0	61,0	48,0	40,0			66560
0.3438	8,733 mm	11/32	10,0	103,0	61,0	48,0	40,0			56454
0.3465	8,800 mm		10,0	103,0	61,0	48,0	40,0			66561
0.3504	8,900 mm		10,0	103,0	61,0	48,0	40,0			66562
0.3543	9,000 mm		10,0	103,0	61,0	48,0	40,0			66563
0.3583	9,100 mm		10,0	103,0	61,0	47,0	40,0			66564
0.3594	9,129 mm	23/64	10,0	103,0	61,0	47,0	40,0			56455
0.3622	9,200 mm		10,0	103,0	61,0	47,0	40,0			66565
0.3661	9,300 mm		10,0	103,0	61,0	47,0	40,0			66566
0.3680	9,347 mm	U	10,0	103,0	61,0	47,0	40,0			56456
0.3701	9,400 mm		10,0	103,0	61,0	47,0	40,0			66567

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TOLERANCES (inch)

 $\leq .1181$ DIAMETERDC = $\pm .00008/\pm .00047$ DCON = h_6 $> .1181$ -.2362 DIAMETERDC = $\pm .00016/\pm .00063$ DCON = h_6 $> .2362$ -.3937 DIAMETERDC = $\pm .00024/\pm .00083$ DCON = h_6 $> .3937$ -.7087 DIAMETERDC = $\pm .00028/\pm .00098$ DCON = h_6 $> .7087$ -1.1811 DIAMETERDC = $\pm .00031/\pm .00114$ DCON = h_6

TOLERANCES (mm)

 ≤ 3 DIAMETERDC = $\pm 0,002/\pm 0,012$ DCON = h_6 > 3 -6 DIAMETERDC = $\pm 0,004/\pm 0,016$ DCON = h_6 > 6 -10 DIAMETERDC = $\pm 0,006/\pm 0,021$ DCON = h_6 > 10 -18 DIAMETERDC = $\pm 0,007/\pm 0,025$ DCON = h_6 > 18 -30 DIAMETERDC = $\pm 0,008/\pm 0,029$ DCON = h_6

STEELS

STAINLESS STEELS

CAST IRON

NON-FERROUS

HIGH TEMP ALLOYS

HARDENED STEELS

142P 5xD

FRACTIONAL & METRIC SERIES

DECIMAL DC	METRIC DC	inch & mm		OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	EDP NO.
		FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON					Ti-NAMITE-X (TX)
0.3740	9,500 mm		10,0	103,0	61,0	47,0	40,0	66568
0.3750	9,525 mm	3/8	10,0	103,0	61,0	47,0	40,0	56457
0.3780	9,600 mm		10,0	103,0	61,0	47,0	40,0	66569
0.3819	9,700 mm		10,0	103,0	61,0	46,0	40,0	66570
0.3858	9,800 mm		10,0	103,0	61,0	46,0	40,0	66571
0.3898	9,900 mm		10,0	103,0	61,0	46,0	40,0	66572
0.3906	9,921 mm	25/64	10,0	103,0	61,0	46,0	40,0	56458
0.3937	10,000 mm		10,0	103,0	61,0	46,0	40,0	66573
0.3976	10,100 mm		12,0	118,0	71,0	56,0	45,0	66574
0.4016	10,200 mm		12,0	118,0	71,0	56,0	45,0	66575
0.4055	10,300 mm		12,0	118,0	71,0	56,0	45,0	66576
0.4062	10,317 mm	13/32	12,0	118,0	71,0	56,0	45,0	56459
0.4095	10,400 mm		12,0	118,0	71,0	55,0	45,0	66577
0.4134	10,500 mm		12,0	118,0	71,0	55,0	45,0	66578
0.4173	10,600 mm		12,0	118,0	71,0	55,0	45,0	66579
0.4213	10,700 mm		12,0	118,0	71,0	55,0	45,0	66580
0.4219	10,716 mm	27/64	12,0	118,0	71,0	55,0	45,0	56460
0.4252	10,800 mm		12,0	118,0	71,0	55,0	45,0	66581
0.4291	10,900 mm		12,0	118,0	71,0	55,0	45,0	66582
0.4331	11,000 mm		12,0	118,0	71,0	54,0	45,0	66583
0.4370	11,100 mm		12,0	118,0	71,0	54,0	45,0	66584
0.4375	11,113 mm	7/16	12,0	118,0	71,0	54,0	45,0	56461
0.4409	11,200 mm		12,0	118,0	71,0	54,0	45,0	66585
0.4449	11,300 mm		12,0	118,0	71,0	54,0	45,0	66586
0.4488	11,400 mm		12,0	118,0	71,0	54,0	45,0	66587
0.4528	11,500 mm		12,0	118,0	71,0	54,0	45,0	66588
0.4567	11,600 mm		12,0	118,0	71,0	54,0	45,0	66589
0.4606	11,700 mm		12,0	118,0	71,0	53,0	45,0	66590
0.4646	11,800 mm		12,0	118,0	71,0	53,0	45,0	66591
0.4685	11,900 mm		12,0	118,0	71,0	53,0	45,0	66592
0.4688	11,908 mm	15/32	12,0	118,0	71,0	53,0	45,0	56462
0.4724	12,000 mm		12,0	118,0	71,0	53,0	45,0	66593
0.4844	12,304 mm	31/64	14,0	124,0	77,0	58,0	45,0	56463
0.4921	12,500 mm		14,0	124,0	77,0	58,0	45,0	66594
0.5000	12,700 mm	1/2	14,0	124,0	77,0	58,0	45,0	56464
0.5039	12,800 mm		14,0	124,0	77,0	58,0	45,0	66595
0.5118	13,000 mm		14,0	124,0	77,0	58,0	45,0	66596
0.5156	13,096 mm	33/64	14,0	124,0	77,0	57,0	45,0	56465
0.5315	13,500 mm		14,0	124,0	77,0	57,0	45,0	66597
0.5433	13,800 mm		14,0	124,0	77,0	56,0	45,0	66598
0.5512	14,000 mm		14,0	124,0	77,0	56,0	45,0	66599
0.5625	14,288 mm	9/16	16,0	133,0	83,0	61,0	48,0	56466
0.5709	14,500 mm		16,0	133,0	83,0	61,0	48,0	66600
0.5781	14,684 mm	37/64	16,0	133,0	83,0	61,0	48,0	56467
0.5827	14,800 mm		16,0	133,0	83,0	61,0	48,0	66601
0.5906	15,000 mm		16,0	133,0	83,0	60,0	48,0	66602
0.6102	15,500 mm		16,0	133,0	83,0	60,0	48,0	66603
0.6221	15,800 mm		16,0	133,0	83,0	59,0	48,0	66604
0.6250	15,875 mm	5/8	16,0	133,0	83,0	59,0	48,0	56468
0.6299	16,000 mm		16,0	133,0	83,0	59,0	48,0	66605
0.6562	16,667 mm	21/32	18,0	143,0	93,0	68,0	48,0	56469
0.6875	17,463 mm	11/16	18,0	143,0	93,0	67,0	48,0	56470
0.7500	19,050 mm	3/4	20,0	153,0	101,0	72,0	50,0	56471

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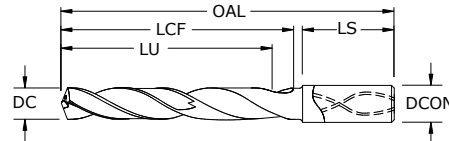


8xD



142P 8xD

FRACTIONAL & METRIC SERIES



- High-performance point design stabilizes on entry for exceptional hole size and cylindricity while also allowing for low thrust force and extended tool life
- Internal coolant hole improves coolant flow to extend tool life and aid in chip evacuation
- 4-margin design improves hole straightness and roundness while providing improved stability for difficult applications like cross holes and when exiting on angle
- Proprietary Ti-NAMITE-X coating and industry leading carbide substrate provides exceptional wear resistance and toughness for demanding applications
- Recommended for materials $\leq 50\text{HRC}$ (475 Bhn)

inch & mm								EDP NO.
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	Ti-NAMITE-X (TX)
0.1181	3,000 mm		6,0	72,0	34,0	29,0	36,0	66606
0.1220	3,100 mm		6,0	72,0	34,0	29,0	36,0	66607
0.1250	3,175 mm	1/8	6,0	72,0	34,0	29,0	36,0	56472
0.1260	3,200 mm		6,0	72,0	34,0	29,0	36,0	66608
0.1299	3,300 mm		6,0	72,0	34,0	29,0	36,0	66609
0.1339	3,400 mm		6,0	72,0	34,0	29,0	36,0	66610
0.1360	3,454 mm	#29	6,0	72,0	34,0	29,0	36,0	56473
0.1378	3,500 mm		6,0	72,0	34,0	29,0	36,0	66611
0.1406	3,571 mm	9/64	6,0	72,0	34,0	29,0	36,0	56474
0.1417	3,600 mm		6,0	72,0	34,0	29,0	36,0	66612
0.1457	3,700 mm		6,0	72,0	34,0	29,0	36,0	66613
0.1496	3,800 mm		6,0	81,0	43,0	37,0	36,0	66614
0.1535	3,900 mm		6,0	81,0	43,0	37,0	36,0	66615
0.1562	3,967 mm	5/32	6,0	81,0	43,0	37,0	36,0	56475
0.1575	4,000 mm		6,0	81,0	43,0	37,0	36,0	66616
0.1590	4,039 mm	#21	6,0	81,0	43,0	37,0	36,0	56476
0.1614	4,100 mm		6,0	81,0	43,0	37,0	36,0	66617
0.1654	4,200 mm		6,0	81,0	43,0	37,0	36,0	66618
0.1693	4,300 mm		6,0	81,0	43,0	37,0	36,0	66619
0.1719	4,366 mm	11/64	6,0	81,0	43,0	36,0	36,0	56477
0.1732	4,400 mm		6,0	81,0	43,0	36,0	36,0	66620
0.1772	4,500 mm		6,0	81,0	43,0	36,0	36,0	66621
0.1811	4,600 mm		6,0	81,0	43,0	36,0	36,0	66622
0.1850	4,699 mm	#13	6,0	81,0	43,0	36,0	36,0	66623
0.1875	4,763 mm	3/16	6,0	95,0	57,0	50,0	36,0	56478
0.1890	4,801 mm	#12	6,0	95,0	57,0	50,0	36,0	66624
0.1929	4,900 mm		6,0	95,0	57,0	50,0	36,0	66625
0.1969	5,000 mm		6,0	95,0	57,0	49,0	36,0	66626
0.2008	5,100 mm		6,0	95,0	57,0	49,0	36,0	66627
0.2031	5,159 mm	13/64	6,0	95,0	57,0	49,0	36,0	56479
0.2047	5,200 mm		6,0	95,0	57,0	49,0	36,0	66628
0.2087	5,300 mm		6,0	95,0	57,0	49,0	36,0	66629
0.2126	5,400 mm		6,0	95,0	57,0	49,0	36,0	66630
0.2165	5,500 mm		6,0	95,0	57,0	49,0	36,0	66631
0.2188	5,558 mm	7/32	6,0	95,0	57,0	49,0	36,0	56480
0.2205	5,600 mm		6,0	95,0	57,0	49,0	36,0	66632

TOLERANCES (inch)

 $\leq .1181$ DIAMETERDC = $\pm .00008/\pm .00047$ DCON = h_6 $> .1181-.2362$ DIAMETERDC = $\pm .00016/\pm .00063$ DCON = h_6 $> .2362-.3937$ DIAMETERDC = $\pm .00024/\pm .00083$ DCON = h_6 $> .3937-.7087$ DIAMETERDC = $\pm .00028/\pm .00098$ DCON = h_6 $> .7087-1.1811$ DIAMETERDC = $\pm .00031/\pm .00114$ DCON = h_6

TOLERANCES (mm)

 ≤ 3 DIAMETERDC = $\pm 0,002/\pm 0,012$ DCON = h_6 $> 3-6$ DIAMETERDC = $\pm 0,004/\pm 0,016$ DCON = h_6 $> 6-10$ DIAMETERDC = $\pm 0,006/\pm 0,021$ DCON = h_6 $> 10-18$ DIAMETERDC = $\pm 0,007/\pm 0,025$ DCON = h_6 $> 18-30$ DIAMETERDC = $\pm 0,008/\pm 0,029$ DCON = h_6

STEELS

STAINLESS STEELS

CAST IRON

NON-FERROUS

HIGH TEMP ALLOYS

HARDENED STEELS

continued on next page

142P 8xD

FRACTIONAL & METRIC SERIES

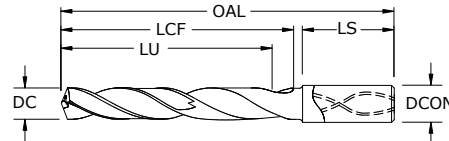
DECIMAL DC	METRIC DC	inch & mm						EDP NO. Ti-NAMITE-X (TX)
		FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	
0.2244	5,700 mm		6,0	95,0	57,0	48,0	36,0	66633
0.2283	5,800 mm		6,0	95,0	57,0	48,0	36,0	66634
0.2323	5,900 mm		6,0	95,0	57,0	48,0	36,0	66635
0.2344	5,954 mm	15/64	6,0	95,0	57,0	48,0	36,0	56481
0.2362	6,000 mm		6,0	95,0	57,0	48,0	36,0	66636
0.2402	6,100 mm		8,0	114,0	76,0	67,0	36,0	66637
0.2441	6,200 mm		8,0	114,0	76,0	67,0	36,0	66638
0.2480	6,300 mm		8,0	114,0	76,0	67,0	36,0	66639
0.2500	6,350 mm	1/4 E	8,0	114,0	76,0	66,0	36,0	56482
0.2520	6,400 mm		8,0	114,0	76,0	66,0	36,0	66640
0.2559	6,500 mm		8,0	114,0	76,0	66,0	36,0	66641
0.2570	6,528 mm	F	8,0	114,0	76,0	66,0	36,0	56483
0.2598	6,600 mm		8,0	114,0	76,0	66,0	36,0	66642
0.2638	6,700 mm		8,0	114,0	76,0	66,0	36,0	66643
0.2656	6,746 mm	17/64	8,0	114,0	76,0	66,0	36,0	56484
0.2677	6,800 mm		8,0	114,0	76,0	66,0	36,0	66644
0.2717	6,900 mm		8,0	114,0	76,0	66,0	36,0	66645
0.2756	7,000 mm		8,0	114,0	76,0	65,0	36,0	66646
0.2795	7,100 mm		8,0	114,0	76,0	65,0	36,0	66647
0.2812	7,142 mm	9/32	8,0	114,0	76,0	65,0	36,0	56485
0.2835	7,200 mm		8,0	114,0	76,0	65,0	36,0	66648
0.2874	7,300 mm		8,0	114,0	76,0	65,0	36,0	66649
0.2913	7,400 mm		8,0	114,0	76,0	65,0	36,0	66650
0.2953	7,500 mm		8,0	114,0	76,0	65,0	36,0	66651
0.2969	7,541 mm	19/64	8,0	114,0	76,0	65,0	36,0	56486
0.2992	7,600 mm		8,0	114,0	76,0	65,0	36,0	66652
0.3031	7,700 mm		8,0	114,0	76,0	64,0	36,0	66653
0.3071	7,800 mm		8,0	114,0	76,0	64,0	36,0	66654
0.3110	7,900 mm		8,0	114,0	76,0	64,0	36,0	66655
0.3125	7,938 mm	5/16	8,0	114,0	76,0	64,0	36,0	56487
0.3150	8,000 mm		8,0	114,0	76,0	64,0	36,0	66656
0.3189	8,100 mm		10,0	142,0	95,0	83,0	40,0	66657
0.3228	8,200 mm		10,0	142,0	95,0	83,0	40,0	66658
0.3268	8,300 mm		10,0	142,0	95,0	83,0	40,0	66659
0.3281	8,334 mm	21/64	10,0	142,0	95,0	83,0	40,0	56488
0.3307	8,400 mm		10,0	142,0	95,0	82,0	40,0	66660
0.3320	8,433 mm	Q	10,0	142,0	95,0	82,0	40,0	56489
0.3346	8,500 mm		10,0	142,0	95,0	82,0	40,0	66661
0.3386	8,600 mm		10,0	142,0	95,0	82,0	40,0	66662
0.3425	8,700 mm		10,0	142,0	95,0	82,0	40,0	66663
0.3438	8,733 mm	11/32	10,0	142,0	95,0	82,0	40,0	56490
0.3465	8,800 mm		10,0	142,0	95,0	82,0	40,0	66664
0.3504	8,900 mm		10,0	142,0	95,0	82,0	40,0	66665
0.3543	9,000 mm		10,0	142,0	95,0	82,0	40,0	66666

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CONTINUED



8xD



142P 8xD

FRACTIONAL & METRIC SERIES

CONTINUED

- High-performance point design stabilizes on entry for exceptional hole size and cylindricity while also allowing for low thrust force and extended tool life
- Internal coolant hole improves coolant flow to extend tool life and aid in chip evacuation
- 4-margin design improves hole straightness and roundness while providing improved stability for difficult applications like cross holes and when exiting on angle
- Proprietary Ti-NAMITE-X coating and industry leading carbide substrate provides exceptional wear resistance and toughness for demanding applications
- Recommended for materials $\leq 50\text{HRc}$ (475 Bhn)

		inch & mm						EDP NO.
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	Ti-NAMITE-X (TX)
0.3583	9,100 mm		10,0	142,0	95,0	81,0	40,0	66667
0.3594	9,129 mm	23/64	10,0	142,0	95,0	81,0	40,0	56491
0.3622	9,200 mm		10,0	142,0	95,0	81,0	40,0	66668
0.3661	9,300 mm		10,0	142,0	95,0	81,0	40,0	66669
0.3680	9,347 mm	U	10,0	142,0	95,0	81,0	40,0	56492
0.3701	9,400 mm		10,0	142,0	95,0	81,0	40,0	66670
0.3740	9,500 mm		10,0	142,0	95,0	81,0	40,0	66671
0.3750	9,525 mm	3/8	10,0	142,0	95,0	81,0	40,0	56493
0.3780	9,600 mm		10,0	142,0	95,0	81,0	40,0	66672
0.3819	9,700 mm		10,0	142,0	95,0	80,0	40,0	66673
0.3858	9,800 mm		10,0	142,0	95,0	80,0	40,0	66674
0.3898	9,900 mm		10,0	142,0	95,0	80,0	40,0	66675
0.3906	9,921 mm	25/64	10,0	142,0	95,0	80,0	40,0	56494
0.3937	10,000 mm		10,0	142,0	95,0	80,0	40,0	66676
0.3976	10,100 mm		12,0	162,0	114,0	99,0	45,0	66677
0.4016	10,200 mm		12,0	162,0	114,0	99,0	45,0	66678
0.4055	10,300 mm		12,0	162,0	114,0	99,0	45,0	66679
0.4062	10,317 mm	13/32	12,0	162,0	114,0	99,0	45,0	56495
0.4095	10,400 mm		12,0	162,0	114,0	98,0	45,0	66680
0.4134	10,500 mm		12,0	162,0	114,0	98,0	45,0	66681
0.4173	10,600 mm		12,0	162,0	114,0	98,0	45,0	66682
0.4213	10,700 mm		12,0	162,0	114,0	98,0	45,0	66683
0.4219	10,716 mm	27/64	12,0	162,0	114,0	98,0	45,0	56496
0.4252	10,800 mm		12,0	162,0	114,0	98,0	45,0	66684
0.4291	10,900 mm		12,0	162,0	114,0	98,0	45,0	66685
0.4331	11,000 mm		12,0	162,0	114,0	97,0	45,0	66686
0.4370	11,100 mm		12,0	162,0	114,0	97,0	45,0	66687
0.4375	11,113 mm	7/16	12,0	162,0	114,0	97,0	45,0	56497
0.4409	11,200 mm		12,0	162,0	114,0	97,0	45,0	66688
0.4449	11,300 mm		12,0	162,0	114,0	97,0	45,0	66689
0.4488	11,400 mm		12,0	162,0	114,0	97,0	45,0	66690
0.4528	11,500 mm		12,0	162,0	114,0	97,0	45,0	66691
0.4567	11,600 mm		12,0	162,0	114,0	97,0	45,0	66692
0.4606	11,700 mm		12,0	162,0	114,0	96,0	45,0	66693

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TOLERANCES (inch)

 $\leq .1181$ DIAMETERDC = $\pm .00008/\pm .00047$ DCON = h_6 $> .1181$ -.2362 DIAMETERDC = $\pm .00016/\pm .00063$ DCON = h_6 $> .2362$ -.3937 DIAMETERDC = $\pm .00024/\pm .00083$ DCON = h_6 $> .3937$ -.7087 DIAMETERDC = $\pm .00028/\pm .00098$ DCON = h_6 $> .7087$ -1.1811 DIAMETERDC = $\pm .00031/\pm .00114$ DCON = h_6

TOLERANCES (mm)

 ≤ 3 DIAMETERDC = $\pm 0,002/\pm 0,012$ DCON = h_6 > 3 -6 DIAMETERDC = $\pm 0,004/\pm 0,016$ DCON = h_6 > 6 -10 DIAMETERDC = $\pm 0,006/\pm 0,021$ DCON = h_6 > 10 -18 DIAMETERDC = $\pm 0,007/\pm 0,025$ DCON = h_6 > 18 -30 DIAMETERDC = $\pm 0,008/\pm 0,029$ DCON = h_6

STEELS

STAINLESS STEELS

CAST IRON

NON-FERROUS

HIGH TEMP ALLOYS

HARDENED STEELS

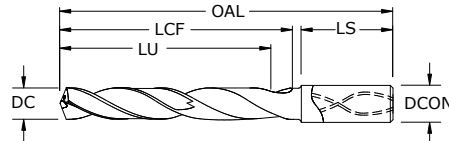
142P 8xD

FRACTIONAL & METRIC SERIES

DECIMAL DC	METRIC DC	inch & mm						EDP NO. Ti-NAMITE-X (TX)	CONTINUED
		FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS		
0.4646	11,800 mm		12,0	162,0	114,0	96,0	45,0	66694	
0.4685	11,900 mm		12,0	162,0	114,0	96,0	45,0	66695	
0.4688	11,908 mm	15/32	12,0	162,0	114,0	96,0	45,0	56498	
0.4724	12,000 mm		12,0	162,0	114,0	96,0	45,0	66696	
0.4844	12,304 mm	31/64	14,0	178,0	133,0	114,0	45,0	56499	
0.4921	12,500 mm		14,0	178,0	133,0	114,0	45,0	66697	
0.5000	12,700 mm	1/2	14,0	178,0	133,0	114,0	45,0	56500	
0.5039	12,800 mm		14,0	178,0	133,0	114,0	45,0	66698	
0.5118	13,000 mm		14,0	178,0	133,0	114,0	45,0	66699	
0.5156	13,096 mm	33/64	14,0	178,0	133,0	113,0	45,0	56501	
0.5315	13,500 mm		14,0	178,0	133,0	113,0	45,0	66700	
0.5433	13,800 mm		14,0	178,0	133,0	113,0	45,0	66701	
0.5512	14,000 mm		14,0	178,0	133,0	113,0	45,0	66702	
0.5625	14,288 mm	9/16	16,0	203,0	152,0	130,0	48,0	56502	
0.5709	14,500 mm		16,0	203,0	152,0	130,0	48,0	66703	
0.5781	14,684 mm	37/64	16,0	203,0	152,0	130,0	48,0	56503	
0.5827	14,800 mm		16,0	203,0	152,0	130,0	48,0	66704	
0.5906	15,000 mm		16,0	203,0	152,0	129,0	48,0	66705	
0.6102	15,500 mm		16,0	203,0	152,0	129,0	48,0	66706	
0.6221	15,800 mm		16,0	203,0	152,0	128,0	48,0	66707	
0.6250	15,875 mm	5/8	16,0	203,0	152,0	128,0	48,0	56504	
0.6299	16,000 mm		16,0	203,0	152,0	128,0	48,0	66708	
0.6562	16,667 mm	21/32	18,0	222,0	171,0	145,0	48,0	56505	
0.6875	17,463 mm	11/16	18,0	222,0	171,0	145,0	48,0	56506	
0.7500	19,050 mm	3/4	20,0	243,0	190,0	161,0	50,0	56507	



12xD



142P 12xD

FRACTIONAL & METRIC SERIES

- High-performance point design stabilizes on entry for exceptional hole size and cylindricity while also allowing for low thrust force and extended tool life
- Internal coolant hole improves coolant flow to extend tool life and aid in chip evacuation
- 4-margin design improves hole straightness and roundness while providing improved stability for difficult applications like cross holes and when exiting on angle
- Proprietary Ti-NAMITE-X coating and industry leading carbide substrate provides exceptional wear resistance and toughness for demanding applications
- Recommended for materials $\leq 50\text{HRC}$ (475 Bhn)

inch & mm								EDP NO.
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	Ti-NAMITE-X (TX)
0.1181	3,000 mm		6,0	87,0	49,0	44,0	36,0	66709
0.1220	3,100 mm		6,0	87,0	49,0	44,0	36,0	66710
0.1250	3,175 mm	1/8	6,0	87,0	49,0	44,0	36,0	56508
0.1260	3,200 mm		6,0	87,0	49,0	44,0	36,0	66711
0.1299	3,300 mm		6,0	87,0	49,0	44,0	36,0	66712
0.1339	3,400 mm		6,0	87,0	49,0	44,0	36,0	66713
0.1360	3,454 mm	#29	6,0	87,0	49,0	44,0	36,0	56509
0.1378	3,500 mm		6,0	87,0	49,0	44,0	36,0	66714
0.1406	3,571 mm	9/64	6,0	87,0	49,0	43,0	36,0	56510
0.1417	3,600 mm		6,0	87,0	49,0	43,0	36,0	66715
0.1457	3,700 mm		6,0	87,0	49,0	43,0	36,0	66716
0.1496	3,800 mm		6,0	100,0	62,0	56,0	36,0	66717
0.1535	3,900 mm		6,0	100,0	62,0	56,0	36,0	66718
0.1562	3,967 mm	5/32	6,0	100,0	62,0	56,0	36,0	56511
0.1575	4,000 mm		6,0	100,0	62,0	56,0	36,0	66719
0.1590	4,039 mm	#21	6,0	100,0	62,0	56,0	36,0	56512
0.1614	4,100 mm		6,0	100,0	62,0	56,0	36,0	66720
0.1654	4,200 mm		6,0	100,0	62,0	55,0	36,0	66721
0.1693	4,300 mm		6,0	100,0	62,0	55,0	36,0	66722
0.1719	4,366 mm	11/64	6,0	100,0	62,0	55,0	36,0	56513
0.1732	4,400 mm		6,0	100,0	62,0	55,0	36,0	66723
0.1772	4,500 mm		6,0	100,0	62,0	55,0	36,0	66724
0.1811	4,600 mm		6,0	100,0	62,0	55,0	36,0	66725
0.1850	4,699 mm	#13	6,0	100,0	62,0	55,0	36,0	66726
0.1875	4,763 mm	3/16	6,0	119,0	81,0	74,0	36,0	56514
0.1890	4,801 mm	#12	6,0	119,0	81,0	74,0	36,0	66727
0.1929	4,900 mm		6,0	119,0	81,0	74,0	36,0	66728
0.1969	5,000 mm		6,0	119,0	81,0	73,0	36,0	66729
0.2008	5,100 mm		6,0	119,0	81,0	73,0	36,0	66730
0.2031	5,159 mm	13/64	6,0	119,0	81,0	73,0	36,0	56515
0.2047	5,200 mm		6,0	119,0	81,0	73,0	36,0	66731
0.2087	5,300 mm		6,0	119,0	81,0	73,0	36,0	66732
0.2126	5,400 mm		6,0	119,0	81,0	73,0	36,0	66733
0.2165	5,500 mm		6,0	119,0	81,0	73,0	36,0	66734

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TOLERANCES (inch)

 $\leq .1181$ DIAMETERDC = $\pm .00008/\pm .00047$ DCON = h_6 $> .1181 - .2362$ DIAMETERDC = $\pm .00016/\pm .00063$ DCON = h_6 $> .2362 - .3937$ DIAMETERDC = $\pm .00024/\pm .00083$ DCON = h_6 $> .3937 - .7087$ DIAMETERDC = $\pm .00028/\pm .00098$ DCON = h_6 $> .7087 - 1.1811$ DIAMETERDC = $\pm .00031/\pm .00114$ DCON = h_6

TOLERANCES (mm)

 ≤ 3 DIAMETERDC = $\pm 0,002/\pm 0,012$ DCON = h_6 $> 3 - 6$ DIAMETERDC = $\pm 0,004/\pm 0,016$ DCON = h_6 $> 6 - 10$ DIAMETERDC = $\pm 0,006/\pm 0,021$ DCON = h_6 $> 10 - 18$ DIAMETERDC = $\pm 0,007/\pm 0,025$ DCON = h_6 $> 18 - 30$ DIAMETERDC = $\pm 0,008/\pm 0,029$ DCON = h_6

STEELS

STAINLESS STEELS

CAST IRON

NON-FERROUS

HIGH TEMP ALLOYS

HARDENED STEELS

142P 12xD

FRACTIONAL & METRIC SERIES

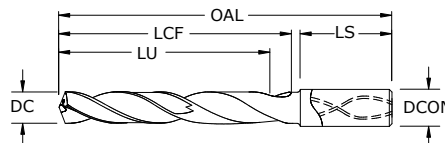
DECIMAL DC	METRIC DC	inch & mm						EDP NO.
		FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	Ti-NAMITE-X (TX)
0.2188	5,558 mm	7/32	6,0	119,0	81,0	73,0	36,0	56516
0.2205	5,600 mm		6,0	119,0	81,0	73,0	36,0	66735
0.2244	5,700 mm		6,0	119,0	81,0	72,0	36,0	66736
0.2283	5,800 mm		6,0	119,0	81,0	72,0	36,0	66737
0.2323	5,900 mm		6,0	119,0	81,0	72,0	36,0	66738
0.2344	5,954 mm	15/64	6,0	119,0	81,0	72,0	36,0	56517
0.2362	6,000 mm		6,0	119,0	81,0	72,0	36,0	66739
0.2402	6,100 mm		8,0	146,0	108,0	99,0	36,0	66740
0.2441	6,200 mm		8,0	146,0	108,0	99,0	36,0	66741
0.2480	6,300 mm		8,0	146,0	108,0	99,0	36,0	66742
0.2500	6,350 mm	1/4 E	8,0	146,0	108,0	98,0	36,0	56518
0.2520	6,400 mm		8,0	146,0	108,0	98,0	36,0	66743
0.2559	6,500 mm		8,0	146,0	108,0	98,0	36,0	66744
0.2570	6,528 mm	F	8,0	146,0	108,0	98,0	36,0	56519
0.2598	6,600 mm		8,0	146,0	108,0	98,0	36,0	66745
0.2638	6,700 mm		8,0	146,0	108,0	98,0	36,0	66746
0.2656	6,746 mm	17/64	8,0	146,0	108,0	98,0	36,0	56520
0.2677	6,800 mm		8,0	146,0	108,0	98,0	36,0	66747
0.2717	6,900 mm		8,0	146,0	108,0	98,0	36,0	66748
0.2756	7,000 mm		8,0	146,0	108,0	97,0	36,0	66749
0.2795	7,100 mm		8,0	146,0	108,0	97,0	36,0	66750
0.2812	7,142 mm	9/32	8,0	146,0	108,0	97,0	36,0	56521
0.2835	7,200 mm		8,0	146,0	108,0	97,0	36,0	66751
0.2874	7,300 mm		8,0	146,0	108,0	97,0	36,0	66752
0.2913	7,400 mm		8,0	146,0	108,0	97,0	36,0	66753
0.2953	7,500 mm		8,0	146,0	108,0	97,0	36,0	66754
0.2969	7,541 mm	19/64	8,0	146,0	108,0	97,0	36,0	56522
0.2992	7,600 mm		8,0	146,0	108,0	97,0	36,0	66755
0.3031	7,700 mm		8,0	146,0	108,0	96,0	36,0	66756
0.3071	7,800 mm		8,0	146,0	108,0	96,0	36,0	66757
0.3110	7,900 mm		8,0	146,0	108,0	96,0	36,0	66758
0.3125	7,938 mm	5/16	8,0	146,0	108,0	96,0	36,0	56523
0.3150	8,000 mm		8,0	146,0	108,0	96,0	36,0	66759
0.3189	8,100 mm		10,0	182,0	135,0	123,0	40,0	66760
0.3228	8,200 mm		10,0	182,0	135,0	123,0	40,0	66761
0.3268	8,300 mm		10,0	182,0	135,0	123,0	40,0	66762
0.3281	8,334 mm	21/64	10,0	182,0	135,0	123,0	40,0	56524
0.3307	8,400 mm		10,0	182,0	135,0	122,0	40,0	66763
0.3320	8,433 mm	Q	10,0	182,0	135,0	122,0	40,0	56525
0.3346	8,500 mm		10,0	182,0	135,0	122,0	40,0	66764
0.3386	8,600 mm		10,0	182,0	135,0	122,0	40,0	66765
0.3425	8,700 mm		10,0	182,0	135,0	122,0	40,0	66766

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CONTINUED



12xD



142P 12xD

FRACTIONAL & METRIC SERIES

CONTINUED

- High-performance point design stabilizes on entry for exceptional hole size and cylindricity while also allowing for low thrust force and extended tool life
- Internal coolant hole improves coolant flow to extend tool life and aid in chip evacuation
- 4-margin design improves hole straightness and roundness while providing improved stability for difficult applications like cross holes and when exiting on angle
- Proprietary Ti-NAMITE-X coating and industry leading carbide substrate provides exceptional wear resistance and toughness for demanding applications
- Recommended for materials $\leq 50\text{HRc}$ (475 Bhn)

inch & mm								EDP NO.
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	Ti-NAMITE-X (TX)
0.3438	8,733 mm	11/32	10,0	182,0	135,0	122,0	40,0	56526
0.3465	8,800 mm		10,0	182,0	135,0	122,0	40,0	66767
0.3504	8,900 mm		10,0	182,0	135,0	122,0	40,0	66768
0.3543	9,000 mm		10,0	182,0	135,0	122,0	40,0	66769
0.3583	9,100 mm		10,0	182,0	135,0	121,0	40,0	66770
0.3594	9,129 mm	23/64	10,0	182,0	135,0	121,0	40,0	56527
0.3622	9,200 mm		10,0	182,0	135,0	121,0	40,0	66771
0.3661	9,300 mm		10,0	182,0	135,0	121,0	40,0	66772
0.3680	9,347 mm	U	10,0	182,0	135,0	121,0	40,0	56528
0.3701	9,400 mm		10,0	182,0	135,0	121,0	40,0	66773
0.3740	9,500 mm		10,0	182,0	135,0	121,0	40,0	66774
0.3750	9,525 mm	3/8	10,0	182,0	135,0	121,0	40,0	56529
0.3780	9,600 mm		10,0	182,0	135,0	121,0	40,0	66775
0.3819	9,700 mm		10,0	182,0	135,0	120,0	40,0	66776
0.3858	9,800 mm		10,0	182,0	135,0	120,0	40,0	66777
0.3898	9,900 mm		10,0	182,0	135,0	120,0	40,0	66778
0.3906	9,921 mm	25/64	10,0	182,0	135,0	120,0	40,0	56530
0.3937	10,000 mm		10,0	182,0	135,0	120,0	40,0	66779
0.3976	10,100 mm		12,0	210,0	162,0	147,0	45,0	66780
0.4016	10,200 mm		12,0	210,0	162,0	147,0	45,0	66781
0.4055	10,300 mm		12,0	210,0	162,0	147,0	45,0	66782
0.4062	10,317 mm	13/32	12,0	210,0	162,0	147,0	45,0	56531
0.4095	10,400 mm		12,0	210,0	162,0	146,0	45,0	66783
0.4134	10,500 mm		12,0	210,0	162,0	146,0	45,0	66784
0.4173	10,600 mm		12,0	210,0	162,0	146,0	45,0	66785
0.4213	10,700 mm		12,0	210,0	162,0	146,0	45,0	66786
0.4219	10,716 mm	27/64	12,0	210,0	162,0	146,0	45,0	56532
0.4252	10,800 mm		12,0	210,0	162,0	146,0	45,0	66787
0.4291	10,900 mm		12,0	210,0	162,0	146,0	45,0	66788
0.4331	11,000 mm		12,0	210,0	162,0	145,0	45,0	66789
0.4370	11,100 mm		12,0	210,0	162,0	145,0	45,0	66790
0.4375	11,113 mm	7/16	12,0	210,0	162,0	145,0	45,0	56533
0.4409	11,200 mm		12,0	210,0	162,0	145,0	45,0	66791
0.4449	11,300 mm		12,0	210,0	162,0	145,0	45,0	66792

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TOLERANCES (inch)

$\leq .1181$ DIAMETER

DC = $\pm .00008/\pm .00047$ DCON = h_6

$> .1181$ – $.2362$ DIAMETER

DC = $\pm .00016/\pm .00063$ DCON = h_6

$> .2362$ – $.3937$ DIAMETER

DC = $\pm .00024/\pm .00083$ DCON = h_6

$> .3937$ – $.7087$ DIAMETER

DC = $\pm .00028/\pm .00098$ DCON = h_6

$> .7087$ – 1.1811 DIAMETER

DC = $\pm .00031/\pm .00114$ DCON = h_6

TOLERANCES (mm)

≤ 3 DIAMETER

DC = $\pm 0,002/\pm 0,012$ DCON = h_6

> 3 – 6 DIAMETER

DC = $\pm 0,004/\pm 0,016$ DCON = h_6

> 6 – 10 DIAMETER

DC = $\pm 0,006/\pm 0,021$ DCON = h_6

> 10 – 18 DIAMETER

DC = $\pm 0,007/\pm 0,025$ DCON = h_6

> 18 – 30 DIAMETER

DC = $\pm 0,008/\pm 0,029$ DCON = h_6

STEELS

STAINLESS STEELS

CAST IRON

NON-FERROUS

HIGH TEMP ALLOYS

HARDENED STEELS

142P 12xD

FRACTIONAL & METRIC SERIES

DECIMAL DC	METRIC DC	inch & mm						EDP NO. Ti-NAMITE-X (TX)	CONTINUED
		FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS		
0.4488	11,400 mm		12,0	210,0	162,0	145,0	45,0	66793	
0.4528	11,500 mm		12,0	210,0	162,0	145,0	45,0	66794	
0.4567	11,600 mm		12,0	210,0	162,0	145,0	45,0	66795	
0.4606	11,700 mm		12,0	210,0	162,0	144,0	45,0	66796	
0.4646	11,800 mm		12,0	210,0	162,0	144,0	45,0	66797	
0.4685	11,900 mm		12,0	210,0	162,0	144,0	45,0	66798	
0.4688	11,908 mm	15/32	12,0	210,0	162,0	144,0	45,0	56534	
0.4724	12,000 mm		12,0	210,0	162,0	144,0	45,0	66799	
0.4844	12,304 mm	31/64	14,0	234,0	189,0	171,0	45,0	56535	
0.4921	12,500 mm		14,0	234,0	189,0	170,0	45,0	66800	
0.5000	12,700 mm	1/2	14,0	234,0	189,0	170,0	45,0	56536	
0.5039	12,800 mm		14,0	234,0	189,0	170,0	45,0	66801	
0.5118	13,000 mm		14,0	234,0	189,0	170,0	45,0	66802	
0.5156	13,096 mm	33/64	14,0	234,0	189,0	169,0	45,0	56537	
0.5315	13,500 mm		14,0	234,0	189,0	169,0	45,0	66803	
0.5433	13,800 mm		14,0	234,0	189,0	168,0	45,0	66804	
0.5512	14,000 mm		14,0	234,0	189,0	168,0	45,0	66805	
0.5625	14,288 mm	9/16	16,0	267,0	216,0	195,0	48,0	56538	
0.5709	14,500 mm		16,0	267,0	216,0	194,0	48,0	66806	
0.5781	14,684 mm	37/64	16,0	267,0	216,0	194,0	48,0	56539	
0.5827	14,800 mm		16,0	267,0	216,0	194,0	48,0	66807	
0.5906	15,000 mm		16,0	267,0	216,0	193,0	48,0	66808	
0.6102	15,500 mm		16,0	267,0	216,0	193,0	48,0	66809	
0.6221	15,800 mm		16,0	267,0	216,0	192,0	48,0	66810	
0.6250	15,875 mm	5/8	16,0	267,0	216,0	192,0	48,0	56540	
0.6299	16,000 mm		16,0	267,0	216,0	192,0	48,0	66811	
0.6562	16,667 mm	21/32	18,0	292,0	241,0	216,0	48,0	56541	
0.6875	17,463 mm	11/16	18,0	292,0	241,0	215,0	48,0	56542	
0.7500	19,050 mm	3/4	20,0	319,0	266,0	238,0	50,0	56543	

Series 142P Fractional	Hardness	Vc (sfm)	DC • in								
			1/8	3/16	1/4	3/8	1/2	5/8	3/4		
P CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536 ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100 TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 175 Bhn or ≤ 7 HRc	425	RPM	12988	8659	6494	4329	3247	2598	2165	
		(340-510)	Fr	0.0043	0.0065	0.0086	0.0129	0.0172	0.0216	0.0259	
			Feed (ipm)	56.0	56.0	56.0	56.0	56.0	56.0	56.0	
	≤ 275 Bhn or ≤ 28 HRc	380	RPM	11613	7742	5806	3871	2903	2323	1935	
		(304-456)	Fr	0.0039	0.0058	0.0078	0.0116	0.0155	0.0194	0.0233	
			Feed (ipm)	45.0	45.0	45.0	45.0	45.0	45.0	45.0	
	≤ 425 Bhn or ≤ 45 HRc	220	RPM	6723	4482	3362	2241	1681	1345	1121	
		(176-264)	Fr	0.0033	0.0049	0.0065	0.0098	0.0131	0.0164	0.0196	
			Feed (ipm)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	
	≤ 275 Bhn or ≤ 28 HRc	330	RPM	10085	6723	5042	3362	2521	2017	1681	
			Fr	0.0033	0.0049	0.0065	0.0098	0.0131	0.0164	0.0196	
			Feed (ipm)	33.0	33.0	33.0	33.0	33.0	33.0	33.0	
		≤ 375 Bhn or ≤ 40 HRc	200	RPM	6112	4075	3056	2037	1528	1222	1019
				Fr	0.0028	0.0042	0.0056	0.0083	0.0111	0.0139	0.0167
				Feed (ipm)	17.0	17.0	17.0	17.0	17.0	17.0	17.0
	≤ 425 Bhn or ≤ 45 HRc	140	RPM	4278	2852	2139	1426	1070	856	713	
			Fr	0.0020	0.0030	0.0040	0.0060	0.0079	0.0099	0.0119	
			Feed (ipm)	8.5	8.5	8.5	8.5	8.5	8.5	8.5	
	≤ 200 Bhn or ≤ 13 HRc	145	RPM	4431	2954	2216	1477	1108	886	739	
			Fr	0.0028	0.0042	0.0056	0.0085	0.0113	0.0141	0.0169	
			Feed (ipm)	12.5	12.5	12.5	12.5	12.5	12.5	12.5	
		≤ 375 Bhn or ≤ 40 HRc	95	RPM	2903	1935	1452	968	726	581	484
				Fr	0.0013	0.0020	0.0027	0.0040	0.0054	0.0067	0.0081
				Feed (ipm)	3.9	3.9	3.9	3.9	3.9	3.9	3.9
M STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F STAINLESS STEELS (DIFFICULT) 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	≤ 185 Bhn or ≤ 9 HRc	305	RPM	9321	6214	4660	3107	2330	1864	1553	
			Fr	0.0026	0.0039	0.0051	0.0077	0.0103	0.0129	0.0154	
			Feed (ipm)	24.0	24.0	24.0	24.0	24.0	24.0	24.0	
	≤ 275 Bhn or ≤ 28 HRc	195	RPM	5959	3973	2980	1986	1490	1192	993	
			Fr	0.0020	0.0030	0.0040	0.0060	0.0081	0.0101	0.0121	
			Feed (ipm)	12.0	12.0	12.0	12.0	12.0	12.0	12.0	
	≤ 275 Bhn or ≤ 28 HRc	150	RPM	4584	3056	2292	1528	1146	917	764	
			Fr	0.0020	0.0030	0.0040	0.0060	0.0079	0.0099	0.0119	
			Feed (ipm)	9.1	9.1	9.1	9.1	9.1	9.1	9.1	
	≤ 375 Bhn or ≤ 40 HRc	110	RPM	3362	2241	1681	1121	840	672	560	
			Fr	0.0018	0.0027	0.0036	0.0054	0.0071	0.0089	0.0107	
			Feed (ipm)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
K CAST IRONS Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	360	RPM	11002	7334	5501	3667	2750	2200	1834	
			Fr	0.0045	0.0068	0.0091	0.0136	0.0182	0.0227	0.0273	
			Feed (ipm)	50.0	50.0	50.0	50.0	50.0	50.0	50.0	
	≤ 260 Bhn or ≤ 26 HRc	335	RPM	10238	6825	5119	3413	2559	2048	1706	
			Fr	0.0045	0.0068	0.0091	0.0136	0.0182	0.0227	0.0273	
			Feed (ipm)	46.5	46.5	46.5	46.5	46.5	46.5	46.5	

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Series 142P Fractional	Hardness	Vc (sfm)		DC • in						
				1/8	3/16	1/4	3/8	1/2	5/8	3/4
N	ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075	770 (616-924)	RPM	23531	15687	11766	7844	5883	4706	3922
			Fr	0.0049	0.0073	0.0098	0.0147	0.0195	0.0244	0.0293
			Feed (ipm)	115.0	115.0	115.0	115.0	115.0	115.0	115.0
		660 (528-792)	RPM	20170	13446	10085	6723	5042	4034	3362
			Fr	0.0050	0.0074	0.0099	0.0149	0.0198	0.0248	0.0297
			Feed (ipm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	COPPER ALLOYS Alum Bronze, C110, Muntz Brass	550 (440-660)	RPM	16808	11205	8404	5603	4202	3362	2801
			Fr	0.0020	0.0030	0.0040	0.0060	0.0080	0.0100	0.0120
			Feed (ipm)	33.5	33.5	33.5	33.5	33.5	33.5	33.5
		440 (352-528)	RPM	13446	8964	6723	4482	3362	2689	2241
			Fr	0.0020	0.0030	0.0040	0.0060	0.0080	0.0100	0.0120
			Feed (ipm)	27.0	27.0	27.0	27.0	27.0	27.0	27.0
S	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400, Rene, Waspaloy	95 (76-114)	RPM	2903	1935	1452	968	726	581	484
			Fr	0.0008	0.0012	0.0016	0.0024	0.0032	0.0040	0.0048
			Feed (ipm)	2.3	2.3	2.3	2.3	2.3	2.3	2.3
		50 (40-60)	RPM	1528	1019	764	509	382	306	255
			Fr	0.0007	0.0010	0.0013	0.0020	0.0026	0.0033	0.0039
			Feed (ipm)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V	215 (172-258)	RPM	6570	4380	3285	2190	1643	1314	1095
			Fr	0.0018	0.0026	0.0035	0.0053	0.0070	0.0088	0.0105
			Feed (ipm)	11.5	11.5	11.5	11.5	11.5	11.5	11.5
		160 (128-192)	RPM	4890	3260	2445	1630	1222	978	815
			Fr	0.0016	0.0024	0.0032	0.0048	0.0064	0.0080	0.0096
			Feed (ipm)	7.8	7.8	7.8	7.8	7.8	7.8	7.8
H	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	85 (68-102)	RPM	2598	1732	1299	866	649	520	433
			Fr	0.0008	0.0013	0.0017	0.0025	0.0034	0.0042	0.0051
			Feed (ipm)	2.2	2.2	2.2	2.2	2.2	2.2	2.2

Bhn (Brinell) HRC (Rockwell C) HRB (Rockwell B)

rpm = Vc x 3.82 / DC

ipm = Fr x RPM

reduce speed and feed for materials harder than listed

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)

Hi-PerCarb

Series 142P Metric	Hardness	Vc (m/min)	DC • mm							
			3	6	8	10	12	14	16	
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	130	RPM	13733	6867	5150	4120	3433	2943	2575
		(104-155)	Fr	0.104	0.207	0.276	0.345	0.414	0.483	0.552
			Feed (mm/min)	1422	1422	1422	1422	1422	1422	1422
		116	RPM	12279	6140	4605	3684	3070	2631	2302
		(93-139)	Fr	0.093	0.186	0.248	0.310	0.372	0.434	0.496
			Feed (mm/min)	1143	1143	1143	1143	1143	1143	1143
		67	RPM	7109	3555	2666	2133	1777	1523	1333
		(54-80)	Fr	0.079	0.157	0.210	0.262	0.314	0.367	0.419
			Feed (mm/min)	559	559	559	559	559	559	559
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	101	RPM	10664	5332	3999	3199	2666	2285	1999
		(80-121)	Fr	0.079	0.157	0.210	0.262	0.314	0.367	0.419
			Feed (mm/min)	838	838	838	838	838	838	838
		61	RPM	6463	3231	2424	1939	1616	1385	1212
		(49-73)	Fr	0.067	0.134	0.178	0.223	0.267	0.312	0.356
			Feed (mm/min)	432	432	432	432	432	432	432
		43	RPM	4524	2262	1696	1357	1131	969	848
		(34-51)	Fr	0.048	0.095	0.127	0.159	0.191	0.223	0.255
			Feed (mm/min)	216	216	216	216	216	216	216
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	44	RPM	4686	2343	1757	1406	1171	1004	879
		(35-53)	Fr	0.068	0.136	0.181	0.226	0.271	0.316	0.361
			Feed (mm/min)	318	318	318	318	318	318	318
		29	RPM	3070	1535	1151	921	767	658	576
		(23-35)	Fr	0.032	0.065	0.086	0.108	0.129	0.151	0.172
			Feed (mm/min)	99	99	99	99	99	99	99
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	93	9856	9856	4928	3696	2957	2464	2112	1848
		(74-112)	0.062	0.062	0.124	0.165	0.206	0.247	0.289	0.330
			610	610	610	610	610	610	610	610
		59	6301	6301	3151	2363	1890	1575	1350	1181
		(48-71)	0.048	0.048	0.097	0.129	0.161	0.193	0.226	0.258
			305	305	305	305	305	305	305	305
	STAINLESS STEELS (DIFFICULT) 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	46	4847	4847	2424	1818	1454	1212	1039	909
		(37-55)	0.048	0.048	0.095	0.127	0.159	0.191	0.223	0.254
			231	231	231	231	231	231	231	231
		34	3555	3555	1777	1333	1066	889	762	666
		(27-40)	0.043	0.043	0.086	0.114	0.143	0.171	0.200	0.229
			152	152	152	152	152	152	152	152
K	CAST IRONS Gray, Malleable, Ductile	110	RPM	11633	5816	4362	3490	2908	2493	2181
		(88-132)	Fr	0.109	0.218	0.291	0.364	0.437	0.509	0.582
			Feed (mm/min)	1270	1270	1270	1270	1270	1270	1270
		102	RPM	10825	5413	4059	3248	2706	2320	2030
		(82-123)	Fr	0.109	0.218	0.291	0.364	0.436	0.509	0.582
			Feed (mm/min)	1181	1181	1181	1181	1181	1181	1181

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Series 142P Metric	Hardness	Vc (m/min)	DC • mm									
			3	6	8	10	12	14	16			
N	ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075	235	RPM	24882	12441	9331	7465	6220	5332	4665		
		≤ 80 Bhn or ≤ 47 HRb	(188-282)	Fr	0.117	0.235	0.313	0.391	0.470	0.548	0.626	
				Feed (mm/min)	2921	2921	2921	2921	2921	2921	2921	
		201	RPM	21327	10664	7998	6398	5332	4570	3999		
		≤ 150 Bhn or ≤ 88 HRb	(161-241)	Fr	0.119	0.238	0.318	0.397	0.476	0.556	0.635	
				Feed (mm/min)	2540	2540	2540	2540	2540	2540	2540	
	COPPER ALLOYS Alum Bronze, C110, Muntz Brass	168	RPM	17773	8886	6665	5332	4443	3808	3332		
		≤ 140 Bhn or ≤ 3 HRc	(134-201)	Fr	0.048	0.096	0.128	0.160	0.192	0.223	0.255	
				Feed (mm/min)	851	851	851	851	851	851	851	
		134	RPM	14218	7109	5332	4265	3555	3047	2666		
		≤ 200 Bhn or ≤ 23 HRc	(107-161)	Fr	0.048	0.096	0.129	0.161	0.193	0.225	0.257	
				Feed (mm/min)	686	686	686	686	686	686	686	
S	HIGH TEMP ALLOYS (Nickel , Cobalt, Iron Base) Inconel 601, 617, 625, Incoloy, Monel 400, Rene, Waspaloy	29	RPM	3070	1535	1151	921	767	658	576		
		≤ 300 Bhn or ≤ 32 HRc	(23-35)	Fr	0.019	0.038	0.051	0.063	0.076	0.089	0.101	
				Feed (mm/min)	58	58	58	58	58	58	58	
		15	RPM	1616	808	606	485	404	346	303		
		≤ 400 Bhn or ≤ 43 HRc	(12-18)	Fr	0.016	0.031	0.042	0.052	0.063	0.073	0.084	
				Feed (mm/min)	25	25	25	25	25	25	25	
	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V	66	RPM	6947	3474	2605	2084	1737	1489	1303		
		≤ 275 Bhn or ≤ 28 HRc	(52-79)	Fr	0.042	0.084	0.112	0.140	0.168	0.196	0.224	
				Feed (mm/min)	292	292	292	292	292	292	292	
		49	RPM	5170	2585	1939	1551	1293	1108	969		
		≤ 350 Bhn or ≤ 38 HRc	(39-59)	Fr	0.038	0.077	0.102	0.128	0.153	0.179	0.204	
				Feed (mm/min)	198	198	198	198	198	198	198	
		26	RPM	2747	1373	1030	824	687	589	515		
		≤ 440 Bhn or ≤ 47 HRc	(21-31)	Fr	0.029	0.057	0.076	0.096	0.115	0.134	0.153	
				Feed (mm/min)	79	79	79	79	79	79	79	
	H	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	26	RPM	2747	1373	1030	824	687	589	515	
			≤ 475 Bhn or ≤ 50 HRc	(21-31)	Fr	0.020	0.041	0.054	0.068	0.081	0.095	0.109
					Feed (mm/min)	56	56	56	56	56	56	56

(Brinell) HRc (Rockwell C) HRb (Rockwell B)

rpm = (Vc x 1000) / (DC x 3.14)

mm/min = Fr x RPM

reduce speed and feed for materials harder than listed

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)

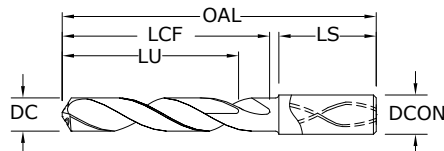


3xD



143M-S 3xD

FRACTIONAL & METRIC SERIES



- Coolant through design improves coolant flow to extend tool life and aid in chip evacuation
- Eccentric 2-margin design reduces frictional heat and minimizes material adhesion to the margins without weakening the drill
- Computer controlled edge honing protects against chip damage
- High-performance point design stabilizes on contact for exceptional hole size and cylindricity allowing for low thrust force and extended tool life
- SGS Ti-NAMITE-A coating provides exceptional wear and erosion resistance when drilling heat resisting alloys like Inconel, Stainless Steel, and Titanium Alloys
- Recommended for materials $\leq 50\text{HRc}$ (475 Bhn)

inch & mm								EDP NO.
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	Ti-NAMITE-A (AITiN)
0.1181	3,000 mm		6,0	62,0	20,0	15,0	36,0	69120
0.1220	3,100 mm		6,0	62,0	20,0	15,0	36,0	69121
0.1250	3,175 mm	1/8	6,0	62,0	20,0	15,0	36,0	56800
0.1260	3,200 mm		6,0	62,0	20,0	15,0	36,0	69122
0.1299	3,300 mm		6,0	62,0	20,0	15,0	36,0	69123
0.1339	3,400 mm		6,0	62,0	20,0	15,0	36,0	69124
0.1360	3,454 mm	#29	6,0	62,0	20,0	15,0	36,0	56801
0.1378	3,500 mm		6,0	62,0	20,0	15,0	36,0	69125
0.1406	3,571 mm	9/64	6,0	62,0	20,0	15,0	36,0	56802
0.1417	3,600 mm		6,0	62,0	20,0	15,0	36,0	69126
0.1457	3,700 mm		6,0	62,0	20,0	15,0	36,0	69127
0.1496	3,800 mm		6,0	66,0	24,0	18,0	36,0	69128
0.1535	3,900 mm		6,0	66,0	24,0	18,0	36,0	69129
0.1562	3,967 mm	5/32	6,0	66,0	24,0	18,0	36,0	56803
0.1575	4,000 mm		6,0	66,0	24,0	18,0	36,0	69130
0.1590	4,039 mm	#21	6,0	66,0	24,0	18,0	36,0	56804
0.1614	4,100 mm		6,0	66,0	24,0	18,0	36,0	69131
0.1654	4,200 mm		6,0	66,0	24,0	18,0	36,0	69132
0.1693	4,300 mm		6,0	66,0	24,0	18,0	36,0	69133
0.1719	4,366 mm	11/64	6,0	66,0	24,0	17,0	36,0	56805
0.1732	4,400 mm		6,0	66,0	24,0	17,0	36,0	69134
0.1772	4,500 mm		6,0	66,0	24,0	17,0	36,0	69135
0.1811	4,600 mm		6,0	66,0	24,0	17,0	36,0	69136
0.1850	4,699 mm	#13	6,0	66,0	24,0	17,0	36,0	69137
0.1875	4,763 mm	3/16	6,0	66,0	28,0	21,0	36,0	56806
0.1890	4,801 mm	#12	6,0	66,0	28,0	21,0	36,0	69138
0.1929	4,900 mm		6,0	66,0	28,0	21,0	36,0	69139
0.1969	5,000 mm		6,0	66,0	28,0	20,0	36,0	69140
0.2008	5,100 mm		6,0	66,0	28,0	20,0	36,0	69141
0.2031	5,159 mm	13/64	6,0	66,0	28,0	20,0	36,0	56807
0.2047	5,200 mm		6,0	66,0	28,0	20,0	36,0	69142
0.2087	5,300 mm		6,0	66,0	28,0	20,0	36,0	69143
0.2126	5,400 mm		6,0	66,0	28,0	20,0	36,0	69144
0.2165	5,500 mm		6,0	66,0	28,0	20,0	36,0	69145
0.2188	5,558 mm	7/32	6,0	66,0	28,0	20,0	36,0	56808
0.2205	5,600 mm		6,0	66,0	28,0	20,0	36,0	69146

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TOLERANCES (inch)

 $\leq .1181$ DIAMETERDC = $+0.0008/+0.0047$ DCON = h_6 $>.1181-.2362$ DIAMETERDC = $+0.0016/+0.0063$ DCON = h_6 $>.2362-.3937$ DIAMETERDC = $+0.0024/+0.0083$ DCON = h_6 $>.3937-.7087$ DIAMETERDC = $+0.0028/+0.0098$ DCON = h_6 $>.7087-1.1811$ DIAMETERDC = $+0.0031/+0.0114$ DCON = h_6

TOLERANCES (mm)

 ≤ 3 DIAMETERDC = $+0,002/+0,012$ DCON = h_6 $>3-6$ DIAMETERDC = $+0,004/+0,016$ DCON = h_6 $>6-10$ DIAMETERDC = $+0,006/+0,021$ DCON = h_6 $>10-18$ DIAMETERDC = $+0,007/+0,025$ DCON = h_6 $>18-30$ DIAMETERDC = $+0,008/+0,029$ DCON = h_6

STEELS

STAINLESS STEELS

CAST IRON

HIGH TEMP ALLOYS

143M-S 3xD

FRACTIONAL & METRIC SERIES

DECIMAL DC	METRIC DC	inch & mm						EDP NO. Ti-NAMITE-A (AITiN)
		FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	
0.2244	5,700 mm		6,0	66,0	28,0	19,0	36,0	69147
0.2283	5,800 mm		6,0	66,0	28,0	19,0	36,0	69148
0.2323	5,900 mm		6,0	66,0	28,0	19,0	36,0	69149
0.2344	5,954 mm	15/64	6,0	66,0	28,0	19,0	36,0	56809
0.2362	6,000 mm		6,0	66,0	28,0	19,0	36,0	69150
0.2402	6,100 mm		8,0	79,0	34,0	25,0	36,0	69151
0.2441	6,200 mm		8,0	79,0	34,0	25,0	36,0	69152
0.2480	6,300 mm		8,0	79,0	34,0	25,0	36,0	69153
0.2500	6,350 mm	1/4 E	8,0	79,0	34,0	24,0	36,0	56810
0.2520	6,400 mm		8,0	79,0	34,0	24,0	36,0	69154
0.2559	6,500 mm		8,0	79,0	34,0	24,0	36,0	69155
0.2570	6,528 mm	F	8,0	79,0	34,0	24,0	36,0	56811
0.2598	6,600 mm		8,0	79,0	34,0	24,0	36,0	69156
0.2638	6,700 mm		8,0	79,0	34,0	24,0	36,0	69157
0.2656	6,746 mm	17/64	8,0	79,0	34,0	24,0	36,0	56812
0.2677	6,800 mm		8,0	79,0	34,0	24,0	36,0	69158
0.2717	6,900 mm		8,0	79,0	34,0	24,0	36,0	69159
0.2756	7,000 mm		8,0	79,0	34,0	24,0	36,0	69160
0.2795	7,100 mm		8,0	79,0	41,0	30,0	36,0	69161
0.2812	7,142 mm	9/32	8,0	79,0	41,0	30,0	36,0	56813
0.2835	7,200 mm		8,0	79,0	41,0	30,0	36,0	69162
0.2874	7,300 mm		8,0	79,0	41,0	30,0	36,0	69163
0.2913	7,400 mm		8,0	79,0	41,0	30,0	36,0	69164
0.2953	7,500 mm		8,0	79,0	41,0	30,0	36,0	69165
0.2969	7,541 mm	19/64	8,0	79,0	41,0	30,0	36,0	56814
0.2992	7,600 mm		8,0	79,0	41,0	30,0	36,0	69166
0.3031	7,700 mm		8,0	79,0	41,0	29,0	36,0	69167
0.3071	7,800 mm		8,0	79,0	41,0	29,0	36,0	69168
0.3110	7,900 mm		8,0	79,0	41,0	29,0	36,0	69169
0.3125	7,938 mm	5/16	8,0	79,0	41,0	29,0	36,0	56815
0.3150	8,000 mm		8,0	79,0	41,0	29,0	36,0	69170
0.3189	8,100 mm		10,0	89,0	47,0	35,0	40,0	69171
0.3228	8,200 mm		10,0	89,0	47,0	35,0	40,0	69172
0.3268	8,300 mm		10,0	89,0	47,0	35,0	40,0	69173
0.3281	8,334 mm	21/64	10,0	89,0	47,0	34,0	40,0	56816
0.3307	8,400 mm		10,0	89,0	47,0	34,0	40,0	69174
0.3320	8,433 mm	Q	10,0	89,0	47,0	34,0	40,0	56817
0.3346	8,500 mm		10,0	89,0	47,0	34,0	40,0	69175
0.3386	8,600 mm		10,0	89,0	47,0	34,0	40,0	69176
0.3425	8,700 mm		10,0	89,0	47,0	34,0	40,0	69177
0.3438	8,733 mm	11/32	10,0	89,0	47,0	34,0	40,0	56818
0.3465	8,800 mm		10,0	89,0	47,0	34,0	40,0	69178
0.3504	8,900 mm		10,0	89,0	47,0	34,0	40,0	69179
0.3543	9,000 mm		10,0	89,0	47,0	34,0	40,0	69180

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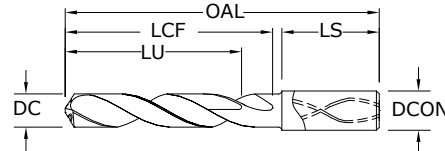


3xD



143M-S 3xD

FRACTIONAL & METRIC SERIES



CONTINUED

- Coolant through design improves coolant flow to extend tool life and aid in chip evacuation
- Eccentric 2-margin design reduces frictional heat and minimizes material adhesion to the margins without weakening the drill
- Computer controlled edge honing protects against chip damage
- High-performance point design stabilizes on contact for exceptional hole size and cylindricity allowing for low thrust force and extended tool life
- SGS Ti-NAMITE-A coating provides exceptional wear and erosion resistance when drilling heat resisting alloys like Inconel, Stainless Steel, and Titanium Alloys
- Recommended for materials ≤ 50HRc (475 Bhn)

inch & mm								EDP NO.
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	Ti-NAMITE-A (AITiN)
0.3583	9,100 mm		10,0	89,0	47,0	33,0	40,0	69181
0.3594	9,129 mm	23/64	10,0	89,0	47,0	33,0	40,0	56819
0.3622	9,200 mm		10,0	89,0	47,0	33,0	40,0	69182
0.3661	9,300 mm		10,0	89,0	47,0	33,0	40,0	69183
0.3680	9,347 mm	U	10,0	89,0	47,0	33,0	40,0	56820
0.3701	9,400 mm		10,0	89,0	47,0	33,0	40,0	69184
0.3740	9,500 mm		10,0	89,0	47,0	33,0	40,0	69185
0.3750	9,525 mm	3/8	10,0	89,0	47,0	33,0	40,0	56821
0.3780	9,600 mm		10,0	89,0	47,0	33,0	40,0	69186
0.3819	9,700 mm		10,0	89,0	47,0	32,0	40,0	69187
0.3858	9,800 mm		10,0	89,0	47,0	32,0	40,0	69188
0.3898	9,900 mm		10,0	89,0	47,0	32,0	40,0	69189
0.3906	9,921 mm	25/64	10,0	89,0	47,0	32,0	40,0	56822
0.3937	10,000 mm		10,0	89,0	47,0	32,0	40,0	69190
0.3976	10,100 mm		12,0	102,0	55,0	40,0	45,0	69191
0.4016	10,200 mm		12,0	102,0	55,0	40,0	45,0	69192
0.4055	10,300 mm		12,0	102,0	55,0	40,0	45,0	69193
0.4062	10,317 mm	13/32	12,0	102,0	55,0	40,0	45,0	56823
0.4095	10,400 mm		12,0	102,0	55,0	39,0	45,0	69194
0.4134	10,500 mm		12,0	102,0	55,0	39,0	45,0	69195
0.4173	10,600 mm		12,0	102,0	55,0	39,0	45,0	69196
0.4213	10,700 mm		12,0	102,0	55,0	39,0	45,0	69197
0.4219	10,716 mm	27/64	12,0	102,0	55,0	39,0	45,0	56824
0.4252	10,800 mm		12,0	102,0	55,0	39,0	45,0	69198
0.4291	10,900 mm		12,0	102,0	55,0	39,0	45,0	69199
0.4331	11,000 mm		12,0	102,0	55,0	39,0	45,0	69200
0.4370	11,100 mm		12,0	102,0	55,0	38,0	45,0	69201
0.4375	11,113 mm	7/16	12,0	102,0	55,0	38,0	45,0	56825
0.4409	11,200 mm		12,0	102,0	55,0	38,0	45,0	69202
0.4449	11,300 mm		12,0	102,0	55,0	38,0	45,0	69203
0.4488	11,400 mm		12,0	102,0	55,0	38,0	45,0	69204
0.4528	11,500 mm		12,0	102,0	55,0	38,0	45,0	69205
0.4567	11,600 mm		12,0	102,0	55,0	38,0	45,0	69206
0.4606	11,700 mm		12,0	102,0	55,0	37,0	45,0	69207
0.4646	11,800 mm		12,0	102,0	55,0	37,0	45,0	69208
0.4685	11,900 mm		12,0	102,0	55,0	37,0	45,0	69209

TOLERANCES (inch)

≤.1181 DIAMETER

DC = +.00008/+0.00047

DCON = h₆

>.1181-.2362 DIAMETER

DC = +.00016/+0.00063

DCON = h₆

>.2362-.3937 DIAMETER

DC = +.00024/+0.00083

DCON = h₆

>.3937-.7087 DIAMETER

DC = +.00028/+0.00098

DCON = h₆

>.7087-1.1811 DIAMETER

DC = +.00031/+0.00114

DCON = h₆

TOLERANCES (mm)

≤3 DIAMETER

DC = +0,002/+0,012

DCON = h₆

>3-6 DIAMETER

DC = +0,004/+0,016

DCON = h₆

>6-10 DIAMETER

DC = +0,006/+0,021

DCON = h₆

>10-18 DIAMETER

DC = +0,007/+0,025

DCON = h₆

>18-30 DIAMETER

DC = +0,008/+0,029

DCON = h₆

STEELS

STAINLESS STEELS

CAST IRON

HIGH TEMP ALLOYS

continued on next page

143M-S 3xD

FRACTIONAL & METRIC SERIES

DECIMAL DC	METRIC DC	inch & mm						EDP NO. Ti-NAMITE-A (AITiN)
		FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	
0.4688	11,908 mm	15/32	12,0	102,0	55,0	37,0	45,0	56826
0.4724	12,000 mm		12,0	102,0	55,0	37,0	45,0	69210
0.4844	12,304 mm	31/64	14,0	107,0	60,0	41,0	45,0	56827
0.4921	12,500 mm		14,0	107,0	60,0	41,0	45,0	69211
0.5000	12,700 mm	1/2	14,0	107,0	60,0	41,0	45,0	56828
0.5039	12,800 mm		14,0	107,0	60,0	41,0	45,0	69212
0.5118	13,000 mm		14,0	107,0	60,0	41,0	45,0	69213
0.5156	13,096 mm	33/64	14,0	107,0	60,0	40,0	45,0	56829
0.5315	13,500 mm		14,0	107,0	60,0	40,0	45,0	69214
0.5433	13,800 mm		14,0	107,0	60,0	39,0	45,0	69215
0.5512	14,000 mm		14,0	107,0	60,0	39,0	45,0	69216
0.5625	14,288 mm	9/16	16,0	115,0	65,0	43,0	48,0	56830
0.5709	14,500 mm		16,0	115,0	65,0	43,0	48,0	69217
0.5781	14,684 mm	37/64	16,0	115,0	65,0	43,0	48,0	56831
0.5827	14,800 mm		16,0	115,0	65,0	43,0	48,0	69218
0.5906	15,000 mm		16,0	115,0	65,0	42,0	48,0	69219
0.6102	15,500 mm		16,0	115,0	65,0	42,0	48,0	69220
0.6221	15,800 mm		16,0	115,0	65,0	41,0	48,0	69221
0.6250	15,875 mm	5/8	16,0	115,0	65,0	41,0	48,0	56832
0.6299	16,000 mm		16,0	115,0	65,0	41,0	48,0	69222
0.6562	16,667 mm	21/32	18,0	123,0	73,0	47,0	48,0	56833
0.6875	17,463 mm	11/16	18,0	123,0	73,0	47,0	48,0	56834
0.7500	19,050 mm	3/4	20,0	131,0	79,0	50,0	50,0	56835

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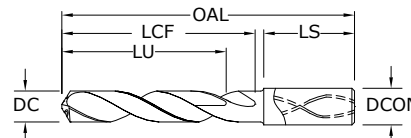


5xD



143M-S 5xD

FRACTIONAL & METRIC SERIES



- Coolant through design improves coolant flow to extend tool life and aid in chip evacuation
- Eccentric 2-margin design reduces frictional heat and minimizes material adhesion to the margins without weakening the drill
- Computer controlled edge honing protects against chip damage
- High-performance point design stabilizes on contact for exceptional hole size and cylindricity allowing for low thrust force and extended tool life
- SGS Ti-NAMITE-A coating provides exceptional wear and erosion resistance when drilling heat resisting alloys like Inconel, Stainless Steel, and Titanium Alloys
- Recommended for materials $\leq 50\text{HRc}$ (475 Bhn)

inch & mm								EDP NO.
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	Ti-NAMITE-A (AITiN)
0.1181	3,000 mm		6,0	66,0	28,0	23,0	36,0	69223
0.1220	3,100 mm		6,0	66,0	28,0	23,0	36,0	69224
0.1250	3,175 mm	1/8	6,0	66,0	28,0	23,0	36,0	56836
0.1260	3,200 mm		6,0	66,0	28,0	23,0	36,0	69225
0.1299	3,300 mm		6,0	66,0	28,0	23,0	36,0	69226
0.1339	3,400 mm		6,0	66,0	28,0	23,0	36,0	69227
0.1360	3,454 mm	#29	6,0	66,0	28,0	23,0	36,0	56837
0.1378	3,500 mm		6,0	66,0	28,0	23,0	36,0	69228
0.1406	3,571 mm	9/64	6,0	66,0	28,0	23,0	36,0	56838
0.1417	3,600 mm		6,0	66,0	28,0	23,0	36,0	69229
0.1457	3,700 mm		6,0	66,0	28,0	23,0	36,0	69230
0.1496	3,800 mm		6,0	74,0	36,0	29,0	36,0	69231
0.1535	3,900 mm		6,0	74,0	36,0	29,0	36,0	69232
0.1562	3,967 mm	5/32	6,0	74,0	36,0	29,0	36,0	56839
0.1575	4,000 mm		6,0	74,0	36,0	29,0	36,0	69233
0.1590	4,039 mm	#21	6,0	74,0	36,0	29,0	36,0	56840
0.1614	4,100 mm		6,0	74,0	36,0	29,0	36,0	69234
0.1654	4,200 mm		6,0	74,0	36,0	29,0	36,0	69235
0.1693	4,300 mm		6,0	74,0	36,0	29,0	36,0	69236
0.1719	4,366 mm	11/64	6,0	74,0	36,0	29,0	36,0	56841
0.1732	4,400 mm		6,0	74,0	36,0	29,0	36,0	69237
0.1772	4,500 mm		6,0	74,0	36,0	29,0	36,0	69238
0.1811	4,600 mm		6,0	74,0	36,0	29,0	36,0	69239
0.1850	4,699 mm	#13	6,0	74,0	36,0	29,0	36,0	69240
0.1875	4,763 mm	3/16	6,0	82,0	44,0	37,0	36,0	56842
0.1890	4,801 mm	#12	6,0	82,0	44,0	37,0	36,0	69241
0.1929	4,900 mm		6,0	82,0	44,0	37,0	36,0	69242
0.1969	5,000 mm		6,0	82,0	44,0	36,0	36,0	69243
0.2008	5,100 mm		6,0	82,0	44,0	36,0	36,0	69244
0.2031	5,159 mm	13/64	6,0	82,0	44,0	36,0	36,0	56843
0.2047	5,200 mm		6,0	82,0	44,0	36,0	36,0	69245
0.2087	5,300 mm		6,0	82,0	44,0	36,0	36,0	69246
0.2126	5,400 mm		6,0	82,0	44,0	36,0	36,0	69247
0.2165	5,500 mm		6,0	82,0	44,0	36,0	36,0	69248
0.2188	5,558 mm	7/32	6,0	82,0	44,0	36,0	36,0	56844
0.2205	5,600 mm		6,0	82,0	44,0	36,0	36,0	69249

TOLERANCES (inch)

 $\leq .1181$ DIAMETERDC = $\pm .00008/\pm .00047$ DCON = h_6 $> .1181 - .2362$ DIAMETERDC = $\pm .00016/\pm .00063$ DCON = h_6 $> .2362 - .3937$ DIAMETERDC = $\pm .00024/\pm .00083$ DCON = h_6 $> .3937 - .7087$ DIAMETERDC = $\pm .00028/\pm .00098$ DCON = h_6 $> .7087 - 1.1811$ DIAMETERDC = $\pm .00031/\pm .00114$ DCON = h_6

TOLERANCES (mm)

 ≤ 3 DIAMETERDC = $\pm 0,002/\pm 0,012$ DCON = h_6 $> 3 - 6$ DIAMETERDC = $\pm 0,004/\pm 0,016$ DCON = h_6 $> 6 - 10$ DIAMETERDC = $\pm 0,006/\pm 0,021$ DCON = h_6 $> 10 - 18$ DIAMETERDC = $\pm 0,007/\pm 0,025$ DCON = h_6 $> 18 - 30$ DIAMETERDC = $\pm 0,008/\pm 0,029$ DCON = h_6

STEELS
STAINLESS STEELS
CAST IRON
HIGH TEMP ALLOYS

continued on next page

143M-S 5xD

FRACTIONAL & METRIC SERIES

inch & mm								EDP NO.	CONTINUED
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	Ti-NAMITE-A (AITIN)	
0.2244	5,700 mm		6,0	82,0	44,0	35,0	36,0	69250	
0.2283	5,800 mm		6,0	82,0	44,0	35,0	36,0	69251	
0.2323	5,900 mm		6,0	82,0	44,0	35,0	36,0	69252	
0.2344	5,954 mm	15/64	6,0	82,0	44,0	35,0	36,0	56845	
0.2362	6,000 mm		6,0	82,0	44,0	35,0	36,0	69253	
0.2402	6,100 mm		8,0	91,0	53,0	44,0	36,0	69254	
0.2441	6,200 mm		8,0	91,0	53,0	44,0	36,0	69255	
0.2480	6,300 mm		8,0	91,0	53,0	44,0	36,0	69256	
0.2500	6,350 mm	1/4 E	8,0	91,0	53,0	43,0	36,0	56846	
0.2520	6,400 mm		8,0	91,0	53,0	43,0	36,0	69257	
0.2559	6,500 mm		8,0	91,0	53,0	43,0	36,0	69258	
0.2570	6,528 mm	F	8,0	91,0	53,0	43,0	36,0	56847	
0.2598	6,600 mm		8,0	91,0	53,0	43,0	36,0	69259	
0.2638	6,700 mm		8,0	91,0	53,0	43,0	36,0	69260	
0.2656	6,746 mm	17/64	8,0	91,0	53,0	43,0	36,0	56848	
0.2677	6,800 mm		8,0	91,0	53,0	43,0	36,0	69261	
0.2717	6,900 mm		8,0	91,0	53,0	43,0	36,0	69262	
0.2756	7,000 mm		8,0	91,0	53,0	42,0	36,0	69263	
0.2795	7,100 mm		8,0	91,0	53,0	42,0	36,0	69264	
0.2812	7,142 mm	9/32	8,0	91,0	53,0	42,0	36,0	56849	
0.2835	7,200 mm		8,0	91,0	53,0	42,0	36,0	69265	
0.2874	7,300 mm		8,0	91,0	53,0	42,0	36,0	69266	
0.2913	7,400 mm		8,0	91,0	53,0	42,0	36,0	69267	
0.2953	7,500 mm		8,0	91,0	53,0	42,0	36,0	69268	
0.2969	7,541 mm	19/64	8,0	91,0	53,0	42,0	36,0	56850	
0.2992	7,600 mm		8,0	91,0	53,0	42,0	36,0	69269	
0.3031	7,700 mm		8,0	91,0	53,0	41,0	36,0	69270	
0.3071	7,800 mm		8,0	91,0	53,0	41,0	36,0	69271	
0.3110	7,900 mm		8,0	91,0	53,0	41,0	36,0	69272	
0.3125	7,938 mm	5/16	8,0	91,0	53,0	41,0	36,0	56851	
0.3150	8,000 mm		8,0	91,0	53,0	41,0	36,0	69273	
0.3189	8,100 mm		10,0	103,0	61,0	49,0	40,0	69274	
0.3228	8,200 mm		10,0	103,0	61,0	49,0	40,0	69275	
0.3268	8,300 mm		10,0	103,0	61,0	49,0	40,0	69276	
0.3281	8,334 mm	21/64	10,0	103,0	61,0	48,0	40,0	56852	
0.3307	8,400 mm		10,0	103,0	61,0	48,0	40,0	69277	
0.3320	8,433 mm	Q	10,0	103,0	61,0	48,0	40,0	56853	
0.3346	8,500 mm		10,0	103,0	61,0	48,0	40,0	69278	
0.3386	8,600 mm		10,0	103,0	61,0	48,0	40,0	69279	
0.3425	8,700 mm		10,0	103,0	61,0	48,0	40,0	69280	
0.3438	8,733 mm	11/32	10,0	103,0	61,0	48,0	40,0	56854	
0.3465	8,800 mm		10,0	103,0	61,0	48,0	40,0	69281	
0.3504	8,900 mm		10,0	103,0	61,0	48,0	40,0	69282	
0.3543	9,000 mm		10,0	103,0	61,0	48,0	40,0	69283	

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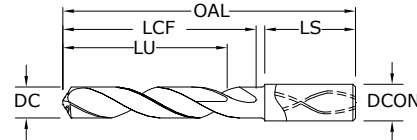


5xD



143M-S 5xD

FRACTIONAL & METRIC SERIES



CONTINUED

- Coolant through design improves coolant flow to extend tool life and aid in chip evacuation
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inch & mm								EDP NO.
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	Ti-NAMITE-A (AITiN)
0.3583	9,100 mm		10,0	103,0	61,0	47,0	40,0	69284
0.3594	9,129 mm	23/64	10,0	103,0	61,0	47,0	40,0	56855
0.3622	9,200 mm		10,0	103,0	61,0	47,0	40,0	69285
0.3661	9,300 mm		10,0	103,0	61,0	47,0	40,0	69286
0.3680	9,347 mm	U	10,0	103,0	61,0	47,0	40,0	56856
0.3701	9,400 mm		10,0	103,0	61,0	47,0	40,0	69287
0.3740	9,500 mm		10,0	103,0	61,0	47,0	40,0	69288
0.3750	9,525 mm	3/8	10,0	103,0	61,0	47,0	40,0	56857
0.3780	9,600 mm		10,0	103,0	61,0	47,0	40,0	69289
0.3819	9,700 mm		10,0	103,0	61,0	46,0	40,0	69290
0.3858	9,800 mm		10,0	103,0	61,0	46,0	40,0	69291
0.3898	9,900 mm		10,0	103,0	61,0	46,0	40,0	69292
0.3906	9,921 mm	25/64	10,0	103,0	61,0	46,0	40,0	56858
0.3937	10,000 mm		10,0	103,0	61,0	46,0	40,0	69293
0.3976	10,100 mm		12,0	118,0	71,0	56,0	45,0	69294
0.4016	10,200 mm		12,0	118,0	71,0	56,0	45,0	69295
0.4055	10,300 mm		12,0	118,0	71,0	56,0	45,0	69296
0.4062	10,317 mm	13/32	12,0	118,0	71,0	56,0	45,0	56859
0.4095	10,400 mm		12,0	118,0	71,0	55,0	45,0	69297
0.4134	10,500 mm		12,0	118,0	71,0	55,0	45,0	69298
0.4173	10,600 mm		12,0	118,0	71,0	55,0	45,0	69299
0.4213	10,700 mm		12,0	118,0	71,0	55,0	45,0	69300
0.4219	10,716 mm	27/64	12,0	118,0	71,0	55,0	45,0	56860
0.4252	10,800 mm		12,0	118,0	71,0	55,0	45,0	69301
0.4291	10,900 mm		12,0	118,0	71,0	55,0	45,0	69302
0.4331	11,000 mm		12,0	118,0	71,0	54,0	45,0	69303
0.4370	11,100 mm		12,0	118,0	71,0	54,0	45,0	69304
0.4375	11,113 mm	7/16	12,0	118,0	71,0	54,0	45,0	56861
0.4409	11,200 mm		12,0	118,0	71,0	54,0	45,0	69305
0.4449	11,300 mm		12,0	118,0	71,0	54,0	45,0	69306
0.4488	11,400 mm		12,0	118,0	71,0	54,0	45,0	69307
0.4528	11,500 mm		12,0	118,0	71,0	54,0	45,0	69308
0.4567	11,600 mm		12,0	118,0	71,0	54,0	45,0	69309
0.4606	11,700 mm		12,0	118,0	71,0	53,0	45,0	69310
0.4646	11,800 mm		12,0	118,0	71,0	53,0	45,0	69311
0.4685	11,900 mm		12,0	118,0	71,0	53,0	45,0	69312

TOLERANCES (inch)

≤.1181 DIAMETER

DC = +.00008/+0.00047
DCON = h₆

>.1181-.2362 DIAMETER

DC = +.00016/+0.00063
DCON = h₆

>.2362-.3937 DIAMETER

DC = +.00024/+0.00083
DCON = h₆

>.3937-.7087 DIAMETER

DC = +.00028/+0.00098
DCON = h₆

>.7087-1.1811 DIAMETER

DC = +.00031/+0.00114
DCON = h₆

TOLERANCES (mm)

≤3 DIAMETER

DC = +0,002/+0,012
DCON = h₆

>3-6 DIAMETER

DC = +0,004/+0,016
DCON = h₆

>6-10 DIAMETER

DC = +0,006/+0,021
DCON = h₆

>10-18 DIAMETER

DC = +0,007/+0,025
DCON = h₆

>18-30 DIAMETER

DC = +0,008/+0,029
DCON = h₆

STEELS

STAINLESS STEELS

CAST IRON

HIGH TEMP ALLOYS

continued on next page

143M-S 5xD

FRACTIONAL & METRIC SERIES

inch & mm								EDP NO.	CONTINUED
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	Ti-NAMITE-A (AITiN)	
0.4688	11,908 mm	15/32	12,0	118,0	71,0	53,0	45,0	56862	
0.4724	12,000 mm		12,0	118,0	71,0	53,0	45,0	69313	
0.4844	12,304 mm	31/64	14,0	124,0	77,0	58,0	45,0	56863	
0.4921	12,500 mm		14,0	124,0	77,0	58,0	45,0	69314	
0.5000	12,700 mm	1/2	14,0	124,0	77,0	58,0	45,0	56864	
0.5039	12,800 mm		14,0	124,0	77,0	58,0	45,0	69315	
0.5118	13,000 mm		14,0	124,0	77,0	58,0	45,0	69316	
0.5156	13,096 mm	33/64	14,0	124,0	77,0	57,0	45,0	56865	
0.5315	13,500 mm		14,0	124,0	77,0	57,0	45,0	69317	
0.5433	13,800 mm		14,0	124,0	77,0	56,0	45,0	69318	
0.5512	14,000 mm		14,0	124,0	77,0	56,0	45,0	69319	
0.5625	14,288 mm	9/16	16,0	133,0	83,0	61,0	48,0	56866	
0.5709	14,500 mm		16,0	133,0	83,0	61,0	48,0	69320	
0.5781	14,684 mm	37/64	16,0	133,0	83,0	61,0	48,0	56867	
0.5827	14,800 mm		16,0	133,0	83,0	61,0	48,0	69321	
0.5906	15,000 mm		16,0	133,0	83,0	60,0	48,0	69322	
0.6102	15,500 mm		16,0	133,0	83,0	60,0	48,0	69323	
0.6221	15,800 mm		16,0	133,0	83,0	59,0	48,0	69324	
0.6250	15,875 mm	5/8	16,0	133,0	83,0	59,0	48,0	56868	
0.6299	16,000 mm		16,0	133,0	83,0	59,0	48,0	69325	
0.6562	16,667 mm	21/32	18,0	143,0	93,0	68,0	48,0	56869	
0.6875	17,463 mm	11/16	18,0	143,0	93,0	67,0	48,0	56870	
0.7500	19,050 mm	3/4	20,0	153,0	101,0	72,0	50,0	56871	

Hi-PerCarb

	Series 143M-S Fractional	Hardness	Vc (sfm)	DC • in							
				1/8	3/16	1/4	3/8	1/2	5/8	3/4	
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	425	RPM	12988	8659	6494	4329	3247	2598	2165
			(340-510)	Fr	0.0039	0.0059	0.0079	0.0118	0.0157	0.0196	0.0236
				Feed (ipm)	51.0	51.0	51.0	51.0	51.0	51.0	51.0
		≤ 275 Bhn or ≤ 28 HRc	380	RPM	11613	7742	5806	3871	2903	2323	1935
			(304-456)	Fr	0.0035	0.0053	0.0071	0.0106	0.0141	0.0177	0.0212
				Feed (ipm)	41.0	41.0	41.0	41.0	41.0	41.0	41.0
		≤ 425 Bhn or ≤ 45 HRc	220	RPM	6723	4482	3362	2241	1681	1345	1121
			(176-264)	Fr	0.0030	0.0045	0.0059	0.0089	0.0119	0.0149	0.0178
				Feed (ipm)	20.0	20.0	20.0	20.0	20.0	20.0	20.0
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc	330	RPM	10085	6723	5042	3362	2521	2017	1681
			(264-396)	Fr	0.0030	0.0045	0.0059	0.0089	0.0119	0.0149	0.0178
				Feed (ipm)	30.0	30.0	30.0	30.0	30.0	30.0	30.0
		≤ 375 Bhn or ≤ 40 HRc	200	RPM	6112	4075	3056	2037	1528	1222	1019
			(160-240)	Fr	0.0025	0.0038	0.0051	0.0076	0.0101	0.0127	0.0152
				Feed (ipm)	15.5	15.5	15.5	15.5	15.5	15.5	15.5
		≤ 425 Bhn or ≤ 45 HRc	140	RPM	4278	2852	2139	1426	1070	856	713
			(112-168)	Fr	0.0018	0.0027	0.0036	0.0054	0.0072	0.0090	0.0108
				Feed (ipm)	7.7	7.7	7.7	7.7	7.7	7.7	7.7
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 200 Bhn or ≤ 13 HRc	145	RPM	4431	2954	2216	1477	1108	886	739
			(116-174)	Fr	0.0026	0.0039	0.0052	0.0078	0.0104	0.0130	0.0156
				Feed (ipm)	11.5	11.5	11.5	11.5	11.5	11.5	11.5
		≤ 375 Bhn or ≤ 40 HRc	95	RPM	2903	1935	1452	968	726	581	484
			(76-114)	Fr	0.0012	0.0018	0.0024	0.0036	0.0048	0.0060	0.0072
				Feed (ipm)	3.5	3.5	3.5	3.5	3.5	3.5	3.5
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 185 Bhn or ≤ 9 HRc	325	RPM	9932	6621	4966	3311	2483	1986	1655
			(260-390)	Fr	0.0030	0.0045	0.0060	0.0091	0.0121	0.0151	0.0181
				Feed (ipm)	30.0	30.0	30.0	30.0	30.0	30.0	30.0
		≤ 275 Bhn or ≤ 28 HRc	210	RPM	6418	4278	3209	2139	1604	1284	1070
			(168-252)	Fr	0.0023	0.0035	0.0047	0.0070	0.0093	0.0117	0.0140
				Feed (ipm)	15.0	15.0	15.0	15.0	15.0	15.0	15.0
	STAINLESS STEELS (DIFFICULT) 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	≤ 275 Bhn or ≤ 28 HRc	160	RPM	4890	3260	2445	1630	1222	978	815
			(128-192)	Fr	0.0023	0.0035	0.0047	0.0070	0.0093	0.0117	0.0140
				Feed (ipm)	11.4	11.4	11.4	11.4	11.4	11.4	11.4
		≤ 375 Bhn or ≤ 40 HRc	115	RPM	3514	2343	1757	1171	879	703	586
			(92-138)	Fr	0.0021	0.0031	0.0042	0.0062	0.0083	0.0104	0.0125
				Feed (ipm)	7.3	7.3	7.3	7.3	7.3	7.3	7.3

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Series 143M-S Fractional	Hardness	Vc (sfm)	DC • in								
			1/8	3/16	1/4	3/8	1/2	5/8	3/4		
K	CAST IRONS Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	360 (288-432)	RPM	11002	7334	5501	3667	2750	2200	1834
			Fr	0.0045	0.0068	0.0091	0.0136	0.0182	0.0227	0.0273	
			Feed (ipm)	50.0	50.0	50.0	50.0	50.0	50.0	50.0	
		≤ 260 Bhn or ≤ 26 HRc	335 (268-402)	RPM	10238	6825	5119	3413	2559	2048	1706
			Fr	0.0045	0.0068	0.0091	0.0136	0.0182	0.0227	0.0273	
			Feed (ipm)	46.5	46.5	46.5	46.5	46.5	46.5	46.5	
S	HIGH TEMP ALLOYS (NICKEL , COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400, Rene, Waspaloy	≤ 300 Bhn or ≤ 32 HRc	130 (104-156)	RPM	3973	2649	1986	1324	993	795	662
			Fr	0.0014	0.0022	0.0029	0.0043	0.0057	0.0072	0.0086	
			Feed (ipm)	5.7	5.7	5.7	5.7	5.7	5.7	5.7	
		≤ 400 Bhn or ≤ 43 HRc	70 (56-84)	RPM	2139	1426	1070	713	535	428	357
			Fr	0.0012	0.0018	0.0024	0.0036	0.0049	0.0061	0.0073	
			Feed (ipm)	2.6	2.6	2.6	2.6	2.6	2.6	2.6	
	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V	≤ 275 Bhn or ≤ 28 HRc	215 (172-258)	RPM	6570	4380	3285	2190	1643	1314	1095
			Fr	0.0018	0.0026	0.0035	0.0053	0.0070	0.0088	0.0105	
			Feed (ipm)	11.5	11.5	11.5	11.5	11.5	11.5	11.5	
		≤ 350 Bhn or ≤ 38 HRc	160 (128-192)	RPM	4890	3260	2445	1630	1222	978	815
			Fr	0.0016	0.0024	0.0032	0.0048	0.0064	0.0080	0.0096	
			Feed (ipm)	7.8	7.8	7.8	7.8	7.8	7.8	7.8	
≤ 440 Bhn or ≤ 47 HRc	85 (68-102)	RPM	2598	1732	1299	866	649	520	433		
	Fr	0.0012	0.0018	0.0024	0.0036	0.0048	0.0060	0.0072			
	Feed (ipm)	3.1	3.1	3.1	3.1	3.1	3.1	3.1			

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)

rpm = Vc x 3.82 / DC

ipm = Fr x RPM

reduce speed and feed for materials harder than listed

refer to the **KYOCERA SGS APEX** for complete technical information (www.kyocera-sgstool.com/apex)

Hi-PerCarb

Series 143M-S Metric	Hardness	Vc (m/min)	DC • mm							
			3	6	8	10	12	14	16	
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	130 (104-155) ≤ 175 Bhn or ≤ 7 HRc	RPM	13733	6867	5150	4120	3433	2943	2575
			Fr	0.094	0.189	0.252	0.314	0.377	0.440	0.503
			Feed (mm/min)	1295	1295	1295	1295	1295	1295	1295
		116 (93-139) ≤ 275 Bhn or ≤ 28 HRc	RPM	12279	6140	4605	3684	3070	2631	2302
			Fr	0.085	0.170	0.226	0.283	0.339	0.396	0.452
			Feed (mm/min)	1041	1041	1041	1041	1041	1041	1041
		67 (54-80) ≤ 425 Bhn or ≤ 45 HRc	RPM	7109	3555	2666	2133	1777	1523	1333
			Fr	0.071	0.143	0.191	0.238	0.286	0.333	0.381
			Feed (mm/min)	508	508	508	508	508	508	508
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	101 (80-121) ≤ 275 Bhn or ≤ 28 HRc	RPM	10664	5332	3999	3199	2666	2285	1999
			Fr	0.071	0.143	0.191	0.238	0.286	0.333	0.381
			Feed (mm/min)	762	762	762	762	762	762	762
		61 (49-73) ≤ 375 Bhn or ≤ 40 HRc	RPM	6463	3231	2424	1939	1616	1385	1212
			Fr	0.061	0.122	0.162	0.203	0.244	0.284	0.325
			Feed (mm/min)	394	394	394	394	394	394	394
		43 (34-51) ≤ 425 Bhn or ≤ 45 HRc	RPM	4524	2262	1696	1357	1131	969	848
			Fr	0.043	0.086	0.115	0.144	0.173	0.202	0.231
			Feed (mm/min)	196	196	196	196	196	196	196
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	44 (35-53) ≤ 200 Bhn or ≤ 13 HRc	RPM	4686	2343	1757	1406	1171	1004	879
			Fr	0.062	0.125	0.166	0.208	0.249	0.291	0.332
			Feed (mm/min)	292	292	292	292	292	292	292
		29 (23-35) ≤ 375 Bhn or ≤ 40 HRc	RPM	3070	1535	1151	921	767	658	576
			Fr	0.029	0.058	0.077	0.097	0.116	0.135	0.154
			Feed (mm/min)	89	89	89	89	89	89	89
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	99 (79-119) ≤ 185 Bhn or ≤ 9 HRc	RPM	10502	5251	3938	3151	2626	2250	1969
			Fr	0.073	0.145	0.193	0.242	0.290	0.339	0.387
			Feed (mm/min)	762	762	762	762	762	762	762
		64 (51-77) ≤ 275 Bhn or ≤ 28 HRc	RPM	6786	3393	2545	2036	1696	1454	1272
			Fr	0.056	0.112	0.150	0.187	0.225	0.262	0.299
			Feed (mm/min)	381	381	381	381	381	381	381
	STAINLESS STEELS (DIFFICULT) 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	49 (39-59) ≤ 275 Bhn or ≤ 28 HRc	RPM	5170	2585	1939	1551	1293	1108	969
			Fr	0.056	0.112	0.149	0.187	0.224	0.261	0.299
			Feed (mm/min)	290	290	290	290	290	290	290
		35 (28-42) ≤ 375 Bhn or ≤ 40 HRc	RPM	3716	1858	1394	1115	929	796	697
			Fr	0.050	0.100	0.133	0.166	0.200	0.233	0.266
			Feed (mm/min)	185	185	185	185	185	185	185

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Series 143M-S Metric	Hardness	Vc (m/min)	DC • mm							
			3	6	8	10	12	14	16	
K	CAST IRONS Gray, Malleable, Ductile	110	RPM	11633	5816	4362	3490	2908	2493	2181
		(88-132)	Fr	0.109	0.218	0.291	0.364	0.437	0.509	0.582
			Feed (mm/min)	1270	1270	1270	1270	1270	1270	1270
		102	RPM	10825	5413	4059	3248	2706	2320	2030
		(82-123)	Fr	0.109	0.218	0.291	0.364	0.436	0.509	0.582
			Feed (mm/min)	1181	1181	1181	1181	1181	1181	1181
S	HIGH TEMP ALLOYS (Nickel , Cobalt, Iron Base) Inconel 601, 617, 625, Incoloy, Monel 400, Rene, Waspaloy	40	RPM	4201	2100	1575	1260	1050	900	788
		(32-48)	Fr	0.034	0.069	0.092	0.115	0.138	0.161	0.184
			Feed (mm/min)	145	145	145	145	145	145	145
		21	RPM	2262	1131	848	679	565	485	424
		(17-26)	Fr	0.029	0.058	0.078	0.097	0.117	0.136	0.156
			Feed (mm/min)	66	66	66	66	66	66	66
	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V	66	RPM	6947	3474	2605	2084	1737	1489	1303
		(52-79)	Fr	0.042	0.084	0.112	0.140	0.168	0.196	0.224
			Feed (mm/min)	292	292	292	292	292	292	292
		49	RPM	5170	2585	1939	1551	1293	1108	969
		(39-59)	Fr	0.038	0.077	0.102	0.128	0.153	0.179	0.204
			Feed (mm/min)	198	198	198	198	198	198	198
		26	RPM	2747	1373	1030	824	687	589	515
		(21-31)	Fr	0.029	0.057	0.076	0.096	0.115	0.134	0.153
			Feed (mm/min)	79	79	79	79	79	79	79

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)

rpm = (Vc x 1000) / (DC x 3.14)

mm/min = Fr x RPM

reduce speed and feed for materials harder than listed

refer to the **KYOCERA SGS APEX** for complete technical information (www.kyocera-sgstool.com/apex)



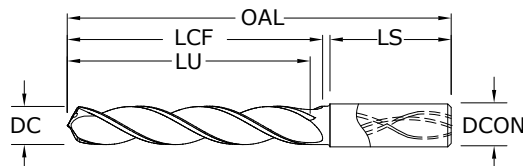
5xD



141K 5xD

FRACTIONAL & METRIC SERIES

- 3-margin design improves hole stability and size control while providing superior finish, roundness and cylindricity
- Self-stabilizing pyramid point design stabilizes the drill on contact with the workpiece
- Open flute structure efficiently transports chips while maintaining strength at high feed rates
- Sculpted gash allows chips to easily flow away from the drill center
- Recommended for materials ≤ 43 HRc (≤ 400 Bhn)



DECIMAL DC	METRIC DC	inch & mm						EDP NO.
		FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	
0.1181	3,000 mm		6,0	66,0	28,0	23,0	36,0	65160
0.1220	3,100 mm		6,0	66,0	28,0	23,0	36,0	65161
0.1250	3,175 mm	1/8	6,0	66,0	28,0	23,0	36,0	55160
0.1260	3,200 mm		6,0	66,0	28,0	23,0	36,0	65162
0.1299	3,300 mm		6,0	66,0	28,0	23,0	36,0	65163
0.1339	3,400 mm		6,0	66,0	28,0	23,0	36,0	65164
0.1360	3,454 mm	#29	6,0	66,0	28,0	23,0	36,0	55161
0.1378	3,500 mm		6,0	66,0	28,0	23,0	36,0	65165
0.1406	3,571 mm	9/64	6,0	66,0	28,0	23,0	36,0	55162
0.1417	3,600 mm		6,0	66,0	28,0	23,0	36,0	65166
0.1457	3,700 mm		6,0	66,0	28,0	23,0	36,0	65167
0.1496	3,800 mm		6,0	74,0	36,0	29,0	36,0	65168
0.1535	3,900 mm		6,0	74,0	36,0	29,0	36,0	65169
0.1562	3,967 mm	5/32	6,0	74,0	36,0	29,0	36,0	55163
0.1575	4,000 mm		6,0	74,0	36,0	29,0	36,0	65170
0.1590	4,039 mm	#21	6,0	74,0	36,0	29,0	36,0	55164
0.1614	4,100 mm		6,0	74,0	36,0	29,0	36,0	65171
0.1654	4,200 mm		6,0	74,0	36,0	29,0	36,0	65172
0.1693	4,300 mm		6,0	74,0	36,0	29,0	36,0	65173
0.1719	4,366 mm	11/64	6,0	74,0	36,0	29,0	36,0	55165
0.1732	4,400 mm		6,0	74,0	36,0	29,0	36,0	65174
0.1772	4,500 mm		6,0	74,0	36,0	29,0	36,0	65175
0.1811	4,600 mm		6,0	74,0	36,0	29,0	36,0	65176
0.1850	4,699 mm	#13	6,0	74,0	36,0	29,0	36,0	65177
0.1875	4,763 mm	3/16	6,0	82,0	44,0	37,0	36,0	55166
0.1890	4,801 mm	#12	6,0	82,0	44,0	37,0	36,0	65178
0.1929	4,900 mm		6,0	82,0	44,0	37,0	36,0	65179
0.1969	5,000 mm		6,0	82,0	44,0	36,0	36,0	65180
0.2008	5,100 mm		6,0	82,0	44,0	36,0	36,0	65181
0.2031	5,159 mm	13/64	6,0	82,0	44,0	36,0	36,0	55167
0.2047	5,200 mm		6,0	82,0	44,0	36,0	36,0	65182
0.2087	5,300 mm		6,0	82,0	44,0	36,0	36,0	65183
0.2126	5,400 mm		6,0	82,0	44,0	36,0	36,0	65184
0.2165	5,500 mm		6,0	82,0	44,0	36,0	36,0	65185
0.2188	5,558 mm	7/32	6,0	82,0	44,0	36,0	36,0	55168
0.2205	5,600 mm		6,0	82,0	44,0	36,0	36,0	65186

TOLERANCES (inch)

 $\leq .1181$ DIAMETERDC = $+0.0008/+0.0047$ DCON = h_6 $> .1181-.2362$ DIAMETERDC = $+0.0016/+0.0063$ DCON = h_6 $> .2362-.3937$ DIAMETERDC = $+0.0024/+0.0083$ DCON = h_6 $> .3937-.7087$ DIAMETERDC = $+0.0028/+0.0098$ DCON = h_6 $> .7087-1.1811$ DIAMETERDC = $+0.0031/+0.0114$ DCON = h_6

TOLERANCES (mm)

 ≤ 3 DIAMETERDC = $+0,002/+0,012$ DCON = h_6 $> 3-6$ DIAMETERDC = $+0,004/+0,016$ DCON = h_6 $> 6-10$ DIAMETERDC = $+0,006/+0,021$ DCON = h_6 $> 10-18$ DIAMETERDC = $+0,007/+0,025$ DCON = h_6

CAST IRON

continued on next page

141K 5xD

FRACTIONAL & METRIC SERIES

DECIMAL DC	METRIC DC	inch & mm						EDP NO. Ti-NAMITE-M (TM)
		FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	
0.2244	5,700 mm		6,0	82,0	44,0	35,0	36,0	65187
0.2283	5,800 mm		6,0	82,0	44,0	35,0	36,0	65188
0.2323	5,900 mm		6,0	82,0	44,0	35,0	36,0	65189
0.2344	5,954 mm	15/64	6,0	82,0	44,0	35,0	36,0	55169
0.2362	6,000 mm		6,0	82,0	44,0	35,0	36,0	65190
0.2402	6,100 mm		8,0	91,0	53,0	44,0	36,0	65191
0.2441	6,200 mm		8,0	91,0	53,0	44,0	36,0	65192
0.2480	6,300 mm		8,0	91,0	53,0	44,0	36,0	65193
0.2500	6,350 mm	1/4 E	8,0	91,0	53,0	43,0	36,0	55170
0.2520	6,400 mm		8,0	91,0	53,0	43,0	36,0	65194
0.2559	6,500 mm		8,0	91,0	53,0	43,0	36,0	65195
0.2570	6,528 mm	F	8,0	91,0	53,0	43,0	36,0	55171
0.2598	6,600 mm		8,0	91,0	53,0	43,0	36,0	65196
0.2638	6,700 mm		8,0	91,0	53,0	43,0	36,0	65197
0.2656	6,746 mm	17/64	8,0	91,0	53,0	43,0	36,0	55172
0.2677	6,800 mm		8,0	91,0	53,0	43,0	36,0	65198
0.2717	6,900 mm		8,0	91,0	53,0	43,0	36,0	65199
0.2756	7,000 mm		8,0	91,0	53,0	42,0	36,0	65200
0.2795	7,100 mm		8,0	91,0	53,0	42,0	36,0	65201
0.2812	7,142 mm	9/32	8,0	91,0	53,0	42,0	36,0	55173
0.2835	7,200 mm		8,0	91,0	53,0	42,0	36,0	65202
0.2874	7,300 mm		8,0	91,0	53,0	42,0	36,0	65203
0.2913	7,400 mm		8,0	91,0	53,0	42,0	36,0	65204
0.2953	7,500 mm		8,0	91,0	53,0	42,0	36,0	65205
0.2969	7,541 mm	19/64	8,0	91,0	53,0	42,0	36,0	55174
0.2992	7,600 mm		8,0	91,0	53,0	42,0	36,0	65206
0.3031	7,700 mm		8,0	91,0	53,0	41,0	36,0	65207
0.3071	7,800 mm		8,0	91,0	53,0	41,0	36,0	65208
0.3110	7,900 mm		8,0	91,0	53,0	41,0	36,0	65209
0.3125	7,938 mm	5/16	8,0	91,0	53,0	41,0	36,0	55175
0.3150	8,000 mm		8,0	91,0	53,0	41,0	36,0	65210
0.3189	8,100 mm		10,0	103,0	61,0	49,0	40,0	65211
0.3228	8,200 mm		10,0	103,0	61,0	49,0	40,0	65212
0.3268	8,300 mm		10,0	103,0	61,0	49,0	40,0	65213
0.3281	8,334 mm	21/64	10,0	103,0	61,0	48,0	40,0	55176
0.3307	8,400 mm		10,0	103,0	61,0	48,0	40,0	65214
0.3320	8,433 mm	Q	10,0	103,0	61,0	48,0	40,0	55177
0.3346	8,500 mm		10,0	103,0	61,0	48,0	40,0	65215
0.3386	8,600 mm		10,0	103,0	61,0	48,0	40,0	65216
0.3425	8,700 mm		10,0	103,0	61,0	48,0	40,0	65217
0.3438	8,733 mm	11/32	10,0	103,0	61,0	48,0	40,0	55178
0.3465	8,800 mm		10,0	103,0	61,0	48,0	40,0	65218
0.3504	8,900 mm		10,0	103,0	61,0	48,0	40,0	65219
0.3543	9,000 mm		10,0	103,0	61,0	48,0	40,0	65220
0.3583	9,100 mm		10,0	103,0	61,0	47,0	40,0	65221
0.3594	9,129 mm	23/64	10,0	103,0	61,0	47,0	40,0	55179

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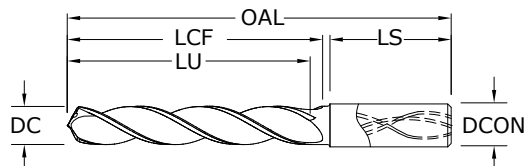


5xD



141K 5xD

FRACTIONAL & METRIC SERIES



CONTINUED

- 3-margin design improves hole stability and size control while providing superior finish, roundness and cylindricity
- Self-stabilizing pyramid point design stabilizes the drill on contact with the workpiece
- Open flute structure efficiently transports chips while maintaining strength at high feed rates
- Sculpted gash allows chips to easily flow away from the drill center
- Recommended for materials ≤ 43 HRc (≤ 400 Bhn)

inch & mm									EDP NO.
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	Ti-NAMITE-M (TM)	
0.3622	9,200 mm		10,0	103,0	61,0	47,0	40,0	65222	
0.3661	9,300 mm		10,0	103,0	61,0	47,0	40,0	65223	
0.3680	9,347 mm	U	10,0	103,0	61,0	47,0	40,0	55180	
0.3701	9,400 mm		10,0	103,0	61,0	47,0	40,0	65224	
0.3740	9,500 mm		10,0	103,0	61,0	47,0	40,0	65225	
0.3750	9,525 mm	3/8	10,0	103,0	61,0	47,0	40,0	55181	
0.3780	9,600 mm		10,0	103,0	61,0	47,0	40,0	65226	
0.3819	9,700 mm		10,0	103,0	61,0	46,0	40,0	65227	
0.3858	9,800 mm		10,0	103,0	61,0	46,0	40,0	65228	
0.3898	9,900 mm		10,0	103,0	61,0	46,0	40,0	65229	
0.3906	9,921 mm	25/64	10,0	103,0	61,0	46,0	40,0	55182	
0.3937	10,000 mm		10,0	103,0	61,0	46,0	40,0	65230	
0.3976	10,100 mm		12,0	118,0	71,0	56,0	45,0	65231	
0.4016	10,200 mm		12,0	118,0	71,0	56,0	45,0	65232	
0.4055	10,300 mm		12,0	118,0	71,0	56,0	45,0	65233	
0.4062	10,317 mm	13/32	12,0	118,0	71,0	56,0	45,0	55183	
0.4095	10,400 mm		12,0	118,0	71,0	55,0	45,0	65234	
0.4134	10,500 mm		12,0	118,0	71,0	55,0	45,0	65235	
0.4173	10,600 mm		12,0	118,0	71,0	55,0	45,0	65236	
0.4213	10,700 mm		12,0	118,0	71,0	55,0	45,0	65237	
0.4219	10,716 mm	27/64	12,0	118,0	71,0	55,0	45,0	55184	
0.4252	10,800 mm		12,0	118,0	71,0	55,0	45,0	65238	
0.4291	10,900 mm		12,0	118,0	71,0	55,0	45,0	65239	
0.4331	11,000 mm		12,0	118,0	71,0	54,0	45,0	65240	
0.4370	11,100 mm		12,0	118,0	71,0	54,0	45,0	65241	
0.4375	11,113 mm	7/16	12,0	118,0	71,0	54,0	45,0	55185	
0.4409	11,200 mm		12,0	118,0	71,0	54,0	45,0	65242	
0.4449	11,300 mm		12,0	118,0	71,0	54,0	45,0	65243	
0.4488	11,400 mm		12,0	118,0	71,0	54,0	45,0	65244	
0.4528	11,500 mm		12,0	118,0	71,0	54,0	45,0	65245	
0.4567	11,600 mm		12,0	118,0	71,0	54,0	45,0	65246	
0.4606	11,700 mm		12,0	118,0	71,0	53,0	45,0	65247	
0.4646	11,800 mm		12,0	118,0	71,0	53,0	45,0	65248	
0.4685	11,900 mm		12,0	118,0	71,0	53,0	45,0	65249	
0.4688	11,908 mm	15/32	12,0	118,0	71,0	53,0	45,0	55186	
0.4724	12,000 mm		12,0	118,0	71,0	53,0	45,0	65250	

TOLERANCES (inch)

 $\leq .1181$ DIAMETERDC = $+0.0008/+0.0047$ DCON = h_6 $>.1181-.2362$ DIAMETERDC = $+0.0016/+0.0063$ DCON = h_6 $>.2362-.3937$ DIAMETERDC = $+0.0024/+0.0083$ DCON = h_6 $>.3937-.7087$ DIAMETERDC = $+0.0028/+0.0098$ DCON = h_6 $>.7087-1.1811$ DIAMETERDC = $+0.0031/+0.0114$ DCON = h_6

TOLERANCES (mm)

 ≤ 3 DIAMETERDC = $+0,002/+0,012$ DCON = h_6 $>3-6$ DIAMETERDC = $+0,004/+0,016$ DCON = h_6 $>6-10$ DIAMETERDC = $+0,006/+0,021$ DCON = h_6 $>10-18$ DIAMETERDC = $+0,007/+0,025$ DCON = h_6

CAST IRON

continued on next page

141K 5xD

FRACTIONAL & METRIC SERIES

inch & mm								EDP NO.
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	Ti-NAMITE-M (TM)
0.4844	12,304 mm	31/64	14,0	124,0	77,0	58,0	45,0	55187
0.4921	12,500 mm		14,0	124,0	77,0	58,0	45,0	65251
0.5000	12,700 mm	1/2	14,0	124,0	77,0	58,0	45,0	55188
0.5039	12,800 mm		14,0	124,0	77,0	58,0	45,0	65252
0.5118	13,000 mm		14,0	124,0	77,0	58,0	45,0	65253
0.5156	13,096 mm	33/64	14,0	124,0	77,0	57,0	45,0	55189
0.5315	13,500 mm		14,0	124,0	77,0	57,0	45,0	65254
0.5433	13,800 mm		14,0	124,0	77,0	56,0	45,0	65255
0.5512	14,000 mm		14,0	124,0	77,0	56,0	45,0	65256
0.5625	14,288 mm	9/16	16,0	133,0	83,0	61,0	48,0	55190
0.5709	14,500 mm		16,0	133,0	83,0	61,0	48,0	65257
0.5781	14,684 mm	37/64	16,0	133,0	83,0	61,0	48,0	55191
0.5827	14,800 mm		16,0	133,0	83,0	61,0	48,0	65258
0.5906	15,000 mm		16,0	133,0	83,0	60,0	48,0	65259
0.6102	15,500 mm		16,0	133,0	83,0	60,0	48,0	65260
0.6221	15,800 mm		16,0	133,0	83,0	59,0	48,0	65261
0.6250	15,875 mm	5/8	16,0	133,0	83,0	59,0	48,0	55192
0.6299	16,000 mm		16,0	133,0	83,0	59,0	48,0	65262
0.6562	16,667 mm	21/32	18,0	143,0	93,0	68,0	48,0	55193
0.6875	17,463 mm	11/16	18,0	143,0	93,0	67,0	48,0	55194
0.7500	19,050 mm	3/4	20,0	153,0	101,0	72,0	50,0	55195

CONTINUED

Hi-PerCarb

Series 141K 5D Fractional	Hardness	Vc (sfm)		DC • in							
				1/8	3/16	1/4	3/8	1/2	5/8	3/4	
K	GRAY CAST IRON FERRITIC ASTM A48: CLASS 20 SAE J431C: GRADE 1800	≤ 150 Bhn or ≤ 1 HRc	450	RPM	13752	9168	6876	4584	3438	2750	2292
			(360-540)	Fr	0.0049	0.0074	0.0099	0.0148	0.0198	0.0247	0.0297
			Feed (ipm)	68	68	68	68	68	68	68	
	GRAY CAST IRON PEARLITIC ASTM A48: CLASS 30, 35, 40 SAE J431C: GRADE 3000	≤ 220 Bhn or ≤ 19 HRc	375	RPM	11460	7640	5730	3820	2865	2292	1910
			(300-450)	Fr	0.0039	0.0059	0.0079	0.0118	0.0157	0.0196	0.0236
			Feed (ipm)	45	45	45	45	45	45	45	
	COMPACTED GRAPHITE IRON	≤ 250 Bhn or ≤ 25 HRc	325	RPM	9932	6621	4966	3311	2483	1986	1655
			(260-390)	Fr	0.0039	0.0059	0.0079	0.0118	0.0157	0.0196	0.0236
			Feed (ipm)	39	39	39	39	39	39	39	
	MALLEABLE CAST IRON FERRITIC ASTM A220: GRADE 40010 SAE J158: GRADE M4504	≤ 160 Bhn or ≤ 3 HRc	450	RPM	13752	9168	6876	4584	3438	2750	2292
			(360-540)	Fr	0.0049	0.0074	0.0099	0.0148	0.0198	0.0247	0.0297
			Feed (ipm)	68	68	68	68	68	68	68	
	MALLEABLE CAST IRON MARTENSITE ASTM A220: GRADE 90001 SAE J158: GRADE M8501	≤ 320 Bhn or ≤ 34 HRc	250	RPM	7640	5093	3820	2547	1910	1528	1273
			(200-300)	Fr	0.0031	0.0047	0.0063	0.0094	0.0126	0.0157	0.0188
			Feed (ipm)	24	24	24	24	24	24	24	

Bhn (Brinell) HRc (Rockwell C)

rpm = Vc x 3.82 / DC

ipm = Fr x rpm

reduce speed and feed for materials harder than listed

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)

METRIC

Hi-PerCarb

Series 141K 5D Metric	Hardness	Vc (m/min)	DC • mm								
			3	6	8	10	12	14	16		
K	GRAY CAST IRON FERRITIC ASTM A48: CLASS 20 SAE J431C: GRADE 1800	≤ 150 Bhn or ≤ 1 HRc	137	RPM	14541	7271	5453	4362	3635	3116	2726
		(110-165)	Fr	0.119	0.237	0.316	0.395	0.475	0.554	0.633	
			Feed (mm/min)	1725	1725	1725	1725	1725	1725	1725	
	GRAY CAST IRON PEARLITIC ASTM A48: CLASS 30, 35, 40 SAE J431C: GRADE 3000	≤ 220 Bhn or ≤ 19 HRc	114	RPM	12118	6059	4544	3635	3029	2597	2272
		(91-137)	Fr	0.094	0.189	0.252	0.315	0.378	0.441	0.504	
			Feed (mm/min)	1145	1145	1145	1145	1145	1145	1145	
	COMPACTED GRAPHITE IRON	≤ 250 Bhn or ≤ 25 HRc	99	RPM	10502	5251	3938	3151	2626	2250	1969
		(79-119)	Fr	0.094	0.189	0.251	0.314	0.377	0.440	0.503	
			Feed (mm/min)	990	990	990	990	990	990	990	
	MALLEABLE CAST IRON FERRITIC ASTM A220: GRADE 40010 SAE J158: GRADE M4504	≤ 160 Bhn or ≤ 3 HRc	137	RPM	14541	7271	5453	4362	3635	3116	2726
		(110-165)	Fr	0.119	0.237	0.316	0.395	0.475	0.554	0.633	
			Feed (mm/min)	1725	1725	1725	1725	1725	1725	1725	
	MALLEABLE CAST IRON MARTENSITE ASTM A220: GRADE 90001 SAE J158: GRADE M8501	≤ 320 Bhn or ≤ 34 HRc	76	RPM	8078	4039	3029	2424	2020	1731	1515
		(61-91)	Fr	0.076	0.151	0.201	0.252	0.302	0.352	0.403	
			Feed (mm/min)	610	610	610	610	610	610	610	

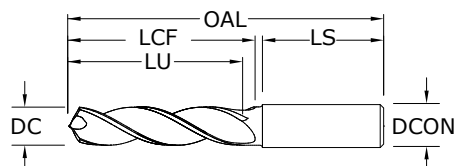
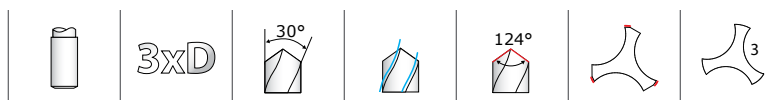
(Brinell) HRc (Rockwell C)

rpm = (Vc x 1000) / (DC x 3.14)

mm/min = Fr x rpm

reduce speed and feed for materials harder than listed

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)



131N 3xD

FRACTIONAL & METRIC SERIES

TOLERANCES (inch)

≤.1181 DIAMETER

DC = +.00008/+0.00047

DCON = h₆

>.1181-.2362 DIAMETER

DC = +.00016/+0.00063

DCON = h₆

>.2362-.3937 DIAMETER

DC = +.00024/+0.00083

DCON = h₆

>.3937-.7087 DIAMETER

DC = +.00028/+0.00098

DCON = h₆

>.7087-1.1811 DIAMETER

DC = +.00031/+0.00114

DCON = h₆

TOLERANCES (mm)

≤3 DIAMETER

DC = +0.002/+0.012

DCON = h₆

>3-6 DIAMETER

DC = +0.004/+0.016

DCON = h₆

>6-10 DIAMETER

DC = +0.006/+0.021

DCON = h₆

>10-18 DIAMETER

DC = +0.007/+0.025

DCON = h₆

NON-FERROUS

		inch & mm						EDP NO.	
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	UNCOATED	Ti-NAMITE-B (TiB ₂)
0.1181	3,000 mm		6,0	62,0	20,0	15,0	36,0	64600	67600
0.1220	3,100 mm		6,0	62,0	20,0	15,0	36,0	64601	67601
0.1250	3,175 mm	1/8	6,0	62,0	20,0	15,0	36,0	54600	54700
0.1260	3,200 mm		6,0	62,0	20,0	15,0	36,0	64602	67602
0.1299	3,300 mm		6,0	62,0	20,0	15,0	36,0	64603	67603
0.1339	3,400 mm		6,0	62,0	20,0	15,0	36,0	64604	67604
0.1360	3,454 mm	#29	6,0	62,0	20,0	15,0	36,0	54601	54701
0.1378	3,500 mm		6,0	62,0	20,0	15,0	36,0	64605	67605
0.1406	3,571 mm	9/64	6,0	62,0	20,0	15,0	36,0	54602	54702
0.1417	3,600 mm		6,0	62,0	20,0	15,0	36,0	64606	67606
0.1457	3,700 mm		6,0	62,0	20,0	15,0	36,0	64607	67607
0.1496	3,800 mm		6,0	66,0	24,0	18,0	36,0	64608	67608
0.1535	3,900 mm		6,0	66,0	24,0	18,0	36,0	64609	67609
0.1562	3,967 mm	5/32	6,0	66,0	24,0	18,0	36,0	54603	54703
0.1575	4,000 mm		6,0	66,0	24,0	18,0	36,0	64610	67610
0.1590	4,039 mm	#21	6,0	66,0	24,0	18,0	36,0	54604	54704
0.1614	4,100 mm		6,0	66,0	24,0	18,0	36,0	64611	67611
0.1654	4,200 mm		6,0	66,0	24,0	18,0	36,0	64612	67612
0.1693	4,300 mm		6,0	66,0	24,0	18,0	36,0	64613	67613
0.1719	4,366 mm	11/64	6,0	66,0	24,0	17,0	36,0	54605	54705
0.1732	4,400 mm		6,0	66,0	24,0	17,0	36,0	64614	67614
0.1772	4,500 mm		6,0	66,0	24,0	17,0	36,0	64615	67615
0.1811	4,600 mm		6,0	66,0	24,0	17,0	36,0	64616	67616
0.1850	4,699 mm	#13	6,0	66,0	24,0	17,0	36,0	64617	67617
0.1875	4,763 mm	3/16	6,0	66,0	28,0	21,0	36,0	54606	54706
0.1890	4,801 mm	#12	6,0	66,0	28,0	21,0	36,0	64618	67618
0.1929	4,900 mm		6,0	66,0	28,0	21,0	36,0	64619	67619
0.1969	5,000 mm		6,0	66,0	28,0	20,0	36,0	64620	67620
0.2008	5,100 mm		6,0	66,0	28,0	20,0	36,0	64621	67621
0.2031	5,159 mm	13/64	6,0	66,0	28,0	20,0	36,0	54607	54707
0.2047	5,200 mm		6,0	66,0	28,0	20,0	36,0	64622	67622
0.2087	5,300 mm		6,0	66,0	28,0	20,0	36,0	64623	67623
0.2126	5,400 mm		6,0	66,0	28,0	20,0	36,0	64624	67624
0.2165	5,500 mm		6,0	66,0	28,0	20,0	36,0	64625	67625
0.2188	5,558 mm	7/32	6,0	66,0	28,0	20,0	36,0	54608	54708
0.2205	5,600 mm		6,0	66,0	28,0	20,0	36,0	64626	67626

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- 3-margin design improves hole stability and size control while providing superior finish, roundness and cylindricity
- Self-stabilizing pyramid point design stabilizes the drill on contact with the workpiece
- Open flute structure efficiently transports chips while maintaining strength at high feed rates
- Sculpted gash allows chips to easily flow away from the drill center
- Recommended for materials ≤ 175 Bhn (≤ 16 HRC)

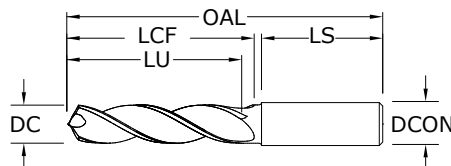


3xD



131N 3xD

FRACTIONAL & METRIC SERIES



CONTINUED

- 3-margin design improves hole stability and size control while providing superior finish, roundness and cylindricity
- Self-stabilizing pyramid point design stabilizes the drill on contact with the workpiece
- Open flute structure efficiently transports chips while maintaining strength at high feed rates
- Sculpted gash allows chips to easily flow away from the drill center
- Recommended for materials ≤ 175 Bhn (≤ 16 HRC)

DECIMAL DC	METRIC DC	inch & mm						EDP NO.	
		FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	UNCOATED	Ti-NAMITE-B (TiB ₂)
0.2244	5,700 mm		6,0	66,0	28,0	19,0	36,0	64627	67627
0.2283	5,800 mm		6,0	66,0	28,0	19,0	36,0	64628	67628
0.2323	5,900 mm		6,0	66,0	28,0	19,0	36,0	64629	67629
0.2344	5,954 mm	15/64	6,0	66,0	28,0	19,0	36,0	54609	54709
0.2362	6,000 mm		6,0	66,0	28,0	19,0	36,0	64630	67630
0.2402	6,100 mm		8,0	79,0	34,0	25,0	36,0	64631	67631
0.2441	6,200 mm		8,0	79,0	34,0	25,0	36,0	64632	67632
0.2480	6,300 mm		8,0	79,0	34,0	25,0	36,0	64633	67633
0.2500	6,350 mm	1/4 E	8,0	79,0	34,0	24,0	36,0	54610	54710
0.2520	6,400 mm		8,0	79,0	34,0	24,0	36,0	64634	67634
0.2559	6,500 mm		8,0	79,0	34,0	24,0	36,0	64635	67635
0.2570	6,528 mm	F	8,0	79,0	34,0	24,0	36,0	54611	54711
0.2598	6,600 mm		8,0	79,0	34,0	24,0	36,0	64636	67636
0.2638	6,700 mm		8,0	79,0	34,0	24,0	36,0	64637	67637
0.2656	6,746 mm	17/64	8,0	79,0	34,0	24,0	36,0	54612	54712
0.2677	6,800 mm		8,0	79,0	34,0	24,0	36,0	64638	67638
0.2717	6,900 mm		8,0	79,0	34,0	24,0	36,0	64639	67639
0.2756	7,000 mm		8,0	79,0	34,0	24,0	36,0	64640	67640
0.2795	7,100 mm		8,0	79,0	41,0	30,0	36,0	64641	67641
0.2812	7,142 mm	9/32	8,0	79,0	41,0	30,0	36,0	54613	54713
0.2835	7,200 mm		8,0	79,0	41,0	30,0	36,0	64642	67642
0.2874	7,300 mm		8,0	79,0	41,0	30,0	36,0	64643	67643
0.2913	7,400 mm		8,0	79,0	41,0	30,0	36,0	64644	67644
0.2953	7,500 mm		8,0	79,0	41,0	30,0	36,0	64645	67645
0.2969	7,541 mm	19/64	8,0	79,0	41,0	30,0	36,0	54614	54714
0.2992	7,600 mm		8,0	79,0	41,0	30,0	36,0	64646	67646
0.3031	7,700 mm		8,0	79,0	41,0	29,0	36,0	64647	67647
0.3071	7,800 mm		8,0	79,0	41,0	29,0	36,0	64648	67648
0.3110	7,900 mm		8,0	79,0	41,0	29,0	36,0	64649	67649
0.3125	7,938 mm	5/16	8,0	79,0	41,0	29,0	36,0	54615	54715
0.3150	8,000 mm		8,0	79,0	41,0	29,0	36,0	64650	67650
0.3189	8,100 mm		10,0	89,0	47,0	35,0	40,0	64651	67651
0.3228	8,200 mm		10,0	89,0	47,0	35,0	40,0	64652	67652
0.3268	8,300 mm		10,0	89,0	47,0	35,0	40,0	64653	67653
0.3281	8,334 mm	21/64	10,0	89,0	47,0	34,0	40,0	54616	54716
0.3307	8,400 mm		10,0	89,0	47,0	34,0	40,0	64654	67654

TOLERANCES (inch)

 $\leq .1181$ DIAMETERDC = $\pm .00008/\pm .00047$ DCON = h_6 $> .1181-.2362$ DIAMETERDC = $\pm .00016/\pm .00063$ DCON = h_6 $> .2362-.3937$ DIAMETERDC = $\pm .00024/\pm .00083$ DCON = h_6 $> .3937-.7087$ DIAMETERDC = $\pm .00028/\pm .00098$ DCON = h_6 $> .7087-1.1811$ DIAMETERDC = $\pm .00031/\pm .00114$ DCON = h_6

TOLERANCES (mm)

 ≤ 3 DIAMETERDC = $\pm 0,002/\pm 0,012$ DCON = h_6 $> 3-6$ DIAMETERDC = $\pm 0,004/\pm 0,016$ DCON = h_6 $> 6-10$ DIAMETERDC = $\pm 0,006/\pm 0,021$ DCON = h_6 $> 10-18$ DIAMETERDC = $\pm 0,007/\pm 0,025$ DCON = h_6

NON-FERROUS

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131N 3xD

FRACTIONAL & METRIC SERIES

DECIMAL DC	METRIC DC	inch & mm						EDP NO.	
		FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	UNCOATED	Ti-NAMITE-B (TiB ₂)
0.3320	8,433 mm	Q	10,0	89,0	47,0	34,0	40,0	54617	54717
0.3346	8,500 mm		10,0	89,0	47,0	34,0	40,0	64655	67655
0.3386	8,600 mm		10,0	89,0	47,0	34,0	40,0	64656	67656
0.3425	8,700 mm		10,0	89,0	47,0	34,0	40,0	64657	67657
0.3438	8,733 mm	11/32	10,0	89,0	47,0	34,0	40,0	54618	54718
0.3465	8,800 mm		10,0	89,0	47,0	34,0	40,0	64658	67658
0.3504	8,900 mm		10,0	89,0	47,0	34,0	40,0	64659	67659
0.3543	9,000 mm		10,0	89,0	47,0	34,0	40,0	64660	67660
0.3583	9,100 mm		10,0	89,0	47,0	33,0	40,0	64661	67661
0.3594	9,129 mm	23/64	10,0	89,0	47,0	33,0	40,0	54619	54719
0.3622	9,200 mm		10,0	89,0	47,0	33,0	40,0	64662	67662
0.3661	9,300 mm		10,0	89,0	47,0	33,0	40,0	64663	67663
0.3680	9,347 mm	U	10,0	89,0	47,0	33,0	40,0	54620	54720
0.3701	9,400 mm		10,0	89,0	47,0	33,0	40,0	64664	67664
0.3740	9,500 mm		10,0	89,0	47,0	33,0	40,0	64665	67665
0.3750	9,525 mm	3/8	10,0	89,0	47,0	33,0	40,0	54621	54721
0.3780	9,600 mm		10,0	89,0	47,0	33,0	40,0	64666	67666
0.3819	9,700 mm		10,0	89,0	47,0	32,0	40,0	64667	67667
0.3858	9,800 mm		10,0	89,0	47,0	32,0	40,0	64668	67668
0.3898	9,900 mm		10,0	89,0	47,0	32,0	40,0	64669	67669
0.3906	9,921 mm	25/64	10,0	89,0	47,0	32,0	40,0	54622	54722
0.3937	10,000 mm		10,0	89,0	47,0	32,0	40,0	64670	67670
0.3976	10,100 mm		12,0	102,0	55,0	40,0	45,0	64671	67671
0.4016	10,200 mm		12,0	102,0	55,0	40,0	45,0	64672	67672
0.4055	10,300 mm		12,0	102,0	55,0	40,0	45,0	64673	67673
0.4062	10,317 mm	13/32	12,0	102,0	55,0	40,0	45,0	54623	54723
0.4095	10,400 mm		12,0	102,0	55,0	39,0	45,0	64674	67674
0.4134	10,500 mm		12,0	102,0	55,0	39,0	45,0	64675	67675
0.4173	10,600 mm		12,0	102,0	55,0	39,0	45,0	64676	67676
0.4213	10,700 mm		12,0	102,0	55,0	39,0	45,0	64677	67677
0.4219	10,716 mm	27/64	12,0	102,0	55,0	39,0	45,0	54624	54724
0.4252	10,800 mm		12,0	102,0	55,0	39,0	45,0	64678	67678
0.4291	10,900 mm		12,0	102,0	55,0	39,0	45,0	64679	67679
0.4331	11,000 mm		12,0	102,0	55,0	39,0	45,0	64680	67680
0.4370	11,100 mm		12,0	102,0	55,0	38,0	45,0	64681	67681
0.4375	11,113 mm	7/16	12,0	102,0	55,0	38,0	45,0	54625	54725
0.4409	11,200 mm		12,0	102,0	55,0	38,0	45,0	64682	67682
0.4449	11,300 mm		12,0	102,0	55,0	38,0	45,0	64683	67683
0.4488	11,400 mm		12,0	102,0	55,0	38,0	45,0	64684	67684
0.4528	11,500 mm		12,0	102,0	55,0	38,0	45,0	64685	67685
0.4567	11,600 mm		12,0	102,0	55,0	38,0	45,0	64686	67686
0.4606	11,700 mm		12,0	102,0	55,0	37,0	45,0	64687	67687
0.4646	11,800 mm		12,0	102,0	55,0	37,0	45,0	64688	67688
0.4685	11,900 mm		12,0	102,0	55,0	37,0	45,0	64689	67689

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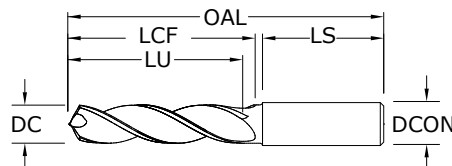


3xD



131N 3xD

FRACTIONAL & METRIC SERIES



CONTINUED

- 3-margin design improves hole stability and size control while providing superior finish, roundness and cylindricity
- Self-stabilizing pyramid point design stabilizes the drill on contact with the workpiece
- Open flute structure efficiently transports chips while maintaining strength at high feed rates
- Sculpted gash allows chips to easily flow away from the drill center
- Recommended for materials ≤ 175 Bhn (≤ 16 HRC)

inch & mm									EDP NO.	
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS		UNCOATED	Ti-NAMITE-B (TiB ₂)
0.4688	11,908 mm	15/32	12,0	102,0	55,0	37,0	45,0		54626	54726
0.4724	12,000 mm		12,0	102,0	55,0	37,0	45,0		64690	67690
0.4844	12,304 mm	31/64	14,0	107,0	60,0	41,0	45,0		54627	54727
0.4921	12,500 mm		14,0	107,0	60,0	41,0	45,0		64691	67691
0.5000	12,700 mm	1/2	14,0	107,0	60,0	41,0	45,0		54628	54728
0.5039	12,800 mm		14,0	107,0	60,0	41,0	45,0		64692	67692
0.5118	13,000 mm		14,0	107,0	60,0	41,0	45,0		64693	67693
0.5156	13,096 mm	33/64	14,0	107,0	60,0	40,0	45,0		54629	54729
0.5315	13,500 mm		14,0	107,0	60,0	40,0	45,0		64694	67694
0.5433	13,800 mm		14,0	107,0	60,0	39,0	45,0		64695	67695
0.5512	14,000 mm		14,0	107,0	60,0	39,0	45,0		64696	67696
0.5625	14,288 mm	9/16	16,0	115,0	65,0	43,0	48,0		54630	54730
0.5709	14,500 mm		16,0	115,0	65,0	43,0	48,0		64697	67697
0.5781	14,684 mm	37/64	16,0	115,0	65,0	43,0	48,0		54631	54731
0.5827	14,800 mm		16,0	115,0	65,0	43,0	48,0		64698	67698
0.5906	15,000 mm		16,0	115,0	65,0	42,0	48,0		64699	67699
0.6102	15,500 mm		16,0	115,0	65,0	42,0	48,0		64700	67700
0.6221	15,800 mm		16,0	115,0	65,0	41,0	48,0		64701	67701
0.6250	15,875 mm	5/8	16,0	115,0	65,0	41,0	48,0		54632	54732
0.6299	16,000 mm		16,0	115,0	65,0	41,0	48,0		64702	67702
0.6562	16,667 mm	21/32	18,0	123,0	73,0	47,0	48,0		54633	54733
0.6875	17,463 mm	11/16	18,0	123,0	73,0	47,0	48,0		54634	54734
0.7500	19,050 mm	3/4	20,0	131,0	79,0	50,0	50,0		54635	54735

TOLERANCES (inch)

≤.1181 DIAMETER

DC = +.00008/+0.00047

DCON = h₆

>.1181-.2362 DIAMETER

DC = +.00016/+0.00063

DCON = h₆

>.2362-.3937 DIAMETER

DC = +.00028/+0.00083

DCON = h₆

>.3937-.7087 DIAMETER

DC = +.00028/+0.00098

DCON = h₆

>.7087-1.1811 DIAMETER

DC = +.00031/+0.00114

DCON = h₆

TOLERANCES (mm)

≤3 DIAMETER

DC = +0,002/+0,012

DCON = h₆

>3-6 DIAMETER

DC = +0,004/+0,016

DCON = h₆

>6-10 DIAMETER

DC = +0,006/+0,021

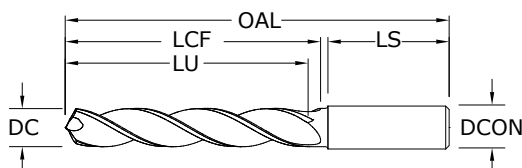
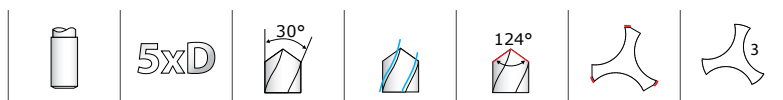
DCON = h₆

>10-18 DIAMETER

DC = +0,007/+0,025

DCON = h₆

NON-FERROUS



131N 5xD

FRACTIONAL & METRIC SERIES

TOLERANCES (inch)

≤.1181 DIAMETER

DC = +.00008/+0.00047

DCON = h₆

>.1181-.2362 DIAMETER

DC = +.00016/+0.00063

DCON = h₆

>.2362-.3937 DIAMETER

DC = +.00024/+0.00083

DCON = h₆

>.3937-.7087 DIAMETER

DC = +.00028/+0.00098

DCON = h₆

>.7087-1.1811 DIAMETER

DC = +.00031/+0.00114

DCON = h₆

TOLERANCES (mm)

≤3 DIAMETER

DC = +0.002/+0.012

DCON = h₆

>3-6 DIAMETER

DC = +0.004/+0.016

DCON = h₆

>6-10 DIAMETER

DC = +0.006/+0.021

DCON = h₆

>10-18 DIAMETER

DC = +0.007/+0.025

DCON = h₆

NON-FERROUS

		inch & mm							EDP NO.	
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS		UNCOATED	Ti-NAMITE-B (TiB ₂)
0.1181	3,000 mm		6,0	66,0	28,0	23,0	36,0		65000	64800
0.1220	3,100 mm		6,0	66,0	28,0	23,0	36,0		65001	64801
0.1250	3,175 mm	1/8	6,0	66,0	28,0	23,0	36,0		55000	54800
0.1260	3,200 mm		6,0	66,0	28,0	23,0	36,0		65002	64802
0.1299	3,300 mm		6,0	66,0	28,0	23,0	36,0		65003	64803
0.1339	3,400 mm		6,0	66,0	28,0	23,0	36,0		65004	64804
0.1360	3,454 mm	#29	6,0	66,0	28,0	23,0	36,0		55001	54801
0.1378	3,500 mm		6,0	66,0	28,0	23,0	36,0		65005	64805
0.1406	3,571 mm	9/64	6,0	66,0	28,0	23,0	36,0		55002	54802
0.1417	3,600 mm		6,0	66,0	28,0	23,0	36,0		65006	64806
0.1457	3,700 mm		6,0	66,0	28,0	23,0	36,0		65007	64807
0.1496	3,800 mm		6,0	74,0	36,0	29,0	36,0		65008	64808
0.1535	3,900 mm		6,0	74,0	36,0	29,0	36,0		65009	64809
0.1562	3,967 mm	5/32	6,0	74,0	36,0	29,0	36,0		55003	54803
0.1575	4,000 mm		6,0	74,0	36,0	29,0	36,0		65010	64810
0.1590	4,039 mm	#21	6,0	74,0	36,0	29,0	36,0		55004	54804
0.1614	4,100 mm		6,0	74,0	36,0	29,0	36,0		65011	64811
0.1654	4,200 mm		6,0	74,0	36,0	29,0	36,0		65012	64812
0.1693	4,300 mm		6,0	74,0	36,0	29,0	36,0		65013	64813
0.1719	4,366 mm	11/64	6,0	74,0	36,0	29,0	36,0		55005	54805
0.1732	4,400 mm		6,0	74,0	36,0	29,0	36,0		65014	64814
0.1772	4,500 mm		6,0	74,0	36,0	29,0	36,0		65015	64815
0.1811	4,600 mm		6,0	74,0	36,0	29,0	36,0		65016	64816
0.1850	4,699 mm	#13	6,0	74,0	36,0	29,0	36,0		65017	64817
0.1875	4,763 mm	3/16	6,0	82,0	44,0	37,0	36,0		55006	54806
0.1890	4,801 mm	#12	6,0	82,0	44,0	37,0	36,0		65018	64818
0.1929	4,900 mm		6,0	82,0	44,0	37,0	36,0		65019	64819
0.1969	5,000 mm		6,0	82,0	44,0	36,0	36,0		65020	64820
0.2008	5,100 mm		6,0	82,0	44,0	36,0	36,0		65021	64821
0.2031	5,159 mm	13/64	6,0	82,0	44,0	36,0	36,0		55007	54807
0.2047	5,200 mm		6,0	82,0	44,0	36,0	36,0		65022	64822
0.2087	5,300 mm		6,0	82,0	44,0	36,0	36,0		65023	64823
0.2126	5,400 mm		6,0	82,0	44,0	36,0	36,0		65024	64824
0.2165	5,500 mm		6,0	82,0	44,0	36,0	36,0		65025	64825
0.2188	5,558 mm	7/32	6,0	82,0	44,0	36,0	36,0		55008	54808
0.2205	5,600 mm		6,0	82,0	44,0	36,0	36,0		65026	64826

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- 3-margin design improves hole stability and size control while providing superior finish, roundness and cylindricity
- Self-stabilizing pyramid point design stabilizes the drill on contact with the workpiece
- Open flute structure efficiently transports chips while maintaining strength at high feed rates
- Sculpted gash allows chips to easily flow away from the drill center
- Recommended for materials ≤ 175 Bhn (≤ 16 HRC)

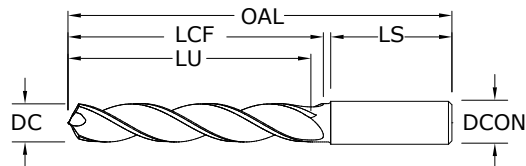


5xD



131N 5xD

FRACTIONAL & METRIC SERIES



CONTINUED

- 3-margin design improves hole stability and size control while providing superior finish, roundness and cylindricity
- Self-stabilizing pyramid point design stabilizes the drill on contact with the workpiece
- Open flute structure efficiently transports chips while maintaining strength at high feed rates
- Sculpted gash allows chips to easily flow away from the drill center
- Recommended for materials ≤ 175 Bhn (≤ 16 HRC)

		inch & mm							EDP NO.	
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS		UNCOATED	Ti-NAMITE-B (TiB ₂)
0.2244	5,700 mm		6,0	82,0	44,0	35,0	36,0		65027	64827
0.2283	5,800 mm		6,0	82,0	44,0	35,0	36,0		65028	64828
0.2323	5,900 mm		6,0	82,0	44,0	35,0	36,0		65029	64829
0.2344	5,954 mm	15/64	6,0	82,0	44,0	35,0	36,0		55009	54809
0.2362	6,000 mm		6,0	82,0	44,0	35,0	36,0		65030	64830
0.2402	6,100 mm		8,0	91,0	53,0	44,0	36,0		65031	64831
0.2441	6,200 mm		8,0	91,0	53,0	44,0	36,0		65032	64832
0.2480	6,300 mm		8,0	91,0	53,0	44,0	36,0		65033	64833
0.2500	6,350 mm	1/4 E	8,0	91,0	53,0	43,0	36,0		55010	54810
0.2520	6,400 mm		8,0	91,0	53,0	43,0	36,0		65034	64834
0.2559	6,500 mm		8,0	91,0	53,0	43,0	36,0		65035	64835
0.2570	6,528 mm	F	8,0	91,0	53,0	43,0	36,0		55011	54811
0.2598	6,600 mm		8,0	91,0	53,0	43,0	36,0		65036	64836
0.2638	6,700 mm		8,0	91,0	53,0	43,0	36,0		65037	64837
0.2656	6,746 mm	17/64	8,0	91,0	53,0	43,0	36,0		55012	54812
0.2677	6,800 mm		8,0	91,0	53,0	43,0	36,0		65038	64838
0.2717	6,900 mm		8,0	91,0	53,0	43,0	36,0		65039	64839
0.2756	7,000 mm		8,0	91,0	53,0	42,0	36,0		65040	64840
0.2795	7,100 mm		8,0	91,0	53,0	42,0	36,0		65041	64841
0.2812	7,142 mm	9/32	8,0	91,0	53,0	42,0	36,0		55013	54813
0.2835	7,200 mm		8,0	91,0	53,0	42,0	36,0		65042	64842
0.2874	7,300 mm		8,0	91,0	53,0	42,0	36,0		65043	64843
0.2913	7,400 mm		8,0	91,0	53,0	42,0	36,0		65044	64844
0.2953	7,500 mm		8,0	91,0	53,0	42,0	36,0		65045	64845
0.2969	7,541 mm	19/64	8,0	91,0	53,0	42,0	36,0		55014	54814
0.2992	7,600 mm		8,0	91,0	53,0	42,0	36,0		65046	64846
0.3031	7,700 mm		8,0	91,0	53,0	41,0	36,0		65047	64847
0.3071	7,800 mm		8,0	91,0	53,0	41,0	36,0		65048	64848
0.3110	7,900 mm		8,0	91,0	53,0	41,0	36,0		65049	64849
0.3125	7,938 mm	5/16	8,0	91,0	53,0	41,0	36,0		55015	54815
0.3150	8,000 mm		8,0	91,0	53,0	41,0	36,0		65050	64850
0.3189	8,100 mm		10,0	103,0	61,0	49,0	40,0		65051	64851
0.3228	8,200 mm		10,0	103,0	61,0	49,0	40,0		65052	64852
0.3268	8,300 mm		10,0	103,0	61,0	49,0	40,0		65053	64853
0.3281	8,334 mm	21/64	10,0	103,0	61,0	48,0	40,0		55016	54816
0.3307	8,400 mm		10,0	103,0	61,0	48,0	40,0		65054	64854

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TOLERANCES (inch)

 $\leq .1181$ DIAMETERDC = $\pm .00008/\pm .00047$ DCON = h_6 $> .1181$ –.2362 DIAMETERDC = $\pm .00016/\pm .00063$ DCON = h_6 $> .2362$ –.3937 DIAMETERDC = $\pm .00024/\pm .00083$ DCON = h_6 $> .3937$ –.7087 DIAMETERDC = $\pm .00028/\pm .00098$ DCON = h_6 $> .7087$ –1.1811 DIAMETERDC = $\pm .00031/\pm .00114$ DCON = h_6

TOLERANCES (mm)

 ≤ 3 DIAMETERDC = $\pm 0,002/\pm 0,012$ DCON = h_6 > 3 –6 DIAMETERDC = $\pm 0,004/\pm 0,016$ DCON = h_6 > 6 –10 DIAMETERDC = $\pm 0,006/\pm 0,021$ DCON = h_6 > 10 –18 DIAMETERDC = $\pm 0,007/\pm 0,025$ DCON = h_6

NON-FERROUS

131N 5xD

FRACTIONAL & METRIC SERIES

inch & mm								EDP NO.		CONTINUED
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	UNCOATED	Ti-NAMITE-B (TiB ₂)	
0.3320	8,433 mm	Q	10,0	103,0	61,0	48,0	40,0	55017	54817	
0.3346	8,500 mm		10,0	103,0	61,0	48,0	40,0	65055	64855	
0.3386	8,600 mm		10,0	103,0	61,0	48,0	40,0	65056	64856	
0.3425	8,700 mm		10,0	103,0	61,0	48,0	40,0	65057	64857	
0.3438	8,733 mm	11/32	10,0	103,0	61,0	48,0	40,0	55018	54818	
0.3465	8,800 mm		10,0	103,0	61,0	48,0	40,0	65058	64858	
0.3504	8,900 mm		10,0	103,0	61,0	48,0	40,0	65059	64859	
0.3543	9,000 mm		10,0	103,0	61,0	48,0	40,0	65060	64860	
0.3583	9,100 mm		10,0	103,0	61,0	47,0	40,0	65061	64861	
0.3594	9,129 mm	23/64	10,0	103,0	61,0	47,0	40,0	55019	54819	
0.3622	9,200 mm		10,0	103,0	61,0	47,0	40,0	65062	64862	
0.3661	9,300 mm		10,0	103,0	61,0	47,0	40,0	65063	64863	
0.3680	9,347 mm	U	10,0	103,0	61,0	47,0	40,0	55020	54820	
0.3701	9,400 mm		10,0	103,0	61,0	47,0	40,0	65064	64864	
0.3740	9,500 mm		10,0	103,0	61,0	47,0	40,0	65065	64865	
0.3750	9,525 mm	3/8	10,0	103,0	61,0	47,0	40,0	55021	54821	
0.3780	9,600 mm		10,0	103,0	61,0	47,0	40,0	65066	64866	
0.3819	9,700 mm		10,0	103,0	61,0	46,0	40,0	65067	64867	
0.3858	9,800 mm		10,0	103,0	61,0	46,0	40,0	65068	64868	
0.3898	9,900 mm		10,0	103,0	61,0	46,0	40,0	65069	64869	
0.3906	9,921 mm	25/64	10,0	103,0	61,0	46,0	40,0	55022	54822	
0.3937	10,000 mm		10,0	103,0	61,0	46,0	40,0	65070	64870	
0.3976	10,100 mm		12,0	118,0	71,0	56,0	45,0	65071	64871	
0.4016	10,200 mm		12,0	118,0	71,0	56,0	45,0	65072	64872	
0.4055	10,300 mm		12,0	118,0	71,0	56,0	45,0	65073	64873	
0.4062	10,317 mm	13/32	12,0	118,0	71,0	56,0	45,0	55023	54823	
0.4095	10,400 mm		12,0	118,0	71,0	55,0	45,0	65074	64874	
0.4134	10,500 mm		12,0	118,0	71,0	55,0	45,0	65075	64875	
0.4173	10,600 mm		12,0	118,0	71,0	55,0	45,0	65076	64876	
0.4213	10,700 mm		12,0	118,0	71,0	55,0	45,0	65077	64877	
0.4219	10,716 mm	27/64	12,0	118,0	71,0	55,0	45,0	55024	54824	
0.4252	10,800 mm		12,0	118,0	71,0	55,0	45,0	65078	64878	
0.4291	10,900 mm		12,0	118,0	71,0	55,0	45,0	65079	64879	
0.4331	11,000 mm		12,0	118,0	71,0	54,0	45,0	65080	64880	
0.4370	11,100 mm		12,0	118,0	71,0	54,0	45,0	65081	64881	
0.4375	11,113 mm	7/16	12,0	118,0	71,0	54,0	45,0	55025	54825	
0.4409	11,200 mm		12,0	118,0	71,0	54,0	45,0	65082	64882	
0.4449	11,300 mm		12,0	118,0	71,0	54,0	45,0	65083	64883	
0.4488	11,400 mm		12,0	118,0	71,0	54,0	45,0	65084	64884	
0.4528	11,500 mm		12,0	118,0	71,0	54,0	45,0	65085	64885	
0.4567	11,600 mm		12,0	118,0	71,0	54,0	45,0	65086	64886	
0.4606	11,700 mm		12,0	118,0	71,0	53,0	45,0	65087	64887	
0.4646	11,800 mm		12,0	118,0	71,0	53,0	45,0	65088	64888	
0.4685	11,900 mm		12,0	118,0	71,0	53,0	45,0	65089	64889	
0.4688	11,908 mm	15/32	12,0	118,0	71,0	53,0	45,0	55026	54826	
0.4724	12,000 mm		12,0	118,0	71,0	53,0	45,0	65090	64890	

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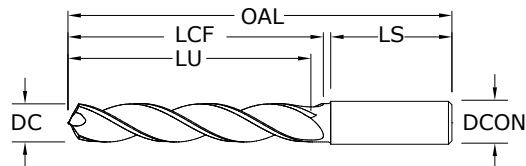


5xD



131N 5xD

FRACTIONAL & METRIC SERIES



CONTINUED

- 3-margin design improves hole stability and size control while providing superior finish, roundness and cylindricity
- Self-stabilizing pyramid point design stabilizes the drill on contact with the workpiece
- Open flute structure efficiently transports chips while maintaining strength at high feed rates
- Sculpted gash allows chips to easily flow away from the drill center
- Recommended for materials ≤ 175 Bhn (≤ 16 HRC)

inch & mm									EDP NO.	
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS		UNCOATED	Ti-NAMITE-B (TiB ₂)
0.4844	12,304 mm	31/64	14,0	124,0	77,0	58,0	45,0		55027	54827
0.4921	12,500 mm		14,0	124,0	77,0	58,0	45,0		65091	64891
0.5000	12,700 mm	1/2	14,0	124,0	77,0	58,0	45,0		55028	54828
0.5039	12,800 mm		14,0	124,0	77,0	58,0	45,0		65092	64892
0.5118	13,000 mm		14,0	124,0	77,0	58,0	45,0		65093	64893
0.5156	13,096 mm	33/64	14,0	124,0	77,0	57,0	45,0		55029	54829
0.5315	13,500 mm		14,0	124,0	77,0	57,0	45,0		65094	64894
0.5433	13,800 mm		14,0	124,0	77,0	56,0	45,0		65095	64895
0.5512	14,000 mm		14,0	124,0	77,0	56,0	45,0		65096	64896
0.5625	14,288 mm	9/16	16,0	133,0	83,0	61,0	48,0		55030	54830
0.5709	14,500 mm		16,0	133,0	83,0	61,0	48,0		65097	64897
0.5781	14,684 mm	37/64	16,0	133,0	83,0	61,0	48,0		55031	54831
0.5827	14,800 mm		16,0	133,0	83,0	61,0	48,0		65098	64898
0.5906	15,000 mm		16,0	133,0	83,0	60,0	48,0		65099	64899
0.6102	15,500 mm		16,0	133,0	83,0	60,0	48,0		65100	64900
0.6221	15,800 mm		16,0	133,0	83,0	59,0	48,0		65101	64901
0.6250	15,875 mm	5/8	16,0	133,0	83,0	59,0	48,0		55032	54832
0.6299	16,000 mm		16,0	133,0	83,0	59,0	48,0		65102	64902
0.6562	16,667 mm	21/32	18,0	143,0	93,0	68,0	48,0		55033	54833
0.6875	17,463 mm	11/16	18,0	143,0	93,0	67,0	48,0		55034	54834
0.7500	19,050 mm	3/4	20,0	153,0	101,0	72,0	50,0		55035	54835

TOLERANCES (inch)

 $\leq .1181$ DIAMETERDC = $\pm .00008/\pm .00047$ DCON = h_6 $> .1181$ –.2362 DIAMETERDC = $\pm .00016/\pm .00063$ DCON = h_6 $> .2362$ –.3937 DIAMETERDC = $\pm .00024/\pm .00083$ DCON = h_6 $> .3937$ –.7087 DIAMETERDC = $\pm .00028/\pm .00098$ DCON = h_6 $> .7087$ –1.1811 DIAMETERDC = $\pm .00031/\pm .00114$ DCON = h_6

TOLERANCES (mm)

 ≤ 3 DIAMETERDC = $\pm 0,002/\pm 0,012$ DCON = h_6 > 3 –6 DIAMETERDC = $\pm 0,004/\pm 0,016$ DCON = h_6 > 6 –10 DIAMETERDC = $\pm 0,006/\pm 0,021$ DCON = h_6 > 10 –18 DIAMETERDC = $\pm 0,007/\pm 0,025$ DCON = h_6

NON-FERROUS

Series 131N 3D & 5D Fractional				DC • in							
	Hardness	Vc (sfm)		1/8	3/16	1/4	3/8	1/2	5/8	3/4	
N	ALUMINUM ALLOYS < 12% SI 6061, 2024, 7075	800	RPM	24448	16299	12224	8149	6112	4890	4075	
		≤ 150 Bhn or ≤ 88 HRb	(640-960)	Fr	0.0055	0.0083	0.0110	0.0166	0.0221	0.0276	0.0331
			Feed (ipm)	135	135	135	135	135	135	135	
	ALUMINUM ALLOYS > 12% SI A356.0, 390.0, 319.0	600	RPM	18336	12224	9168	6112	4584	3667	3056	
		≤ 125 Bhn or ≤ 77 HRb	(480-720)	Fr	0.0055	0.0082	0.0109	0.0164	0.0218	0.0273	0.0327
			Feed (ipm)	100	100	100	100	100	100	100	
	COPPER ALLOYS Alum Bronze, Muntz Brass, Navel Brass	550	RPM	16808	11205	8404	5603	4202	3362	2801	
		≤ 175 Bhn or ≤ 16 HRc	(440-660)	Fr	0.0020	0.0030	0.0040	0.0061	0.0081	0.0101	0.0121
			Feed (ipm)	34	34	34	34	34	34	34	
	PLASTICS Acrylic, PVC, Polypropylene	450	RPM	13752	9168	6876	4584	3438	2750	2292	
			(360-540)	Fr	0.0025	0.0037	0.0049	0.0074	0.0099	0.0124	0.0148
			Feed (ipm)	34	34	34	34	34	34	34	

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)
 $\text{rpm} = \text{Vc} \times 3.82 / \text{DC}$
 $\text{ipm} = \text{Fr} \times \text{rpm}$
 reduce speed and feed for materials harder than listed
 refer to the **KYOCERA SGS APEX** for complete technical information (www.kyocera-sgstool.com/apex)

Series 131N 3D & 5D Metric				DC • mm							
Hardness	Vc (m/min)			3	6	8	10	12	14	16	
N	ALUMINUM ALLOYS < 12% SI 6061, 2024, 7075	≤ 150 Bhn or ≤ 88 HRb	244	RPM	25851	12926	9694	7755	6463	5540	4847
			(195-293)	Fr	0.133	0.265	0.354	0.442	0.531	0.619	0.708
			Feed (mm/min)	3430	3430	3430	3430	3430	3430	3430	3430
		ALUMINUM ALLOYS > 12% SI A356.0, 390.0, 319.0	≤ 125 Bhn or ≤ 77 HRb	183	RPM	19388	9694	7271	5816	4847	4155
	(146-219)			Fr	0.131	0.262	0.349	0.437	0.524	0.611	0.699
			Feed (mm/min)	2540	2540	2540	2540	2540	2540	2540	2540
	COPPER ALLOYS Alum Bronze, Muntz Brass, Navel Brass		≤ 175 Bhn or ≤ 16 HRc	168	RPM	17773	8886	6665	5332	4443	3808
		(134-201)		Fr	0.049	0.097	0.130	0.162	0.194	0.227	0.259
			Feed (mm/min)	864	864	864	864	864	864	864	864
		PLASTICS Acrylic, PVC, Polypropylene		137	RPM	14541	7271	5453	4362	3635	3116
	(110-165)			Fr	0.059	0.119	0.158	0.198	0.238	0.277	0.317
				Feed (mm/min)	864	864	864	864	864	864	864

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)
 $\text{rpm} = (\text{Vc} \times 1000) / (\text{DC} \times 3.14)$
 $\text{mm/min} = \text{Fr} \times \text{rpm}$
 reduce speed and feed for materials harder than listed
 refer to the **KYOCERA SGS APEX** for complete technical information (www.kyocera-sgstool.com/apex)

Series 120



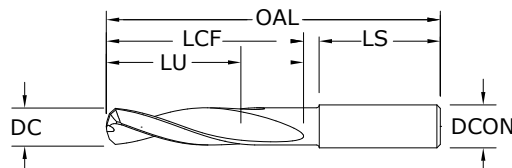
3xD



120

FRACTIONAL & METRIC SERIES

- Double margin design stabilizes the drill for greater hole accuracy and improved surface finish
- Notched point reduces thrust force over conventional designs
- 8 facet point reduces fiber breakout and delamination on exit
- 90 degree secondary chamfer angle improves hole entrance and exit quality



DECIMAL DC	METRIC DC	inch & mm						EDP NO. Di-NAMITE (Diamond)
		FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	
0.0980	2,489 mm	#40	1/8	2	9/16	7/16	1-1/4	50000
0.1063	2,700 mm		6,0	63,0	20,0	16,0	32,0	50001
0.1181	3,000 mm		6,0	63,0	20,0	16,0	36,0	50002
0.1250	3,175 mm	1/8	1/4	2-1/2	3/4	9/16	1-7/16	50003
0.1260	3,200 mm		6,0	63,0	20,0	15,0	36,0	50004
0.1285	3,264 mm	#30	1/4	2-1/2	3/4	9/16	1-7/16	50005
0.1405	3,569 mm	#28	1/4	2-1/2	3/4	9/16	1-7/16	50006
0.1570	3,988 mm	#22	1/4	2-5/8	7/8	5/8	1-7/16	50007
0.1590	4,039 mm	#21	1/4	2-5/8	7/8	5/8	1-7/16	50008
0.1614	4,100 mm		6,0	66,0	24,0	18,0	36,0	50009
0.1660	4,216 mm	#19	1/4	2-5/8	7/8	5/8	1-7/16	50010
0.1719	4,366 mm	11/64	1/4	2-5/8	7/8	5/8	1-7/16	50011
0.1875	4,763 mm	3/16	1/4	2-5/8	1	23/32	1-7/16	50012
0.1910	4,851 mm	#11	1/4	2-5/8	1	23/32	1-7/16	50013
0.1990	5,055 mm	#8	1/4	2-5/8	1	23/32	1-7/16	50014
0.2010	5,105 mm	#7	1/4	2-5/8	1	23/32	1-7/16	50015
0.2210	5,613 mm	#2	1/4	2-5/8	1	21/32	1-7/16	50016
0.2362	6,000 mm		6,0	66,0	28,0	19,0	36,0	50017
0.2500	6,350 mm	1/4 E	1/4	3-1/8	1-5/16	15/16	1-7/16	50018
0.2510	6,380 mm		5/16	3-1/8	1-5/16	15/16	1-7/16	50019
0.2570	6,528 mm	F	5/16	3-1/8	1-5/16	15/16	1-7/16	50020
0.2720	6,909 mm	I	5/16	3-1/8	1-5/16	29/32	1-7/16	50021
0.2770	7,036 mm	J	5/16	3-1/8	1-5/16	29/32	1-7/16	50022
0.2810	7,137 mm	K	5/16	3-1/8	1-9/16	1-9/64	1-7/16	50023
0.3125	7,938 mm	5/16	5/16	3-1/8	1-9/16	1-3/32	1-7/16	50024
0.3150	8,000 mm		8,0	79,0	41,0	29,0	36,0	50025
0.3750	9,525 mm	3/8	3/8	3-1/2	1-27/32	1-9/32	1-9/16	50026
0.3770	9,576 mm	V	1/2	3-1/2	1-27/32	1-9/32	1-9/16	50027
0.3937	10,000 mm		10,0	89,0	47,0	32,0	40,0	50028
0.4375	11,113 mm	7/16	1/2	4-1/16	2-3/16	1-17/32	1-9/16	50029
0.4724	12,000 mm		12,0	102,0	55,0	37,0	45,0	50030
0.5000	12,700 mm	1/2	1/2	4-1/4	2-5/16	1-9/16	1-3/4	50031

TOLERANCES (inch)

DC = +.0000/+0.0005

DCON = h₆

TOLERANCES (mm)

DC = +0,000/+0,013

DCON = h₆

NON-FERROUS

Series 120

Series 120 Fractional			DC • in							
Vc (sfm)			1/8	3/16	1/4	5/16	3/8	7/16	1/2	
N	CFRP, AFRP (Carbon Fiber, Aramid Fiber)	320	RPM	9779	6519	4890	3912	3260	2794	2445
		(256-384)	Fr	0.0006	0.0009	0.0012	0.0015	0.0018	0.0021	0.0024
			Feed (ipm)	5.9	5.9	5.9	5.9	5.9	5.9	5.9
	GFRP (Fiberglass)	240	RPM	7334	4890	3667	2934	2445	2096	1834
		(192-288)	Fr	0.0006	0.0009	0.0012	0.0015	0.0018	0.0021	0.0024
			Feed (ipm)	4.4	4.4	4.4	4.4	4.4	4.4	4.4
	CARBON, GRAPHITE	400	RPM	12224	8149	6112	4890	4075	3493	3056
		(320-480)	Fr	0.0008	0.0012	0.0016	0.0020	0.0024	0.0028	0.0032
			Feed (ipm)	9.8	9.8	9.8	9.8	9.8	9.8	9.8

rpm = Vc x 3.82 / DC

ipm = Fr x rpm

adjust speed and / or feed based on resin type and / or fiber structure

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)

Series 120 Metric			DC • mm							
Vc (m/min)			2.5	3	4	6	8	10	12	
N	CFRP, AFRP (Carbon Fiber, Aramid Fiber)	100	RPM	12722	10602	7951	5301	3976	3181	2650
		(80-120)	Fr	0.012	0.014	0.019	0.028	0.038	0.047	0.057
			Feed (mm/min)	150	150	150	150	150	150	150
	GFRP (Fiberglass)	75	RPM	9542	7951	5963	3976	2982	2385	1988
		(65-90)	Fr	0.012	0.014	0.019	0.029	0.039	0.048	0.058
			Feed (mm/min)	115	115	115	115	115	115	115
	CARBON, GRAPHITE	120	RPM	15266	12722	9542	6361	4771	3817	3181
		(96-144)	Fr	0.015	0.018	0.025	0.037	0.049	0.062	0.074
			Feed (mm/min)	235	235	235	235	235	235	235

rpm = (Vc x 1000) / (DC x 3.14)

mm/min = Fr x rpm

adjust speed and / or feed based on resin type and / or fiber structure

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)

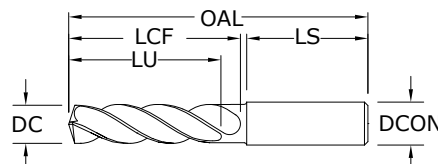


3xD



135 3xD

FRACTIONAL & METRIC SERIES



- 4-margin design improves accuracy and surface finish along with increased strength for aggressive drilling
- Specialized self-centering notched point eliminates the need for spot drilling decreasing thrust and deflection
- Engineered edge protection improves edge strength and reduces edge fatigue allowing for increased feed rates
- Recommended for materials ≤ 50 HRc (≤ 475 Bhn)

inch & mm								EDP NO.
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	Ti-NAMITE-A (AlTiN)
0.0156	0,396 mm	1/64	1/8	1-1/2	1/8	7/64	1	51752*
0.0312	0,792 mm	1/32	1/8	1-1/2	1/4	13/64	1	51269*
0.0469	1,191 mm	3/64	1/8	1-1/2	3/8	5/16	1	51270*
0.0492	1,250 mm		3,0	38,0	9,5	8,0	25,0	64500*
0.0571	1,450 mm		3,0	38,0	9,5	7,0	25,0	64501*
0.0595	1,511 mm	#53	1/8	1-1/2	3/8	9/32	1	64502*
0.0625	1,588 mm	1/16	1/8	2	7/16	11/32	1-1/4	51271*
0.0630	1,600 mm		3,0	50,0	11,0	9,0	32,0	64503*
0.0689	1,750 mm		3,0	50,0	11,0	8,0	32,0	64504*
0.0700	1,778 mm	#50	1/8	2	7/16	21/64	1-1/4	64505*
0.0781	1,984 mm	5/64	1/8	2	1/2	25/64	1-1/4	51272*
0.0785	1,994 mm	#47	1/8	2	1/2	25/64	1-1/4	64506*
0.0807	2,050 mm		3,0	50,0	12,0	9,0	32,0	64507*
0.0810	2,057 mm	#46	1/8	2	1/2	3/8	1-1/4	64508*
0.0890	2,261 mm	#43	1/8	2	1/2	3/8	1-1/4	64509*
0.0935	2,375 mm	#42	1/8	2	1/2	23/64	1-1/4	64510*
0.0938	2,383 mm	3/32	1/8	2	1/2	23/64	1-1/4	51273
0.0980	2,489 mm	#40	1/8	2	9/16	27/64	1-1/4	51274
0.0984	2,500 mm		3,0	50,0	14,0	10,0	32,0	64511
0.0995	2,527 mm	#39	1/8	2	9/16	27/64	1-1/4	51753
0.1015	2,578 mm	#38	1/8	2	9/16	27/64	1-1/4	51754
0.1040	2,642 mm	#37	1/8	2	9/16	13/32	1-1/4	51755
0.1065	2,705 mm	#36	1/8	2	9/16	13/32	1-1/4	51756
0.1094	2,779 mm	7/64	1/8	2	5/8	15/32	1-1/4	51275
0.1100	2,794 mm	#35	1/8	2	5/8	15/32	1-1/4	51276
0.1110	2,819 mm	#34	1/8	2	5/8	15/32	1-1/4	51277
0.1130	2,870 mm	#33	1/8	2	5/8	29/64	1-1/4	51757
0.1142	2,900 mm		3,0	50,0	16,0	12,0	32,0	64512
0.1160	2,946 mm	#32	1/8	2	5/8	29/64	1-1/4	51758
0.1181	3,000 mm		6,0	62,0	20,0	16,0	36,0	63155
0.1200	3,048 mm	#31	1/8	2	5/8	29/64	1-1/4	51759
0.1220	3,100 mm		6,0	62,0	20,0	15,0	36,0	63741
0.1250	3,175 mm	1/8	1/4	2-1/2	3/4	9/16	1-7/16	51330
0.1260	3,200 mm		6,0	62,0	20,0	15,0	36,0	63156
0.1285	3,264 mm	#30	1/4	2-1/2	3/4	9/16	1-7/16	51278
0.1299	3,300 mm		6,0	62,0	20,0	15,0	36,0	63157

*Single Margin

continued on next page

TOLERANCES (inch)

 $\leq .1181$ DIAMETERDC = $\pm .00008/\pm .00047$ DCON = h_6 $> .1181 - .2362$ DIAMETERDC = $\pm .00016/\pm .00063$ DCON = h_6 $> .2362 - .3937$ DIAMETERDC = $\pm .00024/\pm .00083$ DCON = h_6 $> .3937 - .7087$ DIAMETERDC = $\pm .00028/\pm .00098$ DCON = h_6 $> .7087 - 1.1811$ DIAMETERDC = $\pm .00031/\pm .00114$ DCON = h_6

TOLERANCES (mm)

 ≤ 3 DIAMETERDC = $\pm 0,002/\pm 0,012$ DCON = h_6 $> 3 - 6$ DIAMETERDC = $\pm 0,004/\pm 0,016$ DCON = h_6 $> 6 - 10$ DIAMETERDC = $\pm 0,006/\pm 0,021$ DCON = h_6 $> 10 - 18$ DIAMETERDC = $\pm 0,007/\pm 0,025$ DCON = h_6 $> 18 - 30$ DIAMETERDC = $\pm 0,008/\pm 0,029$ DCON = h_6

STEELS

STAINLESS STEELS

CAST IRON

NON-FERROUS

HIGH TEMP ALLOYS

HARDENED STEELS

135 3xD

FRACTIONAL & METRIC SERIES

DECIMAL DC	METRIC DC	inch & mm						EDP NO. Ti-NAMITE-A (AITiN)
		FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	
0.1339	3,400 mm		6,0	62,0	20,0	15,0	36,0	63158
0.1360	3,454 mm	#29	1/4	2-1/2	3/4	9/16	1-7/16	51331
0.1378	3,500 mm		6,0	62,0	20,0	15,0	36,0	63159
0.1405	3,569 mm	#28	1/4	2-1/2	3/4	35/64	1-7/16	51760
0.1406	3,571 mm	9/64	1/4	2-1/2	3/4	9/16	1-7/16	51332
0.1417	3,600 mm		6,0	62,0	20,0	15,0	36,0	63160
0.1440	3,658 mm	#27	1/4	2-1/2	3/4	35/64	1-7/16	51761
0.1457	3,700 mm		6,0	62,0	20,0	14,0	36,0	63161
0.1470	3,734 mm	#26	1/4	2-1/2	3/4	17/32	1-7/16	51762
0.1495	3,797 mm	#25	1/4	2-5/8	7/8	21/32	1-7/16	51333
0.1496	3,800 mm		6,0	66,0	24,0	18,0	36,0	63742
0.1520	3,861 mm	#24	1/4	2-5/8	7/8	21/32	1-7/16	51763
0.1535	3,900 mm		6,0	66,0	24,0	18,0	36,0	63743
0.1540	3,912 mm	#23	1/4	2-5/8	7/8	21/32	1-7/16	51764
0.1562	3,967 mm	5/32	1/4	2-5/8	7/8	41/64	1-7/16	51334
0.1570	3,988 mm	#22	1/4	2-5/8	7/8	41/64	1-7/16	51765
0.1575	4,000 mm		6,0	66,0	24,0	18,0	36,0	63162
0.1590	4,039 mm	#21	1/4	2-5/8	7/8	41/64	1-7/16	51335
0.1610	4,089 mm	#20	1/4	2-5/8	7/8	5/8	1-7/16	51279
0.1614	4,100 mm		6,0	66,0	24,0	18,0	36,0	63744
0.1654	4,200 mm		6,0	66,0	24,0	18,0	36,0	63163
0.1660	4,216 mm	#19	1/4	2-5/8	7/8	5/8	1-7/16	51766
0.1693	4,300 mm		6,0	66,0	24,0	18,0	36,0	63164
0.1695	4,305 mm	#18	1/4	2-5/8	7/8	5/8	1-7/16	51767
0.1719	4,366 mm	11/64	1/4	2-5/8	7/8	39/64	1-7/16	51336
0.1730	4,394 mm	#17	1/4	2-5/8	7/8	5/8	1-7/16	51768
0.1732	4,400 mm		6,0	66,0	24,0	17,0	36,0	63745
0.1770	4,496 mm	#16	1/4	2-5/8	7/8	39/64	1-7/16	51769
0.1772	4,500 mm		6,0	66,0	24,0	17,0	36,0	63165
0.1800	4,572 mm	#15	1/4	2-5/8	7/8	39/64	1-7/16	51770
0.1811	4,600 mm		6,0	66,0	24,0	17,0	36,0	63166
0.1820	4,623 mm	#14	1/4	2-5/8	7/8	39/64	1-7/16	51771
0.1850	4,700 mm	#13	1/4	2-5/8	7/8	39/64	1-7/16	51772
0.1850	4,700 mm	#13	6,0	66,0	24,0	17,0	36,0	63746
0.1875	4,763 mm	3/16	1/4	2-5/8	1	23/32	1-7/16	51337
0.1890	4,800 mm	#12	1/4	2-5/8	1	23/32	1-7/16	51773
0.1890	4,800 mm	#12	6,0	66,0	28,0	21,0	36,0	63167
0.1910	4,851 mm	#11	1/4	2-5/8	1	23/32	1-7/16	51774
0.1929	4,900 mm		6,0	66,0	28,0	21,0	36,0	63747
0.1935	4,915 mm	#10	1/4	2-5/8	1	23/32	1-7/16	51775
0.1960	4,978 mm	#9	1/4	2-5/8	1	23/32	1-7/16	51776
0.1969	5,000 mm		6,0	66,0	28,0	20,0	36,0	63168
0.1990	5,055 mm	#8	1/4	2-5/8	1	45/64	1-7/16	51777
0.2008	5,100 mm		6,0	66,0	28,0	20,0	36,0	63748
0.2010	5,105 mm	#7	1/4	2-5/8	1	45/64	1-7/16	51338
0.2031	5,159 mm	13/64	1/4	2-5/8	1	45/64	1-7/16	51339

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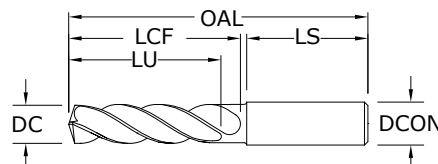


3xD



135 3xD

FRACTIONAL & METRIC SERIES



CONTINUED

- 4-margin design improves accuracy and surface finish along with increased strength for aggressive drilling
- Specialized self-centering notched point eliminates the need for spot drilling decreasing thrust and deflection
- Engineered edge protection improves edge strength and reduces edge fatigue allowing for increased feed rates
- Recommended for materials ≤ 50 HRc (≤ 475 Bhn)

inch & mm								EDP NO.
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	Ti-NAMITE-A (AITiN)
0.2040	5,182 mm	#6	1/4	2-5/8	1	45/64	1-7/16	51778
0.2047	5,200 mm		6,0	66,0	28,0	20,0	36,0	63749
0.2055	5,220 mm	#5	1/4	2-5/8	1	45/64	1-7/16	51779
0.2067	5,250 mm		6,0	66,0	28,0	20,0	36,0	63169
0.2087	5,300 mm		6,0	66,0	28,0	20,0	36,0	63170
0.2090	5,309 mm	#4	1/4	2-5/8	1	11/16	1-7/16	51780
0.2126	5,400 mm		6,0	66,0	28,0	20,0	36,0	63750
0.2130	5,410 mm	#3	1/4	2-5/8	1	11/16	1-7/16	51340
0.2165	5,500 mm		6,0	66,0	28,0	20,0	36,0	63171
0.2188	5,558 mm	7/32	1/4	2-5/8	1	43/64	1-7/16	51341
0.2205	5,600 mm		6,0	66,0	28,0	20,0	36,0	63751
0.2210	5,613 mm	#2	1/4	2-5/8	1	11/16	1-7/16	51781
0.2244	5,700 mm		6,0	66,0	28,0	19,0	36,0	63752
0.2280	5,791 mm	#1	1/4	2-5/8	1	21/32	1-7/16	51782
0.2283	5,800 mm		6,0	66,0	28,0	19,0	36,0	63172
0.2323	5,900 mm		6,0	66,0	28,0	19,0	36,0	63753
0.2340	5,944 mm	A	1/4	2-5/8	1	21/32	1-7/16	51601
0.2344	5,954 mm	15/64	1/4	2-5/8	1	21/32	1-7/16	51342
0.2362	6,000 mm		6,0	66,0	28,0	19,0	36,0	63173
0.2380	6,045 mm	B	1/4	3-1/8	1-5/16	31/32	1-7/16	51602
0.2402	6,100 mm		8,0	79,0	34,0	25,0	36,0	63754
0.2420	6,147 mm	C	1/4	3-1/8	1-5/16	61/64	1-7/16	51603
0.2441	6,200 mm		8,0	79,0	34,0	25,0	36,0	63755
0.2460	6,248 mm	D	1/4	3-1/8	1-5/16	61/64	1-7/16	51604
0.2461	6,250 mm		8,0	79,0	34,0	25,0	36,0	63174
0.2480	6,300 mm		8,0	79,0	34,0	25,0	36,0	63756
0.2500	6,350 mm	1/4 E	1/4	3-1/8	1-5/16	15/16	1-7/16	51343
0.2520	6,400 mm		8,0	79,0	34,0	24,0	36,0	63175
0.2559	6,500 mm		8,0	79,0	34,0	24,0	36,0	63213
0.2570	6,528 mm	F	5/16	3-1/8	1-5/16	59/64	1-7/16	51344
0.2598	6,600 mm		8,0	79,0	34,0	24,0	36,0	63757
0.2610	6,629 mm	G	5/16	3-1/8	1-5/16	59/64	1-7/16	51606
0.2638	6,700 mm		8,0	79,0	34,0	24,0	36,0	63758
0.2656	6,746 mm	17/64	5/16	3-1/8	1-5/16	59/64	1-7/16	51345
0.2660	6,756 mm	H	5/16	3-1/8	1-5/16	59/64	1-7/16	51607
0.2677	6,800 mm		8,0	79,0	34,0	24,0	36,0	63176
0.2717	6,900 mm		8,0	79,0	34,0	24,0	36,0	63759
0.2720	6,909 mm	I	5/16	3-1/8	1-5/16	29/32	1-7/16	51346

TOLERANCES (inch)

 $\leq .1181$ DIAMETERDC = $\pm .00008/\pm .00047$ DCON = h_6 $> .1181$ – $.2362$ DIAMETERDC = $\pm .00016/\pm .00063$ DCON = h_6 $> .2362$ – $.3937$ DIAMETERDC = $\pm .00024/\pm .00083$ DCON = h_6 $> .3937$ – $.7087$ DIAMETERDC = $\pm .00028/\pm .00098$ DCON = h_6 $> .7087$ – 1.1811 DIAMETERDC = $\pm .00031/\pm .00114$ DCON = h_6

TOLERANCES (mm)

 ≤ 3 DIAMETERDC = $\pm 0,002/\pm 0,012$ DCON = h_6 > 3 – 6 DIAMETERDC = $\pm 0,004/\pm 0,016$ DCON = h_6 > 6 – 10 DIAMETERDC = $\pm 0,006/\pm 0,021$ DCON = h_6 > 10 – 18 DIAMETERDC = $\pm 0,007/\pm 0,025$ DCON = h_6 > 18 – 30 DIAMETERDC = $\pm 0,008/\pm 0,029$ DCON = h_6

STEELS

STAINLESS STEELS

CAST IRON

NON-FERROUS

HIGH TEMP ALLOYS

HARDENED STEELS

continued on next page

135 3xD

FRACTIONAL & METRIC SERIES

DECIMAL DC	METRIC DC	inch & mm						EDP NO. Ti-NAMITE-A (AITiN)
		FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	
0.2756	7,000 mm		8,0	79,0	34,0	24,0	36,0	63177
0.2770	7,036 mm	J	5/16	3-1/8	1-5/16	29/32	1-7/16	51608
0.2795	7,100 mm		8,0	79,0	41,0	30,0	36,0	63760
0.2810	7,137 mm	K	5/16	3-1/8	1-9/16	1-9/64	1-7/16	51609
0.2812	7,142 mm	9/32	5/16	3-1/8	1-9/16	1-9/64	1-7/16	51347
0.2835	7,200 mm		8,0	79,0	41,0	30,0	36,0	63761
0.2854	7,250 mm		8,0	79,0	41,0	30,0	36,0	63178
0.2874	7,300 mm		8,0	79,0	41,0	30,0	36,0	63762
0.2900	7,366 mm	L	5/16	3-1/8	1-9/16	1-1/8	1-7/16	51610
0.2913	7,400 mm		8,0	79,0	41,0	30,0	36,0	63763
0.2950	7,493 mm	M	5/16	3-1/8	1-9/16	1-1/8	1-7/16	51611
0.2953	7,500 mm		8,0	79,0	41,0	30,0	36,0	63179
0.2969	7,541 mm	19/64	5/16	3-1/8	1-9/16	1-7/64	1-7/16	51348
0.2992	7,600 mm		8,0	79,0	41,0	30,0	36,0	63764
0.3020	7,671 mm	N	5/16	3-1/8	1-9/16	1-7/64	1-7/16	51612
0.3031	7,700 mm		8,0	79,0	41,0	29,0	36,0	63765
0.3071	7,800 mm		8,0	79,0	41,0	29,0	36,0	63180
0.3110	7,900 mm		8,0	79,0	41,0	29,0	36,0	63766
0.3125	7,938 mm	5/16	5/16	3-1/8	1-9/16	1-3/32	1-7/16	51349
0.3150	8,000 mm		8,0	79,0	41,0	29,0	36,0	63181
0.3160	8,026 mm	O	3/8	3-1/2	1-27/32	1-3/8	1-9/16	51613
0.3189	8,100 mm		10,0	89,0	47,0	35,0	40,0	63767
0.3228	8,200 mm		10,0	89,0	47,0	35,0	40,0	63768
0.3230	8,204 mm	P	3/8	3-1/2	1-27/32	1-23/64	1-9/16	51614
0.3268	8,300 mm		10,0	89,0	47,0	35,0	40,0	63769
0.3281	8,334 mm	21/64	3/8	3-1/2	1-27/32	1-23/64	1-9/16	51350
0.3307	8,400 mm		10,0	89,0	47,0	34,0	40,0	63182
0.3320	8,433 mm	Q	3/8	3-1/2	1-27/32	1-11/32	1-9/16	51351
0.3346	8,500 mm		10,0	89,0	47,0	34,0	40,0	63183
0.3386	8,600 mm		10,0	89,0	47,0	34,0	40,0	63770
0.3390	8,611 mm	R	3/8	3-1/2	1-27/32	1-11/32	1-9/16	51615
0.3425	8,700 mm		10,0	89,0	47,0	34,0	40,0	63771
0.3438	8,733 mm	11/32	3/8	3-1/2	1-27/32	1-21/64	1-9/16	51352
0.3465	8,800 mm		10,0	89,0	47,0	34,0	40,0	63184
0.3480	8,839 mm	S	3/8	3-1/2	1-27/32	1-21/64	1-9/16	51616
0.3504	8,900 mm		10,0	89,0	47,0	34,0	40,0	63772
0.3543	9,000 mm		10,0	89,0	47,0	34,0	40,0	63185
0.3580	9,093 mm	T	3/8	3-1/2	1-27/32	1-5/16	1-9/16	51617
0.3583	9,100 mm		10,0	89,0	47,0	33,0	40,0	63773
0.3594	9,129 mm	23/64	3/8	3-1/2	1-27/32	1-21/64	1-9/16	51353
0.3622	9,200 mm		10,0	89,0	47,0	33,0	40,0	63774
0.3642	9,250 mm		10,0	89,0	47,0	33,0	40,0	63186
0.3661	9,300 mm		10,0	89,0	47,0	33,0	40,0	63775
0.3680	9,347 mm	U	3/8	3-1/2	1-27/32	1-19/64	1-9/16	51354
0.3701	9,400 mm		10,0	89,0	47,0	33,0	40,0	63776
0.3740	9,500 mm		10,0	89,0	47,0	33,0	40,0	63187

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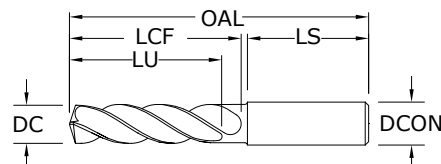


3xD



135 3xD

FRACTIONAL & METRIC SERIES



CONTINUED

- 4-margin design improves accuracy and surface finish along with increased strength for aggressive drilling
- Specialized self-centering notched point eliminates the need for spot drilling decreasing thrust and deflection
- Engineered edge protection improves edge strength and reduces edge fatigue allowing for increased feed rates
- Recommended for materials ≤ 50 HRc (≤ 475 Bhn)

inch & mm									EDP NO.
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	Ti-NAMITE-A (AlTiN)	
0.3750	9,525 mm	3/8	3/8	3-1/2	1-27/32	1-9/32	1-9/16	51355	
0.3770	9,576 mm	V	1/2	3-1/2	1-27/32	1-9/32	1-9/16	51618	
0.3780	9,600 mm		10,0	89,0	47,0	33,0	40,0	63777	
0.3819	9,700 mm		10,0	89,0	47,0	32,0	40,0	63778	
0.3858	9,800 mm		10,0	89,0	47,0	32,0	40,0	63779	
0.3860	9,804 mm	W	1/2	3-1/2	1-27/32	1-17/64	1-9/16	51619	
0.3898	9,900 mm		10,0	89,0	47,0	40,0	40,0	63780	
0.3906	9,921 mm	25/64	1/2	3-1/2	1-27/32	1-37/64	1-9/16	51356	
0.3937	10,000 mm		10,0	89,0	47,0	40,0	40,0	63188	
0.3970	10,083 mm	X	1/2	4-1/16	2-3/16	1-51/64	1-49/64	51620	
0.3976	10,100 mm		12,0	102,0	55,0	45,0	45,0	63781	
0.4016	10,200 mm		12,0	102,0	55,0	45,0	45,0	63189	
0.4040	10,261 mm	Y	1/2	4-1/16	2-3/16	1-51/64	1-49/64	51621	
0.4055	10,300 mm		12,0	102,0	55,0	45,0	45,0	63782	
0.4062	10,317 mm	13/32	1/2	4-1/16	2-3/16	1-51/64	1-49/64	51357	
0.4095	10,400 mm		12,0	102,0	55,0	45,0	45,0	63783	
0.4130	10,490 mm	Z	1/2	4-1/16	2-3/16	1-51/64	1-49/64	51622	
0.4134	10,500 mm		12,0	102,0	55,0	40,0	45,0	63190	
0.4173	10,600 mm		12,0	102,0	55,0	40,0	45,0	63784	
0.4213	10,700 mm		12,0	102,0	55,0	40,0	45,0	63785	
0.4219	10,716 mm	27/64	1/2	4-1/16	2-3/16	1-19/32	1-49/64	51358	
0.4252	10,800 mm		12,0	102,0	55,0	40,0	45,0	63191	
0.4291	10,900 mm		12,0	102,0	55,0	40,0	45,0	63786	
0.4331	11,000 mm		12,0	102,0	55,0	39,0	45,0	63192	
0.4370	11,100 mm		12,0	102,0	55,0	39,0	45,0	63787	
0.4375	11,113 mm	7/16	1/2	4-1/16	2-3/16	1-37/64	1-49/64	51359	
0.4409	11,200 mm		12,0	102,0	55,0	39,0	45,0	63788	
0.4429	11,250 mm		12,0	102,0	55,0	39,0	45,0	63193	
0.4449	11,300 mm		12,0	102,0	55,0	39,0	45,0	63789	
0.4488	11,400 mm		12,0	102,0	55,0	38,0	45,0	63790	
0.4528	11,500 mm		12,0	102,0	55,0	38,0	45,0	63194	
0.4531	11,509 mm	29/64	1/2	4-1/16	2-3/16	1-33/64	1-49/64	51360	
0.4567	11,600 mm		12,0	102,0	55,0	38,0	45,0	63791	
0.4606	11,700 mm		12,0	102,0	55,0	37,0	45,0	63792	
0.4646	11,800 mm		12,0	102,0	55,0	37,0	45,0	63793	
0.4685	11,900 mm		12,0	102,0	55,0	37,0	45,0	63794	

TOLERANCES (inch)

 $\leq .1181$ DIAMETERDC = $+0.0008/+0.0047$ DCON = h_6 $>.1181-.2362$ DIAMETERDC = $+0.0016/+0.0063$ DCON = h_6 $>.2362-.3937$ DIAMETERDC = $+0.0024/+0.0083$ DCON = h_6 $>.3937-.7087$ DIAMETERDC = $+0.0028/+0.0098$ DCON = h_6 $>.7087-1.1811$ DIAMETERDC = $+0.0031/+0.0114$ DCON = h_6

TOLERANCES (mm)

 ≤ 3 DIAMETERDC = $+0,002/+0,012$ DCON = h_6 $>3-6$ DIAMETERDC = $+0,004/+0,016$ DCON = h_6 $>6-10$ DIAMETERDC = $+0,006/+0,021$ DCON = h_6 $>10-18$ DIAMETERDC = $+0,007/+0,025$ DCON = h_6 $>18-30$ DIAMETERDC = $+0,008/+0,029$ DCON = h_6

STEELS

STAINLESS STEELS

CAST IRON

NON-FERROUS

HIGH TEMP ALLOYS

HARDENED STEELS

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135 3xD

FRACTIONAL & METRIC SERIES

DECIMAL DC	METRIC DC	inch & mm						EDP NO. Ti-NAMITE-A (AITiN)
		FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	
0.4688	11,908 mm	15/32	1/2	4-1/16	2-3/16	1-31/64	1-49/64	51361
0.4724	12,000 mm		12,0	102,0	55,0	37,0	45,0	63195
0.4844	12,304 mm	31/64	1/2	4-1/4	2-5/16	1-19/32	1-49/64	51362
0.4921	12,500 mm		14,0	107,0	60,0	41,0	45,0	63196
0.5000	12,700 mm	1/2	1/2	4-1/4	2-5/16	1-9/16	1-49/64	51363
0.5039	12,800 mm		14,0	107,0	60,0	41,0	45,0	63197
0.5118	13,000 mm		14,0	107,0	60,0	41,0	45,0	63198
0.5156	13,096 mm	33/64	5/8	4-1/4	2-5/16	1-35/64	1-49/64	51364
0.5312	13,492 mm	17/32	5/8	4-1/4	2-5/16	1-33/64	1-49/64	51365
0.5315	13,500 mm		14,0	107,0	60,0	40,0	45,0	63199
0.5469	13,891 mm	35/64	5/8	4-1/4	2-5/16	1-1/2	1-49/64	51783
0.5512	14,000 mm		14,0	107,0	60,0	39,0	45,0	63200
0.5625	14,288 mm	9/16	5/8	4-9/16	2-1/2	1-21/32	1-57/64	51366
0.5709	14,500 mm		16,0	115,0	65,0	43,0	48,0	63201
0.5781	14,684 mm	37/64	5/8	4-9/16	2-1/2	1-41/64	1-57/64	51367
0.5906	15,000 mm		16,0	115,0	65,0	42,0	48,0	63202
0.5938	15,083 mm	19/32	5/8	4-9/16	2-1/2	1-39/64	1-57/64	51784
0.6094	15,479 mm	39/64	5/8	4-9/16	2-1/2	1-19/32	1-57/64	51785
0.6102	15,500 mm		16,0	115,0	65,0	42,0	48,0	63203
0.6250	15,875 mm	5/8	5/8	4-9/16	2-1/2	1-9/16	1-57/64	51368
0.6299	16,000 mm		16,0	115,0	65,0	41,0	48,0	63204
0.6406	16,271 mm	41/64	3/4	4-7/8	2-3/4	1-51/64	1-57/64	51786
0.6496	16,500 mm		18,0	123,0	73,0	48,0	48,0	63205
0.6562	16,667 mm	21/32	3/4	4-7/8	2-3/4	1-25/32	1-57/64	51369
0.6693	17,000 mm		18,0	123,0	73,0	47,0	48,0	63206
0.6719	17,066 mm	43/64	3/4	4-7/8	2-3/4	1-3/4	1-57/64	51787
0.6875	17,463 mm	11/16	3/4	4-7/8	2-3/4	1-47/64	1-57/64	51370
0.6890	17,500 mm		18,0	123,0	73,0	47,0	48,0	63207
0.7031	17,859 mm	45/64	3/4	4-7/8	2-3/4	1-45/64	1-57/64	51788
0.7087	18,000 mm		18,0	123,0	73,0	46,0	48,0	63208
0.7188	18,258 mm	23/32	3/4	4-7/8	2-3/4	1-43/64	1-57/64	51789
0.7283	18,500 mm		20,0	131,0	79,0	51,0	50,0	63209
0.7344	18,654 mm	47/64	3/4	4-7/8	2-3/4	1-21/32	1-57/64	51790
0.7480	19,000 mm		20,0	131,0	79,0	51,0	50,0	63210
0.7500	19,050 mm	3/4	3/4	5-1/4	3-1/16	1-15/16	1-31/32	51371
0.7656	19,446 mm	49/64	7/8	5-1/4	3-1/16	1-59/64	1-31/32	51372
0.7677	19,500 mm		20,0	131,0	79,0	50,0	50,0	63211
0.7812	19,842 mm	25/32	7/8	6	3-11/16	2-33/64	2-1/8	51791
0.7874	20,000 mm		20,0	131,0	79,0	49,0	50,0	63212
0.7969	20,241 mm	51/64	7/8	6	3-11/16	2-1/2	2-1/8	51792
0.8071	20,500 mm		22,0	150,0	93,0	62,0	53,0	64513
0.8125	20,638 mm	13/16	7/8	6	3-11/16	2-15/32	2-1/8	51373
0.8268	21,000 mm		22,0	150,0	93,0	61,0	53,0	64514
0.8661	22,000 mm		22,0	150,0	93,0	60,0	53,0	64515
0.8750	22,225 mm	7/8	7/8	6	3-11/16	2-3/8	2-1/8	51374
0.9219	23,416 mm	59/64	1	6	3-11/16	2-5/16	2-1/8	51375

CONTINUED

	Series 135 3D Fractional	Hardness	Vc (sfm)	DC • in							
				1/32	1/8	1/4	3/8	1/2	5/8	7/8	
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	385	RPM	47062	11766	5883	3922	2941	2353	1681
			(308-462)	Fr	0.0010	0.0038	0.0076	0.0115	0.0153	0.0191	0.0268
				Feed (ipm)	45.0	45.0	45.0	45.0	45.0	45.0	45.0
		≤ 275 Bhn or ≤ 28 HRc	350	RPM	42784	10696	5348	3565	2674	2139	1528
			(280-420)	Fr	0.0009	0.0036	0.0071	0.0107	0.0142	0.0178	0.0249
				Feed (ipm)	38.0	38.0	38.0	38.0	38.0	38.0	38.0
		≤ 425 Bhn or ≤ 45 HRc	200	RPM	24448	6112	3056	2037	1528	1222	873
			(160-240)	Fr	0.0007	0.0029	0.0059	0.0088	0.0118	0.0147	0.0206
				Feed (ipm)	18.0	18.0	18.0	18.0	18.0	18.0	18.0
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc	300	RPM	36672	9168	4584	3056	2292	1834	1310
			(240-360)	Fr	0.0007	0.0029	0.0059	0.0088	0.0118	0.0147	0.0206
				Feed (ipm)	27.0	27.0	27.0	27.0	27.0	27.0	27.0
		≤ 375 Bhn or ≤ 40 HRc	185	RPM	22614	5654	2827	1885	1413	1131	808
			(148-222)	Fr	0.0006	0.0026	0.0051	0.0077	0.0103	0.0128	0.0180
				Feed (ipm)	14.5	14.5	14.5	14.5	14.5	14.5	14.5
		≤ 425 Bhn or ≤ 45 HRc	130	RPM	15891	3973	1986	1324	993	795	568
			(104-156)	Fr	0.0004	0.0018	0.0035	0.0053	0.0070	0.0088	0.0123
				Feed (ipm)	7.0	7.0	7.0	7.0	7.0	7.0	7.0
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 200 Bhn or ≤ 13 HRc	130	RPM	15891	3973	1986	1324	993	795	568
			(104-156)	Fr	0.0007	0.0026	0.0053	0.0079	0.0106	0.0132	0.0185
				Feed (ipm)	10.5	10.5	10.5	10.5	10.5	10.5	10.5
		≤ 375 Bhn or ≤ 40 HRc	90	RPM	11002	2750	1375	917	688	550	393
			(72-108)	Fr	0.0003	0.0012	0.0023	0.0035	0.0047	0.0058	0.0081
				Feed (ipm)	3.2	3.2	3.2	3.2	3.2	3.2	3.2
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 185 Bhn or ≤ 9 HRc	275	RPM	33616	8404	4202	2801	2101	1681	1201
			(220-330)	Fr	0.0006	0.0026	0.0051	0.0077	0.0102	0.0128	0.0179
				Feed (ipm)	21.5	21.5	21.5	21.5	21.5	21.5	21.5
		≤ 275 Bhn or ≤ 28 HRc	170	RPM	20781	5195	2598	1732	1299	1039	742
			(136-204)	Fr	0.0005	0.0020	0.0040	0.0061	0.0081	0.0101	0.0141
				Feed (ipm)	10.5	10.5	10.5	10.5	10.5	10.5	10.5
	STAINLESS STEELS (DIFFICULT) 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	≤ 275 Bhn or ≤ 28 HRc	90	RPM	11002	2750	1375	917	688	550	393
			(72-108)	Fr	0.0005	0.0020	0.0040	0.0060	0.0080	0.0100	0.0140
				Feed (ipm)	5.5	5.5	5.5	5.5	5.5	5.5	5.5
		≤ 375 Bhn or ≤ 40 HRc	65	RPM	7946	1986	993	662	497	397	284
			(52-78)	Fr	0.0004	0.0018	0.0035	0.0053	0.0070	0.0088	0.0123
				Feed (ipm)	3.5	3.5	3.5	3.5	3.5	3.5	3.5
K	CAST IRONS Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	320	RPM	39117	9779	4890	3260	2445	1956	1397
			(256-384)	Fr	0.0012	0.0046	0.0092	0.0138	0.0184	0.0230	0.0322
				Feed (ipm)	45.0	45.0	45.0	45.0	45.0	45.0	45.0
		≤ 260 Bhn or ≤ 26 HRc	285	RPM	34838	8710	4355	2903	2177	1742	1244
			(228-342)	Fr	0.0011	0.0046	0.0092	0.0138	0.0184	0.0230	0.0321
				Feed (ipm)	40.0	40.0	40.0	40.0	40.0	40.0	40.0

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	Series 135 3D Fractional	Hardness	Vc (sfm)	DC • in									
				1/32	1/8	1/4	3/8	1/2	5/8	7/8			
N	ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075	≤ 80 Bhn or ≤ 47 HRb	700	RPM	85568	21392	10696	7131	5348	4278	3056		
			(560-840)	Fr	0.0012	0.0049	0.0098	0.0147	0.0196	0.0245	0.0344		
				Feed (ipm)	105.0	105.0	105.0	105.0	105.0	105.0	105.0		
		≤ 150 Bhn or ≤ 88 HRb	600	RPM	73344	18336	9168	6112	4584	3667	2619		
			(480-720)	Fr	0.0012	0.0050	0.0099	0.0149	0.0199	0.0248	0.0347		
				Feed (ipm)	91.0	91.0	91.0	91.0	91.0	91.0	91.0		
		COPPER ALLOYS Alum Bronze, C110, Muntz Brass	≤ 140 Bhn or ≤ 3 HRc	500	RPM	61120	15280	7640	5093	3820	3056	2183	
				(400-600)	Fr	0.0005	0.0020	0.0039	0.0059	0.0079	0.0098	0.0137	
					Feed (ipm)	30.0	30.0	30.0	30.0	30.0	30.0	30.0	
	≤ 200 Bhn or ≤ 23 HRc		400	RPM	48896	12224	6112	4075	3056	2445	1746		
			(320-480)	Fr	0.0005	0.0020	0.0040	0.0060	0.0080	0.0100	0.0140		
				Feed (ipm)	24.5	24.5	24.5	24.5	24.5	24.5	24.5		
	S		HIGH TEMP ALLOYS (NICKEL , COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400, Rene, Waspaloy	≤ 300 Bhn or ≤ 32 HRc	55	RPM	6723	1681	840	560	420	336	240
					(44-66)	Fr	0.0002	0.0008	0.0015	0.0023	0.0031	0.0039	0.0054
						Feed (ipm)	1.3	1.3	1.3	1.3	1.3	1.3	1.3
		≤ 400 Bhn or ≤ 43 HRc		30	RPM	3667	917	458	306	229	183	131	
				(24-36)	Fr	0.0002	0.0007	0.0013	0.0020	0.0026	0.0033	0.0046	
					Feed (ipm)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	
TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V		≤ 275 Bhn or ≤ 28 HRc		135	RPM	16502	4126	2063	1375	1031	825	589	
				(108-162)	Fr	0.0004	0.0018	0.0035	0.0053	0.0071	0.0088	0.0124	
					Feed (ipm)	7.3	7.3	7.3	7.3	7.3	7.3	7.3	
		≤ 350 Bhn or ≤ 38 HRc	100	RPM	12224	3056	1528	1019	764	611	437		
			(80-120)	Fr	0.0004	0.0016	0.0033	0.0049	0.0065	0.0082	0.0115		
				Feed (ipm)	5.0	5.0	5.0	5.0	5.0	5.0	5.0		
	≤ 440 Bhn or ≤ 47 HRc	55	RPM	6723	1681	840	560	420	336	240			
		(44-66)	Fr	0.0003	0.0012	0.0024	0.0036	0.0048	0.0059	0.0083			
			Feed (ipm)	2.0	2.0	2.0	2.0	2.0	2.0	2.0			
H	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 475 Bhn or ≤ 50 HRc	75	RPM	9168	2292	1146	764	573	458	327		
			(60-90)	Fr	0.0002	0.0008	0.0016	0.0024	0.0031	0.0039	0.0055		
				Feed (ipm)	1.8	1.8	1.8	1.8	1.8	1.8	1.8		

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)

rpm = Vc x 3.82 / DC

ipm = Fr x rpm

reduce speed and feed for materials harder than listed

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)

Hi-PerCarb

Series 135 3D Metric	Hardness	Vc (m/min)	DC • mm									
			1.5	3	6	8	10	12	16	20		
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	117	RPM	24882	12441	6220	4665	3732	3110	2333	1866
			(94-141)	Fr	0.047	0.094	0.189	0.252	0.315	0.378	0.504	0.630
				Feed (mm/min)	1175	1175	1175	1175	1175	1175	1175	1175
		≤ 275 Bhn or ≤ 28 HRc	107	RPM	22620	11310	5655	4241	3393	2827	2121	1696
			(85-128)	Fr	0.043	0.086	0.172	0.229	0.286	0.343	0.457	0.572
				Feed (mm/min)	970	970	970	970	970	970	970	970
		≤ 475 Bhn or ≤ 45 HRc	61	RPM	12926	6463	3231	2424	1939	1616	1212	969
			(49-73)	Fr	0.036	0.071	0.142	0.190	0.237	0.285	0.380	0.475
				Feed (mm/min)	460	460	460	460	460	460	460	460
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc	91	RPM	19388	9694	4847	3635	2908	2424	1818	1454
			(73-110)	Fr	0.036	0.071	0.142	0.190	0.237	0.285	0.380	0.475
				Feed (mm/min)	690	690	690	690	690	690	690	690
		≤ 375 Bhn or ≤ 40 HRc	56	RPM	11956	5978	2989	2242	1793	1495	1121	897
			(45-68)	Fr	0.031	0.061	0.122	0.163	0.204	0.244	0.326	0.407
				Feed (mm/min)	365	365	365	365	365	365	365	365
		≤ 425 Bhn or ≤ 45 HRc	40	RPM	8402	4201	2100	1575	1260	1050	788	630
			(32-48)	Fr	0.021	0.042	0.083	0.111	0.139	0.167	0.222	0.278
				Feed (mm/min)	175	175	175	175	175	175	175	175
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 200 Bhn or ≤ 13 HRc	40	RPM	8402	4201	2100	1575	1260	1050	788	630
			(32-48)	Fr	0.032	0.063	0.126	0.168	0.210	0.252	0.336	0.421
				Feed (mm/min)	265	265	265	265	265	265	265	265
		≤ 375 Bhn or ≤ 40 HRc	27	RPM	5816	2908	1454	1091	872	727	545	436
			(22-33)	Fr	0.014	0.028	0.055	0.073	0.092	0.110	0.147	0.183
				Feed (mm/min)	80	80	80	80	80	80	80	80
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 185 Bhn or ≤ 9 HRc	84	RPM	17773	8886	4443	3332	2666	2222	1666	1333
			(67-101)	Fr	0.031	0.061	0.123	0.164	0.204	0.245	0.327	0.409
				Feed (mm/min)	545	545	545	545	545	545	545	545
		≤ 275 Bhn or ≤ 28 HRc	52	RPM	10987	5493	2747	2060	1648	1373	1030	824
			(41-62)	Fr	0.024	0.047	0.095	0.126	0.158	0.189	0.252	0.316
				Feed (mm/min)	260	260	260	260	260	260	260	260
	STAINLESS STEELS (DIFFICULT) 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	≤ 275 Bhn or ≤ 28 HRc	27	RPM	5816	2908	1454	1091	872	727	545	436
			(22-33)	Fr	0.023	0.046	0.093	0.124	0.155	0.186	0.248	0.309
				Feed (mm/min)	135	135	135	135	135	135	135	135
		≤ 375 Bhn or ≤ 40 HRc	20	RPM	4201	2100	1050	788	630	525	394	315
			(16-24)	Fr	0.020	0.040	0.081	0.108	0.135	0.162	0.216	0.270
				Feed (mm/min)	85	85	85	85	85	85	85	85
K	CAST IRONS Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	98	RPM	20681	10340	5170	3878	3102	2585	1939	1551
			(78-117)	Fr	0.055	0.110	0.220	0.293	0.366	0.439	0.585	0.732
				Feed (mm/min)	1135	1135	1135	1135	1135	1135	1135	1135
		≤ 260 Bhn or ≤ 26 HRc	87	RPM	18419	9209	4605	3454	2763	2302	1727	1381
			(69-104)	Fr	0.055	0.110	0.219	0.292	0.366	0.439	0.585	0.731
				Feed (mm/min)	1010	1010	1010	1010	1010	1010	1010	1010

continued on next page

Series 135 3D Metric		Hardness	Vc (m/min)	DC • mm									
				1.5	3	6	8	10	12	16	20		
N	ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075	≤ 80 Bhn or ≤ 47 HRb	213	RPM	45239	22620	11310	8482	6786	5655	4241	3393	
			(171-256)	Fr	0.059	0.119	0.238	0.317	0.396	0.476	0.634	0.793	
				Feed (mm/min)	2690	2690	2690	2690	2690	2690	2690	2690	
		≤ 150 Bhn or ≤ 8 HRb	183	RPM	38777	19388	9694	7271	5816	4847	3635	2908	
			(146-219)	Fr	0.060	0.120	0.240	0.320	0.400	0.480	0.640	0.799	
				Feed (mm/min)	2325	2325	2325	2325	2325	2325	2325	2325	
	COPPER ALLOYS Alum Bronze, C110, Muntz Brass	≤ 140 Bhn or ≤ 3 HRc	152	RPM	32314	16157	8078	6059	4847	4039	3029	2424	
			(122-183)	Fr	0.024	0.048	0.096	0.128	0.160	0.192	0.256	0.320	
				Feed (mm/min)	776	776	776	776	776	776	776	776	
		≤ 200 Bhn or ≤ 23 HRc	122	RPM	25851	12926	6463	4847	3878	3231	2424	1939	
			(98-146)	Fr	0.024	0.049	0.097	0.130	0.162	0.195	0.260	0.325	
				Feed (mm/min)	630	630	630	630	630	630	630	630	
S	HIGH TEMP ALLOYS (NICKEL , COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400, Rene, Waspaloy	≤ 300 Bhn or ≤ 32 HRc	17	RPM	3555	1777	889	666	533	444	333	267	
			(13-20)	Fr	0.010	0.020	0.039	0.053	0.066	0.079	0.105	0.131	
				Feed (mm/min)	35	35	35	35	35	35	35	35	
		≤ 400 Bhn or ≤ 43 HRc	9	RPM	1939	969	485	364	291	242	182	145	
			(7-11)	Fr	0.008	0.015	0.031	0.041	0.052	0.062	0.083	0.103	
				Feed (mm/min)	15	15	15	15	15	15	15	15	
		TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V	≤ 275 Bhn or ≤ 28 HRc	41	RPM	8725	4362	2181	1636	1309	1091	818	654
				(33-49)	Fr	0.021	0.042	0.085	0.113	0.141	0.170	0.226	0.283
					Feed (mm/min)	185	185	185	185	185	185	185	185
	≤ 350 Bhn or ≤ 38 HRc		30	RPM	6463	3231	1616	1212	969	808	606	485	
			(24-37)	Fr	0.019	0.039	0.077	0.103	0.129	0.155	0.206	0.258	
				Feed (mm/min)	125	125	125	125	125	125	125	125	
	≤ 440 Bhn or ≤ 47 HRc		17	RPM	3555	1777	889	666	533	444	333	267	
			(13-20)	Fr	0.014	0.028	0.056	0.075	0.094	0.113	0.150	0.188	
				Feed (mm/min)	50	50	50	50	50	50	50	50	
	H	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 475 Bhn or ≤ 50 HRc	23	RPM	4847	2424	1212	909	727	606	454	364
				(18-27)	Fr	0.009	0.019	0.037	0.050	0.062	0.074	0.099	0.124
					Feed (mm/min)	45	45	45	45	45	45	45	45

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)

rpm = (Vc x 1000) / (DC x 3.14)

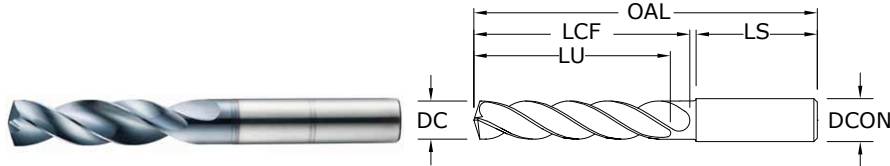
mm/min = Fr x rpm

reduce speed and feed for materials harder than listed

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)



5xD



135 5xD

FRACTIONAL & METRIC SERIES

- 4-margin design improves accuracy and surface finish along with increased strength for aggressive drilling
- Specialized self-centering notched point eliminates the need for spot drilling decreasing thrust and deflection
- Engineered edge protection improves edge strength and reduces edge fatigue allowing for increased feed rates
- Recommended for materials ≤ 56 HRc (≤ 577 Bhn)

inch & mm								EDP NO.
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	Ti-NAMITE-A (AlTiN)
0.0156	0,396 mm	1/64	1/8	1 1/2	5/32	1/8	1	52300*
0.0312	0,792 mm	1/32	1/8	1 1/2	5/16	17/64	1	52301*
0.0469	1,191 mm	3/64	1/8	1 1/2	25/64	21/64	1	52302*
0.0492	1,250 mm		3,0	38,0	10,0	8,0	25,0	64520*
0.0571	1,450 mm		3,0	38,0	10,0	8,0	25,0	64521*
0.0595	1,511 mm	#53	1/8	1-1/2	25/64	5/16	1	64522*
0.0625	1,588 mm	1/16	1/8	2	15/32	3/8	1-1/4	52303*
0.0630	1,600 mm		3,0	50,0	12,0	10,0	32,0	64523*
0.0689	1,750 mm		3,0	50,0	12,0	9,0	32,0	64524*
0.0700	1,778 mm	#50	1/8	2	15/32	23/64	1-1/4	64525*
0.0781	1,984 mm	5/64	1/8	2	35/64	7/16	1-1/4	52304*
0.0785	1,994 mm	#47	1/8	2	35/64	7/16	1-1/4	64526*
0.0807	2,050 mm		3,0	50,0	14,0	11,0	32,0	64527*
0.0810	2,057 mm	#46	1/8	2	35/64	27/64	1-1/4	64528*
0.0890	2,261 mm	#43	1/8	2	19/32	15/32	1-1/4	64529*
0.0935	2,375 mm	#42	1/8	2	5/8	31/64	1-1/4	64530*
0.0938	2,383 mm	3/32	1/8	2	5/8	31/64	1-1/4	52305
0.0980	2,489 mm	#40	1/8	2	43/64	17/32	1-1/4	52306
0.0984	2,500 mm		3,0	50,0	17,0	13,0	32,0	64531
0.0995	2,527 mm	#39	1/8	2	43/64	17/32	1-1/4	52307
0.1015	2,578 mm	#38	1/8	2	43/64	17/32	1-1/4	52308
0.1040	2,642 mm	#37	1/8	2	45/64	35/64	1-1/4	52309
0.1065	2,705 mm	#36	1/8	2	45/64	35/64	1-1/4	52310
0.1094	2,779 mm	7/64	1/8	2	3/4	19/32	1-1/4	52311
0.1100	2,794 mm	#35	1/8	2	3/4	19/32	1-1/4	52312
0.1110	2,819 mm	#34	1/8	2	3/4	19/32	1-1/4	52313
0.1130	2,870 mm	#33	1/8	2	3/4	19/32	1-1/4	52314
0.1142	2,900 mm		3,0	50,0	19,0	15,0	32,0	64532
0.1160	2,946 mm	#32	1/8	2	3/4	37/64	1-1/4	52315
0.1181	3,000 mm		6,0	66,0	28,0	24,0	36,0	64100
0.1200	3,048 mm	#31	1/8	2	3/4	37/64	1-1/4	52316
0.1220	3,100 mm		6,0	66,0	28,0	23,0	36,0	64101
0.1250	3,175 mm	1/8	1/4	3	1	13/16	1-7/16	51580
0.1260	3,200 mm		6,0	66,0	28,0	23,0	36,0	64102
0.1285	3,264 mm	#30	1/4	3	1	13/16	1-7/16	51581
0.1299	3,300 mm		6,0	66,0	28,0	23,0	36,0	64103

*Single Margin

continued on next page

TOLERANCES (inch)

 $\leq .1181$ DIAMETERDC = $\pm .00008/\pm .00047$ DCON = h_6 $> .1181 - .2362$ DIAMETERDC = $\pm .00016/\pm .00063$ DCON = h_6 $> .2362 - .3937$ DIAMETERDC = $\pm .00024/\pm .00083$ DCON = h_6 $> .3937 - .7087$ DIAMETERDC = $\pm .00028/\pm .00098$ DCON = h_6 $> .7087 - 1.1811$ DIAMETERDC = $\pm .00031/\pm .00114$ DCON = h_6

TOLERANCES (mm)

 ≤ 3 DIAMETERDC = $\pm 0,002/\pm 0,012$ DCON = h_6 $> 3 - 6$ DIAMETERDC = $\pm 0,004/\pm 0,016$ DCON = h_6 $> 6 - 10$ DIAMETERDC = $\pm 0,006/\pm 0,021$ DCON = h_6 $> 10 - 18$ DIAMETERDC = $\pm 0,007/\pm 0,025$ DCON = h_6 $> 18 - 30$ DIAMETERDC = $\pm 0,008/\pm 0,029$ DCON = h_6

STEELS

STAINLESS STEELS

CAST IRON

NON-FERROUS

HIGH TEMP ALLOYS

HARDENED STEELS

135 5xD

FRACTIONAL & METRIC SERIES

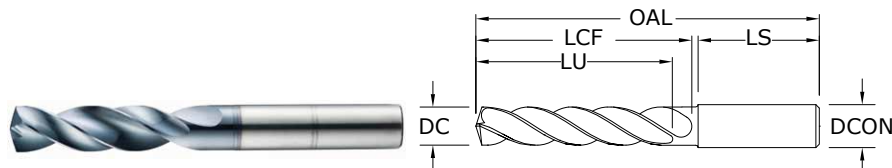
DECIMAL DC	METRIC DC	inch & mm		OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	EDP NO.
		FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON					Ti-NAMITE-A (AITiN)
0.1339	3,400 mm		6,0	66,0	28,0	23,0	36,0	64104
0.1360	3,454 mm	#29	1/4	3	1	51/64	1-7/16	51582
0.1378	3,500 mm		6,0	66,0	28,0	23,0	36,0	64105
0.1405	3,569 mm	#28	1/4	3	1	51/64	1-7/16	52317
0.1406	3,571 mm	9/64	1/4	3	1	51/64	1-7/16	51583
0.1417	3,600 mm		6,0	66,0	28,0	23,0	36,0	64106
0.1440	3,658 mm	#27	1/4	3	1	51/64	1-7/16	52318
0.1457	3,700 mm		6,0	66,0	28,0	22,0	36,0	64107
0.1470	3,734 mm	#26	1/4	3	1	25/32	1-7/16	52319
0.1495	3,797 mm	#25	1/4	3-1/4	1-1/4	1-1/32	1-7/16	51584
0.1496	3,800 mm		6,0	74,0	36,0	30,0	36,0	64108
0.1520	3,861 mm	#24	1/4	3-1/4	1-1/4	1-1/32	1-7/16	52321
0.1535	3,900 mm		6,0	74,0	36,0	30,0	36,0	64109
0.1540	3,912 mm	#23	1/4	3-1/4	1-1/4	1-1/32	1-7/16	52322
0.1562	3,967 mm	5/32	1/4	3-1/4	1-1/4	1-1/64	1-7/16	51585
0.1570	3,988 mm	#22	1/4	3-1/4	1-1/4	1-1/64	1-7/16	52323
0.1575	4,000 mm		6,0	74,0	36,0	30,0	36,0	64110
0.1590	4,039 mm	#21	1/4	3-1/4	1-1/4	1-1/64	1-7/16	51586
0.1610	4,089 mm	#20	1/4	3-1/4	1-1/4	1	1-7/16	51587
0.1614	4,100 mm		6,0	74,0	36,0	30,0	36,0	64111
0.1654	4,200 mm		6,0	74,0	36,0	30,0	36,0	64112
0.1660	4,216 mm	#19	1/4	3-1/4	1-1/4	1	1-7/16	52324
0.1693	4,300 mm		6,0	74,0	36,0	30,0	36,0	64113
0.1695	4,305 mm	#18	1/4	3-1/4	1-1/4	1	1-7/16	52325
0.1719	4,366 mm	11/64	1/4	3-1/4	1-1/4	1	1-7/16	51588
0.1730	4,394 mm	#17	1/4	3-1/4	1-1/4	1	1-7/16	52326
0.1732	4,400 mm		6,0	74,0	36,0	29,0	36,0	64114
0.1772	4,500 mm		6,0	74,0	36,0	29,0	36,0	64115
0.1800	4,572 mm	#15	1/4	3-1/4	1-1/4	63/64	1-7/16	52327
0.1811	4,600 mm		6,0	74,0	36,0	29,0	36,0	64116
0.1820	4,623 mm	#14	1/4	3-1/4	1-1/4	63/64	1-7/16	52328
0.1850	4,699 mm	#13	1/4	3-1/4	1-1/4	63/64	1-7/16	52329
0.1850	4,699 mm	#13	6,0	74,0	36,0	29,0	36,0	64117
0.1875	4,763 mm	3/16	1/4	3-1/4	1-3/4	1-15/32	1-7/16	51589
0.1890	4,801 mm	#12	1/4	3-1/4	1-3/4	1-15/32	1-7/16	52330
0.1890	4,801 mm	#12	6,0	82,0	44,0	37,0	36,0	64118
0.1929	4,900 mm		6,0	82,0	44,0	37,0	36,0	64119
0.1935	4,915 mm	#10	1/4	3-1/4	1-3/4	1-15/32	1-7/16	52331
0.1960	4,978 mm	#9	1/4	3-1/4	1-3/4	1-15/32	1-7/16	52332
0.1969	5,000 mm		6,0	82,0	44,0	36,0	36,0	64120
0.1990	5,055 mm	#8	1/4	3-1/4	1-3/4	1-15/32	1-7/16	52333
0.2008	5,100 mm		6,0	82,0	44,0	36,0	36,0	64121
0.2010	5,105 mm	#7	1/4	3-1/4	1-3/4	1-29/64	1-7/16	51506
0.2031	5,159 mm	13/64	1/4	3-1/4	1-3/4	1-29/64	1-7/16	51507
0.2040	5,182 mm	#6	1/4	3 1/4	1 3/4	1-29/64	1 7/16	52334
0.2047	5,200 mm		6,0	82,0	44,0	36,0	36,0	64122

continued on next page

CONTINUED



5xD



135 5xD

FRACTIONAL & METRIC SERIES

CONTINUED

- 4-margin design improves accuracy and surface finish along with increased strength for aggressive drilling
- Specialized self-centering notched point eliminates the need for spot drilling decreasing thrust and deflection
- Engineered edge protection improves edge strength and reduces edge fatigue allowing for increased feed rates
- Recommended for materials ≤ 56 HRc (≤ 577 Bhn)

DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	inch & mm		OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	EDP NO.
			SHANK DIAMETER DCON	Ti-NAMITE-A (AITiN)					
0.2055	5,220 mm	#5	1/4	51590	3-1/4	1-3/4	1-29/64	1-7/16	
0.2067	5,250 mm		6,0	64123	82,0	44,0	36,0	36,0	
0.2087	5,300 mm		6,0	64124	82,0	44,0	36,0	36,0	
0.2090	5,309 mm	#4	1/4	51508	3-1/4	1-3/4	1-7/16	1-7/16	
0.2126	5,400 mm		6,0	64125	82,0	44,0	36,0	36,0	
0.2130	5,410 mm	#3	1/4	51509	3-1/4	1-3/4	1-7/16	1-7/16	
0.2165	5,500 mm		6,0	64126	82,0	44,0	36,0	36,0	
0.2188	5,558 mm	7/32	1/4	51510	3-1/4	1-3/4	1-27/64	1-7/16	
0.2205	5,600 mm		6,0	64127	82,0	44,0	36,0	36,0	
0.2210	5,613 mm	#2	1/4	52335	3-1/4	1-3/4	1-27/64	1-7/16	
0.2244	5,700 mm		6,0	64128	82,0	44,0	35,0	36,0	
0.2280	5,791 mm	#1	1/4	52336	3-1/4	1-3/4	1-13/32	1-7/16	
0.2283	5,800 mm		6,0	64129	82,0	44,0	35,0	36,0	
0.2323	5,900 mm		6,0	64130	82,0	44,0	35,0	36,0	
0.2340	5,944 mm	A	1/4	52337	3-1/4	1-3/4	1-13/32	1-7/16	
0.2344	5,954 mm	15/64	1/4	51591	3-1/4	1-3/4	1-13/32	1-7/16	
0.2362	6,000 mm		6,0	64131	82,0	44,0	35,0	36,0	
0.2380	6,045 mm	B	1/4	52338	3 5/8	2-5/64	1-13/32	1-7/16	
0.2402	6,100 mm		8,0	64132	91,0	53,0	44,0	36,0	
0.2420	6,147 mm	C	1/4	52339	3 5/8	2-5/64	1-13/32	1-7/16	
0.2441	6,200 mm		8,0	64133	91,0	53,0	44,0	36,0	
0.2460	6,248 mm	D	1/4	52340	3 5/8	2-5/64	1-13/32	1-7/16	
0.2461	6,250 mm		8,0	64134	91,0	53,0	44,0	36,0	
0.2480	6,300 mm		8,0	64135	91,0	53,0	44,0	36,0	
0.2500	6,350 mm	1/4 E	1/4	51511	3-5/8	2-5/64	1-45/64	1-7/16	
0.2520	6,400 mm		8,0	64136	91,0	53,0	43,0	36,0	
0.2559	6,500 mm		8,0	64137	91,0	53,0	43,0	36,0	
0.2570	6,528 mm	F	5/16	51512	3-5/8	2-5/64	1-45/64	1-7/16	
0.2598	6,600 mm		8,0	64138	91,0	53,0	43,0	36,0	
0.2610	6,629 mm	G	5/16	52341	3 5/8	2 5/64	1-11/16	1 7/16	
0.2638	6,700 mm		8,0	64139	91,0	53,0	43,0	36,0	
0.2656	6,746 mm	17/64	5/16	51513	3-5/8	2-5/64	1-11/16	1-7/16	
0.2660	6,756 mm	H	5/16	52342	3-5/8	2-5/64	1-11/16	1-7/16	
0.2677	6,800 mm		8,0	64140	91,0	53,0	43,0	36,0	
0.2717	6,900 mm		8,0	64141	91,0	53,0	43,0	36,0	
0.2720	6,909 mm	I	5/16	51514	3-5/8	2-5/64	1-43/64	1-7/16	

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TOLERANCES (inch)

 $\leq .1181$ DIAMETERDC = $\pm .00008/\pm .00047$ DCON = h_6 $> .1181 - .2362$ DIAMETERDC = $\pm .00016/\pm .00063$ DCON = h_6 $> .2362 - .3937$ DIAMETERDC = $\pm .00024/\pm .00083$ DCON = h_6 $> .3937 - .7087$ DIAMETERDC = $\pm .00028/\pm .00098$ DCON = h_6 $> .7087 - 1.1811$ DIAMETERDC = $\pm .00031/\pm .00114$ DCON = h_6

TOLERANCES (mm)

 ≤ 3 DIAMETERDC = $\pm 0,002/\pm 0,012$ DCON = h_6 $> 3 - 6$ DIAMETERDC = $\pm 0,004/\pm 0,016$ DCON = h_6 $> 6 - 10$ DIAMETERDC = $\pm 0,006/\pm 0,021$ DCON = h_6 $> 10 - 18$ DIAMETERDC = $\pm 0,007/\pm 0,025$ DCON = h_6 $> 18 - 30$ DIAMETERDC = $\pm 0,008/\pm 0,029$ DCON = h_6

STEELS

STAINLESS STEELS

CAST IRON

NON-FERROUS

HIGH TEMP ALLOYS

HARDENED STEELS

135 5xD

FRACTIONAL & METRIC SERIES

DECIMAL DC	METRIC DC	inch & mm						EDP NO. Ti-NAMITE-A (AITiN)
		FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	
0.2756	7,000 mm		8,0	91,0	53,0	42,0	36,0	64142
0.2770	7,036 mm	J	5/16	3 5/8	2-5/64	1-43/64	1-7/16	52343
0.2795	7,100 mm		8,0	91,0	53,0	42,0	36,0	64143
0.2810	7,137 mm	K	5/16	3 5/8	2-5/64	1-21/32	1-7/16	52344
0.2812	7,142 mm	9/32	5/16	3-5/8	2-5/64	1-21/32	1-7/16	51515
0.2835	7,200 mm		8,0	91,0	53,0	42,0	36,0	64144
0.2854	7,250 mm		8,0	91,0	53,0	42,0	36,0	64145
0.2874	7,300 mm		8,0	91,0	53,0	42,0	36,0	64146
0.2900	7,366 mm	L	5/16	3-5/8	2-5/64	1-41/64	1-7/16	52345
0.2913	7,400 mm		8,0	91,0	53,0	42,0	36,0	64147
0.2950	7,493 mm	M	5/16	3-5/8	2-5/64	1-41/64	1-7/16	52346
0.2953	7,500 mm		8,0	91,0	53,0	42,0	36,0	64148
0.2969	7,541 mm	19/64	5/16	3-5/8	2-5/64	1-41/64	1-7/16	51516
0.2992	7,600 mm		8,0	91,0	53,0	42,0	36,0	64149
0.3020	7,671 mm	N	5/16	3-5/8	2-5/64	1-5/8	1-7/16	52347
0.3031	7,700 mm		8,0	91,0	53,0	41,0	36,0	64150
0.3071	7,800 mm		8,0	91,0	53,0	41,0	36,0	64151
0.3110	7,900 mm		8,0	91,0	53,0	41,0	36,0	64152
0.3125	7,938 mm	5/16	5/16	3-5/8	2-5/64	1-39/64	1-7/16	51517
0.3150	8,000 mm		8,0	91,0	53,0	41,0	36,0	64153
0.3160	8,026 mm	O	3/8	4	2-13/32	1-15/16	1-9/16	52348
0.3189	8,100 mm		10,0	103,0	61,0	49,0	40,0	64154
0.3228	8,200 mm		10,0	103,0	61,0	49,0	40,0	64155
0.3230	8,204 mm	P	3/8	4	2-13/32	1-59/64	1-9/16	51518
0.3268	8,300 mm		10,0	103,0	61,0	49,0	40,0	64156
0.3281	8,334 mm	21/64	3/8	4	2-13/32	1-59/64	1-9/16	51519
0.3307	8,400 mm		10,0	103,0	61,0	48,0	40,0	64157
0.3320	8,433 mm	Q	3/8	4	2-13/32	1-59/64	1-9/16	51520
0.3346	8,500 mm		10,0	103,0	61,0	48,0	40,0	64158
0.3386	8,600 mm		10,0	103,0	61,0	48,0	40,0	64159
0.3390	8,611 mm	R	3/8	4	2-13/32	1-29/32	1-9/16	52349
0.3425	8,700 mm		10,0	103,0	61,0	48,0	40,0	64160
0.3438	8,733 mm	11/32	3/8	4	2-13/32	1-57/64	1-9/16	51521
0.3465	8,800 mm		10,0	103,0	61,0	48,0	40,0	64161
0.3480	8,839 mm	S	3/8	4	2-13/32	1-57/64	1-9/16	51522
0.3504	8,900 mm		10,0	103,0	61,0	48,0	40,0	64162
0.3543	9,000 mm		10,0	103,0	61,0	48,0	40,0	64163
0.3580	9,093 mm	T	3/8	4	2 13/32	1-7/8	1 9/16	52350
0.3583	9,100 mm		10,0	103,0	61,0	47,0	40,0	64164
0.3594	9,129 mm	23/64	3/8	4	2-13/32	1-7/8	1-9/16	51523
0.3622	9,200 mm		10,0	103,0	61,0	47,0	40,0	64165
0.3642	9,250 mm		10,0	103,0	61,0	47,0	40,0	64166
0.3661	9,300 mm		10,0	103,0	61,0	47,0	40,0	64167
0.3680	9,347 mm	U	3/8	4	2-13/32	1-55/64	1-9/16	51524
0.3701	9,400 mm		10,0	103,0	61,0	47,0	40,0	64168
0.3740	9,500 mm		10,0	103,0	61,0	47,0	40,0	64169

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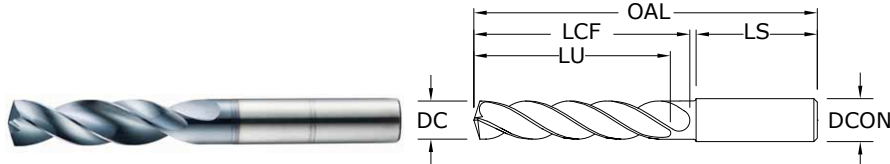


5xD



135 5xD

FRACTIONAL & METRIC SERIES



CONTINUED

- 4-margin design improves accuracy and surface finish along with increased strength for aggressive drilling
- Specialized self-centering notched point eliminates the need for spot drilling decreasing thrust and deflection
- Engineered edge protection improves edge strength and reduces edge fatigue allowing for increased feed rates
- Recommended for materials ≤ 56 HRc (≤ 577 Bhn)

inch & mm									EDP NO.
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	Ti-NAMITE-A (AITiN)	
0.3750	9,525 mm	3/8	3/8	4	2-13/32	1-27/32	1-9/16	51525	
0.3770	9,576 mm	V	1/2	4	2-13/32	1-27/32	1-9/16	52351	
0.3780	9,600 mm		10,0	103,0	61,0	47,0	40,0	64170	
0.3819	9,700 mm		10,0	103,0	61,0	46,0	40,0	64171	
0.3858	9,800 mm		10,0	103,0	61,0	46,0	40,0	64172	
0.3860	9,804 mm	W	1/2	4	2-13/32	1-53/64	1-9/16	51526	
0.3898	9,900 mm		10,0	103,0	61,0	46,0	40,0	64173	
0.3906	9,921 mm	25/64	1/2	4	2-13/32	1-53/64	1-9/16	51527	
0.3937	10,000 mm		10,0	103,0	61,0	46,0	40,0	64174	
0.3970	10,084 mm	X	1/2	4-11/16	2-3/4	2-5/32	1-49/64	52352	
0.3976	10,100 mm		12,0	118,0	71,0	56,0	45,0	64175	
0.4016	10,200 mm		12,0	118,0	71,0	56,0	45,0	64176	
0.4040	10,262 mm	Y	1/2	4-11/16	2-3/4	2-5/32	1-49/64	52353	
0.4055	10,300 mm		12,0	118,0	71,0	56,0	45,0	64177	
0.4062	10,317 mm	13/32	1/2	4-11/16	2-3/4	2-9/64	1-49/64	51528	
0.4095	10,400 mm		12,0	118,0	71,0	55,0	45,0	64178	
0.4130	10,490 mm	Z	1/2	4-11/16	2-3/4	2-9/64	1-49/64	52354	
0.4134	10,500 mm		12,0	118,0	71,0	55,0	45,0	64179	
0.4173	10,600 mm		12,0	118,0	71,0	55,0	45,0	64180	
0.4213	10,700 mm		12,0	118,0	71,0	55,0	45,0	64181	
0.4219	10,716 mm	27/64	1/2	4-11/16	2-3/4	2-1/8	1-49/64	51529	
0.4252	10,800 mm		12,0	118,0	71,0	55,0	45,0	64182	
0.4291	10,900 mm		12,0	118,0	71,0	55,0	45,0	64183	
0.4331	11,000 mm		12,0	118,0	71,0	54,0	45,0	64184	
0.4370	11,100 mm		12,0	118,0	71,0	54,0	45,0	64185	
0.4375	11,113 mm	7/16	1/2	4-11/16	2-3/4	2-3/32	1-49/64	51530	
0.4409	11,200 mm		12,0	118,0	71,0	54,0	45,0	64186	
0.4429	11,250 mm		12,0	118,0	71,0	54,0	45,0	64187	
0.4449	11,300 mm		12,0	118,0	71,0	54,0	45,0	64188	
0.4488	11,400 mm		12,0	118,0	71,0	54,0	45,0	64189	
0.4528	11,500 mm		12,0	118,0	71,0	54,0	45,0	64190	
0.4531	11,509 mm	29/64	1/2	4-11/16	2-3/4	2-5/64	1-49/64	51531	
0.4567	11,600 mm		12,0	118,0	71,0	54,0	45,0	64191	
0.4606	11,700 mm		12,0	118,0	71,0	53,0	45,0	64192	
0.4646	11,800 mm		12,0	118,0	71,0	53,0	45,0	64193	
0.4685	11,900 mm		12,0	118,0	71,0	53,0	45,0	64194	

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TOLERANCES (inch)

 $\leq .1181$ DIAMETER

DC = $+0.0008/+0.0047$
DCON = h_6

>.1181-.2362 DIAMETER

DC = $+0.0016/+0.0063$
DCON = h_6

>.2362-.3937 DIAMETER

DC = $+0.0024/+0.0083$
DCON = h_6

>.3937-.7087 DIAMETER

DC = $+0.0028/+0.0098$
DCON = h_6

>.7087-1.1811 DIAMETER

DC = $+0.0031/+0.0114$
DCON = h_6

TOLERANCES (mm)

 ≤ 3 DIAMETER

DC = $+0,002/+0,012$
DCON = h_6

>3-6 DIAMETER

DC = $+0,004/+0,016$
DCON = h_6

>6-10 DIAMETER

DC = $+0,006/+0,021$
DCON = h_6

>10-18 DIAMETER

DC = $+0,007/+0,025$
DCON = h_6

>18-30 DIAMETER

DC = $+0,008/+0,029$
DCON = h_6

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

135 5xD

FRACTIONAL & METRIC SERIES

DECIMAL DC	METRIC DC	inch & mm						EDP NO. Ti-NAMITE-A (AITiN)
		FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	
0.4688	11,908 mm	15/32	1/2	4-11/16	2-3/4	2-3/64	1-49/64	51532
0.4724	12,000 mm		12,0	118,0	71,0	53,0	45,0	64195
0.4844	12,304 mm	31/64	1/2	4-7/8	3-1/32	1-5/16	1-49/64	51533
0.4921	12,500 mm		14,0	124,0	77,0	58,0	45,0	64196
0.5000	12,700 mm	1/2	1/2	4-7/8	3-1/32	2-9/32	1-49/64	51534
0.5039	12,800 mm		14,0	124,0	77,0	58,0	45,0	64197
0.5118	13,000 mm		14,0	124,0	77,0	58,0	45,0	64198
0.5156	13,096 mm	33/64	5/8	4-7/8	3-1/32	2-17/64	1-49/64	51535
0.5312	13,492 mm	17/32	5/8	4-7/8	3-1/32	2-15/64	1-49/64	51536
0.5315	13,500 mm		14,0	124,0	77,0	57,0	45,0	64199
0.5469	13,800 mm	35/64	5/8	4-7/8	3-1/32	2-7/32	1-49/64	51537
0.5512	14,000 mm		14,0	124,0	77,0	56,0	45,0	64200
0.5625	14,288 mm	9/16	5/8	5-1/4	3-1/4	2-13/32	1-57/64	51538
0.5709	14,500 mm		16,0	133,0	83,0	61,0	48,0	64201
0.5781	14,684 mm	37/64	5/8	5-1/4	3-1/4	2-25/64	1-57/64	51539
0.5906	15,000 mm		16,0	133,0	83,0	60,0	48,0	64202
0.5938	15,083 mm	19/32	5/8	5-1/4	3-1/4	2-23/64	1-57/64	51592
0.6094	15,479 mm	39/64	5/8	5-1/4	3-1/4	2-11/32	1-57/64	51593
0.6102	15,500 mm		16,0	133,0	83,0	60,0	48,0	64203
0.6250	15,875 mm	5/8	5/8	5-1/4	3-1/4	2-5/16	1-57/64	51540
0.6299	16,000 mm		16,0	133,0	83,0	59,0	48,0	64204
0.6406	16,271 mm	41/64	3/4	5-5/8	3-5/8	2-43/64	1-57/64	51594
0.6496	16,500 mm		18,0	143,0	93,0	68,0	48,0	64205
0.6562	16,667 mm	21/32	3/4	5-5/8	3-5/8	2-41/64	1-57/64	51541
0.6693	17,000 mm		18,0	143,0	93,0	67,0	48,0	64206
0.6719	17,066 mm	43/64	3/4	5-5/8	3-5/8	2-5/8	1-57/64	51595
0.6875	17,463 mm	11/16	3/4	5-5/8	3-5/8	2-19/32	1-57/64	51542
0.6890	17,500 mm		18,0	143,0	93,0	67,0	48,0	64207
0.7031	17,859 mm	45/64	3/4	5-5/8	3-5/8	2-37/64	1-57/64	51543
0.7087	18,000 mm		18,0	143,0	93,0	66,0	48,0	64208
0.7188	18,258 mm	23/32	3/4	6	4	2-59/64	1-31/32	51596
0.7283	18,500 mm		20,0	153,0	101,0	73,0	50,0	64209
0.7344	18,654 mm	47/64	3/4	6	4	2-29/32	1-31/32	51544
0.7480	19,000 mm		20,0	153,0	101,0	73,0	50,0	64210
0.7500	19,050 mm	3/4	3/4	6	4	2-7/8	1-31/32	51545
0.7656	19,446 mm	49/64	7/8	6	4	2-55/64	1-31/32	52355
0.7677	19,500 mm		20,0	153,0	101,0	72,0	50,0	64211
0.7812	19,842 mm	25/32	7/8	6	4	2-55/64	1-31/32	52356
0.7874	20,000 mm		20,0	153,0	101,0	71,0	50,0	64212
0.7969	20,241 mm	51/64	7/8	6	4	2-13/16	1-31/32	52357
0.8071	20,500 mm		22,0	153,0	101,0	70,0	50,0	64533
0.8125	20,638 mm	13/16	7/8	6-1/2	4-1/2	3-3/32	1-31/32	52358
0.8268	21,000 mm		22,0	153,0	101,0	69,0	50,0	64534
0.8661	22,000 mm		22,0	178,0	127,0	94,0	50,0	64535
0.8750	22,225 mm	7/8	7/8	6-1/2	4-1/2	3-3/16	1-31/32	52359
0.9219	23,416 mm	59/64	1	7	5	3-5/8	2-1/8	52360

CONTINUED

	Series 135 5D Fractional	Hardness	Vc (sfm)	DC • in							
				1/32	1/8	1/4	3/8	1/2	5/8	7/8	
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	345	RPM	42173	10543	5272	3514	2636	2109	1506
			(276-414)	Fr	0.0010	0.0040	0.0080	0.0120	0.0159	0.0199	0.0279
				Feed (ipm)	42.0	42.0	42.0	42.0	42.0	42.0	42.0
		≤ 275 Bhn or ≤ 28 HRc	310	RPM	37894	9474	4737	3158	2368	1895	1353
			(248-372)	Fr	0.0009	0.0036	0.0072	0.0108	0.0144	0.0179	0.0251
				Feed (ipm)	34.0	34.0	34.0	34.0	34.0	34.0	34.0
		≤ 425 Bhn or ≤ 45 HRc	180	RPM	22003	5501	2750	1834	1375	1100	786
			(144-216)	Fr	0.0007	0.0030	0.0060	0.0090	0.0120	0.0150	0.0210
				Feed (ipm)	16.5	16.5	16.5	16.5	16.5	16.5	16.5
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc	270	RPM	33005	8251	4126	2750	2063	1650	1179
			(216-324)	Fr	0.0008	0.0030	0.0061	0.0091	0.0121	0.0151	0.0212
				Feed (ipm)	25.0	25.0	25.0	25.0	25.0	25.0	25.0
		≤ 375 Bhn or ≤ 40 HRc	165	RPM	20170	5042	2521	1681	1261	1008	720
			(132-198)	Fr	0.0006	0.0026	0.0052	0.0077	0.0103	0.0129	0.0180
				Feed (ipm)	13.0	13.0	13.0	13.0	13.0	13.0	13.0
		≤ 425 Bhn or ≤ 45 HRc	115	RPM	14058	3514	1757	1171	879	703	502
			(92-138)	Fr	0.0004	0.0018	0.0035	0.0053	0.0071	0.0088	0.0123
				Feed (ipm)	6.2	6.2	6.2	6.2	6.2	6.2	6.2
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 200 Bhn or ≤ 13 HRc	120	RPM	14669	3667	1834	1222	917	733	524
			(96-144)	Fr	0.0006	0.0026	0.0051	0.0077	0.0103	0.0128	0.0179
				Feed (ipm)	9.4	9.4	9.4	9.4	9.4	9.4	9.4
		≤ 375 Bhn or ≤ 40 HRc	80	RPM	9779	2445	1222	815	611	489	349
			(64-96)	Fr	0.0003	0.0012	0.0024	0.0036	0.0047	0.0059	0.0083
				Feed (ipm)	2.9	2.9	2.9	2.9	2.9	2.9	2.9
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 185 Bhn or ≤ 9 HRc	250	RPM	30560	7640	3820	2547	1910	1528	1091
			(200-300)	Fr	0.0006	0.0026	0.0051	0.0077	0.0102	0.0128	0.0179
				Feed (ipm)	19.5	19.5	19.5	19.5	19.5	19.5	19.5
		≤ 275 Bhn or ≤ 28 HRc	150	RPM	18336	4584	2292	1528	1146	917	655
			(120-180)	Fr	0.0005	0.0020	0.0039	0.0059	0.0079	0.0098	0.0137
				Feed (ipm)	9.0	9.0	9.0	9.0	9.0	9.0	9.0
	STAINLESS STEELS (DIFFICULT) 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	≤ 275 Bhn or ≤ 28 HRc	80	RPM	9779	2445	1222	815	611	489	349
			(64-96)	Fr	0.0005	0.0020	0.0039	0.0059	0.0079	0.0098	0.0137
				Feed (ipm)	4.8	4.8	4.8	4.8	4.8	4.8	4.8
		≤ 375 Bhn or ≤ 40 HRc	55	RPM	6723	1681	840	560	420	336	240
			(44-66)	Fr	0.0004	0.0018	0.0036	0.0054	0.0071	0.0089	0.0125
				Feed (ipm)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
K	CAST IRONS Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	300	RPM	36672	9168	4584	3056	2292	1834	1310
			(240-360)	Fr	0.0011	0.0045	0.0089	0.0134	0.0179	0.0224	0.0313
				Feed (ipm)	41.0	41.0	41.0	41.0	41.0	41.0	41.0
		≤ 260 Bhn or ≤ 26 HRc	265	RPM	32394	8098	4049	2699	2025	1620	1157
			(212-318)	Fr	0.0011	0.0046	0.0091	0.0137	0.0183	0.0228	0.0320
				Feed (ipm)	37.0	37.0	37.0	37.0	37.0	37.0	37.0

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	Series 135 5D Fractional	Hardness	Vc (sfm)	DC • in							
				1/32	1/8	1/4	3/8	1/2	5/8	7/8	
N	ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075	≤ 80 Bhn or ≤ 47 HRb	635	RPM	77622	19406	9703	6469	4851	3881	2772
			(508-762)	Fr	0.0012	0.0049	0.0099	0.0148	0.0198	0.0247	0.0346
				Feed (ipm)	96.0	96.0	96.0	96.0	96.0	96.0	96.0
		≤ 150 Bhn or ≤ 88 HRc	540	RPM	66010	16502	8251	5501	4126	3300	2357
			(432-648)	Fr	0.0012	0.0050	0.0099	0.0149	0.0199	0.0248	0.0348
				Feed (ipm)	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	COPPER ALLOYS Alum Bronze, C110, Muntz Brass	≤ 140 Bhn or ≤ 3 HRc	450	RPM	55008	13752	6876	4584	3438	2750	1965
			(360-540)	Fr	0.0005	0.0020	0.0040	0.0060	0.0080	0.0100	0.0140
				Feed (ipm)	27.5	27.5	27.5	27.5	27.5	27.5	27.5
		≤ 200 Bhn or ≤ 23 HRc	360	RPM	44006	11002	5501	3667	2750	2200	1572
			(288-432)	Fr	0.0005	0.0020	0.0040	0.0060	0.0080	0.0100	0.0140
				Feed (ipm)	22.0	22.0	22.0	22.0	22.0	22.0	22.0
S	HIGH TEMP ALLOYS (Nickel , Cobalt, Iron Base) Inconel 601, 617, 625, Incoloy, Monel 400, Rene, Waspaloy	≤ 300 Bhn or ≤ 32 HRc	40	RPM	4890	1222	611	407	306	244	175
			(32-48)	Fr	0.0002	0.0008	0.0016	0.0025	0.0033	0.0041	0.0057
				Feed (ipm)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
		≤ 400 Bhn or ≤ 43 HRc	20	RPM	2445	611	306	204	153	122	87
			(16-24)	Fr	0.0002	0.0007	0.0013	0.0020	0.0026	0.0033	0.0046
				Feed (ipm)	0.4	0.4	0.4	0.4	0.4	0.4	0.4
	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V	≤ 275 Bhn or ≤ 28 HRc	105	RPM	12835	3209	1604	1070	802	642	458
			(84-126)	Fr	0.0005	0.0018	0.0036	0.0054	0.0072	0.0090	0.0127
				Feed (ipm)	5.8	5.8	5.8	5.8	5.8	5.8	5.8
		≤ 350 Bhn or ≤ 38 HRc	80	RPM	9779	2445	1222	815	611	489	349
			(64-96)	Fr	0.0004	0.0016	0.0032	0.0048	0.0064	0.0080	0.0112
				Feed (ipm)	3.9	3.9	3.9	3.9	3.9	3.9	3.9
		≤ 440 Bhn or ≤ 47 HRc	42	RPM	5134	1284	642	428	321	257	183
			(34-50)	Fr	0.0003	0.0012	0.0025	0.0037	0.0050	0.0062	0.0087
				Feed (ipm)	1.6	1.6	1.6	1.6	1.6	1.6	1.6
H	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 475 Bhn or ≤ 50 HRc	70	RPM	8557	2139	1070	713	535	428	306
			(56-84)	Fr	0.0002	0.0008	0.0016	0.0024	0.0032	0.0040	0.0056
				Feed (ipm)	1.7	1.7	1.7	1.7	1.7	1.7	1.7

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)

rpm = Vc x 3.82 / DC

ipm = Fr x rpm

reduce speed and feed for materials harder than listed

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)

Hi-PerCarb

	Series 135M 5D Metric	Hardness	Vc (m/min)	DC • mm								
				1.5	3	6	8	10	12	16	20	
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	105	RPM	22297	11148	5574	4181	3344	2787	2090	1672
			(84-126)	Fr	0.048	0.095	0.190	0.254	0.317	0.380	0.507	0.634
				Feed (mm/min)	1060	1060	1060	1060	1060	1060	1060	1060
		≤ 275 Bhn or ≤ 28 HRc	94	RPM	20035	10017	5009	3756	3005	2504	1878	1503
			(76-113)	Fr	0.043	0.085	0.171	0.228	0.285	0.341	0.455	0.569
				Feed (mm/min)	855	855	855	855	855	855	855	855
		≤ 425 Bhn or ≤ 45 HRc	55	RPM	11633	5816	2908	2181	1745	1454	1091	872
			(44-66)	Fr	0.036	0.071	0.143	0.190	0.238	0.285	0.381	0.476
				Feed (mm/min)	415	415	415	415	415	415	415	415
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc	82	RPM	17449	8725	4362	3272	2617	2181	1636	1309
			(66-99)	Fr	0.036	0.072	0.143	0.191	0.239	0.287	0.382	0.478
				Feed (mm/min)	625	625	625	625	625	625	625	625
		≤ 375 Bhn or ≤ 40 HRc	50	RPM	10664	5332	2666	1999	1600	1333	1000	800
			(40-60)	Fr	0.031	0.062	0.124	0.165	0.206	0.248	0.330	0.413
				Feed (mm/min)	330	330	330	330	330	330	330	330
		≤ 425 Bhn or ≤ 45 HRc	35	RPM	7432	3716	1858	1394	1115	929	697	557
			(28-42)	Fr	0.022	0.043	0.086	0.115	0.144	0.172	0.230	0.287
				Feed (mm/min)	160	160	160	160	160	160	160	160
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 200 Bhn or ≤ 13 HRc	37	RPM	7755	3878	1939	1454	1163	969	727	582
			(29-44)	Fr	0.031	0.062	0.124	0.165	0.206	0.248	0.330	0.413
				Feed (mm/min)	240	240	240	240	240	240	240	240
		≤ 375 Bhn or ≤ 40 HRc	24	RPM	5170	2585	1293	969	776	646	485	388
			(20-29)	Fr	0.015	0.029	0.058	0.077	0.097	0.116	0.155	0.193
				Feed (mm/min)	75	75	75	75	75	75	75	75
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 185 Bhn or ≤ 9 HRc	76	RPM	16157	8078	4039	3029	2424	2020	1515	1212
			(61-91)	Fr	0.031	0.061	0.123	0.163	0.204	0.245	0.327	0.408
				Feed (mm/min)	495	495	495	495	495	495	495	495
		≤ 275 Bhn or ≤ 28 HRc	46	RPM	9694	4847	2424	1818	1454	1212	909	727
			(37-55)	Fr	0.024	0.047	0.095	0.127	0.158	0.190	0.253	0.316
				Feed (mm/min)	230	230	230	230	230	230	230	230
	STAINLESS STEELS (DIFFICULT) 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	≤ 275 Bhn or ≤ 28 HRc	24	RPM	5170	2585	1293	969	776	646	485	388
			(20-29)	Fr	0.023	0.046	0.093	0.124	0.155	0.186	0.248	0.309
				Feed (mm/min)	120	120	120	120	120	120	120	120
		≤ 375 Bhn or ≤ 40 HRc	17	RPM	3555	1777	889	666	533	444	333	267
			(13-20)	Fr	0.021	0.042	0.084	0.113	0.141	0.169	0.225	0.281
				Feed (mm/min)	75	75	75	75	75	75	75	75
K	CAST IRONS Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	91	RPM	19388	9694	4847	3635	2908	2424	1818	1454
			(73-110)	Fr	0.054	0.108	0.217	0.289	0.361	0.433	0.578	0.722
				Feed (mm/min)	1050	1050	1050	1050	1050	1050	1050	1050
		≤ 260 Bhn or ≤ 26 HRc	81	RPM	17126	8563	4282	3211	2569	2141	1606	1284
			(65-97)	Fr	0.055	0.109	0.218	0.291	0.364	0.437	0.582	0.728
				Feed (mm/min)	935	935	935	935	935	935	935	935

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	Series 135M 5D Metric	Hardness	Vc (m/min)	DC • mm							
				1.5	3	6	8	10	12	16	20
N	ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075	≤ 80 Bhn or ≤ 47 HRb	194	RPM	41039	20519	10260	7695	6156	5130	3078
			(155-232)	Fr	0.059	0.118	0.237	0.316	0.395	0.474	0.632
				Feed (mm/min)	2430	2430	2430	2430	2430	2430	2430
		≤ 150 Bhn or ≤ 88 HRc	165	RPM	34899	17449	8725	6544	5235	4362	2617
			(132-198)	Fr	0.059	0.118	0.237	0.316	0.394	0.473	0.631
				Feed (mm/min)	2065	2065	2065	2065	2065	2065	2065
	COPPER ALLOYS Alum Bronze, C110, Muntz Brass	≤ 140 Bhn or ≤ 3 HRc	137	RPM	29082	14541	7271	5453	4362	3635	2181
			(110-165)	Fr	0.027	0.053	0.107	0.142	0.178	0.213	0.284
				Feed (mm/min)	775	775	775	775	775	775	775
		≤ 200 Bhn or ≤ 23 HRc	110	RPM	23266	11633	5816	4362	3490	2908	1745
			(88-132)	Fr	0.027	0.054	0.108	0.144	0.181	0.217	0.289
				Feed (mm/min)	630	630	630	630	630	630	630
S	HIGH TEMP ALLOYS (Nickel, Cobalt, Iron Base) Inconel 601, 617, 625, Incoloy, Monel 400, Rene, Waspaloy	≤ 300 Bhn or ≤ 32 HRc	12	RPM	2585	1293	646	485	388	323	242
			(10-15)	Fr	0.010	0.019	0.039	0.052	0.064	0.077	0.103
				Feed (mm/min)	25	25	25	25	25	25	25
		≤ 400 Bhn or ≤ 43 HRc	6	RPM	1293	646	323	242	194	162	121
			(5-7)	Fr	0.007	0.014	0.028	0.037	0.046	0.056	0.074
				Feed (mm/min)	9	9	9	9	9	9	9
	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V	≤ 275 Bhn or ≤ 28 HRc	32	RPM	6786	3393	1696	1272	1018	848	636
			(26-38)	Fr	0.021	0.043	0.085	0.114	0.142	0.171	0.228
				Feed (mm/min)	145	145	145	145	145	145	145
		≤ 350 Bhn or ≤ 38 HRc	24	RPM	5170	2585	1293	969	776	646	485
			(20-29)	Fr	0.019	0.039	0.077	0.103	0.129	0.155	0.206
				Feed (mm/min)	100	100	100	100	100	100	100
		≤ 440 Bhn or ≤ 47 HRc	13	RPM	2714	1357	679	509	407	339	254
			(10-15)	Fr	0.015	0.029	0.059	0.079	0.098	0.118	0.157
				Feed (mm/min)	40	40	40	40	40	40	40
H	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 475 Bhn or ≤ 50 HRc	21	RPM	4524	2262	1131	848	679	565	424
			(17-26)	Fr	0.010	0.019	0.038	0.051	0.064	0.076	0.102
				Feed (mm/min)	43	43	43	43	43	43	43

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)

rpm = (Vc x 1000) / (DC x 3.14)

mm/min = Fr x rpm

reduce speed and feed for materials harder than listed

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)

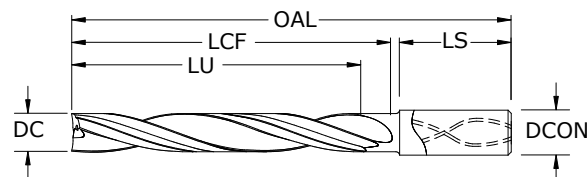


3xD



146U 3xD

FRACTIONAL & METRIC SERIES



- 4-margin design improves accuracy and surface finish along with increased strength for aggressive drilling
- Specialized self-centering notched point eliminates the need for spot drilling decreasing thrust and deflection
- Engineered edge protection improves edge strength and reduces edge fatigue allowing for increased feed rates
- Recommended for materials ≤ 56 HRc (≤ 577 Bhn)

inch & mm								EDP NO.
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	Ti-NAMITE-X (TX)
0.1181	3,000 mm		6,0	55,0	13,0	9,0	34,0	67705
0.1220	3,100 mm		6,0	55,0	14,0	9,0	34,0	67706
0.1250	3,175 mm	1/8	6,0	55,0	14,0	10,0	34,0	58800
0.1260	3,200 mm		6,0	55,0	14,0	10,0	34,0	67707
0.1299	3,300 mm		6,0	55,0	15,0	10,0	34,0	67708
0.1339	3,400 mm		6,0	55,0	15,0	10,0	34,0	67709
0.1360	3,454 mm	#29	6,0	55,0	16,0	10,0	34,0	58801
0.1378	3,500 mm		6,0	55,0	16,0	11,0	34,0	67710
0.1405	3,569 mm	#28	6,0	55,0	16,0	11,0	34,0	58802
0.1406	3,571 mm	9/64	6,0	55,0	16,0	11,0	34,0	58803
0.1417	3,600 mm		6,0	55,0	16,0	11,0	34,0	67711
0.1457	3,700 mm		6,0	60,0	17,0	11,0	34,0	67712
0.1470	3,734 mm	#26	6,0	60,0	17,0	11,0	34,0	58804
0.1495	3,797 mm	#25	6,0	60,0	17,0	11,0	34,0	58805
0.1496	3,800 mm		6,0	60,0	17,0	11,0	34,0	67713
0.1520	3,861 mm	#24	6,0	60,0	17,0	12,0	34,0	58806
0.1535	3,900 mm		6,0	60,0	18,0	12,0	34,0	67714
0.1562	3,967 mm	5/32	6,0	60,0	18,0	12,0	34,0	58807
0.1570	3,988 mm	#22	6,0	60,0	18,0	12,0	34,0	58808
0.1575	4,000 mm		6,0	60,0	18,0	12,0	34,0	67715
0.1590	4,039 mm	#21	6,0	60,0	18,0	12,0	34,0	58809
0.1610	4,089 mm	#20	6,0	60,0	18,0	12,0	34,0	58810
0.1614	4,100 mm		6,0	60,0	18,0	12,0	34,0	67716
0.1654	4,200 mm		6,0	60,0	19,0	13,0	34,0	67717
0.1693	4,300 mm		6,0	60,0	19,0	13,0	34,0	67718
0.1719	4,366 mm	11/64	6,0	60,0	20,0	13,0	34,0	58811
0.1732	4,400 mm		6,0	60,0	20,0	13,0	34,0	67719
0.1770	4,496 mm	#16	6,0	60,0	20,0	13,0	34,0	58812
0.1772	4,500 mm		6,0	60,0	20,0	14,0	34,0	67720
0.1811	4,600 mm		6,0	60,0	21,0	14,0	34,0	67721
0.1850	4,699 mm	#13	6,0	60,0	21,0	14,0	34,0	58813
0.1875	4,763 mm	3/16	6,0	60,0	21,0	14,0	34,0	58814
0.1890	4,801 mm	#12	6,0	65,0	22,0	14,0	33,0	58815
0.1929	4,900 mm		6,0	65,0	22,0	15,0	33,0	67724
0.1935	4,915 mm	#10	6,0	65,0	22,0	15,0	33,0	58816
0.1969	5,000 mm		6,0	65,0	23,0	15,0	33,0	67725

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TOLERANCES (inch)

 $\leq .1181$ DIAMETERDC = $+0.0008/+0.0047$ DCON = h_6 $>.1181-.2362$ DIAMETERDC = $+0.0016/+0.0063$ DCON = h_6 $>.2362-.3937$ DIAMETERDC = $+0.0024/+0.0083$ DCON = h_6 $>.3937-.7087$ DIAMETERDC = $+0.0028/+0.0098$ DCON = h_6 $>.7087-1.1811$ DIAMETERDC = $+0.0031/+0.0114$ DCON = h_6

TOLERANCES (mm)

 ≤ 3 DIAMETERDC = $+0,002/+0,012$ DCON = h_6 $>3-6$ DIAMETERDC = $+0,004/+0,016$ DCON = h_6 $>6-10$ DIAMETERDC = $+0,006/+0,021$ DCON = h_6 $>10-18$ DIAMETERDC = $+0,007/+0,025$ DCON = h_6 $>18-30$ DIAMETERDC = $+0,008/+0,029$ DCON = h_6

STEELS

STAINLESS STEELS

CAST IRON

NON-FERROUS

HIGH TEMP ALLOYS

HARDENED STEELS

146U 3xD

FRACTIONAL & METRIC SERIES

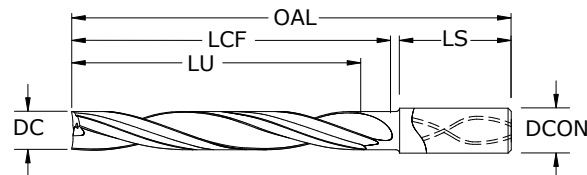
DECIMAL DC	METRIC DC	inch & mm						EDP NO. Ti-NAMITE-X (TX)
		FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	
0.2008	5,100 mm		6,0	65,0	23,0	15,0	33,0	67726
0.2010	5,105 mm	#7	6,0	65,0	23,0	15,0	33,0	58817
0.2031	5,159 mm	13/64	6,0	65,0	23,0	15,0	33,0	58818
0.2047	5,200 mm		6,0	65,0	23,0	16,0	33,0	67727
0.2087	5,300 mm		6,0	65,0	24,0	16,0	33,0	67728
0.2090	5,309 mm	#4	6,0	65,0	24,0	16,0	33,0	58819
0.2126	5,400 mm		6,0	65,0	24,0	16,0	33,0	67729
0.2130	5,410 mm	#3	6,0	65,0	24,0	16,0	33,0	58820
0.2165	5,500 mm		6,0	65,0	25,0	16,0	33,0	67730
0.2188	5,558 mm	7/32	6,0	65,0	25,0	17,0	33,0	58821
0.2205	5,600 mm		6,0	65,0	25,0	17,0	33,0	67731
0.2244	5,700 mm		6,0	65,0	26,0	17,0	33,0	67732
0.2283	5,800 mm		6,0	65,0	26,0	17,0	33,0	67733
0.2323	5,900 mm		6,0	65,0	27,0	18,0	33,0	67734
0.2344	5,954 mm	15/64	6,0	65,0	27,0	18,0	33,0	58822
0.2362	6,000 mm		6,0	65,0	27,0	18,0	33,0	67735
0.2402	6,100 mm		8,0	70,0	28,0	19,0	34,0	67736
0.2441	6,200 mm		8,0	70,0	28,0	19,0	34,0	67737
0.2461	6,250 mm		8,0	70,0	28,0	19,0	34,0	67738
0.2480	6,300 mm		8,0	70,0	28,0	19,0	34,0	67739
0.2500	6,350 mm	1/4 E	8,0	70,0	29,0	19,0	34,0	58823
0.2520	6,400 mm		8,0	70,0	29,0	19,0	34,0	67740
0.2559	6,500 mm		8,0	70,0	29,0	19,0	34,0	67741
0.2570	6,528 mm	F	8,0	70,0	29,0	20,0	34,0	58824
0.2598	6,600 mm		8,0	70,0	30,0	20,0	34,0	67742
0.2638	6,700 mm		8,0	70,0	30,0	20,0	34,0	67743
0.2656	6,746 mm	17/64	8,0	70,0	30,0	20,0	34,0	58825
0.2677	6,800 mm		8,0	70,0	31,0	20,0	34,0	67744
0.2717	6,900 mm		8,0	70,0	31,0	21,0	34,0	67745
0.2720	6,909 mm	I	8,0	70,0	31,0	21,0	34,0	58826
0.2756	7,000 mm		8,0	75,0	32,0	21,0	34,0	67746
0.2795	7,100 mm		8,0	75,0	32,0	21,0	34,0	67747
0.2812	7,142 mm	9/32	8,0	75,0	32,0	21,0	34,0	58827
0.2835	7,200 mm		8,0	75,0	32,0	22,0	34,0	67748
0.2854	7,250 mm		8,0	75,0	33,0	22,0	34,0	67749
0.2874	7,300 mm		8,0	75,0	33,0	22,0	34,0	67750
0.2913	7,400 mm		8,0	75,0	33,0	22,0	34,0	67751
0.2953	7,500 mm		8,0	75,0	34,0	23,0	34,0	67752
0.2969	7,541 mm	19/64	8,0	75,0	34,0	23,0	34,0	58828
0.2992	7,600 mm		8,0	75,0	34,0	23,0	34,0	67753
0.3031	7,700 mm		8,0	75,0	35,0	23,0	34,0	67754
0.3071	7,800 mm		8,0	75,0	35,0	23,0	34,0	67755
0.3110	7,900 mm		8,0	75,0	36,0	24,0	34,0	67756
0.3125	7,938 mm	5/16	8,0	75,0	36,0	24,0	34,0	58829
0.3150	8,000 mm		8,0	75,0	36,0	24,0	34,0	67757
0.3189	8,100 mm		10,0	80,0	36,0	24,0	34,0	67758

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CONTINUED



3xD



146U 3xD

FRACTIONAL & METRIC SERIES

CONTINUED

- 4-margin design improves accuracy and surface finish along with increased strength for aggressive drilling
- Specialized self-centering notched point eliminates the need for spot drilling decreasing thrust and deflection
- Engineered edge protection improves edge strength and reduces edge fatigue allowing for increased feed rates
- Recommended for materials ≤ 56 HRc (≤ 577 Bhn)

inch & mm								EDP NO.
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	Ti-NAMITE-X (TX)
0.3228	8,200 mm		10,0	80,0	37,0	25,0	34,0	67759
0.3268	8,300 mm		10,0	80,0	37,0	25,0	34,0	67760
0.3281	8,334 mm	21/64	10,0	80,0	38,0	25,0	34,0	58830
0.3307	8,400 mm		10,0	80,0	38,0	25,0	34,0	67761
0.3320	8,433 mm	Q	10,0	80,0	38,0	25,0	34,0	58831
0.3346	8,500 mm		10,0	80,0	38,0	25,0	34,0	67762
0.3386	8,600 mm		10,0	80,0	39,0	26,0	34,0	67763
0.3425	8,700 mm		10,0	80,0	39,0	26,0	34,0	67764
0.3438	8,733 mm	11/32	10,0	80,0	39,0	26,0	34,0	58832
0.3465	8,800 mm		10,0	80,0	40,0	26,0	34,0	67765
0.3504	8,900 mm		10,0	80,0	40,0	27,0	34,0	67766
0.3543	9,000 mm		10,0	80,0	40,0	27,0	34,0	67767
0.3583	9,100 mm		10,0	80,0	41,0	27,0	34,0	67768
0.3594	9,129 mm	23/64	10,0	80,0	41,0	27,0	34,0	58833
0.3622	9,200 mm		10,0	80,0	41,0	28,0	35,0	67769
0.3661	9,300 mm		10,0	85,0	42,0	28,0	35,0	67770
0.3680	9,347 mm	U	10,0	85,0	42,0	28,0	35,0	58834
0.3701	9,400 mm		10,0	85,0	42,0	28,0	35,0	67771
0.3740	9,500 mm		10,0	85,0	43,0	28,0	35,0	67772
0.3750	9,525 mm	3/8	10,0	85,0	43,0	29,0	35,0	58835
0.3780	9,600 mm		10,0	85,0	43,0	29,0	35,0	67773
0.3819	9,700 mm		10,0	85,0	44,0	29,0	35,0	67774
0.3858	9,800 mm		10,0	85,0	44,0	29,0	35,0	67775
0.3898	9,900 mm		10,0	85,0	45,0	30,0	35,0	67776
0.3906	9,921 mm	25/64	10,0	85,0	45,0	30,0	35,0	58836
0.3937	10,000 mm		10,0	85,0	45,0	30,0	35,0	67777
0.3970	10,084 mm	X	12,0	90,0	46,0	31,0	36,0	58837
0.3976	10,100 mm		12,0	90,0	46,0	31,0	36,0	67778
0.4016	10,200 mm		12,0	90,0	46,0	31,0	36,0	67779
0.4040	10,262 mm	Y	12,0	90,0	46,0	31,0	36,0	58838
0.4055	10,300 mm		12,0	90,0	46,0	31,0	36,0	67780
0.4062	10,317 mm	13/32	12,0	90,0	46,0	31,0	36,0	58839
0.4094	10,400 mm		12,0	90,0	47,0	31,0	36,0	67781
0.4134	10,500 mm		12,0	90,0	47,0	32,0	36,0	67782
0.4173	10,600 mm		12,0	90,0	48,0	32,0	36,0	67783
0.4213	10,700 mm		12,0	90,0	48,0	32,0	36,0	67784

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TOLERANCES (inch)

 $\leq .1181$ DIAMETER

DC = $+0.0008/+0.0047$
DCON = h_6

 $>.1181-.2362$ DIAMETER

DC = $+0.0016/+0.0063$
DCON = h_6

 $>.2362-.3937$ DIAMETER

DC = $+0.0024/+0.0083$
DCON = h_6

 $>.3937-.7087$ DIAMETER

DC = $+0.0028/+0.0098$
DCON = h_6

 $>.7087-1.1811$ DIAMETER

DC = $+0.0031/+0.0114$
DCON = h_6

TOLERANCES (mm)

 ≤ 3 DIAMETER

DC = $+0,002/+0,012$
DCON = h_6

 $>3-6$ DIAMETER

DC = $+0,004/+0,016$
DCON = h_6

 $>6-10$ DIAMETER

DC = $+0,006/+0,021$
DCON = h_6

 $>10-18$ DIAMETER

DC = $+0,007/+0,025$
DCON = h_6

 $>18-30$ DIAMETER

DC = $+0,008/+0,029$
DCON = h_6

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

146U 3xD

FRACTIONAL & METRIC SERIES

DECIMAL DC	METRIC DC	inch & mm						EDP NO. Ti-NAMITE-X (TX)
		FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	
0.4219	10,716 mm	27/64	12,0	90,0	48,0	32,0	36,0	58840
0.4252	10,800 mm		12,0	90,0	49,0	32,0	36,0	67785
0.4291	10,900 mm		12,0	90,0	49,0	33,0	36,0	67786
0.4331	11,000 mm		12,0	95,0	50,0	33,0	36,0	67787
0.4370	11,100 mm		12,0	95,0	50,0	33,0	36,0	67788
0.4375	11,113 mm	7/16	12,0	95,0	50,0	33,0	36,0	58841
0.4409	11,200 mm		12,0	95,0	50,0	34,0	36,0	67789
0.4449	11,300 mm		12,0	95,0	51,0	34,0	36,0	67790
0.4488	11,400 mm		12,0	95,0	51,0	34,0	36,0	67791
0.4528	11,500 mm		12,0	95,0	52,0	35,0	36,0	67792
0.4531	11,509 mm	29/64	12,0	95,0	52,0	35,0	36,0	58842
0.4567	11,600 mm		12,0	95,0	52,0	35,0	36,0	67793
0.4606	11,700 mm		12,0	95,0	53,0	35,0	36,0	67794
0.4646	11,800 mm		12,0	95,0	53,0	35,0	36,0	67795
0.4685	11,900 mm		12,0	95,0	54,0	36,0	36,0	67796
0.4688	11,908 mm	15/32	12,0	95,0	54,0	36,0	36,0	58843
0.4724	12,000 mm		12,0	95,0	54,0	36,0	36,0	67797
0.4844	12,304 mm	31/64	14,0	105,0	55,0	37,0	37,0	58844
0.4921	12,500 mm		14,0	105,0	56,0	37,0	37,0	67798
0.5000	12,700 mm	1/2	14,0	105,0	57,0	38,0	37,0	58845
0.5039	12,800 mm		14,0	105,0	58,0	38,0	37,0	67799
0.5118	13,000 mm		14,0	105,0	58,0	39,0	37,0	67800
0.5156	13,096 mm	33/64	14,0	105,0	59,0	39,0	37,0	58846
0.5312	13,492 mm	17/32	14,0	105,0	61,0	40,0	37,0	58847
0.5315	13,500 mm		14,0	105,0	61,0	41,0	37,0	67801
0.5469	13,891 mm	35/64	14,0	105,0	63,0	42,0	37,0	58848
0.5512	14,000 mm		14,0	105,0	63,0	42,0	37,0	67802
0.5625	14,288 mm	9/16	16,0	115,0	64,0	43,0	38,0	58849
0.5709	14,500 mm		16,0	115,0	65,0	44,0	38,0	67803
0.5781	14,684 mm	37/64	16,0	115,0	66,0	44,0	38,0	58850
0.5906	15,000 mm		16,0	115,0	68,0	45,0	38,0	67804
0.5938	15,083 mm	19/32	16,0	115,0	68,0	45,0	38,0	58851
0.6094	15,479 mm	39/64	16,0	115,0	70,0	46,0	38,0	58852
0.6102	15,500 mm		16,0	115,0	70,0	46,0	38,0	67805
0.6250	15,875 mm	5/8	16,0	115,0	71,0	48,0	38,0	58853
0.6299	16,000 mm		16,0	115,0	72,0	48,0	38,0	67806
0.6406	16,271 mm	41/64	18,0	130,0	73,0	49,0	44,0	58854
0.6496	16,500 mm		18,0	130,0	74,0	49,0	44,0	67807
0.6562	16,667 mm	21/32	18,0	130,0	75,0	50,0	44,0	58855
0.6693	17,000 mm		18,0	130,0	77,0	51,0	44,0	67808
0.6719	17,066 mm	43/64	18,0	130,0	77,0	51,0	44,0	58856
0.6875	17,463 mm	11/16	18,0	130,0	79,0	52,0	44,0	58857
0.6890	17,500 mm		18,0	130,0	79,0	53,0	44,0	67809
0.7031	17,859 mm	45/64	18,0	130,0	80,0	54,0	44,0	58858

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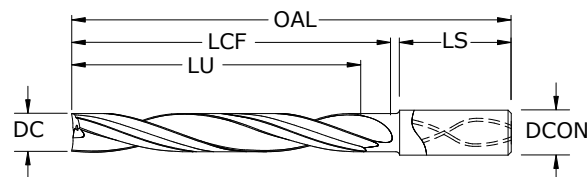


3xD



146U 3xD

FRACTIONAL & METRIC SERIES



CONTINUED

- 4-margin design improves accuracy and surface finish along with increased strength for aggressive drilling
- Specialized self-centering notched point eliminates the need for spot drilling decreasing thrust and deflection
- Engineered edge protection improves edge strength and reduces edge fatigue allowing for increased feed rates
- Recommended for materials ≤ 56 HRC (≤ 577 Bhn)

inch & mm								EDP NO.
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	Ti-NAMITE-X (TX)
0.7087	18,000 mm		18,0	130,0	81,0	54,0	44,0	67810
0.7188	18,258 mm	23/32	20,0	140,0	82,0	55,0	45,0	58859
0.7283	18,500 mm		20,0	140,0	83,0	55,0	45,0	67811
0.7344	18,654 mm	47/64	20,0	140,0	84,0	56,0	45,0	58860
0.7480	19,000 mm		20,0	140,0	85,0	57,0	45,0	67812
0.7500	19,050 mm	3/4	20,0	140,0	86,0	57,0	45,0	58861
0.7656	19,446 mm	49/64	20,0	140,0	88,0	58,0	45,0	58862
0.7677	19,500 mm		20,0	140,0	88,0	58,0	45,0	67813
0.7812	19,842 mm	25/32	20,0	140,0	89,0	60,0	45,0	58863
0.7874	20,000 mm		20,0	140,0	90,0	60,0	45,0	67814
0.7969	20,241 mm	51/64	22,0	150,0	91,0	61,0	52,0	58864
0.8071	20,500 mm		22,0	150,0	92,0	62,0	52,0	67815
0.8125	20,638 mm	13/16	22,0	150,0	93,0	62,0	52,0	58865

TOLERANCES (inch)

 $\leq .1181$ DIAMETERDC = $+0.0008/+0.0047$ DCON = h_6 $>.1181-.2362$ DIAMETERDC = $+0.0016/+0.0063$ DCON = h_6 $>.2362-.3937$ DIAMETERDC = $+0.0024/+0.0083$ DCON = h_6 $>.3937-.7087$ DIAMETERDC = $+0.0028/+0.0098$ DCON = h_6 $>.7087-1.1811$ DIAMETERDC = $+0.0031/+0.0114$ DCON = h_6

TOLERANCES (mm)

 ≤ 3 DIAMETERDC = $+0,002/+0,012$ DCON = h_6 $>3-6$ DIAMETERDC = $+0,004/+0,016$ DCON = h_6 $>6-10$ DIAMETERDC = $+0,006/+0,021$ DCON = h_6 $>10-18$ DIAMETERDC = $+0,007/+0,025$ DCON = h_6 $>18-30$ DIAMETERDC = $+0,008/+0,029$ DCON = h_6

STEELS

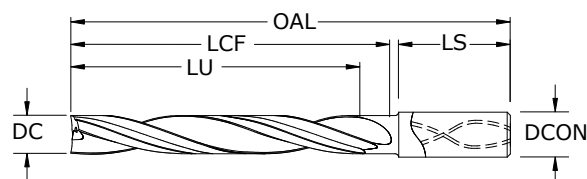
STAINLESS STEELS

CAST IRON

NON-FERROUS

HIGH TEMP ALLOYS

HARDENED STEELS



146U 5xD

FRACTIONAL & METRIC SERIES

TOLERANCES (inch)

≤.1181 DIAMETER

DC = +.00008/+0.00047

DCON = h₆

>.1181-.2362 DIAMETER

DC = +.00016/+0.00063

DCON = h₆

>.2362-.3937 DIAMETER

DC = +.00024/+0.00083

DCON = h₆

>.3937-.7087 DIAMETER

DC = +.00028/+0.00098

DCON = h₆

>.7087-1.1811 DIAMETER

DC = +.00031/+0.00114

DCON = h₆

TOLERANCES (mm)

≤3 DIAMETER

DC = +0.002/+0.012

DCON = h₆

>3-6 DIAMETER

DC = +0.004/+0.016

DCON = h₆

>6-10 DIAMETER

DC = +0.006/+0.021

DCON = h₆

>10-18 DIAMETER

DC = +0.007/+0.025

DCON = h₆

>18-30 DIAMETER

DC = +0.008/+0.029

DCON = h₆

STEELS

STAINLESS STEELS

CAST IRON

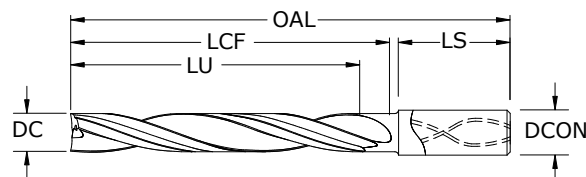
HIGH TEMP ALLOYS

NON-FERROUS

		inch & mm							EDP NO.
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	Ti-NAMITE-X (TX)	
0.1181	3,000 mm		6,0	75,0	19,0	15,0	51,0	67816	
0.1220	3,100 mm		6,0	80,0	20,0	15,0	49,0	67817	
0.1250	3,175 mm	1/8	6,0	80,0	21,0	16,0	49,0	58866	
0.1260	3,200 mm		6,0	80,0	21,0	16,0	49,0	67818	
0.1299	3,300 mm		6,0	80,0	21,0	16,0	49,0	67819	
0.1339	3,400 mm		6,0	80,0	22,0	17,0	49,0	67820	
0.1360	3,454 mm	#29	6,0	80,0	22,0	17,0	49,0	58867	
0.1378	3,500 mm		6,0	80,0	23,0	18,0	49,0	67821	
0.1405	3,569 mm	#28	6,0	80,0	23,0	18,0	49,0	58868	
0.1406	3,571 mm	9/64	6,0	80,0	23,0	18,0	49,0	58869	
0.1417	3,600 mm		6,0	80,0	23,0	18,0	49,0	67822	
0.1457	3,700 mm		6,0	80,0	24,0	19,0	49,0	67823	
0.1470	3,734 mm	#26	6,0	80,0	24,0	19,0	49,0	58870	
0.1495	3,797 mm	#25	6,0	80,0	25,0	19,0	49,0	58871	
0.1496	3,800 mm		6,0	80,0	25,0	19,0	49,0	67824	
0.1520	3,861 mm	#24	6,0	80,0	25,0	19,0	49,0	58872	
0.1535	3,900 mm		6,0	80,0	25,0	19,0	49,0	67825	
0.1562	3,967 mm	5/32	6,0	80,0	26,0	20,0	49,0	58873	
0.1570	3,988 mm	#22	6,0	80,0	26,0	20,0	49,0	58874	
0.1575	4,000 mm		6,0	80,0	26,0	20,0	49,0	67826	
0.1590	4,039 mm	#21	6,0	80,0	26,0	20,0	49,0	58875	
0.1610	4,089 mm	#20	6,0	90,0	27,0	20,0	53,0	58876	
0.1614	4,100 mm		6,0	90,0	27,0	20,0	53,0	67827	
0.1654	4,200 mm		6,0	90,0	27,0	21,0	53,0	67828	
0.1693	4,300 mm		6,0	90,0	28,0	22,0	53,0	67829	
0.1719	4,366 mm	11/64	6,0	90,0	28,0	22,0	53,0	58877	
0.1732	4,400 mm		6,0	90,0	29,0	22,0	53,0	67830	
0.1770	4,496 mm	#16	6,0	90,0	29,0	22,0	53,0	58878	
0.1772	4,500 mm		6,0	90,0	29,0	23,0	53,0	67831	
0.1811	4,600 mm		6,0	90,0	30,0	23,0	53,0	67832	
0.1850	4,699 mm	#13	6,0	90,0	31,0	23,0	53,0	58879	
0.1875	4,763 mm	3/16	6,0	90,0	31,0	24,0	53,0	58880	
0.1890	4,801 mm	#12	6,0	90,0	31,0	24,0	53,0	58881	
0.1929	4,900 mm		6,0	90,0	32,0	24,0	53,0	67835	
0.1935	4,915 mm	#10	6,0	90,0	32,0	25,0	53,0	58882	
0.1969	5,000 mm		6,0	95,0	33,0	25,0	51,0	67836	
0.2008	5,100 mm		6,0	95,0	33,0	26,0	51,0	67837	
0.2010	5,105 mm	#7	6,0	95,0	33,0	26,0	51,0	58883	
0.2031	5,159 mm	13/64	6,0	95,0	34,0	26,0	51,0	58884	
0.2047	5,200 mm		6,0	95,0	34,0	26,0	51,0	67838	
0.2087	5,300 mm		6,0	95,0	34,0	27,0	51,0	67839	
0.2090	5,309 mm	#4	6,0	95,0	35,0	27,0	51,0	58885	

continued on next page

- 4-margin design improves accuracy and surface finish along with increased strength for aggressive drilling
- Specialized self-centering notched point reduces the need for spot drilling decreasing thrust and deflection
- Engineered edge protection improves edge strength and reduces edge fatigue allowing for increased feed rates
- Recommended for materials ≤ 56 HRc (≤ 577 Bhn)



146U 5xD

FRACTIONAL & METRIC SERIES

CONTINUED

- 4-margin design improves accuracy and surface finish along with increased strength for aggressive drilling
- Specialized self-centering notched point reduces the need for spot drilling decreasing thrust and deflection
- Engineered edge protection improves edge strength and reduces edge fatigue allowing for increased feed rates
- Recommended for materials ≤ 56 HRC (≤ 577 Bhn)

inch & mm								EDP NO.
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	TI-NAMITE-X (TX)
0.2126	5,400 mm		6,0	95,0	35,0	27,0	51,0	67840
0.2130	5,410 mm	#3	6,0	95,0	35,0	27,0	51,0	58886
0.2165	5,500 mm		6,0	95,0	36,0	27,0	51,0	67841
0.2188	5,558 mm	7/32	6,0	95,0	36,0	28,0	51,0	58887
0.2205	5,600 mm		6,0	95,0	36,0	28,0	51,0	67842
0.2244	5,700 mm		6,0	95,0	37,0	28,0	51,0	67843
0.2283	5,800 mm		6,0	95,0	38,0	29,0	51,0	67844
0.2323	5,900 mm		6,0	95,0	38,0	30,0	51,0	67845
0.2344	5,954 mm	15/64	6,0	95,0	39,0	30,0	51,0	58888
0.2362	6,000 mm		6,0	95,0	39,0	30,0	51,0	67846
0.2402	6,100 mm		8,0	100,0	40,0	31,0	49,0	67847
0.2441	6,200 mm		8,0	100,0	40,0	31,0	49,0	67848
0.2461	6,250 mm		8,0	100,0	41,0	31,0	49,0	67849
0.2480	6,300 mm		8,0	100,0	41,0	31,0	49,0	67850
0.2500	6,350 mm	1/4 E	8,0	100,0	41,0	32,0	49,0	58889
0.2520	6,400 mm		8,0	100,0	42,0	32,0	49,0	67851
0.2559	6,500 mm		8,0	100,0	42,0	32,0	49,0	67852
0.2570	6,528 mm	F	8,0	100,0	42,0	33,0	49,0	58890
0.2598	6,600 mm		8,0	100,0	43,0	33,0	49,0	67853
0.2638	6,700 mm		8,0	100,0	44,0	34,0	49,0	67854
0.2656	6,746 mm	17/64	8,0	100,0	44,0	34,0	49,0	58891
0.2677	6,800 mm		8,0	100,0	44,0	34,0	49,0	67855
0.2717	6,900 mm		8,0	100,0	45,0	35,0	49,0	67856
0.2720	6,909 mm	I	8,0	100,0	45,0	35,0	49,0	58892
0.2756	7,000 mm		8,0	100,0	46,0	35,0	49,0	67857
0.2795	7,100 mm		8,0	100,0	46,0	35,0	49,0	67858
0.2812	7,142 mm	9/32	8,0	100,0	46,0	36,0	49,0	58893
0.2835	7,200 mm		8,0	110,0	47,0	36,0	53,0	67859
0.2854	7,250 mm		8,0	110,0	47,0	36,0	53,0	67860
0.2874	7,300 mm		8,0	110,0	47,0	36,0	53,0	67861
0.2913	7,400 mm		8,0	110,0	48,0	37,0	53,0	67862
0.2953	7,500 mm		8,0	110,0	49,0	38,0	53,0	67863
0.2969	7,541 mm	19/64	8,0	110,0	49,0	38,0	53,0	58894
0.2992	7,600 mm		8,0	110,0	49,0	38,0	53,0	67864
0.3031	7,700 mm		8,0	110,0	50,0	38,0	53,0	67865
0.3071	7,800 mm		8,0	110,0	51,0	39,0	53,0	67866
0.3110	7,900 mm		8,0	110,0	51,0	39,0	53,0	67867
0.3125	7,938 mm	5/16	8,0	110,0	52,0	40,0	53,0	58895
0.3150	8,000 mm		8,0	110,0	52,0	40,0	53,0	67868
0.3189	8,100 mm		10,0	115,0	53,0	41,0	51,0	67869
0.3228	8,200 mm		10,0	115,0	53,0	41,0	51,0	67870
0.3268	8,300 mm		10,0	115,0	54,0	42,0	51,0	67871

TOLERANCES (inch)

 $\leq .1181$ DIAMETERDC = $\pm .00008/\pm .00047$ DCON = h_6 $> .1181-.2362$ DIAMETERDC = $\pm .00016/\pm .00063$ DCON = h_6 $> .2362-.3937$ DIAMETERDC = $\pm .00024/\pm .00083$ DCON = h_6 $> .3937-.7087$ DIAMETERDC = $\pm .00028/\pm .00098$ DCON = h_6 $> .7087-1.1811$ DIAMETERDC = $\pm .00031/\pm .00114$ DCON = h_6

TOLERANCES (mm)

 ≤ 3 DIAMETERDC = $\pm 0,002/\pm 0,012$ DCON = h_6 $> 3-6$ DIAMETERDC = $\pm 0,004/\pm 0,016$ DCON = h_6 $> 6-10$ DIAMETERDC = $\pm 0,006/\pm 0,021$ DCON = h_6 $> 10-18$ DIAMETERDC = $\pm 0,007/\pm 0,025$ DCON = h_6 $> 18-30$ DIAMETERDC = $\pm 0,008/\pm 0,029$ DCON = h_6

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

continued on next page

146U 5xD

FRACTIONAL & METRIC SERIES

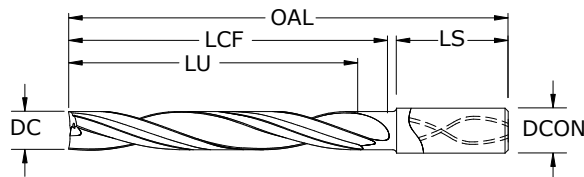
CONTINUED

DECIMAL DC	METRIC DC	inch & mm		OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	EDP NO.
		FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON					Ti-NAMITE-X (TX)
0.3281	8,334 mm	21/64	10,0	115,0	54,0	42,0	51,0	58896
0.3307	8,400 mm		10,0	115,0	55,0	42,0	51,0	67872
0.3320	8,433 mm	Q	10,0	115,0	55,0	42,0	51,0	58897
0.3346	8,500 mm		10,0	115,0	55,0	42,0	51,0	67873
0.3386	8,600 mm		10,0	115,0	56,0	43,0	51,0	67874
0.3425	8,700 mm		10,0	115,0	57,0	43,0	51,0	67875
0.3438	8,733 mm	11/32	10,0	115,0	57,0	44,0	51,0	58898
0.3465	8,800 mm		10,0	115,0	57,0	44,0	51,0	67876
0.3504	8,900 mm		10,0	115,0	58,0	45,0	51,0	67877
0.3543	9,000 mm		10,0	115,0	58,0	45,0	51,0	67878
0.3583	9,100 mm		10,0	115,0	59,0	46,0	51,0	67879
0.3594	9,129 mm	23/64	10,0	115,0	59,0	46,0	51,0	58899
0.3622	9,200 mm		10,0	125,0	60,0	46,0	55,0	67880
0.3661	9,300 mm		10,0	125,0	60,0	46,0	55,0	67881
0.3680	9,347 mm	U	10,0	125,0	61,0	47,0	55,0	58900
0.3701	9,400 mm		10,0	125,0	61,0	47,0	55,0	67882
0.3740	9,500 mm		10,0	125,0	62,0	47,0	55,0	67883
0.3750	9,525 mm	3/8	10,0	125,0	62,0	48,0	55,0	58901
0.3780	9,600 mm		10,0	125,0	62,0	48,0	55,0	67884
0.3819	9,700 mm		10,0	125,0	63,0	49,0	55,0	67885
0.3858	9,800 mm		10,0	125,0	64,0	49,0	55,0	67886
0.3898	9,900 mm		10,0	125,0	64,0	50,0	55,0	67887
0.3906	9,921 mm	25/64	10,0	125,0	64,0	50,0	55,0	58902
0.3937	10,000 mm		10,0	125,0	65,0	50,0	55,0	67888
0.3970	10,084 mm	X	12,0	135,0	66,0	50,0	57,0	58903
0.3976	10,100 mm		12,0	135,0	66,0	50,0	57,0	67889
0.4016	10,200 mm		12,0	135,0	66,0	51,0	57,0	67890
0.4040	10,262 mm	Y	12,0	135,0	67,0	51,0	57,0	58904
0.4055	10,300 mm		12,0	135,0	67,0	51,0	57,0	67891
0.4062	10,317 mm	13/32	12,0	135,0	67,0	52,0	57,0	58905
0.4094	10,400 mm		12,0	135,0	68,0	52,0	57,0	67892
0.4134	10,500 mm		12,0	135,0	68,0	53,0	57,0	67893
0.4173	10,600 mm		12,0	135,0	69,0	53,0	57,0	67894
0.4213	10,700 mm		12,0	135,0	70,0	54,0	57,0	67895
0.4219	10,716 mm	27/64	12,0	135,0	70,0	54,0	57,0	58906
0.4252	10,800 mm		12,0	135,0	70,0	54,0	57,0	67896
0.4291	10,900 mm		12,0	135,0	71,0	54,0	57,0	67897
0.4331	11,000 mm		12,0	135,0	72,0	55,0	57,0	67898
0.4370	11,100 mm		12,0	135,0	72,0	55,0	57,0	67899
0.4375	11,113 mm	7/16	12,0	135,0	72,0	56,0	57,0	58907
0.4409	11,200 mm		12,0	135,0	73,0	56,0	57,0	67900
0.4449	11,300 mm		12,0	135,0	73,0	57,0	57,0	67901
0.4488	11,400 mm		12,0	145,0	74,0	57,0	62,0	67902
0.4528	11,500 mm		12,0	145,0	75,0	58,0	62,0	67903
0.4531	11,509 mm	29/64	12,0	145,0	75,0	58,0	62,0	58908
0.4567	11,600 mm		12,0	145,0	75,0	58,0	62,0	67904
0.4606	11,700 mm		12,0	145,0	76,0	58,0	62,0	67905
0.4646	11,800 mm		12,0	145,0	77,0	59,0	62,0	67906
0.4685	11,900 mm		12,0	145,0	77,0	59,0	62,0	67907
0.4688	11,908 mm	15/32	12,0	145,0	77,0	60,0	62,0	58909

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5xD



146U 5xD

FRACTIONAL & METRIC SERIES

CONTINUED

- 4-margin design improves accuracy and surface finish along with increased strength for aggressive drilling
- Specialized self-centering notched point reduces the need for spot drilling decreasing thrust and deflection
- Engineered edge protection improves edge strength and reduces edge fatigue allowing for increased feed rates
- Recommended for materials ≤ 56 HRC (≤ 577 Bhn)

DECIMAL DC	METRIC DC	inch & mm		OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	EDP NO. TI-NAMITE-X (TX)
		FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON					
0.4724	12,000 mm		12,0	145,0	78,0	60,0	62,0	67908
0.4844	12,304 mm	31/64	14,0	155,0	80,0	62,0	59,0	58910
0.4921	12,500 mm		14,0	155,0	81,0	62,0	59,0	67909
0.5000	12,700 mm	1/2	14,0	155,0	83,0	64,0	59,0	58911
0.5039	12,800 mm		14,0	155,0	83,0	64,0	59,0	67910
0.5118	13,000 mm		14,0	155,0	84,0	65,0	59,0	67911
0.5156	13,096 mm	33/64	14,0	155,0	85,0	65,0	59,0	58912
0.5312	13,492 mm	17/32	14,0	155,0	88,0	67,0	59,0	58913
0.5315	13,500 mm		14,0	155,0	88,0	68,0	59,0	67912
0.5469	13,891 mm	35/64	14,0	155,0	90,0	69,0	59,0	58914
0.5512	14,000 mm		14,0	155,0	91,0	70,0	59,0	67913
0.5625	14,288 mm	9/16	16,0	175,0	93,0	71,0	66,0	58915
0.5709	14,500 mm		16,0	175,0	94,0	73,0	66,0	67914
0.5781	14,684 mm	37/64	16,0	175,0	95,0	73,0	66,0	58916
0.5906	15,000 mm		16,0	175,0	98,0	75,0	66,0	67915
0.5938	15,083 mm	19/32	16,0	175,0	98,0	75,0	66,0	58917
0.6094	15,479 mm	39/64	16,0	175,0	101,0	77,0	66,0	58918
0.6102	15,500 mm		16,0	175,0	101,0	77,0	66,0	67916
0.6250	15,875 mm	5/8	16,0	175,0	103,0	79,0	66,0	58919
0.6299	16,000 mm		16,0	175,0	104,0	80,0	66,0	67917
0.6406	16,271 mm	41/64	18,0	195,0	106,0	81,0	73,0	58920
0.6496	16,500 mm		18,0	195,0	107,0	82,0	73,0	67918
0.6562	16,667 mm	21/32	18,0	195,0	108,0	83,0	73,0	58921
0.6693	17,000 mm		18,0	195,0	111,0	85,0	73,0	67919
0.6719	17,066 mm	43/64	18,0	195,0	111,0	85,0	73,0	58922
0.6875	17,463 mm	11/16	18,0	195,0	114,0	87,0	73,0	58923
0.6890	17,500 mm		18,0	195,0	114,0	88,0	73,0	67920
0.7031	17,859 mm	45/64	18,0	195,0	116,0	89,0	73,0	58924
0.7087	18,000 mm		18,0	195,0	117,0	90,0	73,0	67921
0.7188	18,258 mm	23/32	20,0	215,0	119,0	91,0	80,0	58925
0.7283	18,500 mm		20,0	215,0	120,0	92,0	80,0	67922
0.7344	18,654 mm	47/64	20,0	215,0	121,0	93,0	80,0	58926
0.7480	19,000 mm		20,0	215,0	123,0	95,0	80,0	67923
0.7500	19,050 mm	3/4	20,0	215,0	124,0	95,0	80,0	58927
0.7656	19,446 mm	49/64	20,0	215,0	126,0	97,0	80,0	58928
0.7677	19,500 mm		20,0	215,0	127,0	97,0	80,0	67924
0.7812	19,842 mm	25/32	20,0	215,0	129,0	99,0	80,0	58929
0.7874	20,000 mm		20,0	215,0	130,0	100,0	80,0	67925
0.7969	20,241 mm	51/64	22,0	220,0	132,0	101,0	81,0	58930
0.8071	20,500 mm		22,0	220,0	133,0	103,0	81,0	67926
0.8125	20,638 mm	13/16	22,0	220,0	134,0	103,0	81,0	58931

TOLERANCES (inch)

 $\leq .1181$ DIAMETERDC = $\pm .00008/\pm .00047$ DCON = h_6 $> .1181-.2362$ DIAMETERDC = $\pm .00016/\pm .00063$ DCON = h_6 $> .2362-.3937$ DIAMETERDC = $\pm .00024/\pm .00083$ DCON = h_6 $> .3937-.7087$ DIAMETERDC = $\pm .00028/\pm .00098$ DCON = h_6 $> .7087-1.1811$ DIAMETERDC = $\pm .00031/\pm .00114$ DCON = h_6

TOLERANCES (mm)

 ≤ 3 DIAMETERDC = $\pm 0,002/\pm 0,012$ DCON = h_6 $> 3-6$ DIAMETERDC = $\pm 0,004/\pm 0,016$ DCON = h_6 $> 6-10$ DIAMETERDC = $\pm 0,006/\pm 0,021$ DCON = h_6 $> 10-18$ DIAMETERDC = $\pm 0,007/\pm 0,025$ DCON = h_6 $> 18-30$ DIAMETERDC = $\pm 0,008/\pm 0,029$ DCON = h_6

STEELS

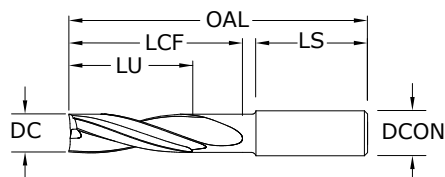
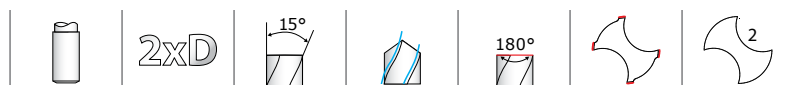
STAINLESS STEELS

CAST IRON

NON-FERROUS

HIGH TEMP ALLOYS

HARDENED STEELS



136U 2xD

FRACTIONAL & METRIC SERIES

TOLERANCES (inch)

≤.1181 DIAMETER

DC = +.00008/+0.00047

DCON = h₆

>.1181-.2362 DIAMETER

DC = +.00016/+0.00063

DCON = h₆

>.2362-.3937 DIAMETER

DC = +.00024/+0.00083

DCON = h₆

>.3937-.7087 DIAMETER

DC = +.00028/+0.00098

DCON = h₆

>.7087-1.1811 DIAMETER

DC = +.00031/+0.00114

DCON = h₆

TOLERANCES (mm)

≤3 DIAMETER

DC = +0.002/+0.012

DCON = h₆

>3-6 DIAMETER

DC = +0.004/+0.016

DCON = h₆

>6-10 DIAMETER

DC = +0.006/+0.021

DCON = h₆

>10-18 DIAMETER

DC = +0.007/+0.025

DCON = h₆

>18-30 DIAMETER

DC = +0.008/+0.029

DCON = h₆

STEELS

STAINLESS STEELS

CAST IRON

HIGH TEMP ALLOYS

NON-FERROUS

inch & mm									EDP NO.
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	Ti-NAMITE-X (TX)	
0.0591	1,500 mm		6,0	45,0	5,0	3,0	33,0	67060	
0.0625	1,588 mm	1/16	6,0	45,0	6,0	3,0	33,0	58480	
0.0630	1,600 mm		6,0	45,0	6,0	3,0	33,0	67061	
0.0669	1,700 mm		6,0	45,0	6,0	3,0	33,0	67062	
0.0709	1,800 mm		6,0	45,0	6,0	4,0	33,0	67063	
0.0748	1,900 mm		6,0	45,0	7,0	4,0	33,0	67064	
0.0781	1,984 mm	5/64	6,0	45,0	7,0	4,0	33,0	58481	
0.0787	2,000 mm		6,0	45,0	7,0	4,0	33,0	67065	
0.0827	2,100 mm		6,0	45,0	7,0	4,0	33,0	67066	
0.0866	2,200 mm		6,0	50,0	8,0	4,0	31,0	67067	
0.0906	2,300 mm		6,0	50,0	8,0	5,0	31,0	67068	
0.0938	2,383 mm	3/32	6,0	50,0	8,0	5,0	31,0	58482	
0.0945	2,400 mm		6,0	50,0	8,0	5,0	31,0	67069	
0.0984	2,500 mm		6,0	50,0	9,0	5,0	31,0	67070	
0.1015	2,578 mm	#38	6,0	50,0	9,0	5,0	31,0	58483	
0.1024	2,600 mm		6,0	50,0	9,0	5,0	31,0	67071	
0.1040	2,642 mm	#37	6,0	50,0	9,0	5,0	31,0	58484	
0.1063	2,700 mm		6,0	50,0	9,0	5,0	31,0	67072	
0.1065	2,705 mm	#36	6,0	50,0	9,0	5,0	31,0	58485	
0.1094	2,779 mm	7/64	6,0	50,0	10,0	6,0	31,0	58486	
0.1102	2,800 mm		6,0	50,0	10,0	6,0	31,0	67073	
0.1130	2,870 mm	#33	6,0	50,0	10,0	6,0	31,0	58487	
0.1142	2,900 mm		6,0	50,0	10,0	6,0	31,0	67074	
0.1181	3,000 mm		6,0	50,0	10,0	6,0	31,0	67075	
0.1220	3,100 mm		6,0	50,0	11,0	6,0	31,0	67076	
0.1250	3,175 mm	1/8	6,0	50,0	11,0	6,0	31,0	58488	
0.1260	3,200 mm		6,0	50,0	11,0	6,0	31,0	67077	
0.1299	3,300 mm		6,0	50,0	12,0	7,0	31,0	67078	
0.1339	3,400 mm		6,0	50,0	12,0	7,0	31,0	67079	
0.1360	3,454 mm	#29	6,0	50,0	12,0	7,0	31,0	58489	
0.1378	3,500 mm		6,0	50,0	12,0	7,0	31,0	67080	
0.1405	3,569 mm	#28	6,0	50,0	12,0	7,0	31,0	58490	
0.1406	3,571 mm	9/64	6,0	50,0	12,0	7,0	31,0	58491	
0.1417	3,600 mm		6,0	50,0	13,0	7,0	31,0	67081	
0.1457	3,700 mm		6,0	50,0	13,0	7,0	31,0	67082	
0.1470	3,734 mm	#26	6,0	50,0	13,0	7,0	31,0	58492	
0.1495	3,797 mm	#25	6,0	50,0	13,0	8,0	31,0	58493	
0.1496	3,800 mm		6,0	50,0	13,0	8,0	31,0	67083	

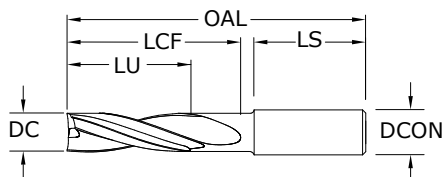
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- 4-margin design improves accuracy and surface finish along with increased strength for aggressive drilling
- Specialized self-centering notched point eliminates the need for spot drilling decreasing thrust and deflection
- Engineered edge protection improves edge strength and reduces edge fatigue allowing for increased feed rates
- Recommended for materials ≤ 56 HRc (≤ 577 Bhn)



136U 2xD

FRACTIONAL & METRIC SERIES



CONTINUED

- 4-margin design improves accuracy and surface finish along with increased strength for aggressive drilling
- Specialized self-centering notched point eliminates the need for spot drilling decreasing thrust and deflection
- Engineered edge protection improves edge strength and reduces edge fatigue allowing for increased feed rates
- Recommended for materials ≤ 56 HRC (≤ 577 Bhn)

inch & mm									EDP NO.
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	Ti-NAMITE-X (TX)	
0.1520	3,861 mm	#24	6,0	50,0	14,0	8,0	31,0	58494	
0.1535	3,900 mm		6,0	50,0	14,0	8,0	31,0	67084	
0.1562	3,967 mm	5/32	6,0	50,0	14,0	8,0	31,0	58495	
0.1570	3,988 mm	#22	6,0	50,0	14,0	8,0	31,0	58496	
0.1575	4,000 mm		6,0	50,0	14,0	8,0	31,0	67085	
0.1590	4,039 mm	#21	6,0	50,0	14,0	8,0	31,0	58497	
0.1610	4,089 mm	#20	6,0	50,0	14,0	8,0	31,0	58498	
0.1614	4,100 mm		6,0	50,0	14,0	8,0	31,0	67086	
0.1654	4,200 mm		6,0	60,0	15,0	8,0	34,0	67087	
0.1693	4,300 mm		6,0	60,0	15,0	9,0	34,0	67088	
0.1719	4,366 mm	11/64	6,0	60,0	15,0	9,0	34,0	58499	
0.1732	4,400 mm		6,0	60,0	15,0	9,0	34,0	67089	
0.1770	4,496 mm	#16	6,0	60,0	16,0	9,0	34,0	58500	
0.1772	4,500 mm		6,0	60,0	16,0	9,0	34,0	67090	
0.1811	4,600 mm		6,0	60,0	16,0	9,0	34,0	67091	
0.1850	4,699 mm	#13	6,0	60,0	16,0	9,0	34,0	58501	
0.1875	4,763 mm	3/16	6,0	60,0	17,0	10,0	34,0	58502	
0.1890	4,801 mm	#12	6,0	60,0	17,0	10,0	34,0	58503	
0.1929	4,900 mm		6,0	60,0	17,0	10,0	34,0	67094	
0.1935	4,915 mm	#10	6,0	60,0	17,0	10,0	34,0	58504	
0.1969	5,000 mm		6,0	60,0	18,0	10,0	34,0	67095	
0.2008	5,100 mm		6,0	60,0	18,0	10,0	34,0	67096	
0.2010	5,105 mm	#7	6,0	60,0	18,0	10,0	34,0	58505	
0.2031	5,159 mm	13/64	6,0	60,0	18,0	10,0	34,0	58506	
0.2047	5,200 mm		6,0	60,0	18,0	10,0	34,0	67097	
0.2087	5,300 mm		6,0	60,0	19,0	11,0	34,0	67098	
0.2090	5,309 mm	#4	6,0	60,0	19,0	11,0	34,0	58507	
0.2126	5,400 mm		6,0	60,0	19,0	11,0	34,0	67099	
0.2130	5,410 mm	#3	6,0	60,0	19,0	11,0	34,0	58508	
0.2165	5,500 mm		6,0	60,0	19,0	11,0	34,0	67100	
0.2188	5,558 mm	7/32	6,0	60,0	19,0	11,0	34,0	58509	
0.2205	5,600 mm		6,0	60,0	20,0	11,0	34,0	67101	
0.2244	5,700 mm		6,0	60,0	20,0	11,0	34,0	67102	
0.2283	5,800 mm		6,0	60,0	20,0	12,0	34,0	67103	
0.2323	5,900 mm		6,0	60,0	21,0	12,0	34,0	67104	
0.2344	5,954 mm	15/64	6,0	60,0	21,0	12,0	34,0	58510	
0.2362	6,000 mm		6,0	60,0	21,0	12,0	34,0	67105	
0.2402	6,100 mm		8,0	70,0	22,0	13,0	37,0	67106	

TOLERANCES (inch)

 $\leq .1181$ DIAMETERDC = $+0.0008/+0.00047$ DCON = h_6 $>.1181-.2362$ DIAMETERDC = $+0.0016/+0.00063$ DCON = h_6 $>.2362-.3937$ DIAMETERDC = $+0.0024/+0.00083$ DCON = h_6 $>.3937-.7087$ DIAMETERDC = $+0.0028/+0.00098$ DCON = h_6 $>.7087-1.1811$ DIAMETERDC = $+0.0031/+0.00114$ DCON = h_6

TOLERANCES (mm)

 ≤ 3 DIAMETERDC = $+0.002/+0.012$ DCON = h_6 $>3-6$ DIAMETERDC = $+0.004/+0.016$ DCON = h_6 $>6-10$ DIAMETERDC = $+0.006/+0.021$ DCON = h_6 $>10-18$ DIAMETERDC = $+0.007/+0.025$ DCON = h_6 $>18-30$ DIAMETERDC = $+0.008/+0.029$ DCON = h_6

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

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136U 2xD

FRACTIONAL & METRIC SERIES

CONTINUED

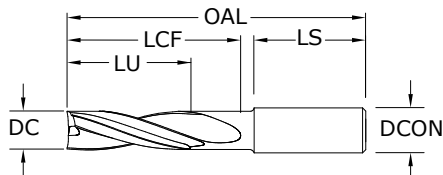
DECIMAL DC	METRIC DC	inch & mm						EDP NO. Ti-NAMITE-X (TX)
		FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	
0.2441	6,200 mm		8,0	70,0	22,0	12,0	37,0	67107
0.2461	6,250 mm		8,0	70,0	22,0	13,0	37,0	67108
0.2480	6,300 mm		8,0	70,0	22,0	13,0	37,0	67109
0.2500	6,350 mm	1/4 E	8,0	70,0	22,0	13,0	37,0	58511
0.2520	6,400 mm		8,0	70,0	22,0	13,0	37,0	67110
0.2559	6,500 mm		8,0	70,0	23,0	13,0	37,0	67111
0.2570	6,528 mm	F	8,0	70,0	23,0	13,0	37,0	58512
0.2598	6,600 mm		8,0	70,0	23,0	13,0	37,0	67112
0.2638	6,700 mm		8,0	70,0	23,0	13,0	37,0	67113
0.2656	6,746 mm	17/64	8,0	70,0	24,0	13,0	37,0	58513
0.2677	6,800 mm		8,0	70,0	24,0	14,0	37,0	67114
0.2717	6,900 mm		8,0	70,0	24,0	14,0	37,0	67115
0.2720	6,909 mm	I	8,0	70,0	24,0	14,0	37,0	58514
0.2756	7,000 mm		8,0	70,0	25,0	14,0	37,0	67116
0.2795	7,100 mm		8,0	70,0	25,0	14,0	37,0	67117
0.2812	7,142 mm	9/32	8,0	70,0	25,0	14,0	37,0	58515
0.2835	7,200 mm		8,0	70,0	25,0	14,0	37,0	67118
0.2854	7,250 mm		8,0	70,0	25,0	14,0	37,0	67119
0.2874	7,300 mm		8,0	70,0	26,0	15,0	37,0	67120
0.2913	7,400 mm		8,0	70,0	26,0	15,0	37,0	67121
0.2953	7,500 mm		8,0	70,0	26,0	15,0	37,0	67122
0.2969	7,541 mm	19/64	8,0	70,0	26,0	15,0	37,0	58516
0.2992	7,600 mm		8,0	70,0	27,0	15,0	37,0	67123
0.3031	7,700 mm		8,0	70,0	27,0	15,0	37,0	67124
0.3071	7,800 mm		8,0	70,0	27,0	16,0	37,0	67125
0.3110	7,900 mm		8,0	70,0	28,0	16,0	37,0	67126
0.3125	7,938 mm	5/16	8,0	70,0	28,0	16,0	37,0	58517
0.3150	8,000 mm		8,0	70,0	28,0	16,0	37,0	67127
0.3189	8,100 mm		10,0	80,0	29,0	17,0	40,0	67128
0.3228	8,200 mm		10,0	80,0	29,0	16,0	40,0	67129
0.3268	8,300 mm		10,0	80,0	29,0	17,0	40,0	67130
0.3281	8,334 mm	21/64	10,0	80,0	29,0	17,0	40,0	58518
0.3307	8,400 mm		10,0	80,0	29,0	17,0	40,0	67131
0.3320	8,433 mm	Q	10,0	80,0	30,0	17,0	40,0	58519
0.3346	8,500 mm		10,0	80,0	30,0	17,0	40,0	67132
0.3386	8,600 mm		10,0	80,0	30,0	17,0	40,0	67133
0.3425	8,700 mm		10,0	80,0	30,0	17,0	40,0	67134
0.3438	8,733 mm	11/32	10,0	80,0	31,0	17,0	40,0	58520
0.3465	8,800 mm		10,0	80,0	31,0	18,0	40,0	67135
0.3504	8,900 mm		10,0	80,0	31,0	18,0	40,0	67136
0.3543	9,000 mm		10,0	80,0	31,0	18,0	40,0	67137
0.3583	9,100 mm		10,0	80,0	32,0	18,0	40,0	67138
0.3594	9,129 mm	23/64	10,0	80,0	32,0	18,0	40,0	58521
0.3622	9,200 mm		10,0	80,0	32,0	18,0	40,0	67139
0.3661	9,300 mm		10,0	80,0	33,0	19,0	40,0	67140
0.3680	9,347 mm	U	10,0	80,0	33,0	19,0	40,0	58522

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136U 2xD

FRACTIONAL & METRIC SERIES



CONTINUED

- 4-margin design improves accuracy and surface finish along with increased strength for aggressive drilling
- Specialized self-centering notched point eliminates the need for spot drilling decreasing thrust and deflection
- Engineered edge protection improves edge strength and reduces edge fatigue allowing for increased feed rates
- Recommended for materials ≤ 56 HRC (≤ 577 Bhn)

inch & mm								EDP NO.
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	Ti-NAMITE-X (TX)
0.3701	9,400 mm		10,0	80,0	33,0	19,0	40,0	67141
0.3740	9,500 mm		10,0	80,0	33,0	19,0	40,0	67142
0.3750	9,525 mm	3/8	10,0	80,0	33,0	19,0	40,0	58523
0.3780	9,600 mm		10,0	80,0	34,0	19,0	40,0	67143
0.3819	9,700 mm		10,0	80,0	34,0	19,0	40,0	67144
0.3858	9,800 mm		10,0	80,0	34,0	20,0	40,0	67145
0.3898	9,900 mm		10,0	80,0	35,0	20,0	40,0	67146
0.3906	9,921 mm	25/64	10,0	80,0	35,0	20,0	40,0	58524
0.3937	10,000 mm		10,0	80,0	35,0	20,0	40,0	67147
0.3970	10,084 mm	X	12,0	90,0	36,0	21,0	43,0	58525
0.3976	10,100 mm		12,0	90,0	36,0	21,0	43,0	67148
0.4016	10,200 mm		12,0	90,0	36,0	20,0	43,0	67149
0.4040	10,262 mm	Y	12,0	90,0	36,0	21,0	43,0	58526
0.4055	10,300 mm		12,0	90,0	36,0	21,0	43,0	67150
0.4062	10,317 mm	13/32	12,0	90,0	36,0	21,0	43,0	58527
0.4094	10,400 mm		12,0	90,0	36,0	21,0	43,0	67151
0.4134	10,500 mm		12,0	90,0	37,0	21,0	43,0	67152
0.4173	10,600 mm		12,0	90,0	37,0	21,0	43,0	67153
0.4213	10,700 mm		12,0	90,0	37,0	21,0	43,0	67154
0.4219	10,716 mm	27/64	12,0	90,0	38,0	21,0	43,0	58528
0.4252	10,800 mm		12,0	90,0	38,0	22,0	43,0	67155
0.4291	10,900 mm		12,0	90,0	38,0	22,0	43,0	67156
0.4331	11,000 mm		12,0	90,0	39,0	22,0	43,0	67157
0.4370	11,100 mm		12,0	90,0	39,0	22,0	43,0	67158
0.4375	11,113 mm	7/16	12,0	90,0	39,0	22,0	43,0	58529
0.4409	11,200 mm		12,0	90,0	39,0	22,0	43,0	67159
0.4449	11,300 mm		12,0	90,0	40,0	23,0	43,0	67160
0.4488	11,400 mm		12,0	90,0	40,0	23,0	43,0	67161
0.4528	11,500 mm		12,0	90,0	40,0	23,0	43,0	67162
0.4531	11,509 mm	29/64	12,0	90,0	40,0	23,0	43,0	58530
0.4567	11,600 mm		12,0	90,0	41,0	23,0	43,0	67163
0.4606	11,700 mm		12,0	90,0	41,0	23,0	43,0	67164
0.4646	11,800 mm		12,0	90,0	41,0	24,0	43,0	67165
0.4685	11,900 mm		12,0	90,0	42,0	24,0	43,0	67166
0.4688	11,908 mm	15/32	12,0	90,0	42,0	24,0	43,0	58531
0.4724	12,000 mm		12,0	90,0	42,0	24,0	43,0	67167
0.4844	12,304 mm	31/64	14,0	100,0	43,0	25,0	46,0	58532
0.4921	12,500 mm		14,0	100,0	44,0	25,0	46,0	67168

TOLERANCES (inch)

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

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136U 2xD

FRACTIONAL & METRIC SERIES

inch & mm								EDP NO.
DECIMAL DC	METRIC DC	FRACTIONAL/ LETTER/WIRE DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	SHANK LENGTH LS	TI-NAMITE-X (TX)
0.5000	12,700 mm	1/2	14,0	100,0	44,0	25,0	46,0	58533
0.5039	12,800 mm		14,0	100,0	45,0	26,0	46,0	67169
0.5118	13,000 mm		14,0	100,0	45,0	26,0	46,0	67170
0.5156	13,096 mm	33/64	14,0	100,0	46,0	26,0	46,0	58534
0.5312	13,492 mm	17/32	14,0	100,0	47,0	27,0	46,0	58535
0.5315	13,500 mm		14,0	100,0	47,0	27,0	46,0	67171
0.5469	13,891 mm	35/64	14,0	100,0	49,0	28,0	46,0	58536
0.5512	14,000 mm		14,0	100,0	49,0	28,0	46,0	67172
0.5625	14,288 mm	9/16	16,0	110,0	50,0	29,0	49,0	58537
0.5709	14,500 mm		16,0	110,0	51,0	29,0	49,0	67173
0.5781	14,684 mm	37/64	16,0	110,0	51,0	29,0	49,0	58538
0.5906	15,000 mm		16,0	110,0	53,0	30,0	49,0	67174
0.5938	15,083 mm	19/32	16,0	110,0	53,0	30,0	49,0	58539
0.6094	15,479 mm	39/64	16,0	110,0	54,0	31,0	49,0	58540
0.6102	15,500 mm		16,0	110,0	54,0	31,0	49,0	67175
0.6250	15,875 mm	5/8	16,0	110,0	56,0	32,0	49,0	58541
0.6299	16,000 mm		16,0	110,0	56,0	32,0	49,0	67176
0.6406	16,271 mm	41/64	18,0	125,0	57,0	33,0	57,0	58542
0.6496	16,500 mm		18,0	125,0	58,0	33,0	57,0	67177
0.6562	16,667 mm	21/32	18,0	125,0	58,0	33,0	57,0	58543
0.6693	17,000 mm		18,0	125,0	60,0	34,0	57,0	67178
0.6719	17,066 mm	43/64	18,0	125,0	60,0	34,0	57,0	58544
0.6875	17,463 mm	11/16	18,0	125,0	61,0	35,0	57,0	58545
0.6890	17,500 mm		18,0	125,0	61,0	35,0	57,0	67179
0.7031	17,859 mm	45/64	18,0	125,0	63,0	36,0	57,0	58546
0.7087	18,000 mm		18,0	125,0	63,0	36,0	57,0	67180
0.7188	18,258 mm	23/32	20,0	135,0	64,0	37,0	60,0	58547
0.7283	18,500 mm		20,0	135,0	65,0	37,0	60,0	67181
0.7344	18,654 mm	47/64	20,0	135,0	65,0	37,0	60,0	58548
0.7480	19,000 mm		20,0	135,0	66,0	38,0	60,0	67182
0.7500	19,050 mm	3/4	20,0	135,0	67,0	38,0	60,0	58549
0.7656	19,446 mm	49/64	20,0	135,0	68,0	39,0	60,0	58550
0.7677	19,500 mm		20,0	135,0	68,0	39,0	60,0	67183
0.7812	19,842 mm	25/32	20,0	135,0	69,0	40,0	60,0	58551
0.7874	20,000 mm		20,0	135,0	70,0	40,0	60,0	67184
0.7969	20,241 mm	51/64	22,0	145,0	71,0	40,0	68,0	58552
0.8071	20,500 mm		22,0	145,0	72,0	41,0	68,0	67185
0.8125	20,638 mm	13/16	22,0	145,0	72,0	41,0	68,0	58553

CONTINUED

Series 146U, 136U Fractional				DC • in								
	Hardness	Vc (sfm)		1/16	1/8	1/4	3/8	1/2	5/8	3/4	13/16	
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	285	RPM	17419	8710	4355	2903	2177	1742	1452	1340
			(228-342)	Fr	0.0016	0.0031	0.0062	0.0093	0.0124	0.0155	0.0186	0.0202
				Feed (ipm)	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0
		≤ 275 Bhn or ≤ 28 HRc	255	RPM	15586	7793	3896	2598	1948	1559	1299	1199
			(204-306)	Fr	0.0013	0.0027	0.0054	0.0081	0.0108	0.0135	0.0162	0.0175
				Feed (ipm)	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
		≤ 425 Bhn or ≤ 45 HRc	145	RPM	8862	4431	2216	1477	1108	886	739	682
			(116-174)	Fr	0.0011	0.0023	0.0045	0.0068	0.0090	0.0113	0.0135	0.0147
				Feed (ipm)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc	220	RPM	13446	6723	3362	2241	1681	1345	1121	1034
			(176-264)	Fr	0.0015	0.0030	0.0059	0.0089	0.0119	0.0149	0.0178	0.0193
				Feed (ipm)	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
		≤ 375 Bhn or ≤ 40 HRc	135	RPM	8251	4126	2063	1375	1031	825	688	635
			(108-162)	Fr	0.0013	0.0027	0.0053	0.0080	0.0107	0.0133	0.0160	0.0173
				Feed (ipm)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 200 Bhn or ≤ 13 HRc	125	RPM	7640	3820	1910	1273	955	764	637	588	
		(100-150)	Fr	0.0012	0.0025	0.0050	0.0075	0.0099	0.0124	0.0149	0.0162	
			Feed (ipm)	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5
	≤ 375 Bhn or ≤ 40 HRc	90	RPM	5501	2750	1375	917	688	550	458	423	
		(72-108)	Fr	0.0005	0.0011	0.0022	0.0033	0.0044	0.0055	0.0065	0.0071	
			Feed (ipm)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 185 Bhn or ≤ 9 HRc	265	RPM	16197	8098	4049	2699	2025	1620	1350	1246
			(212-318)	Fr	0.0008	0.0016	0.0032	0.0048	0.0064	0.0080	0.0096	0.0104
				Feed (ipm)	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0
		≤ 275 Bhn or ≤ 28 HRc	170	RPM	10390	5195	2598	1732	1299	1039	866	799
			(136-204)	Fr	0.0006	0.0013	0.0025	0.0038	0.0050	0.0063	0.0075	0.0081
				Feed (ipm)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
	STAINLESS STEELS (DIFFICULT) 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	≤ 275 Bhn or ≤ 28 HRc	130	RPM	7946	3973	1986	1324	993	795	662	611
			(104-156)	Fr	0.0006	0.0013	0.0025	0.0038	0.0050	0.0063	0.0076	0.0082
				Feed (ipm)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
		≤ 375 Bhn or ≤ 40 HRc	95	RPM	5806	2903	1452	968	726	581	484	447
			(76-114)	Fr	0.0006	0.0011	0.0023	0.0034	0.0045	0.0057	0.0068	0.0074
				Feed (ipm)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
K	GRAY CAST IRONS	≤ 220 Bhn or ≤ 19 HRc	250	RPM	15280	7640	3820	2547	1910	1528	1273	1175
			(200-300)	Fr	0.0016	0.0031	0.0063	0.0094	0.0126	0.0157	0.0188	0.0204
				Feed (ipm)	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
	DUCTILE CAST IRONS	≤ 260 Bhn or ≤ 26 HRc	220	RPM	13446	6723	3362	2241	1681	1345	1121	1034
			(176-264)	Fr	0.0015	0.0030	0.0059	0.0089	0.0119	0.0149	0.0178	0.0193
				Feed (ipm)	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0

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Series 146U, 136U Fractional				DC • in								
		Hardness	Vc (sfm)	1/16	1/8	1/4	3/8	1/2	5/8	3/4	13/16	
N	ALUMINUM ALLOYS (WROUGHT) 2024, 6061, 7075	≤ 150 Bhn or ≤ 88 HRb	475	RPM	29032	14516	7258	4839	3629	2903	2419	2233
			Fr	0.0016	0.0031	0.0062	0.0093	0.0124	0.0155	0.0186	0.0202	
			Feed (ipm)	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	
	ALUMINUM ALLOYS (CAST) A356, A380, 390	≤ 140 Bhn or ≤ 3 HRc	380	RPM	23226	11613	5806	3871	2903	2323	1935	1787
			Fr	0.0014	0.0028	0.0055	0.0083	0.0110	0.0138	0.0165	0.0179	
			Feed (ipm)	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	
S	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V	≤ 275 Bhn or ≤ 28 HRc	175	RPM	10696	5348	2674	1783	1337	1070	891	823
			Fr	0.0007	0.0014	0.0028	0.0042	0.0055	0.0069	0.0083	0.0090	
			Feed (ipm)	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	
		≤ 350 Bhn or ≤ 38 HRc	130	RPM	7946	3973	1986	1324	993	795	662	611
			Fr	0.0006	0.0013	0.0025	0.0038	0.0050	0.0063	0.0076	0.0082	
			Feed (ipm)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
		≤ 440 Bhn or ≤ 47 HRc	70	RPM	4278	2139	1070	713	535	428	357	329
			Fr	0.0005	0.0009	0.0019	0.0028	0.0037	0.0047	0.0056	0.0061	
			Feed (ipm)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
H	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 450 Bhn or ≤ 48 HRc	95	RPM	5806	2903	1452	968	726	581	484	447
			Fr	0.0008	0.0016	0.0031	0.0047	0.0062	0.0078	0.0093	0.0101	
			Feed (ipm)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 475 Bhn or ≤ 50 HRc	80	RPM	4890	2445	1222	815	611	489	407	376
			Fr	0.0007	0.0014	0.0029	0.0043	0.0057	0.0072	0.0086	0.0093	
			Feed (ipm)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	

reduce rates when material is harder than listed, when drilling conditions are not optimum, or coolant is not available
 rates shown are for drilling into a flat surface and should be lowered using the reduction multiplier when the workpiece is angled or curved
 reduce rates 10 to 20 percent when using drills without internal coolant
 always use the shortest overhang possible
 longer drills may require a spot drill operation to avoid walking on entry
 internal coolant required in ISO S and M material groups or when drilling depth exceeds 3xD
 Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)
 $\text{rpm} = \text{Vc} \times 3.82 / \text{DC}$
 $\text{ipm} = \text{Fr} \times \text{rpm}$
 speed and feed for materials harder than listed
 refer to the **KYOCERA SGS APEX** for complete technical information (www.kyocera-sgstool.com/apex)

angle °	reduction multiplier	
	speed x	feed x
up to 30	1.0	0.6
over 30	0.7	0.4

Series 146U, 136U				DC • mm								
Metric	Hardness	Vc (m/mm)		1.5	3	6	8	10	12	16	20	
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	87	RPM	18419	9209	4605	3454	2763	2302	1727	1381
			(69-104)	Fr	0.037	0.074	0.149	0.199	0.248	0.298	0.397	0.496
				Feed (mm/min)	686	686	686	686	686	686	686	686
		≤ 275 Bhn or ≤ 28 HRc	78	RPM	16480	8240	4120	3090	2472	2060	1545	1236
			(62-93)	Fr	0.032	0.065	0.129	0.173	0.216	0.259	0.345	0.432
				Feed (mm/min)	533	533	533	533	533	533	533	533
		≤ 425 Bhn or ≤ 45 HRc	44	RPM	9371	4686	2343	1757	1406	1171	879	703
			(35-53)	Fr	0.027	0.054	0.108	0.145	0.181	0.217	0.289	0.361
				Feed (mm/min)	254	254	254	254	254	254	254	254
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc	67	RPM	14218	7109	3555	2666	2133	1777	1333	1066
			(54-80)	Fr	0.036	0.071	0.143	0.191	0.238	0.286	0.381	0.476
				Feed (mm/min)	508	508	508	508	508	508	508	508
		≤ 375 Bhn or ≤ 40 HRc	41	RPM	8725	4362	2181	1636	1309	1091	818	654
			(33-49)	Fr	0.032	0.064	0.128	0.171	0.213	0.256	0.342	0.427
				Feed (mm/min)	279	279	279	279	279	279	279	279
TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 200 Bhn or ≤ 13 HRc	38	RPM	8078	4039	2020	1515	1212	1010	757	606	
		(30-46)	Fr	0.030	0.060	0.119	0.159	0.199	0.239	0.319	0.398	
			Feed (mm/min)	241	241	241	241	241	241	241	241	
	≤ 375 Bhn or ≤ 40 HRc	27	RPM	5816	2908	1454	1091	872	727	545	436	
		(22-33)	Fr	0.013	0.026	0.052	0.070	0.087	0.105	0.140	0.175	
			Feed (mm/min)	76	76	76	76	76	76	76	76	
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 185 Bhn or ≤ 9 HRc	81	RPM	17126	8563	4282	3211	2569	2141	1606	1284
			(65-97)	Fr	0.019	0.039	0.077	0.103	0.129	0.154	0.206	0.257
				Feed (mm/min)	330	330	330	330	330	330	330	330
		≤ 275 Bhn or ≤ 28 HRc	52	RPM	10987	5493	2747	2060	1648	1373	1030	824
			(41-62)	Fr	0.015	0.030	0.060	0.080	0.100	0.120	0.160	0.200
				Feed (mm/min)	165	165	165	165	165	165	165	165
	STAINLESS STEELS (DIFFICULT) 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	≤ 275 Bhn or ≤ 28 HRc	40	RPM	8402	4201	2100	1575	1260	1050	788	630
			(32-48)	Fr	0.015	0.030	0.060	0.081	0.101	0.121	0.161	0.202
				Feed (mm/min)	127	127	127	127	127	127	127	127
		≤ 375 Bhn or ≤ 40 HRc	29	RPM	6140	3070	1535	1151	921	767	576	460
			(23-35)	Fr	0.014	0.027	0.055	0.073	0.091	0.109	0.146	0.182
				Feed (mm/min)	84	84	84	84	84	84	84	84
K	GRAY CAST IRONS	≤ 220 Bhn or ≤ 19 HRc	76	RPM	16157	8078	4039	3029	2424	2020	1515	1212
			(61-91)	Fr	0.038	0.075	0.151	0.201	0.252	0.302	0.402	0.503
				Feed (mm/min)	610	610	610	610	610	610	610	610
	DUCTILE CAST IRONS	≤ 260 Bhn or ≤ 26 HRc	67	RPM	14218	7109	3555	2666	2133	1777	1333	1066
			(54-80)	Fr	0.036	0.071	0.143	0.191	0.238	0.286	0.381	0.476
				Feed (mm/min)	508	508	508	508	508	508	508	508

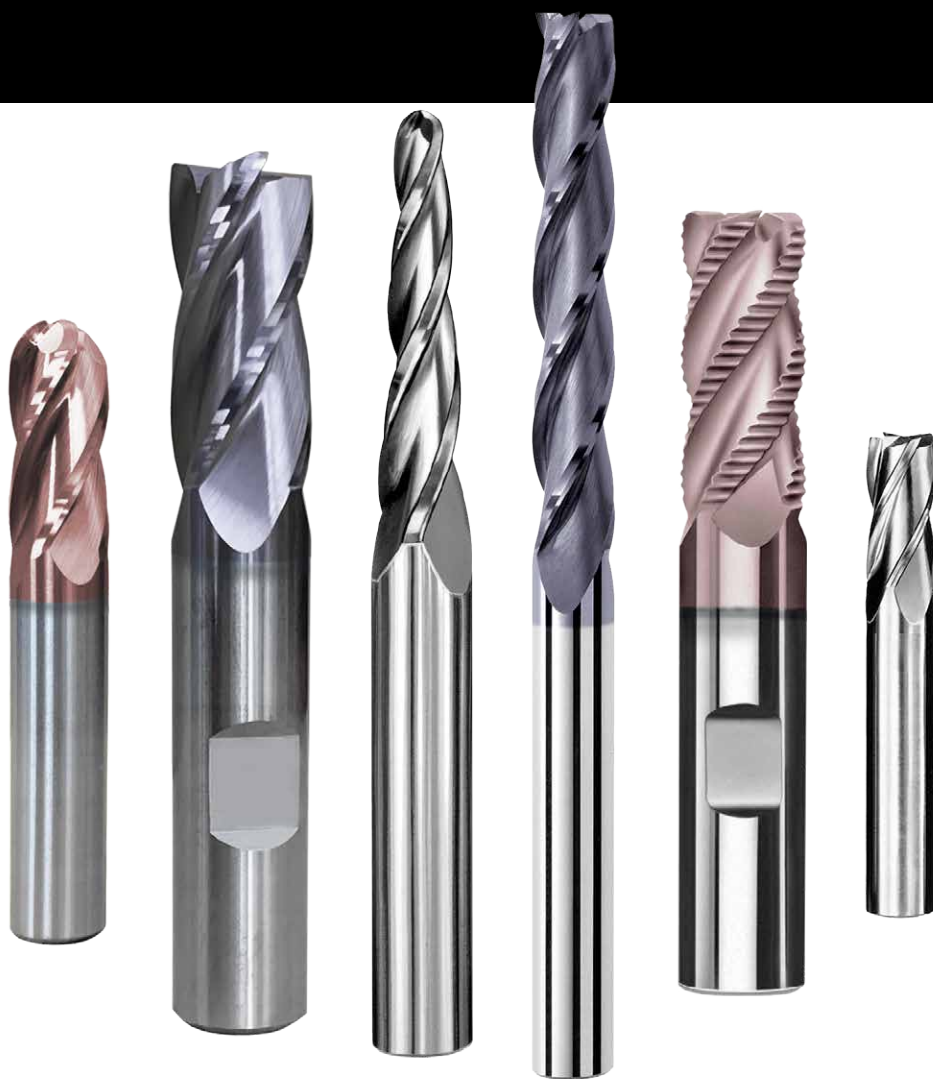
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Series 146U, 136U Metric			Vc (m/mm)	DC • mm								
Hardness				1.5	3	6	8	10	12	16	20	
N	ALUMINUM ALLOYS (WROUGHT) 2024, 6061, 7075	≤ 150 Bhn or ≤ 88 HRb	145 (116-174)	RPM	30698	15349	7675	5756	4605	3837	2878	2302
			Fr	0.037	0.074	0.149	0.199	0.248	0.298	0.397	0.496	
			Feed (mm/min)	1143	1143	1143	1143	1143	1143	1143	1143	
	ALUMINUM ALLOYS (CAST) A356, A380, 390	≤ 140 Bhn or ≤ 3 HRc	116 (93-139)	RPM	24559	12279	6140	4605	3684	3070	2302	1842
			Fr	0.033	0.066	0.132	0.177	0.221	0.265	0.353	0.441	
			Feed (mm/min)	813	813	813	813	813	813	813	813	
S	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V	≤ 275 Bhn or ≤ 28 HRc	53 (43-64)	RPM	11310	5655	2827	2121	1696	1414	1060	848
			Fr	0.017	0.033	0.066	0.089	0.111	0.133	0.177	0.222	
			Feed (mm/min)	188	188	188	188	188	188	188	188	
		≤ 350 Bhn or ≤ 38 HRc	40 (32-48)	RPM	8402	4201	2100	1575	1260	1050	788	630
			Fr	0.015	0.030	0.060	0.081	0.101	0.121	0.161	0.202	
			Feed (mm/min)	127	127	127	127	127	127	127	127	
		≤ 440 Bhn or ≤ 47 HRc	21 (17-26)	RPM	4524	2262	1131	848	679	565	424	339
			Fr	0.011	0.022	0.045	0.060	0.075	0.090	0.120	0.150	
			Feed (mm/min)	51	51	51	51	51	51	51	51	
H	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 450 Bhn or ≤ 48 HRc	29 (23-35)	RPM	6140	3070	1535	1151	921	767	576	460
			Fr	0.019	0.037	0.074	0.099	0.124	0.149	0.199	0.248	
			Feed (mm/min)	114	114	114	114	114	114	114	114	
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 475 Bhn or ≤ 50 HRc	24 (20-29)	RPM	5170	2585	1293	969	776	646	485	388
			Fr	0.017	0.034	0.069	0.092	0.115	0.138	0.183	0.229	
			Feed (mm/min)	89	89	89	89	89	89	89	89	

reduce rates when material is harder than listed, when drilling conditions are not optimum, or coolant is not available
 rates shown are for drilling into a flat surface and should be lowered using the reduction multiplier when the workpiece is angled or curved
 reduce rates 10 to 20 percent when using drills without internal coolant
 always use the shortest overhang possible
 longer drills may require a spot drill operation to avoid walking on entry
 internal coolant required in ISO S and M material groups or when drilling depth exceeds 3xD
 Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)
 $\text{rpm} = (\text{Vc} \times 1000) / (\text{DC} \times 3.14)$
 $\text{mm/min} = \text{Fr} \times \text{rpm}$
 speed and feed for materials harder than listed
 refer to the **KYOCERA SGS APEX** for complete technical information (www.kyocera-sgstool.com/apex)

angle °	reduction multiplier	
	speed x	feed x
up to 30	1.0	0.6
over 30	0.7	0.4

General Application End Mills



Milling

SERIES	GENERAL APPLICATION END MILLS DESCRIPTION	PAGE	S&F PAGE
3	2 Flute Square End Standard Length Fractional	288	324, 325
3L	2 Flute Square End Long Reach Fractional	288	324, 325
3EL	2 Flute Square End Extended Length Fractional	288	324, 325
3CR	2 Flute Corner Radius Standard Length Fractional	288	324, 325
3B	2 Flute Ball End Standard Length Fractional	291	324
3LB	2 Flute Ball End Long Reach Fractional	291	324
3ELB	2 Flute Ball End Extended Length Fractional	291	324
3M	2 Flute Square End Standard Length Metric	293	330
3XLM	2 Flute Square End Extra Long Reach Metric	293	330
3MB	2 Flute Ball End Standard Length Metric	294	331
3XLMB	2 Flute Ball End Extra Long Reach Metric	294	331
17	2 Flute Square End Stub Fractional	295	325
17M	2 Flute Square End Stub Metric	295	330
52	2 Flute High Shear Square End Standard Length Fractional	296	327
52M	2 Flute High Shear Square End Standard Length Metric	296	332
59	2 Flute Square End Long Reach Fractional	297	325
59B	2 Flute Ball End Long Reach Fractional	298	331
59M	2 Flute Square End Long Reach Metric	299	331
59MB	2 Flute Ball End Long Reach Metric	300	331
5	3 Flute Square End Standard Length Fractional	301	325
5B	3 Flute Ball End Standard Length Fractional	302	325
5M	3 Flute Square End Standard Length Metric	303	330
5XLM	3 Flute Square End Extra Long Reach Metric	303	330
5MB	3 Flute Ball End Standard Length Metric	304	330
5XLMB	3 Flute Ball End Extra Long Reach Metric	304	330
23	3 Flute Tapered Square End Standard Length Fractional	305	325
24	3 Flute Tapered Corner Radius Standard Length Fractional	306	325
1	4 Flute Square End Standard Length Fractional	307	324, 325
1L	4 Flute Square End Long Reach Fractional	307	324, 325
1EL	4 Flute Square End Extended Length Fractional	307	324, 325
1CR	4 Flute Corner Radius Standard Length Fractional	307	324, 325
1B	4 Flute Ball End Standard Length Fractional	311	324
1LB	4 Flute Ball End Long Reach Fractional	311	324
1ELB	4 Flute Ball End Extended Length Fractional	311	324
1M	4 Flute Square End Standard Length Metric	313	330
1XLM	4 Flute Square End Extra Long Reach Metric	313	330
1MCR	4 Flute Corner Radius Standard Length Metric	313	330

Speed & Feed Recommendations listed at the end of this section

SERIES	GENERAL APPLICATION END MILLS DESCRIPTION	PAGE	S&F PAGE
1MB	4 Flute Ball End Standard Length Metric	316	330
1XLMB	4 Flute Ball End Extra Long Reach Metric	316	330
14	4 Flute Double End Square Stub Fractional	317	325
14B	4 Flute Double End Ball Stub Fractional	318	330
14M	4 Flute Double End Square Stub Metric	317	330
14MB	4 Flute Double End Ball Stub Metric	318	330
16	4 Flute Square End Stub Fractional	307	325
16M	4 Flute Square End Stub Metric	313	330
54	4 Flute High Shear Square End Standard Length Fractional	319	327
54M	4 Flute High Shear Square End Standard Length Metric	319	332
61	Multi-Flute Coarse Pitch Rougher Fractional	320	328
61M	Multi-Flute Coarse Pitch Rougher Metric	320	334
62	Multi-Flute Fine Pitch Rougher Fractional	321	329
62M	Multi-Flute Fine Pitch Rougher Metric	321	335
End Mill Sets	2, 3, & 4 Flute Square End Series 1, 3, 5, 14	322	324, 325
	2, 3, & 4 Flute Ball End Series 1B, 3B, 5B, 14B	323	324, 325

Speed & Feed Recommendations listed at the end of this section

Fresado

SERIE	DESCRIPCIÓN DE FRESAS DE USO GENERAL	PÁGINA	S&F PÁGINA
3	2 filos, punta cuadrada, longitud estándar, fraccional	288	324, 325
3L	2 filos, punta cuadrada, largo alcance, fraccional	288	324, 325
3EL	2 filos, punta cuadrada, longitud extendida, fraccional	288	324, 325
3CR	2 filos, radio angulado, longitud estándar, fraccional	288	324, 325
3B	2 filos, punta esférica, longitud estándar, fraccional	291	324
3LB	2 filos, punta esférica, largo alcance, fraccional	291	324
3ELB	2 filos, punta esférica, longitud extendida, fraccional	291	324
3M	2 filos, punta cuadrada, longitud estándar, métrico	293	330
3XLM	2 filos, punta cuadrada, alcance extralargo, métrico	293	330
3MB	2 filos, punta esférica, longitud estándar, métrico	294	331
3XLMB	2 filos, punta esférica, alcance extralargo, métrico	294	331
17	2 filos, pieza de punta cuadrada, fraccional	295	325
17M	2 filos, pieza de punta cuadrada, métrico	295	330

SERIE	DESCRIPCIÓN DE FRESAS DE USO GENERAL	PÁGINA	S&F PÁGINA
52	2 filos, alto rendimiento, punta cuadrada, longitud estándar, fraccional	296	327
52M	2 filos, alto rendimiento, punta cuadrada, longitud estándar, métrico	296	332
59	2 filos, punta cuadrada, largo alcance, fraccional	297	325
59B	2 filos, punta esférica, largo alcance, fraccional	298	331
59M	2 filos, punta cuadrada, largo alcance, métrico	299	331
59MB	2 filos, punta esférica, largo alcance, métrico	300	331
5	3 filos, punta cuadrada, longitud estándar, fraccional	301	325
5B	3 filos, punta esférica, longitud estándar, fraccional	302	325
5M	3 filos, punta cuadrada, longitud estándar, métrico	303	330
5XLM	3 filos, punta cuadrada, alcance extralargo, métrico	303	330
5MB	3 filos, punta esférica, longitud estándar, métrico	304	330
5XLMB	3 filos, punta esférica, alcance extralargo, métrico	304	330
23	3 filos, cónico, punta cuadrada, longitud estándar, fraccional	305	325
24	3 filos, cónico, radio angulado, longitud estándar, fraccional	306	325
1	4 filos, punta cuadrada, longitud estándar, fraccional	307	324, 325
1L	4 filos, punta cuadrada, largo alcance, fraccional	307	324, 325
1EL	4 filos, punta cuadrada, longitud extendida, fraccional	307	324, 325
1CR	4 filos, radio angulado, longitud estándar, fraccional	307	324, 325
1B	4 filos, punta esférica, longitud estándar, fraccional	311	324
1LB	4 filos, punta esférica, largo alcance, fraccional	311	324
1ELB	4 filos, punta esférica, longitud extendida, fraccional	311	324
1M	4 filos, punta cuadrada, longitud estándar, métrico	313	330
1XLM	4 filos, punta cuadrada, alcance extralargo, métrico	313	330
1MCR	4 filos, radio angulado, longitud estándar, métrico	313	330
1MB	4 filos, punta esférica, longitud estándar, métrico	316	330
1XLMB	4 filos, punta esférica, alcance extralargo, métrico	316	330
14	4 filos, pieza doble de punta cuadrada, fraccional	317	325
14B	4 filos, pieza doble de punta esférica, fraccional	318	330
14M	4 filos, pieza doble de punta cuadrada, métrico	317	330
14MB	4 filos, pieza doble de punta esférica, métrico	318	330
16	4 filos, pieza de punta cuadrada, fraccional	307	325
16M	4 filos, pieza de punta cuadrada, métrico	313	330
54	4 filos, alto rendimiento, punta cuadrada, longitud estándar, fraccional	319	327
54M	4 filos, alto rendimiento, punta cuadrada, longitud estándar, métrico	319	332
61	Filo múltiple, paso grueso, desbastador, fraccional	320	328
61M	Filo múltiple, paso grueso, desbastador, métrico	320	334
62	Filo múltiple, paso fino, desbastador, fraccional	321	329
62M	Filo múltiple, paso fino, desbastador, métrico	321	335
Juegos de fresas	2, 3 y 4 filos, punta cuadrada, series 1, 3, 5, 14	322	324, 325
	2, 3 y 4 filos, punta esférica, series 1B, 3B, 5B, 14B	323	324, 325

Recomendaciones de Velocidad y Avance mostrados al final de esta sección.

SÉRIES	DESCRIPTION DE FRAISES À USAGE GÉNÉRAL	PAGE	S&F PAGE
3	2 dents non rayonné longueur standard (fractionnel)	288	324, 325
3L	2 dents non rayonné longue portée (fractionnel)	288	324, 325
3EL	2 dents non rayonné extra-long (fractionnel)	288	324, 325
3CR	2 dents rayonné longueur standard (fractionnel)	288	324, 325
3B	2 dents à bout hémisphérique longueur standard (fractionnel)	291	324
3LB	2 dents à bout hémisphérique longue portée (fractionnel)	291	324
3ELB	2 dents à bout hémisphérique extra-long (fractionnel)	291	324
3M	2 dents non rayonné longueur standard (métrique)	293	330
3XLM	2 dents non rayonné portée extra-longue (métrique)	293	330
3MB	2 dents à bout hémisphérique longueur standard (métrique)	294	331
3XLMB	2 dents à bout hémisphérique portée extra-longue (métrique)	294	331
17	2 dents non rayonné court (fractionnel)	295	325
17M	2 dents non rayonné court (métrique)	295	330
52	2 dents cisaillement élevé non rayonné longueur standard (fractionnel)	296	327
52M	2 dents cisaillement élevé non rayonné longueur standard (métrique)	296	332
59	2 dents non rayonné longue portée (fractionnel)	297	325
59B	2 dents à bout hémisphérique longue portée (fractionnel)	298	331
59M	2 dents non rayonné longue portée (métrique)	299	331
59MB	2 dents à bout hémisphérique longue portée (métrique)	300	331
5	3 dents non rayonné longueur standard (fractionnel)	301	325
5B	3 dents à bout hémisphérique longueur standard (fractionnel)	302	325
5M	3 dents non rayonné longueur standard (métrique)	303	330
5XLM	3 dents non rayonné portée extra-longue (métrique)	303	330
5MB	3 dents à bout hémisphérique longueur standard (métrique)	304	330
5XLMB	3 dents à bout hémisphérique portée extra-longue (métrique)	304	330
23	3 dents conique non rayonné longueur standard (fractionnel)	305	325
24	3 dents conique rayonné longueur standard (fractionnel)	306	325
1	4 dents non rayonné longueur standard (fractionnel)	307	324, 325
1L	4 dents non rayonné longue portée (fractionnel)	307	324, 325
1EL	4 dents non rayonné extra-long (fractionnel)	307	324, 325
1CR	4 dents rayonné longueur standard (fractionnel)	307	324, 325
1B	4 dents à bout hémisphérique longueur standard (fractionnel)	311	324
1LB	4 dents à bout hémisphérique longue portée (fractionnel)	311	324
1ELB	4 dents à bout hémisphérique extra-long (fractionnel)	311	324
1M	4 dents non rayonné longueur standard (métrique)	313	330
1XLM	4 dents non rayonné portée extra-longue (métrique)	313	330
1MCR	4 dents rayonné longueur standard (métrique)	313	330
1MB	4 dents à bout hémisphérique longueur standard (métrique)	316	330
1XLMB	4 dents à bout hémisphérique portée extra-longue (métrique)	316	330

SÉRIES	DESCRIPTION DE FRAISES À USAGE GÉNÉRAL	PAGE	S&F PAGE
14	4 dents à double bouts plats court (fractionnel)	317	325
14B	4 dents à double bouts hémisphériques court (fractionnel)	318	330
14M	4 dents à double bouts plats court (métrique)	317	330
14MB	4 dents à double bouts hémisphériques court (métrique)	318	330
16	4 dents non rayonné court (fractionnel)	307	325
16M	4 dents non rayonné court (métrique)	313	330
54	4 dents cisaillement élevé non rayonné longueur standard (fractionnel)	319	327
54M	4 dents cisaillement élevé non rayonné longueur standard (métrique)	319	332
61	Multi-dents à pas gros d'ébauche (fractionnel)	320	328
61M	Multi-dents à pas gros d'ébauche (métrique)	320	334
62	Multi-dents à pas fin d'ébauche (fractionnel)	321	329
62M	Multi-dents à pas fin d'ébauche (métrique)	321	335
Jeux de fraises	2, 3, & 4 Série goujure non rayonné 1, 3, 5, 14	322	324, 325
	2, 3, & 4 Série goujure à bout hémisphérique 1B, 3B, 5B, 14B	323	324, 325

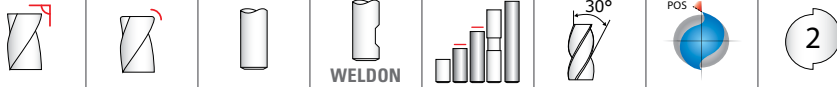
Les avances et les vitesses recommandées se trouvent à la fin du chapitre.

SERIE	BESCHREIBUNG DER STANDARD-SCHAFTFRÄSER	SEITE	S&F SEITE
3	Zölliger Schaftfräser mit 2 Schneiden ohne Eckenradien, Standardlänge	288	324, 325
3L	Zölliger Langloch-Schaftfräser mit 2 Schneiden ohne Eckenradien	288	324, 325
3EL	Zölliger Schaftfräser mit 2 Schneiden ohne Eckenradien, extra lang	288	324, 325
3CR	Zölliger Schaftfräser mit 2 Schneiden mit Eckenradien, Standardlänge	288	324, 325
3B	Zölliger Radiuschaftfräser mit 2 Schneiden, Standardlänge	291	324
3LB	Zölliger Langloch-Radiuschaftfräser mit 2 Schneiden	291	324
3ELB	Zölliger Schaftfräser mit 2 Schneiden, Extra lang	291	324
3M	Schaftfräser mit 2 Schneiden ohne Eckenradien, Standardlänge	293	330
3XLM	Langloch-Schaftfräser mit 2 Schneiden ohne Eckenradien	293	330
3MB	Schaftfräser mit 2 Schneiden, Standardlänge	294	331
3XLMB	Superlangloch-Schaftfräser mit 2 Schneiden	294	331
17	Zölliger Schaftfräser mit 2 Schneiden ohne Eckenradien, kurze Ausführung	295	325
17M	Schaftfräser mit 2 Schneiden ohne Eckenradien, kurze Ausführung	295	330
52	Zölliger Schaftfräser hoher Scherfestigkeit mit 2 Schneiden ohne Eckenradien, Standardlänge	296	327
52M	Schaftfräser hoher Scherfestigkeit mit 2 Schneiden ohne Eckenradien, Standardlänge	296	332
59	Zölliger Langloch-Schaftfräser mit 2 Schneiden ohne Eckenradien	297	325
59B	Zölliger Langloch-Radiuschaftfräser mit 2 Schneiden	298	331
59M	Langloch-Schaftfräser mit 2 Schneiden ohne Eckenradien	299	331
59MB	Langloch-Radiuschaftfräser mit 2 Schneiden	300	331
5	Zölliger Schaftfräser mit 3 Schneiden ohne Eckenradien, Standardlänge	301	325
5B	Zölliger Schaftfräser mit 3 Schneiden, Standardlänge	302	325
5M	Schaftfräser mit 3 Schneiden ohne Eckenradien, Standardlänge	303	330
5XLM	Langloch-Schaftfräser mit 3 Schneiden ohne Eckenradien	303	330
5MB	Schaftfräser mit 3 Schneiden, Standardlänge	304	330
5XLMB	Langloch-Schaftfräser mit 3 Schneiden	304	330
23	Zölliger Schaftfräser mit 3 Schneiden ohne Eckenradien, Standardlänge	305	325
24	Zölliger Schaftfräser mit 3 Schneiden mit Eckenradien, Standardlänge	306	325
1	Zölliger Schaftfräser mit 4 Schneiden ohne Eckenradien, Standardlänge	307	324, 325
1L	Zölliger Langloch-Schaftfräser mit 4 Schneiden ohne Eckenradien	307	324, 325
1EL	Zölliger Schaftfräser mit 4 Schneiden ohne Eckenradien, extra lang	307	324, 325
1CR	Zölliger Schaftfräser mit 4 Schneiden mit Eckenradien, Standardlänge	307	324, 325
1B	Zölliger Schaftfräser mit 4 Schneiden, Standardlänge	311	324
1LB	Zölliger Langloch-Radiuschaftfräser mit 4 Schneiden	311	324
1ELB	Zölliger Schaftfräser mit 4 Schneiden, Extra lang	311	324
1M	Schaftfräser mit 4 Schneiden ohne Eckenradien, Standardlänge	313	330
1XLM	Superlangloch-Schaftfräser mit 4 Schneiden ohne Eckenradien	313	330
1MCR	Schaftfräser mit 4 Schneiden mit Eckenradien, Standardlänge	313	330
1MB	Schaftfräser mit 4 Schneiden, Standardlänge	316	330
1XLMB	Langloch-Radiuschaftfräser mit 4 Schneiden	316	330

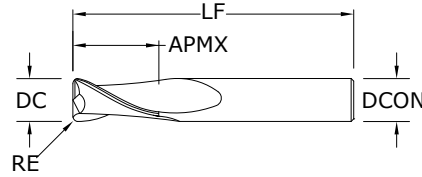
SERIE	BESCHREIBUNG DER STANDARD-SCHAFTFRÄSER	SEITE	S&F SEITE
14	Zölliger Schaftfräser mit 4 Schneiden, kurze Ausführung	317	325
14B	Zölliger Doppelend-Radiusschaftfräser mit 4 Schneiden, kurze Ausführung	318	330
14M	Schaftfräser mit 4 Schneiden, kurze Ausführung	317	330
14MB	Doppelend-Radiusschaftfräser mit 4 Schneiden, kurze Ausführung	318	330
16	Zölliger Schaftfräser mit 4 Schneiden ohne Eckenradien, kurze Ausführung	307	325
16M	Schaftfräser mit 4 Schneiden ohne Eckenradien, kurze Ausführung	313	330
54	Zölliger Schaftfräser hoher Scherfestigkeit mit 4 Schneiden ohne Eckenradien, Standardlänge	319	327
54M	Schaftfräser hoher Scherfestigkeit mit 4 Schneiden ohne Eckenradien, Standardlänge	319	332
61	Zölliger mehrschneidiger fein verzahnter Schruppfräser	320	328
61M	Mehrschneidiger fein verzahnter Schruppfräser	320	334
62	Zölliger mehrschneidiger fein verzahnter Schruppfräser	321	329
62M	Mehrschneidiger fein verzahnter Schruppfräser	321	335
Richtwerte zum Fräsen	Schaftfräser mit 2, 3 und 4 Schneiden ohne Eckenradien, Serien 1, 3, 5, 14, 15	322	324, 325
	Radiusschaftfräser mit 2, 3 und 4 Schneiden, Serien 1B, 3B, 5B, 14B, 15B	323	324, 325

Schnittwertempfehlungen finden Sie am Ende dieses Abschnitts

2 Flute Square End • 2 Flute Corner Radius



**3•3L•
3EL•3CR**
FRACTIONAL SERIES



TOLERANCES (inch)

<1/8 DIAMETER

DC = +0.000/-0.001

DCON = h_6

≥1/8 DIAMETER

DC = +0.000/-0.002

3CR DC = -0.001/-0.002

DCON = h_6

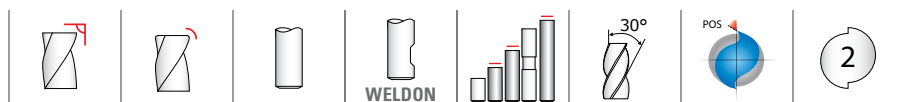
RE = +0.000/-0.002

STEELS
STAINLESS STEELS
CAST IRON
NON-FERROUS
HIGH TEMP ALLOYS

CUTTING DIAMETER DC	LENGTH OF CUT APMX	inch				EDP NO.					SERIES
		OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	WELDON FLAT	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	1/2	1-1/2	1/8	.015		38201	38202	38315	38357	—	3CR
1/8	1/2	1-1/2	1/8	.020		38203	38204	38316	38358	—	3CR
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	5/8	2	3/16	.015		38209	38210	38317	38359	—	3CR
3/16	5/8	2	3/16	.020		38211	38212	38318	38360	—	3CR
3/16	5/8	2	3/16	.030		38213	38214	38319	38361	—	3CR
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	3/4	2-1/2	1/4	.015		38219	38220	38320	38362	—	3CR
1/4	3/4	2-1/2	1/4	.020		38221	38222	38321	38363	—	3CR
1/4	3/4	2-1/2	1/4	.030		38223	38224	38322	38364	—	3CR
1/4	3/4	2-1/2	1/4	.045		38225	38226	38323	38365	—	3CR
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

continued on next page

2 Flute Square End • 2 Flute Corner Radius



TOLERANCES (inch)

<1/8 DIAMETER

DC = +0.000 / -0.001

DCON = h_6

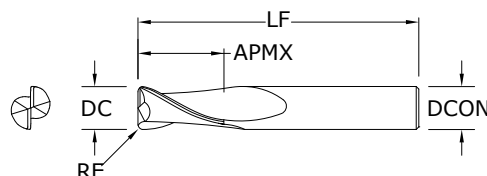
≥1/8 DIAMETER

DC = +0.000 / -0.002

3CR DC = -0.001 / -0.002

DCON = h_6

RE = +0.000 / -0.002



**3•3L•
3EL•3CR**
FRACTIONAL SERIES

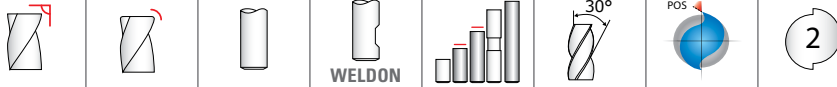
inch						EDP NO.					SERIES
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	WELDON FLAT	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	Di-NAMITE (Diamond)	
19/64	13/16	2-1/2	5/16	—		30337	39337	39537	30449	—	3
*5/16	13/16	2-1/2	5/16	—		30339	39339	39539	30450	91282	3
5/16	13/16	2-1/2	5/16	.015		38231	38232	38324	38366	—	3CR
5/16	13/16	2-1/2	5/16	.020		38233	38234	38325	38367	—	3CR
5/16	13/16	2-1/2	5/16	.030		38235	38236	38326	38368	—	3CR
5/16	13/16	2-1/2	5/16	.045		38237	38238	38327	38369	—	3CR
5/16	1-1/8	3	5/16	—		33305	31821	31826	31853	—	3L
5/16	1-5/8	4	5/16	—		33325	31941	31951	31961	—	3EL
21/64	1	2-1/2	3/8	—		30341	39341	39541	30451	—	3
11/32	1	2-1/2	3/8	—		30343	39343	39543	30452	—	3
23/64	1	2-1/2	3/8	—		30345	39345	39545	30453	—	3
*3/8	1	2-1/2	3/8	—		30347	39347	39547	30454	91286	3
3/8	1	2-1/2	3/8	.015	•	38245	38246	38328	38370	—	3CR
3/8	1	2-1/2	3/8	.020	•	38247	38248	38329	38371	—	3CR
3/8	1	2-1/2	3/8	.030	•	38249	38250	38330	38372	—	3CR
3/8	1	2-1/2	3/8	.045	•	38251	38252	38331	38373	—	3CR
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	1	3	1/2	.015	•	38259	38260	38332	38374	—	3CR
1/2	1	3	1/2	.020	•	38261	38262	38333	38375	—	3CR
1/2	1	3	1/2	.030	•	38263	38264	38334	38376	—	3CR
1/2	1	3	1/2	.045	•	38265	38266	38335	38377	—	3CR
1/2	1	3	1/2	.060	•	38267	38268	38336	38378	—	3CR
1/2	2	4-1/2	1/2	—		33311	31806	31816	31856	—	3L

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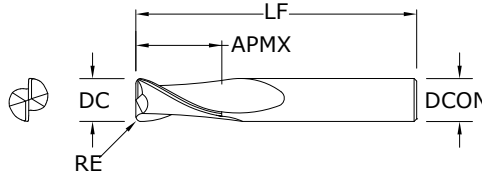
CONTINUED

STEELS
STAINLESS STEELS
CAST IRON
NON-FERROUS
HIGH TEMP ALLOYS

2 Flute Square End • 2 Flute Corner Radius



**3•3L•
3EL•3CR**
FRACTIONAL SERIES



TOLERANCES (inch)

<1/8 DIAMETER

DC = +0.000/-0.001

DCON = h_6

≥1/8 DIAMETER

DC = +0.000/-0.002

3CR DC = -0.001/-0.002

DCON = h_6

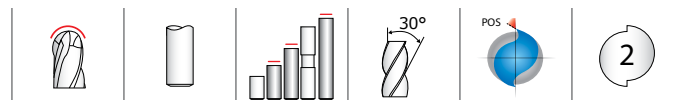
RE = +0.000/-0.002

CONTINUED

STEELS
STAINLESS STEELS
CAST IRON
NON-FERROUS
HIGH TEMP ALLOYS

CUTTING DIAMETER DC	LENGTH OF CUT APMX	inch		CORNER RADIUS RE	WELDON FLAT	EDP NO.					SERIES
		OVERALL LENGTH LF	SHANK DIAMETER DCON			UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	Di-NAMITE (Diamond)	
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	1-1/4	3-1/2	5/8	.015	•	38273	38274	38337	38379	—	3CR
5/8	1-1/4	3-1/2	5/8	.020	•	38275	38276	38338	38380	—	3CR
5/8	1-1/4	3-1/2	5/8	.030	•	38277	38278	38339	38381	—	3CR
5/8	1-1/4	3-1/2	5/8	.045	•	38279	38280	38340	38382	—	3CR
5/8	1-1/4	3-1/2	5/8	.060	•	38281	38282	38341	38383	—	3CR
5/8	1-1/4	3-1/2	5/8	.090	•	38283	38284	38342	38384	—	3CR
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	1-1/2	4	3/4	.015	•	38287	38288	38343	38385	—	3CR
3/4	1-1/2	4	3/4	.020	•	38289	38290	38344	38386	—	3CR
3/4	1-1/2	4	3/4	.030	•	38291	38292	38345	38387	—	3CR
3/4	1-1/2	4	3/4	.045	•	38293	38294	38346	38388	—	3CR
3/4	1-1/2	4	3/4	.060	•	38295	38296	38347	38389	—	3CR
3/4	1-1/2	4	3/4	.090	•	38297	38298	38348	38390	—	3CR
3/4	1-1/2	4	3/4	.125	•	38299	38300	38349	38391	—	3CR
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	1-1/2	4	1	.015	•	38301	38302	38350	38392	—	3CR
1	1-1/2	4	1	.020	•	38303	38304	38351	38393	—	3CR
1	1-1/2	4	1	.030	•	38305	38306	38352	38394	—	3CR
1	1-1/2	4	1	.045	•	38307	38308	38353	38395	—	3CR
1	1-1/2	4	1	.060	•	38309	38310	38354	38396	—	3CR
1	1-1/2	4	1	.090	•	38311	38312	38355	38397	—	3CR
1	1-1/2	4	1	.125	•	38313	38314	38356	38398	—	3CR
1	2-1/4	5	1	—		33317	31824	31819	31859	—	3L
1	3	6	1	—		33337	31947	31957	31967	—	3EL
*Series 3 Set						30389	39389	39589	30470	—	3

2 Flute Ball End



TOLERANCES (inch)

<1/8 DIAMETER

DC = +0.000 / -0.001

DCON = h_6

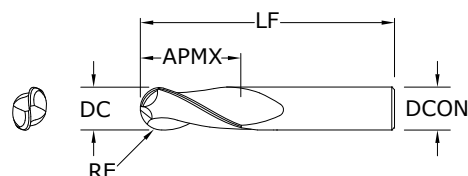
RE = +0.000 / -0.0005

≥1/8 DIAMETER

DC = +0.000 / -0.002

DCON = h_6

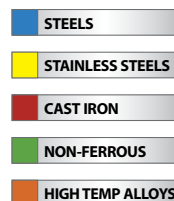
RE = +0.000 / -0.001



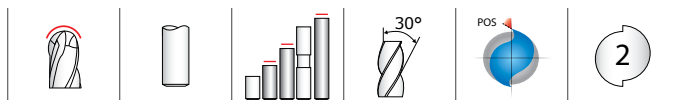
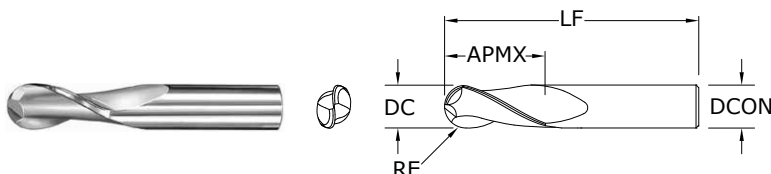
**3B•3LB•
3ELB**
FRACTIONAL SERIES

inch				EDP NO.			SERIES
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	UNCOATED	Ti-NAMITE-A (AlTiN)	Di-NAMITE (Diamond)	
1/64	1/32	1-1/2	1/8	30302	30471	—	3B
1/32	5/64	1-1/2	1/8	30304	30472	—	3B
3/64	7/64	1-1/2	1/8	30306	30473	—	3B
1/16	3/16	1-1/2	1/8	30308	30474	91267	3B
5/64	3/16	1-1/2	1/8	30310	30475	—	3B
3/32	9/32	1-1/2	1/8	30312	30476	—	3B
7/64	3/8	1-1/2	1/8	30314	30477	—	3B
1/8	3/8	1-1/2	1/8	30378	30599	—	3B
*1/8	1/2	1-1/2	1/8	30316	30478	91271	3B
1/8	3/4	2-1/4	1/8	33342	31890	—	3LB
1/8	1	3	1/8	33344	31988	—	3ELB
9/64	1/2	2	3/16	30318	30479	—	3B
5/32	1/2	2	3/16	30320	30480	—	3B
11/64	5/8	2	3/16	30322	30481	—	3B
*3/16	5/8	2	3/16	30324	30482	91275	3B
3/16	3/4	2-1/2	3/16	33302	31891	—	3LB
3/16	1-1/8	3	3/16	33322	31989	—	3ELB
13/64	5/8	2-1/2	1/4	30326	30483	—	3B
7/32	5/8	2-1/2	1/4	30328	30484	—	3B
15/64	3/4	2-1/2	1/4	30330	30485	—	3B
*1/4	3/4	2-1/2	1/4	30332	30486	91279	3B
1/4	1-1/8	3	1/4	33304	31892	—	3LB
1/4	1-1/2	4	1/4	33324	31990	—	3ELB
17/64	3/4	2-1/2	5/16	30334	30487	—	3B
9/32	3/4	2-1/2	5/16	30336	30488	—	3B
19/64	13/16	2-1/2	5/16	30338	30489	—	3B
*5/16	13/16	2-1/2	5/16	30340	30490	91283	3B
5/16	1-1/8	3	5/16	33306	31893	—	3LB
5/16	1-5/8	4	5/16	33326	31991	—	3ELB
21/64	1	2-1/2	3/8	30342	30491	—	3B
11/32	1	2-1/2	3/8	30344	30492	—	3B
23/64	1	2-1/2	3/8	30346	30493	—	3B

continued on next page



2 Flute Ball End


**3B•3LB•
3ELB**
FRACTIONAL SERIES
**TOLERANCES (inch)****<1/8 DIAMETER**

DC = +0.000 / -0.001

DCON = h_6

RE = +0.000 / -0.0005

≥1/8 DIAMETER

DC = +0.000 / -0.002

DCON = h_6

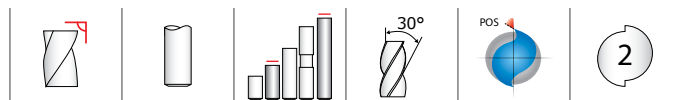
RE = +0.000 / -0.001

STEELS
STAINLESS STEELS
CAST IRON
NON-FERROUS
HIGH TEMP ALLOYS

inch				EDP NO.			SERIES
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	UNCOATED	Ti-NAMITE-A (AlTiN)	Di-NAMITE (Diamond)	
*3/8	1	2-1/2	3/8	30348	30494	91287	3B
3/8	1-1/8	3	3/8	33308	31894	—	3LB
3/8	1-3/4	4	3/8	33328	31992	—	3ELB
25/64	1	2-3/4	7/16	30350	30495	—	3B
13/32	1	2-3/4	7/16	30352	30496	—	3B
27/64	1	2-3/4	7/16	30354	30497	—	3B
7/16	1	2-3/4	7/16	30356	30498	—	3B
7/16	2	4-1/2	7/16	33310	31895	—	3LB
7/16	3	6	7/16	33330	31993	—	3ELB
29/64	1	3	1/2	30358	30499	—	3B
15/32	1	3	1/2	30360	30500	—	3B
31/64	1	3	1/2	30362	30591	—	3B
*1/2	1	3	1/2	30364	30592	91291	3B
1/2	2	4-1/2	1/2	33312	31896	—	3LB
1/2	3	6	1/2	33332	31994	—	3ELB
9/16	1-1/8	3-1/2	9/16	30366	30593	—	3B
5/8	1-1/4	3-1/2	5/8	30368	30594	—	3B
5/8	2-1/4	5	5/8	33314	31897	—	3LB
5/8	3	6	5/8	33334	31995	—	3ELB
11/16	1-3/8	4	3/4	30370	30595	—	3B
3/4	1-1/2	4	3/4	30372	30596	—	3B
3/4	2-1/4	5	3/4	33316	31898	—	3LB
3/4	3	6	3/4	33336	31996	—	3ELB
7/8	1-1/2	4	7/8	30374	30597	—	3B
1	1-1/2	4	1	30376	30598	—	3B
1	2-1/4	5	1	33318	31899	—	3LB
1	3	6	1	33338	31997	—	3ELB
*Series 3B Set				30390	30600	—	3B

RE = 1/2 Cutting Diameter (DC)

2 Flute Square End



TOLERANCES (mm)

<3 DIAMETER

DC = +0,0000/-0.0254

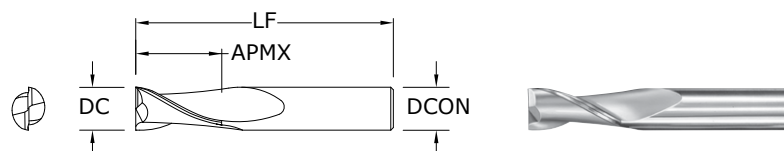
DCON = h_6

≥3 DIAMETER

DC = +0,0000/-0.0508

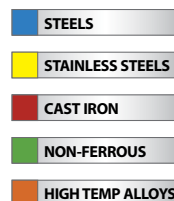
DCON = h_6

RE = +0,0000/-0.0508



**3M•
3XLM**
METRIC SERIES

mm				EDP NO.		SERIES
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	UNCOATED	Ti-NAMITE-A (AlTiN)	
1,0	4,0	38,0	3,0	40305	48671	3M
1,5	4,5	38,0	3,0	40309	48672	3M
2,0	6,3	38,0	3,0	40313	48673	3M
2,5	9,5	38,0	3,0	40317	48674	3M
3,0	12,0	38,0	3,0	40321	48675	3M
3,0	25,0	75,0	3,0	43301	49453	3XLM
3,5	12,0	50,0	4,0	40325	48676	3M
4,0	14,0	50,0	4,0	40329	48677	3M
4,0	25,0	75,0	4,0	43303	49454	3XLM
4,5	16,0	50,0	6,0	40333	48678	3M
5,0	16,0	50,0	6,0	40337	48679	3M
5,0	25,0	75,0	5,0	43307	49456	3XLM
6,0	19,0	50,0	6,0	40341	48680	3M
6,0	25,0	75,0	6,0	43305	49455	3XLM
7,0	19,0	63,0	8,0	40345	48681	3M
8,0	20,0	63,0	8,0	40349	48682	3M
8,0	25,0	75,0	8,0	43315	49457	3XLM
9,0	22,0	75,0	10,0	40353	48683	3M
10,0	22,0	75,0	10,0	40357	48684	3M
10,0	38,0	100,0	10,0	43325	49458	3XLM
11,0	25,0	75,0	12,0	40361	48685	3M
12,0	25,0	75,0	12,0	40365	48686	3M
12,0	50,0	100,0	12,0	43335	49459	3XLM
12,0	75,0	150,0	12,0	43345	49460	3XLM
14,0	32,0	89,0	14,0	40369	48687	3M
14,0	75,0	150,0	14,0	43355	49461	3XLM
16,0	32,0	89,0	16,0	40373	48688	3M
16,0	75,0	150,0	16,0	43365	49462	3XLM
18,0	38,0	100,0	18,0	40377	48689	3M
18,0	75,0	150,0	18,0	43375	49463	3XLM
20,0	38,0	100,0	20,0	40381	48690	3M
20,0	75,0	150,0	20,0	43385	49464	3XLM
25,0	38,0	100,0	25,0	40385	48691	3M
25,0	75,0	150,0	25,0	43395	49465	3XLM

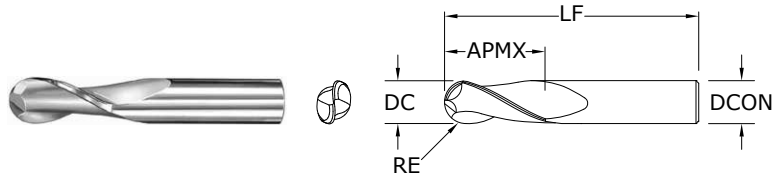


2 Flute Ball End



3MB• 3XLMB

METRIC SERIES



TOLERANCES (mm)

<3 DIAMETER

DC = +0,0000 / -0,0254

DCON = h_6

RE = +0,0000 / -0,0127

≥3 DIAMETER

DC = +0,0000 / -0,0508

DCON = h_6

RE = +0,0000 / -0,0254

STEELS
STAINLESS STEELS
CAST IRON
NON-FERROUS
HIGH TEMP ALLOYS

mm				EDP NO.		SERIES
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	UNCOATED	Ti-NAMITE-A (AlTiN)	
1,0	4,0	38,0	3,0	40306	48735	3MB
1,5	4,5	38,0	3,0	40310	48736	3MB
2,0	6,3	38,0	3,0	40314	48737	3MB
2,5	9,5	38,0	3,0	40318	48738	3MB
3,0	12,0	38,0	3,0	40322	48739	3MB
3,0	25,0	75,0	3,0	43302	49570	3XLMB
3,5	12,0	50,0	4,0	40326	48740	3MB
4,0	14,0	50,0	4,0	40330	48741	3MB
4,0	25,0	75,0	4,0	43304	49571	3XLMB
4,5	16,0	50,0	6,0	40334	48742	3MB
5,0	16,0	50,0	6,0	40338	48743	3MB
5,0	25,0	75,0	5,0	43308	49573	3XLMB
6,0	19,0	50,0	6,0	40342	48744	3MB
6,0	25,0	75,0	6,0	43306	49572	3XLMB
7,0	19,0	63,0	8,0	40346	48745	3MB
8,0	20,0	63,0	8,0	40350	48746	3MB
8,0	25,0	75,0	8,0	43316	49574	3XLMB
9,0	22,0	75,0	10,0	40354	48747	3MB
10,0	22,0	75,0	10,0	40358	48748	3MB
10,0	38,0	100,0	10,0	43326	49575	3XLMB
11,0	25,0	75,0	12,0	40362	48749	3MB
12,0	25,0	75,0	12,0	40366	48750	3MB
12,0	50,0	100,0	12,0	43336	49576	3XLMB
12,0	75,0	150,0	12,0	43346	49577	3XLMB
14,0	32,0	89,0	14,0	40370	48751	3MB
14,0	75,0	150,0	14,0	43356	49578	3XLMB
16,0	32,0	89,0	16,0	40374	48752	3MB
16,0	75,0	150,0	16,0	43366	49579	3XLMB
18,0	38,0	100,0	18,0	40378	48753	3MB
18,0	75,0	150,0	18,0	43376	49580	3XLMB
20,0	38,0	100,0	20,0	40382	48754	3MB
20,0	75,0	150,0	20,0	43386	49581	3XLMB
25,0	38,0	100,0	25,0	40386	48755	3MB
25,0	75,0	150,0	25,0	43396	49582	3XLMB

RE = 1/2 Cutting Diameter (DC)

2 Flute Square End Stub

TOLERANCES (inch)

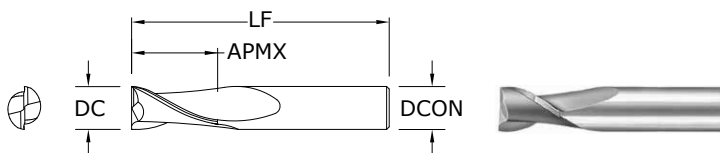
<1/8 DIAMETER

DC = +0.000/-0.001

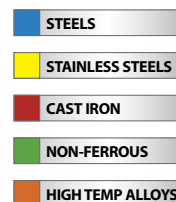
DCON = h_6

≥1/8 DIAMETER

DC = +0.000/-0.002

DCON = h_6 
17
FRACTIONAL SERIES

inch				EDP NO.	
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	UNCOATED	Ti-NAMITE-A (AlTiN)
1/16	1/8	1-1/2	1/8	31701	31358
3/32	3/16	1-1/2	1/8	31703	31359
1/8	1/4	1-1/2	1/8	31705	31360
5/32	5/16	2	3/16	31707	31361
3/16	3/8	2	3/16	31709	31362
7/32	7/16	2	1/4	31711	31363
1/4	1/2	2	1/4	31713	31364
5/16	1/2	2	5/16	31715	31365
3/8	5/8	2	3/8	31717	31366
7/16	5/8	2-1/2	7/16	31719	31367
1/2	5/8	2-1/2	1/2	31721	31368
5/8	3/4	3	5/8	31723	31369
3/4	1	3	3/4	31725	31370



TOLERANCES (mm)

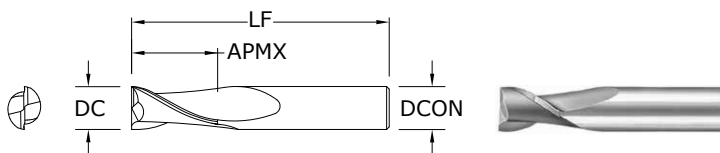
<3 DIAMETER

DC = +0.0000/-0.0254

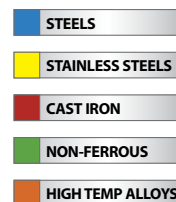
DCON = h_6

≥3 DIAMETER

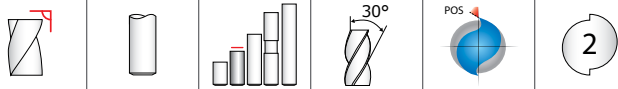
DC = +0.0000/-0.0508

DCON = h_6 
17M
METRIC SERIES

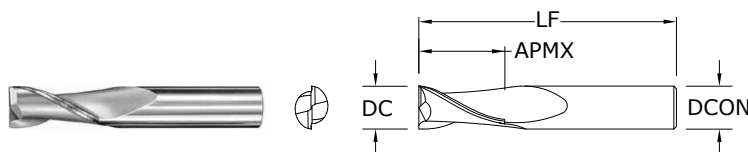
mm				EDP NO.	
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	UNCOATED	Ti-NAMITE-A (AlTiN)
1,0	2,0	38,0	3,0	41705	49304
1,5	3,0	38,0	3,0	41709	49305
2,0	4,0	38,0	3,0	41713	49306
2,5	5,0	38,0	3,0	41717	49307
3,0	6,0	38,0	3,0	41721	49308
3,5	7,0	50,0	4,0	41725	49309
4,0	8,0	50,0	4,0	41729	49310
4,5	9,5	50,0	4,5	41733	49311
5,0	10,0	50,0	5,0	41737	49312
6,0	12,0	50,0	6,0	41741	49313
7,0	12,0	50,0	8,0	41745	49314
8,0	12,0	50,0	8,0	41749	49315
9,0	14,0	50,0	9,0	41753	49316
10,0	16,0	50,0	10,0	41757	49317
11,0	19,0	63,0	12,0	41761	49318
12,0	19,0	63,0	12,0	41765	49319



2 Flute High Shear

**52**

FRACTIONAL SERIES

**TOLERANCES (inch)****<1/8 DIAMETER**

DC = +0.000 / -0.001

DCON = h₆**≥1/8 DIAMETER**

DC = +0.000 / -0.002

DCON = h₆

inch

EDP NO.

CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	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

TOLERANCES (mm)**<3 DIAMETER**

DC = +0.0000 / -0.0254

DCON = h₆**≥3 DIAMETER**

DC = +0.0000 / -0.0508

DCON = h₆

mm

EDP NO.

CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	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

NON-FERROUS

2 Flute Square End Long Reach

TOLERANCES (inch)

1/8-1/4 DIAMETER

DC = +0.0000 / -0.0012

DCON = h_6

>1/4-3/8 DIAMETER

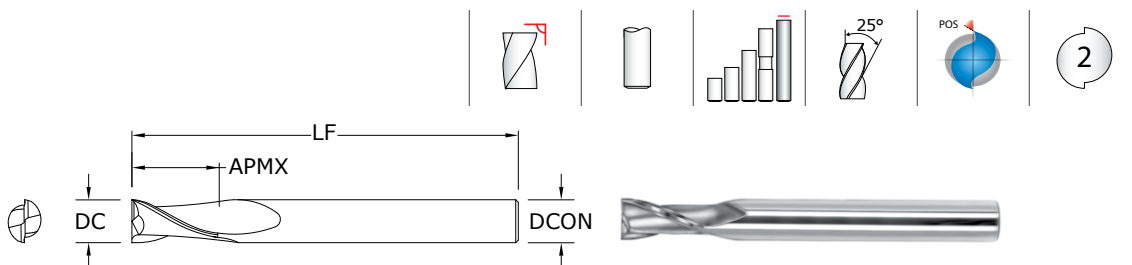
DC = +0.0000 / -0.0016

DCON = h_6

>3/8-3/4 DIAMETER

DC = +0.0000 / -0.0020

DCON = h_6

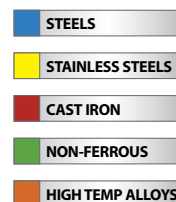


59

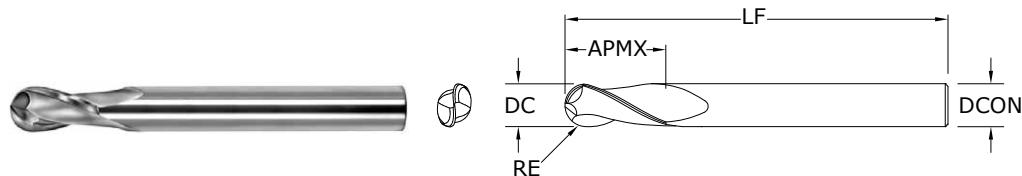
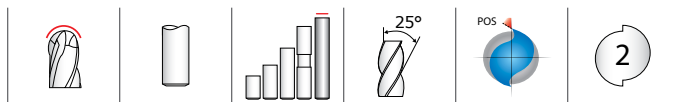
FRACTIONAL SERIES

inch				EDP NO.
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	Ti-NAMITE-A (AITIN)
1/8	3/8	2-1/2	1/4	32270
3/16	9/16	3	1/4	32271
1/4	5/8	3-1/2	1/4	32272
5/16	11/16	4	5/16	32273
3/8	7/8	4	3/8	32274
1/2	1	4-1/2	1/2	32275
5/8	1-1/8	5	5/8	32276
3/4	1-3/8	5-1/4	3/4	32277

Neck Option Available



2 Flute Ball End Long Reach



59B

FRACTIONAL SERIES

TOLERANCES (inch)

1/8–1/4 DIAMETER

DC = +0.0000 / -0.0012

DCON = h_6

RE = +0.0000 / -0.0006

>1/4–3/8 DIAMETER

DC = +0.0000 / -0.0016

DCON = h_6

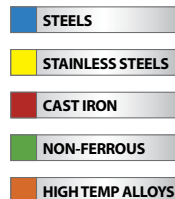
RE = +0.0000 / -0.0008

>3/8–3/4 DIAMETER

DC = +0.0000 / -0.0020

DCON = h_6

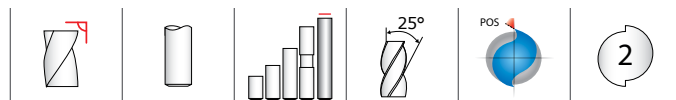
RE = +0.0000 / -0.0010



inch				EDP NO.
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	Ti-NAMITE-A (AlTiN)
1/8	3/8	2-1/2	1/4	32200
3/16	9/16	3	1/4	32201
1/4	5/8	3-1/2	1/4	32202
5/16	11/16	4	5/16	32203
3/8	7/8	4	3/8	32204
1/2	1	4-1/2	1/2	32205
5/8	1-1/8	5	5/8	32206
3/4	1-3/8	5-1/4	3/4	32207

Neck Option Available
RE = 1/2 Cutting Diameter (DC)

2 Flute Square End Long Reach



TOLERANCES (mm)

3-6 DIAMETER

DC = +0,0000 / -0,0254

DCON = h_6

>6-10 DIAMETER

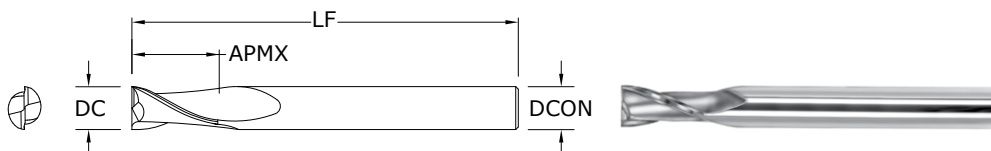
DC = +0,0000 / -0,0406

DCON = h_6

>10-20 DIAMETER

DC = +0,0000 / -0,0508

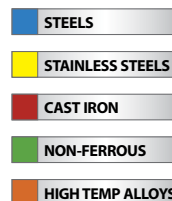
DCON = h_6



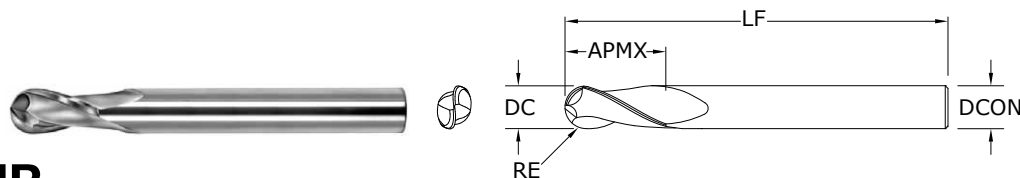
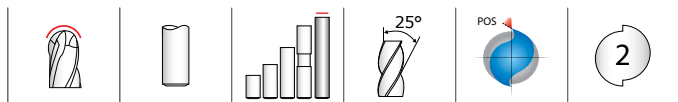
59M
METRIC SERIES

mm				EDP NO.	
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	UNCOATED	Ti-NAMITE-A (AlTiN)
3,0	9,0	60,0	6,0	43910	43950
4,0	12,0	70,0	6,0	43911	43951
6,0	15,0	80,0	6,0	43912	43952
8,0	20,0	89,0	8,0	43913	43953
10,0	25,0	100,0	10,0	43914	43954
12,0	30,0	110,0	12,0	43915	43955
14,0	35,0	120,0	16,0	43916	43956
16,0	40,0	120,0	16,0	43917	43957
18,0	40,0	130,0	20,0	43918	43958
20,0	45,0	130,0	20,0	43919	43959

Neck Option Available



2 Flute Ball End Long Reach



59MB
METRIC SERIES

TOLERANCES (mm)

3–6 DIAMETER

DC = +0,0000 / -0,0254

DCON = h_6

RE = +0,0000 / -0,0127

>6–10 DIAMETER

DC = +0,0000 / -0,0406

DCON = h_6

RE = +0,0000 / -0,0203

>10–20 DIAMETER

DC = +0,0000 / -0,0508

DCON = h_6

RE = +0,0000 / -0,0254

STEELS
STAINLESS STEELS
CAST IRON
NON-FERROUS
HIGH TEMP ALLOYS

mm				EDP NO.	
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	UNCOATED	Ti-NAMITE-A (AlTiN)
3,0	9,0	60,0	6,0	43900	49642
4,0	12,0	70,0	6,0	43901	49643
6,0	15,0	80,0	6,0	43902	49644
8,0	20,0	89,0	8,0	43903	49645
10,0	25,0	100,0	10,0	43904	49646
12,0	30,0	110,0	12,0	43905	49647
14,0	35,0	120,0	16,0	43906	49648
16,0	40,0	120,0	16,0	43907	49649
18,0	40,0	130,0	20,0	43908	49650
20,0	45,0	130,0	20,0	43909	49651

Neck Option Available

RE = 1/2 Cutting Diameter (DC)

3 Flute Square End



TOLERANCES (inch)

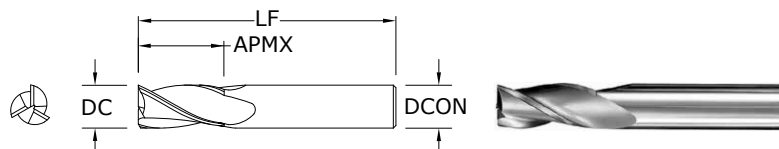
<1/8 DIAMETER

DC = +0.000/-0.001

DCON = h_6

≥1/8 DIAMETER

DC = +0.000/-0.002

DCON = h_6 

5

FRACTIONAL SERIES

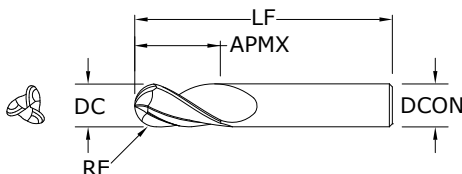
inch				EDP NO.			
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)
1/64	1/32	1-1/2	1/8	30501	39701	30771	30811
1/32	5/64	1-1/2	1/8	30503	39703	30772	30812
3/64	7/64	1-1/2	1/8	30505	39705	30773	30813
1/16	3/16	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
*Series 5 Set				30589	39789	30810	30850

STEELS
STAINLESS STEELS
CAST IRON
NON-FERROUS
HIGH TEMP ALLOYS

3 Flute Ball End

**5B**

FRACTIONAL SERIES

**TOLERANCES (inch)****<1/8 DIAMETER**

DC = +0.000/-0.001

DCON = h_6

RE = +0.000/-0.0005

≥1/8 DIAMETER

DC = +0.000/-0.002

DCON = h_6

RE = +0.000/-0.001

inch

EDP NO.

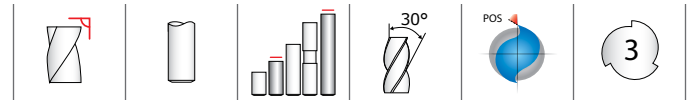
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	UNCOATED	Ti-NAMITE-A (AlTiN)
1/64	1/32	1-1/2	1/8	30502	31130
1/32	5/64	1-1/2	1/8	30504	31131
3/64	7/64	1-1/2	1/8	30506	31132
1/16	3/16	1-1/2	1/8	30508	31133
5/64	3/16	1-1/2	1/8	30510	31134
3/32	9/32	1-1/2	1/8	30512	31135
7/64	3/8	1-1/2	1/8	30514	31136
1/8	3/8	1-1/2	1/8	30516	31137
*1/8	1/2	1-1/2	1/8	30518	31138
9/64	1/2	2	3/16	30520	31139
5/32	1/2	2	3/16	30522	31140
11/64	5/8	2	3/16	30524	31141
*3/16	5/8	2	3/16	30526	31142
13/64	5/8	2-1/2	1/4	30528	31143
7/32	5/8	2-1/2	1/4	30530	31144
15/64	3/4	2-1/2	1/4	30532	31145
*1/4	3/4	2-1/2	1/4	30534	31146
17/64	3/4	2-1/2	5/16	30536	31147
9/32	3/4	2-1/2	5/16	30538	31148
19/64	13/16	2-1/2	5/16	30540	31149
*5/16	13/16	2-1/2	5/16	30542	31150
21/64	1	2-1/2	3/8	30544	31151
11/32	1	2-1/2	3/8	30546	31152
23/64	1	2-1/2	3/8	30548	31153
*3/8	1	2-1/2	3/8	30550	31154
25/64	1	2-3/4	7/16	30552	31155
13/32	1	2-3/4	7/16	30554	31156
27/64	1	2-3/4	7/16	30556	31157
7/16	1	2-3/4	7/16	30558	31158
29/64	1	3	1/2	30560	31159
15/32	1	3	1/2	30562	31160
31/64	1	3	1/2	30564	31161
*1/2	1	3	1/2	30566	31162
9/16	1-1/8	3-1/2	9/16	30568	31163
5/8	1-1/4	3-1/2	5/8	30570	31164
11/16	1-3/8	4	3/4	30572	31165
3/4	1-1/2	4	3/4	30574	31166
7/8	1-1/2	4	7/8	30576	31167
1	1-1/2	4	1	30590	31169

*Series 5B Set

RE = 1/2 Cutting Diameter (DC)

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

3 Flute Square End



TOLERANCES (mm)

<3 DIAMETER

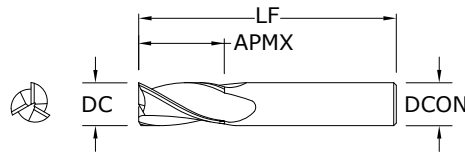
DC = +0,0000/-0,0254

DCON = h_6

≥3 DIAMETER

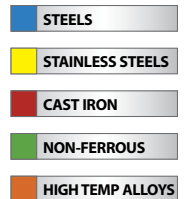
DC = +0,0000/-0,0508

DCON = h_6



**5M•
5XLM**
METRIC SERIES

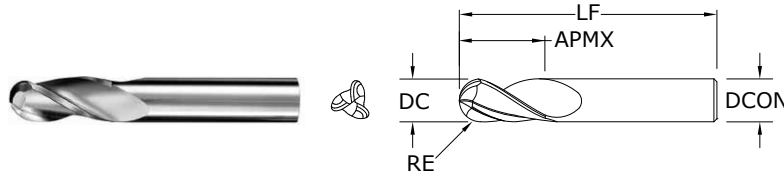
mm				EDP NO.		SERIES
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	UNCOATED	Ti-NAMITE-A (AlTiN)	
1,0	4,0	38,0	3,0	40505	48799	5M
1,5	4,5	38,0	3,0	40509	48800	5M
2,0	6,3	38,0	3,0	40513	48801	5M
2,5	9,5	38,0	3,0	40517	48802	5M
3,0	12,0	38,0	3,0	40521	48803	5M
3,0	25,0	75,0	3,0	43501	49492	5XLM
3,5	12,0	50,0	4,0	40525	48804	5M
4,0	14,0	50,0	4,0	40529	48805	5M
4,0	25,0	75,0	4,0	43503	49493	5XLM
4,5	16,0	50,0	6,0	40533	48806	5M
5,0	16,0	50,0	6,0	40537	48807	5M
5,0	25,0	75,0	5,0	43507	49495	5XLM
6,0	19,0	50,0	6,0	40541	48808	5M
6,0	25,0	75,0	6,0	43505	49494	5XLM
7,0	19,0	63,0	8,0	40545	48809	5M
8,0	20,0	63,0	8,0	40549	48810	5M
8,0	25,0	75,0	8,0	43515	49496	5XLM
9,0	22,0	75,0	10,0	40553	48811	5M
10,0	22,0	75,0	10,0	40557	48812	5M
10,0	38,0	100,0	10,0	43525	49497	5XLM
11,0	25,0	75,0	12,0	40561	48813	5M
12,0	25,0	75,0	12,0	40565	48814	5M
12,0	50,0	100,0	12,0	43535	49498	5XLM
12,0	75,0	150,0	12,0	43545	49499	5XLM
14,0	32,0	89,0	14,0	40569	48815	5M
14,0	75,0	150,0	14,0	43555	49500	5XLM
16,0	32,0	89,0	16,0	40573	48816	5M
16,0	75,0	150,0	16,0	43565	49501	5XLM
18,0	38,0	100,0	18,0	40577	48817	5M
18,0	75,0	150,0	18,0	43575	49502	5XLM
20,0	38,0	100,0	20,0	40581	48818	5M
20,0	75,0	150,0	20,0	43585	49503	5XLM
25,0	38,0	100,0	25,0	40585	48819	5M
25,0	75,0	150,0	25,0	43595	49504	5XLM



3 Flute Ball End



**5MB•
5XLMB**
METRIC SERIES



TOLERANCES (mm)

<3 DIAMETER

DC = +0,0000 / -0.0254

DCON = h_8

RE = +0,0000 / -0.0127

≥3 DIAMETER

DC = +0,0000 / -0.0508

DCON = h_8

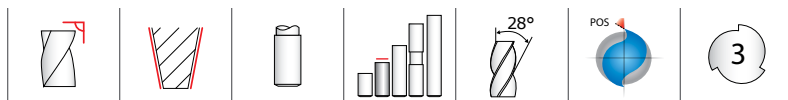
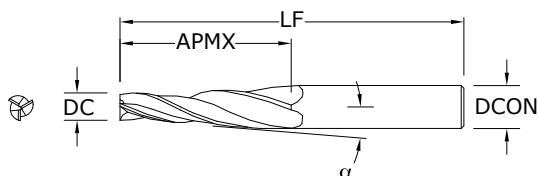
RE = +0,0000 / -0.0254

STEELS
STAINLESS STEELS
CAST IRON
NON-FERROUS
HIGH TEMP ALLOYS

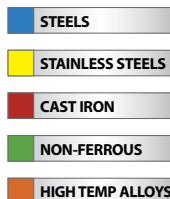
mm				EDP NO.		SERIES
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	UNCOATED	Ti-NAMITE-A (AlTiN)	
1,0	4,0	38,0	3,0	40506	48863	5MB
1,5	4,5	38,0	3,0	40510	48864	5MB
2,0	6,3	38,0	3,0	40514	48865	5MB
2,5	9,5	38,0	3,0	40518	48866	5MB
3,0	12,0	38,0	3,0	40522	48867	5MB
3,0	25,0	75,0	3,0	43502	49609	5XLMB
3,5	12,0	50,0	4,0	40526	48868	5MB
4,0	14,0	50,0	4,0	40530	48869	5MB
4,0	25,0	75,0	4,0	43504	49610	5XLMB
4,5	16,0	50,0	6,0	40534	48870	5MB
5,0	16,0	50,0	6,0	40538	48871	5MB
5,0	25,0	75,0	5,0	43508	49612	5XLMB
6,0	19,0	50,0	6,0	40542	48872	5MB
6,0	25,0	75,0	6,0	43506	49611	5XLMB
7,0	19,0	63,0	8,0	40546	48873	5MB
8,0	20,0	63,0	8,0	40550	48874	5MB
8,0	25,0	75,0	8,0	43516	49613	5XLMB
9,0	22,0	75,0	10,0	40554	48875	5MB
10,0	22,0	75,0	10,0	40558	48876	5MB
10,0	38,0	100,0	10,0	43526	49614	5XLMB
11,0	25,0	75,0	12,0	40562	48877	5MB
12,0	25,0	75,0	12,0	40566	48878	5MB
12,0	50,0	100,0	12,0	43536	49615	5XLMB
12,0	75,0	150,0	12,0	43546	49616	5XLMB
14,0	32,0	89,0	14,0	40570	48879	5MB
14,0	75,0	150,0	14,0	43556	49617	5XLMB
16,0	32,0	89,0	16,0	40574	48880	5MB
16,0	75,0	150,0	16,0	43566	49618	5XLMB
18,0	38,0	100,0	18,0	40578	48881	5MB
18,0	75,0	150,0	18,0	43576	49619	5XLMB
20,0	38,0	100,0	20,0	40582	48882	5MB
20,0	75,0	150,0	20,0	43586	49620	5XLMB
25,0	38,0	100,0	25,0	40586	48883	5MB
25,0	75,0	150,0	25,0	43596	49621	5XLMB

RE = 1/2 Cutting Diameter (DC)

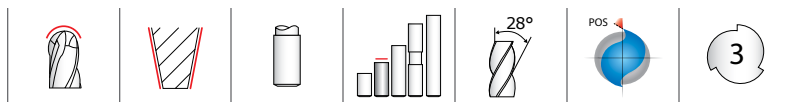
Tapered Square End


TOLERANCES (inch)
 $DC = +0.001 / -0.002$
 $DCON = h_6$
 $\alpha = +10' / -10'$

23
FRACTIONAL SERIES

SHANK DIAMETER DCON	CENTER LINE ANGLE α	inch			EDP NO.	
		SMALL DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	UNCOATED	Ti-NAMITE-A (AlTiN)
1/4	1°	1/8	1-1/2	3	32301	32345
1/4	1°30'	1/8	1-1/2	3	32303	32346
1/4	2°	1/8	1-1/4	3	32305	32347
1/4	3°	1/8	1	3	32307	32348
1/4	5°	1/8	3/4	3	32309	32349
1/4	7°	1/8	1/2	3	32311	32350
1/4	10°	3/32	1/2	3	32313	32351
3/8	1°	3/16	1-3/4	3-1/2	32315	32352
3/8	1°30'	3/16	1-3/4	3-1/2	32317	32353
3/8	2°	3/16	1-3/4	3-1/2	32319	32354
3/8	3°	5/32	1-3/4	3-1/2	32321	32355
3/8	5°	1/8	1-1/2	3-1/2	32323	32356
3/8	7°	1/8	1	3-1/2	32325	32357
3/8	10°	1/8	3/4	3-1/2	32327	32358
1/2	1°	1/4	2	4	32329	32359
1/2	2°	1/4	2	4	32333	32360
1/2	3°	1/4	2	4	32335	32361
1/2	5°	1/4	1-1/4	4	32337	32362
1/2	7°	3/16	1-1/4	4	32339	32363
1/2	10°	1/8	1	4	32341	32364

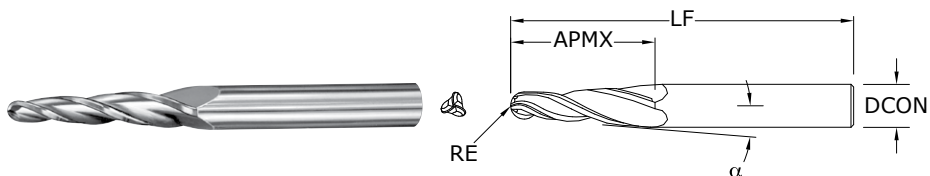


Tapered Ball End



24

FRACTIONAL SERIES



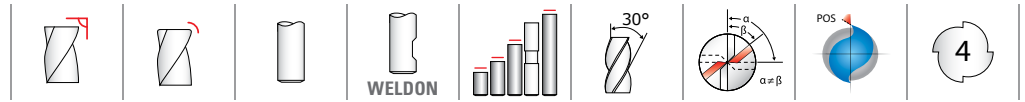
TOLERANCES (inch)

DCON = h_6
 RE = $+0.0000/-0.0010$
 α = $+10' / -10'$

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

SHANK DIAMETER DCON	CENTER LINE ANGLE α	inch			EDP NO.	
		RADIUS RE	LENGTH OF CUT APMX	OVERALL LENGTH LF	UNCOATED	Ti-NAMITE-A (AlTiN)
1/4	1°	.062	1-1/2	3	32402	32470
1/4	1°30'	.062	1-1/2	3	32404	32471
1/4	2°	.062	1-1/4	3	32406	32472
1/4	3°	.062	1	3	32408	32473
1/4	5°	.062	3/4	3	32410	32474
1/4	7°	.062	1/2	3	32412	32475
1/4	10°	.047	1/2	3	32414	32476
3/8	1°	.093	1-3/4	3-1/2	32416	32477
3/8	1°30'	.093	1-3/4	3-1/2	32418	32478
3/8	2°	.093	1-3/4	3-1/2	32420	32479
3/8	3°	.078	1-3/4	3-1/2	32422	32480
3/8	5°	.062	1-1/2	3-1/2	32424	32481
3/8	7°	.062	1	3-1/2	32426	32482
3/8	10°	.062	3/4	3-1/2	32428	32483
1/2	1°	.125	2	4	32430	32484
1/2	2°	.125	2	4	32434	32485
1/2	3°	.125	2	4	32436	32486
1/2	5°	.125	1-1/4	4	32438	32487
1/2	7°	.093	1-1/4	4	32440	32488
1/2	10°	.062	1	4	32442	32489

4 Flute Square End • 4 Flute Corner Radius



TOLERANCES (inch)

<1/8 DIAMETER

DC = +0.000/-0.001

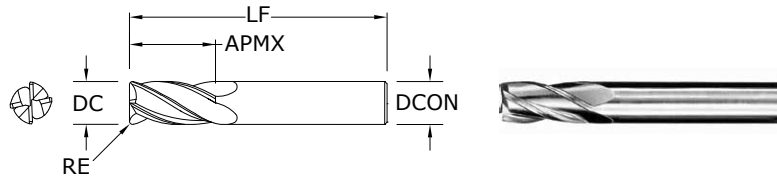
DCON = h_6

≥1/8 DIAMETER

DC = +0.000/-0.002

DCON = h_6

RE = +0.000/-0.002



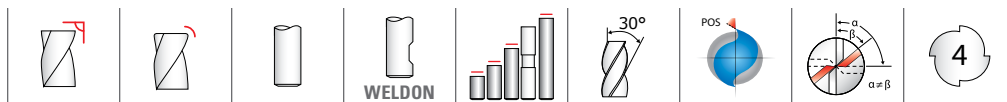
1•1L•1EL•
1CR•16
 FRACTIONAL SERIES

inch						EDP NO.					SERIES
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	WELDON FLAT	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	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	1/8	1-1/2	1/8	—		31601	31650	31238	31251	—	16
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	3/16	1-1/2	1/8	—		31603	31651	31239	31252	—	16
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	1/4	1-1/2	1/8	—		31605	31652	31240	31253	—	16
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	1/2	1-1/2	1/8	.015		38001	38002	38115	38157	—	1CR
1/8	1/2	1-1/2	1/8	.020		38003	38004	38116	38158	—	1CR
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	5/16	2	3/16	—		31607	31653	31241	31254	—	16
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	3/8	2	3/16	—		31609	31654	31242	31255	—	16
*3/16	5/8	2	3/16	—		30123	39123	39023	30002	91276	1
3/16	5/8	2	3/16	.015		38009	38010	38117	38159	—	1CR
3/16	5/8	2	3/16	.020		38011	38012	38118	38160	—	1CR
3/16	5/8	2	3/16	.030		38013	38014	38119	38161	—	1CR
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	7/16	2	1/4	—		31611	31655	31243	31256	—	16
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	1/2	2	1/4	—		31613	31656	31244	31257	—	16
*1/4	3/4	2-1/2	1/4	—		30131	39131	39031	30006	91280	1
1/4	3/4	2-1/2	1/4	—	•	30300	—	—	—	—	1

STEELS
STAINLESS STEELS
CAST IRON
NON-FERROUS
HIGH TEMP ALLOYS

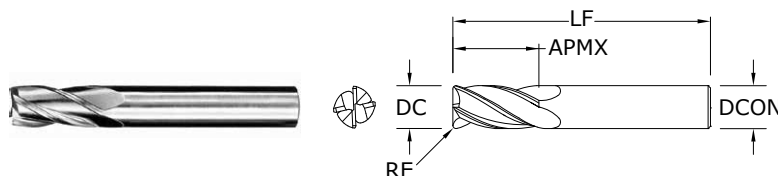
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4 Flute Square End • 4 Flute Corner Radius



**1•1L•1EL •
1CR • 16**

FRACTIONAL SERIES



TOLERANCES (inch)

<1/8 DIAMETER

DC = +0.000/-0.001

DCON = h_6

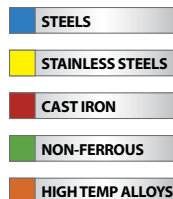
≥1/8 DIAMETER

DC = +0.000/-0.002

DCON = h_6

RE = +0.000/-0.002

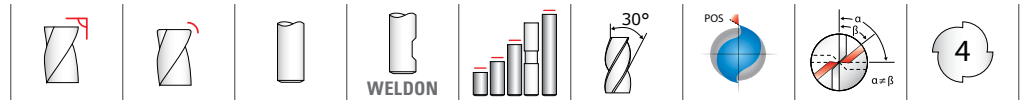
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CUTTING DIAMETER DC	LENGTH OF CUT APMX	inch			WELDON FLAT	EDP NO.					SERIES
		OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE		UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	Di-NAMITE (Diamond)	
1/4	3/4	2-1/2	1/4	.015		38019	38020	38120	38162	—	1CR
1/4	3/4	2-1/2	1/4	.020		38021	38022	38121	38163	—	1CR
1/4	3/4	2-1/2	1/4	.030		38023	38024	38122	38164	—	1CR
1/4	3/4	2-1/2	1/4	.045		38025	38026	38123	38165	—	1CR
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	1/2	2	5/16	—		31615	31657	31245	31258	—	16
*5/16	13/16	2-1/2	5/16	—		30139	39139	39039	30010	91284	1
5/16	13/16	2-1/2	5/16	.015		38031	38032	38124	38166	—	1CR
5/16	13/16	2-1/2	5/16	.020		38033	38034	38125	38167	—	1CR
5/16	13/16	2-1/2	5/16	.030		38035	38036	38126	38168	—	1CR
5/16	13/16	2-1/2	5/16	.045		38037	38038	38127	38169	—	1CR
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	5/8	2	3/8	—		31617	31658	31246	31259	—	16
*3/8	1	2-1/2	3/8	—		30147	39147	39047	30014	91288	1
3/8	1	2-1/2	3/8	—	•	30179	39179	—	30379	—	1
3/8	1	2-1/2	3/8	.015	•	38045	38046	38128	38170	—	1CR
3/8	1	2-1/2	3/8	.020	•	38047	38048	38129	38171	—	1CR
3/8	1	2-1/2	3/8	.030	•	38049	38050	38130	38172	—	1CR
3/8	1	2-1/2	3/8	.045	•	38051	38052	38131	38173	—	1CR
3/8	1-1/8	3	3/8	—		33107	31731	31741	31764	—	1L
3/8	1-3/4	4	3/8	—		33127	31864	31874	31884	—	1EL
25/64	1	2-3/4	7/16	—		30149	39149	39049	30015	—	1
13/32	1	2-3/4	7/16	—		30151	39151	39051	30016	—	1
27/64	1	2-3/4	7/16	—		30153	39153	39053	30017	—	1

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4 Flute Square End • 4 Flute Corner Radius



TOLERANCES (inch)

<1/8 DIAMETER

DC = +0.000/-0.001

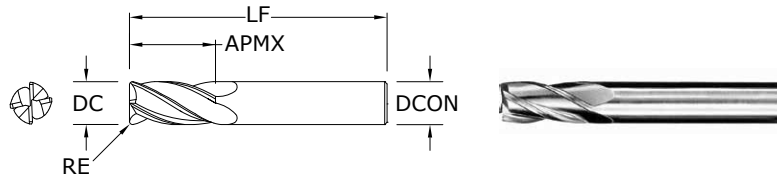
DCON = h_6

≥1/8 DIAMETER

DC = +0.000/-0.002

DCON = h_6

RE = +0.000/-0.002

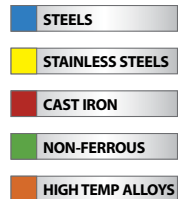


**1•1L• 1EL•
1CR• 16**
FRACTIONAL SERIES

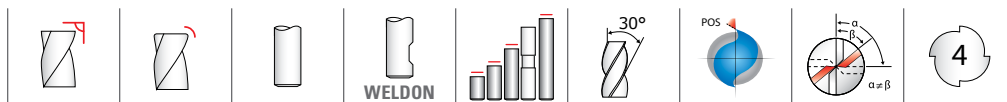
inch						EDP NO.					SERIES
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	WELDON FLAT	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	Di-NAMITE (Diamond)	
7/16	5/8	2-1/2	7/16	—		31619	31659	31247	31260	—	16
7/16	1	2-3/4	7/16	—		30155	39155	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	5/8	2-1/2	1/2	—		31621	31660	31248	31261	—	16
*1/2	1	3	1/2	—		30163	39163	39063	30022	91292	1
1/2	1	3	1/2	—	•	30180	39180	—	30380	—	1
1/2	1	3	1/2	.015	•	38059	38060	38132	38174	—	1CR
1/2	1	3	1/2	.020	•	38061	38062	38133	38175	—	1CR
1/2	1	3	1/2	.030	•	38063	38064	38134	38176	—	1CR
1/2	1	3	1/2	.045	•	38065	38066	38135	38177	—	1CR
1/2	1	3	1/2	.060	•	38067	38068	38136	38178	—	1CR
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	3/4	3	5/8	—		31623	31661	31249	31262	—	16
5/8	1-1/4	3-1/2	5/8	—		30167	39167	39067	30024	—	1
5/8	1-1/4	3-1/2	5/8	—	•	30181	—	—	30381	—	1
5/8	1-1/4	3-1/2	5/8	.015	•	38073	38074	38137	38179	—	1CR
5/8	1-1/4	3-1/2	5/8	.020	•	38075	38076	38138	38180	—	1CR
5/8	1-1/4	3-1/2	5/8	.030	•	38077	38078	38139	38181	—	1CR
5/8	1-1/4	3-1/2	5/8	.045	•	38079	38080	38140	38182	—	1CR
5/8	1-1/4	3-1/2	5/8	.060	•	38081	38082	38141	38183	—	1CR
5/8	1-1/4	3-1/2	5/8	.090	•	38083	38084	38142	38184	—	1CR
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	3	3/4	—		31625	31662	31250	31263	—	16
3/4	1-1/2	4	3/4	—		30171	39171	39071	30026	—	1

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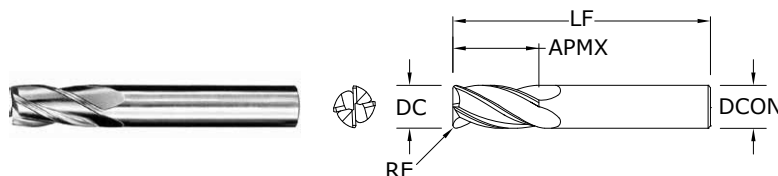
CONTINUED



4 Flute Square End • 4 Flute Corner Radius



**1•1L•1EL•
1CR•16**
FRACTIONAL SERIES



TOLERANCES (inch)

<1/8 DIAMETER

DC = +0.000 / -0.001

DCON = h_6

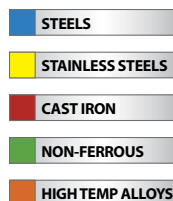
≥1/8 DIAMETER

DC = +0.000 / -0.002

DCON = h_6

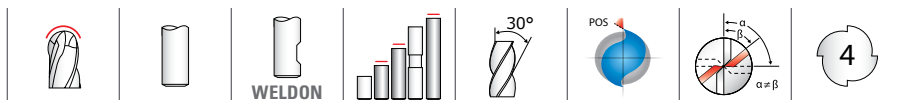
RE = +0.000 / -0.002

CONTINUED



inch						EDP NO.					SERIES
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	WELDON FLAT	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	Di-NAMITE (Diamond)	
3/4	1-1/2	4	3/4	—	•	30182	—	—	30382	—	1
3/4	1-1/2	4	3/4	.015	•	38087	38088	38143	38185	—	1CR
3/4	1-1/2	4	3/4	.020	•	38089	38090	38144	38186	—	1CR
3/4	1-1/2	4	3/4	.030	•	38091	38092	38145	38187	—	1CR
3/4	1-1/2	4	3/4	.045	•	38093	38094	38146	38188	—	1CR
3/4	1-1/2	4	3/4	.060	•	38095	38096	38147	38189	—	1CR
3/4	1-1/2	4	3/4	.090	•	38097	38098	38148	38190	—	1CR
3/4	1-1/2	4	3/4	.125	•	38099	38100	38149	38191	—	1CR
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	39175	39075	30028	—	1
1	1-1/2	4	1	—		30183	—	—	30383	—	1
1	1-1/2	4	1	.015	•	38101	38102	38150	38192	—	1CR
1	1-1/2	4	1	.020	•	38103	38104	38151	38193	—	1CR
1	1-1/2	4	1	.030	•	38105	38106	38152	38194	—	1CR
1	1-1/2	4	1	.045	•	38107	38108	38153	38195	—	1CR
1	1-1/2	4	1	.060	•	38109	38110	38154	38196	—	1CR
1	1-1/2	4	1	.090	•	38111	38112	38155	38197	—	1CR
1	1-1/2	4	1	.125	•	38113	38114	38156	38198	—	1CR
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 Ball End



TOLERANCES (inch)

<1/8 DIAMETER

DC = +0.000/-0.001

DCON = h_6

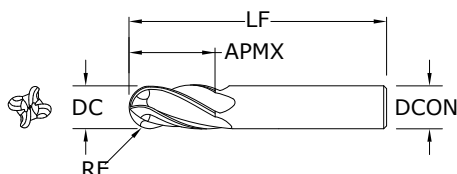
RE = +0.000/-0.0005

≥1/8 DIAMETER

DC = +0.000/-0.002

DCON = h_6

RE = +0.000/-0.001

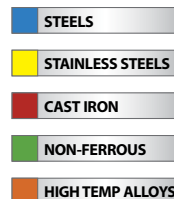


**1B • 1LB •
1ELB**
FRACTIONAL SERIES

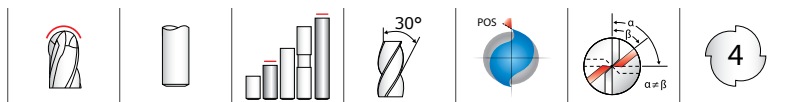
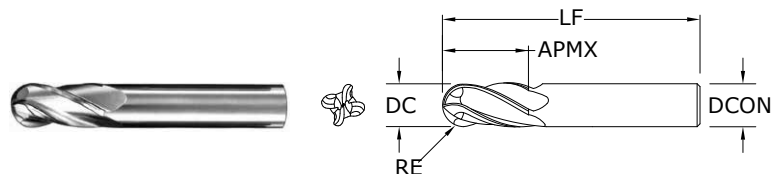
inch					EDP NO.				SERIES
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	WELDON FLAT	UNCOATED	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	Di-NAMITE (Diamond)	
1/64	1/32	1-1/2	1/8		30102	39002	30031	—	1B
1/32	5/64	1-1/2	1/8		30104	39004	30032	—	1B
3/64	7/64	1-1/2	1/8		30106	39006	30033	—	1B
1/16	3/16	1-1/2	1/8		30108	39008	30034	91269	1B
5/64	3/16	1-1/2	1/8		30110	39010	30035	—	1B
3/32	9/32	1-1/2	1/8		30112	39012	30036	—	1B
7/64	3/8	1-1/2	1/8		30114	39014	30037	—	1B
*1/8	3/8	1-1/2	1/8		30178	39078	30069	—	1B
1/8	1/2	1-1/2	1/8		30116	39016	30038	91273	1B
1/8	3/4	2-1/4	1/8		33142	31780	31790	—	1LB
1/8	1	3	1/8		33144	31918	31928	—	1ELB
9/64	1/2	2	3/16		30118	39018	30039	—	1B
5/32	1/2	2	3/16		30120	39020	30040	—	1B
11/64	5/8	2	3/16		30122	39022	30041	—	1B
*3/16	5/8	2	3/16		30124	39024	30042	91277	1B
3/16	3/4	2-1/2	3/16		33102	31781	31791	—	1LB
3/16	1-1/8	3	3/16		33122	31919	31929	—	1ELB
13/64	5/8	2-1/2	1/4		30126	39026	30043	—	1B
7/32	5/8	2-1/2	1/4		30128	39028	30044	—	1B
15/64	3/4	2-1/2	1/4		30130	39030	30045	—	1B
*1/4	3/4	2-1/2	1/4		30132	39032	30046	91281	1B
1/4	1-1/8	3	1/4		33104	31782	31792	—	1LB
1/4	1-1/2	4	1/4		33124	31920	31930	—	1ELB
17/64	3/4	2-1/2	5/16		30134	39034	30047	—	1B
9/32	3/4	2-1/2	5/16		30136	39036	30048	—	1B
19/64	13/16	2-1/2	5/16		30138	39038	30049	—	1B
*5/16	13/16	2-1/2	5/16		30140	39040	30050	91285	1B
5/16	1-1/8	3	5/16		33106	31783	31793	—	1LB
5/16	1-5/8	4	5/16		33126	31921	31931	—	1ELB
21/64	1	2-1/2	3/8		30142	39042	30051	—	1B
11/32	1	2-1/2	3/8		30144	39044	30052	—	1B
23/64	1	2-1/2	3/8		30146	39046	30053	—	1B
*3/8	1	2-1/2	3/8		30148	39048	30054	91289	1B
3/8	1	2-1/2	3/8	•	30184	—	30384	—	1B
3/8	1-1/8	3	3/8		33108	31784	31794	—	1LB
3/8	1-3/4	4	3/8		33128	31922	31932	—	1ELB

RE = 1/2 Cutting Diameter (DC)

continued on next page



4 Flute Ball End


**1B•1LB•
1ELB**
FRACTIONAL SERIES


TOLERANCES (inch)

<1/8 DIAMETER

DC = +0.000/-0.001

DCON = h_6

RE = +0.000/-0.0005

≥1/8 DIAMETER

DC = +0.000/-0.002

DCON = h_6

RE = +0.000/-0.001

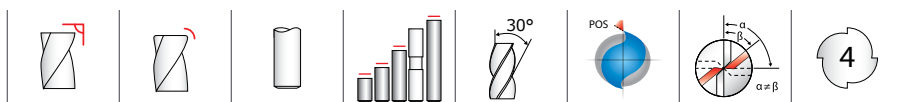
CONTINUED

STEELS
STAINLESS STEELS
CAST IRON
NON-FERROUS
HIGH TEMP ALLOYS

CUTTING DIAMETER DC	LENGTH OF CUT APMX	inch			WELDON FLAT	EDP NO.				SERIES
		OVERALL LENGTH LF	SHANK DIAMETER DCON			UNCOATED	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	Di-NAMITE (Diamond)	
25/64	1	2-3/4	7/16			30150	39050	30055	—	1B
13/32	1	2-3/4	7/16			30152	39052	30056	—	1B
27/64	1	2-3/4	7/16			30154	39054	30057	—	1B
7/16	1	2-3/4	7/16			30156	39056	30058	—	1B
7/16	2	4-1/2	7/16			33110	31785	31795	—	1LB
7/16	3	6	7/16			33130	31923	31933	—	1ELB
29/64	1	3	1/2			30158	39058	30059	—	1B
15/32	1	3	1/2			30160	39060	30060	—	1B
31/64	1	3	1/2			30162	39062	30061	—	1B
*1/2	1	3	1/2			30164	39064	30062	91293	1B
1/2	1	3	1/2	•		30185	—	30385	—	1B
1/2	2	4-1/2	1/2			33112	31786	31796	—	1LB
1/2	3	6	1/2			33132	31924	31934	—	1ELB
9/16	1-1/8	3-1/2	9/16			30166	39066	30063	—	1B
5/8	1-1/4	3-1/2	5/8			30168	39068	30064	—	1B
5/8	1-1/4	3-1/2	5/8	•		30186	—	30386	—	1B
5/8	2-1/4	5	5/8			33114	31787	31797	—	1LB
5/8	3	6	5/8			33134	31925	31935	—	1ELB
11/16	1-3/8	4	3/4			30170	39070	30065	—	1B
3/4	1-1/2	4	3/4			30172	39072	30066	—	1B
3/4	1-1/2	4	3/4	•		30187	—	30387	—	1B
3/4	2-1/4	5	3/4			33116	31788	31798	—	1LB
3/4	3	6	3/4			33136	31926	31936	—	1ELB
7/8	1-1/2	4	7/8			30174	39074	30067	—	1B
1	1-1/2	4	1			30176	39076	30068	—	1B
1	1-1/2	4	1	•		30188	—	30388	—	1B
1	2-1/4	5	1			33118	31789	31799	—	1LB
1	3	6	1			33138	31927	31937	—	1ELB
*Series 1B Set						30190	39090	30070	—	1B

RE = 1/2 Cutting Diameter (DC)

4 Flute Square End • 4 Flute Corner Radius



TOLERANCES (mm)

<3 DIAMETER

DC = +0,0000 / -0,0254

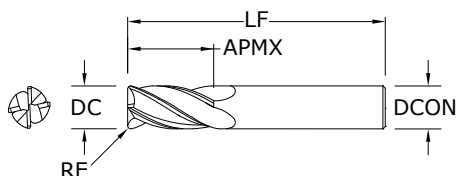
DCON = h_6

≥3 DIAMETER

DC = +0,0000 / -0,0508

DCON = h_6

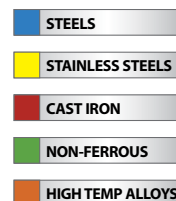
RE = +0,0000 / -0,0508



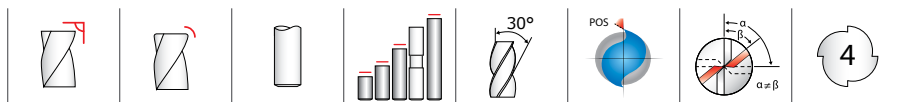
**1M • 1XLM •
1MCR • 16M**
METRIC SERIES

mm					EDP NO.				SERIES
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	CORNER RADIUS RE	SHANK DIAMETER DCON	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	
1,0	2,0	38,0	—	3,0	41605	49136	49157	49178	16M
1,0	4,0	38,0	—	3,0	40105	48500	48522	48543	1M
1,5	3,0	38,0	—	3,0	41609	49137	49158	49179	16M
1,5	4,5	38,0	—	3,0	40109	48501	48523	48544	1M
2,0	4,0	38,0	—	3,0	41613	49138	49159	49180	16M
2,0	6,3	38,0	—	3,0	40113	48502	48524	48545	1M
2,5	5,0	38,0	—	3,0	41617	49139	49160	49181	16M
2,5	9,5	38,0	—	3,0	40117	48503	48525	48546	1M
3,0	6,0	38,0	—	3,0	41621	49140	49161	49182	16M
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	7,0	50,0	—	4,0	41625	49141	49162	49183	16M
3,5	12,0	50,0	—	4,0	40125	48505	48527	48548	1M
4,0	8,0	50,0	—	4,0	41629	49142	49163	49184	16M
4,0	14,0	50,0	—	4,0	40129	48506	48528	48549	1M
4,0	14,0	50,0	0,25	4,0	—	—	—	40000	1MCR
4,0	14,0	50,0	0,50	4,0	—	—	—	40001	1MCR
4,0	14,0	50,0	0,76	4,0	—	—	—	40002	1MCR
4,0	14,0	50,0	1,00	4,0	—	—	—	40003	1MCR
4,0	25,0	75,0	—	4,0	43103	49389	49402	49415	1XLM
4,5	9,5	50,0	—	4,5	41633	49143	49164	49185	16M
4,5	16,0	50,0	—	6,0	40133	48507	48529	48550	1M
5,0	10,0	50,0	—	5,0	41637	49144	49165	49186	16M
5,0	16,0	50,0	—	6,0	40137	48508	48530	48551	1M
5,0	16,0	50,0	0,25	6,0	—	—	—	40004	1MCR
5,0	16,0	50,0	0,50	6,0	—	—	—	40005	1MCR
5,0	16,0	50,0	0,76	5,0	—	—	—	40006	1MCR
5,0	16,0	50,0	1,00	6,0	—	—	—	40007	1MCR
5,0	16,0	50,0	1,25	5,0	—	—	—	40008	1MCR
5,0	25,0	75,0	—	5,0	43107	49391	49404	49417	1XLM
6,0	12,0	50,0	—	6,0	41641	49145	49166	49187	16M
6,0	19,0	50,0	—	6,0	40141	48509	48531	48552	1M

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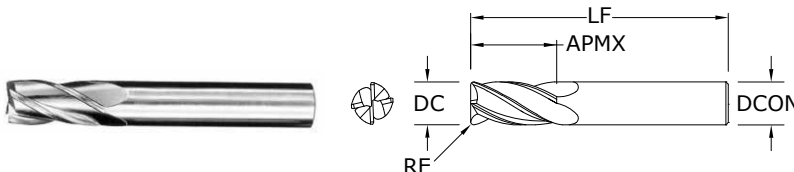


4 Flute Square End • 4 Flute Corner Radius



**1M • 1XLM •
1MCR • 16M**

METRIC SERIES



TOLERANCES (mm)

<3 DIAMETER

DC = +0,0000/-0,0254

DCON = h_6

≥3 DIAMETER

DC = +0,0000/-0,0508

DCON = h_6

RE = +0,0000/-0,0508

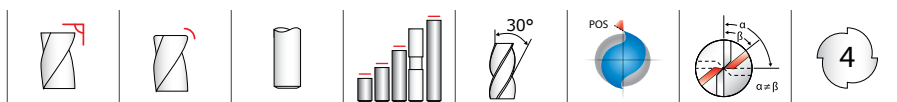
CONTINUED

STEELS
STAINLESS STEELS
CAST IRON
NON-FERROUS
HIGH TEMP ALLOYS

mm					EDP NO.				SERIES
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	CORNER RADIUS RE	SHANK DIAMETER DCON	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	
6,0	19,0	50,0	0,25	6,0	—	—	—	40009	1MCR
6,0	19,0	50,0	0,50	6,0	—	—	—	40010	1MCR
6,0	19,0	50,0	0,75	6,0	—	—	—	40011	1MCR
6,0	19,0	50,0	1,00	6,0	—	—	—	40012	1MCR
6,0	19,0	50,0	1,50	6,0	—	—	—	40014	1MCR
6,0	25,0	75,0	—	6,0	43105	49390	49403	49416	1XLM
7,0	12,0	50,0		8,0	41645	49146	49167	49188	16M
7,0	19,0	63,0	—	8,0	40145	48510	48532	48553	1M
8,0	12,0	50,0		8,0	41649	49147	49168	49189	16M
8,0	20,0	63,0	—	8,0	40149	48511	48533	48554	1M
8,0	20,0	63,0	0,50	8,0	—	—	—	40015	1MCR
8,0	20,0	63,0	0,75	8,0	—	—	—	40016	1MCR
8,0	20,0	63,0	1,00	8,0	—	—	—	40017	1MCR
8,0	20,0	63,0	1,25	8,0	—	—	—	40018	1MCR
8,0	20,0	63,0	1,50	8,0	—	—	—	40019	1MCR
8,0	20,0	63,0	2,00	8,0	—	—	—	40020	1MCR
10,0	22,0	75,0	0,76	10,0	—	—	—	40022	1MCR
8,0	25,0	75,0	—	8,0	43115	49392	49405	49418	1XLM
9,0	14,0	50,0		9,0	41653	49148	49169	49190	16M
9,0	22,0	75,0	—	10,0	40153	48512	48534	48555	1M
10,0	16,0	50,0		10,0	41657	49149	49170	49191	16M
10,0	22,0	75,0	—	10,0	40157	48513	48535	48556	1M
10,0	22,0	75,0	0,50	10,0	—	—	—	40021	1MCR
10,0	22,0	75,0	1,00	10,0	—	—	—	40023	1MCR
10,0	22,0	75,0	1,50	10,0	—	—	—	40024	1MCR
10,0	22,0	75,0	2,00	10,0	—	—	—	40025	1MCR
10,0	22,0	75,0	3,00	10,0	—	—	—	40026	1MCR
10,0	38,0	100,0	—	10,0	43125	49393	49406	49419	1XLM
11,0	19,0	63,0		12,0	41661	49150	49171	49192	16M
11,0	25,0	75,0	—	12,0	40161	48514	48536	48557	1M
12,0	19,0	63,0		12,0	40165	49151	49172	49193	16M
12,0	25,0	75,0	—	12,0	41665	48515	48537	48558	1M
12,0	25,0	75,0	0,50	12,0	—	—	—	40028	1MCR
12,0	25,0	75,0	0,76	12,0	—	—	—	40029	1MCR
12,0	25,0	75,0	1,00	12,0	—	—	—	40030	1MCR
12,0	25,0	75,0	1,50	12,0	—	—	—	40031	1MCR

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4 Flute Square End • 4 Flute Corner Radius



TOLERANCES (mm)

<3 DIAMETER

DC = +0,0000 / -0,0254

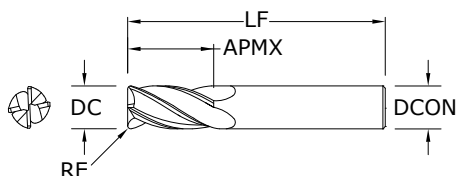
DCON = h_6

≥3 DIAMETER

DC = +0,0000 / -0,0508

DCON = h_6

RE = +0,0000 / -0,0508



**1M • 1XLM •
1MCR • 16M**

METRIC SERIES

mm					EDP NO.				SERIES
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	CORNER RADIUS RE	SHANK DIAMETER DCON	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	
12,0	25,0	75,0	2,00	12,0	—	—	—	40032	1MCR
12,0	25,0	75,0	3,00	12,0	—	—	—	40033	1MCR
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	32,0	89,0	0,50	16,0	—	—	—	40035	1MCR
16,0	32,0	89,0	0,76	16,0	—	—	—	40036	1MCR
16,0	32,0	89,0	1,00	16,0	—	—	—	40037	1MCR
16,0	32,0	89,0	1,50	16,0	—	—	—	40038	1MCR
16,0	32,0	89,0	2,00	16,0	—	—	—	40039	1MCR
16,0	32,0	89,0	3,00	16,0	—	—	—	40040	1MCR
16,0	32,0	89,0	3,20	16,0	—	—	—	40041	1MCR
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

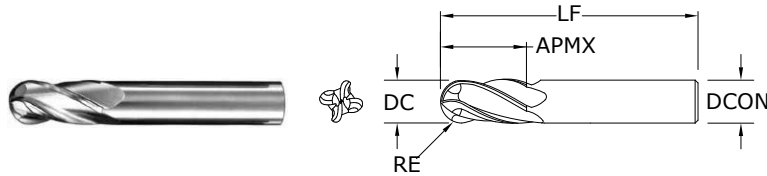
CONTINUED

STEELS
STAINLESS STEELS
CAST IRON
NON-FERROUS
HIGH TEMP ALLOYS

4 Flute Ball End



**1MB•
1XLMB**
METRIC SERIES



TOLERANCES (mm)

<3 DIAMETER

DC = +0,0000 / -0.0254

DCON = h_6

RE = +0,0000 / -0.0127

≥3 DIAMETER

DC = +0,0000 / -0.0508

DCON = h_6

RE = +0,0000 / -0.0254

STEELS
STAINLESS STEELS
CAST IRON
NON-FERROUS
HIGH TEMP ALLOYS

mm				EDP NO.		SERIES
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	UNCOATED	Ti-NAMITE-A (AITiN)	
1,0	4,0	38,0	3,0	40106	48607	1MB
1,5	4,5	38,0	3,0	40110	48608	1MB
2,0	6,3	38,0	3,0	40114	48609	1MB
2,5	9,5	38,0	3,0	40118	48610	1MB
3,0	12,0	38,0	3,0	40122	48611	1MB
3,0	25,0	75,0	3,0	43102	49531	1XLMB
3,5	12,0	50,0	4,0	40126	48612	1MB
4,0	14,0	50,0	4,0	40130	48613	1MB
4,0	25,0	75,0	4,0	43104	49532	1XLMB
4,5	16,0	50,0	6,0	40134	48614	1MB
5,0	16,0	50,0	6,0	40138	48615	1MB
5,0	25,0	75,0	5,0	43108	49534	1XLMB
6,0	19,0	50,0	6,0	40142	48616	1MB
6,0	25,0	75,0	6,0	43106	49533	1XLMB
7,0	19,0	63,0	8,0	40146	48617	1MB
8,0	20,0	63,0	8,0	40150	48618	1MB
8,0	25,0	75,0	8,0	43116	49535	1XLMB
9,0	22,0	75,0	10,0	40154	48619	1MB
10,0	22,0	75,0	10,0	40158	48620	1MB
10,0	38,0	100,0	10,0	43126	49536	1XLMB
11,0	25,0	75,0	12,0	40162	48621	1MB
12,0	25,0	75,0	12,0	40166	48622	1MB
12,0	50,0	100,0	12,0	43136	49537	1XLMB
12,0	75,0	150,0	12,0	43146	49538	1XLMB
14,0	32,0	89,0	14,0	40170	48623	1MB
14,0	75,0	150,0	14,0	43156	49539	1XLMB
16,0	32,0	89,0	16,0	40174	48624	1MB
16,0	75,0	150,0	16,0	43166	49540	1XLMB
18,0	38,0	100,0	18,0	40178	48625	1MB
18,0	75,0	150,0	18,0	43176	49541	1XLMB
20,0	38,0	100,0	20,0	40182	48626	1MB
20,0	75,0	150,0	20,0	43186	49542	1XLMB
25,0	38,0	100,0	25,0	40186	48627	1MB
25,0	75,0	150,0	25,0	43196	49543	1XLMB

RE = 1/2 Cutting Diameter (DC)

4 Flute Double End

TOLERANCES (inch)

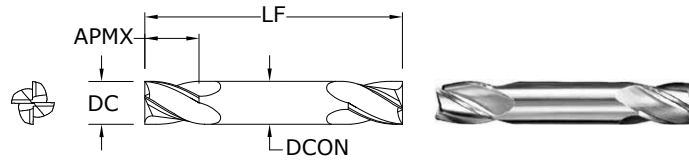
<1/8 DIAMETER

DC = +0.000/-0.001

DCON = h₆

≥1/8 DIAMETER

DC = +0.000/-0.002

DCON = h₆14
FRACTIONAL SERIES

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

STEELS
STAINLESS STEELS
CAST IRON
NON-FERROUS
HIGH TEMP ALLOYS

TOLERANCES (mm)

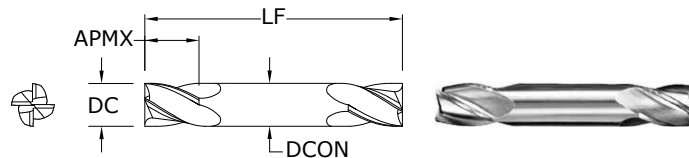
<3 DIAMETER

DC = +0.0000/-0.0254

DCON = h₆

≥3 DIAMETER

DC = +0.0000/-0.0508

DCON = h₆14M
METRIC SERIES

mm				EDP NO.			
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	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

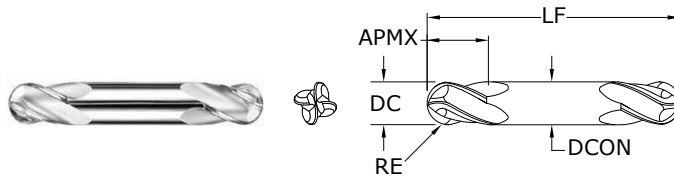
STEELS
STAINLESS STEELS
CAST IRON
NON-FERROUS
HIGH TEMP ALLOYS

4 Flute Double End Ball End



14B

FRACTIONAL SERIES



TOLERANCES (inch)

<1/8 DIAMETER

DC = +0.000/-0.001

DCON = h_6

RE = +0.000/-0.005

≥1/8 DIAMETER

DC = +0.000/-0.002

DCON = h_6

RE = +0.000/-0.001

STEELS

STAINLESS STEELS

CAST IRON

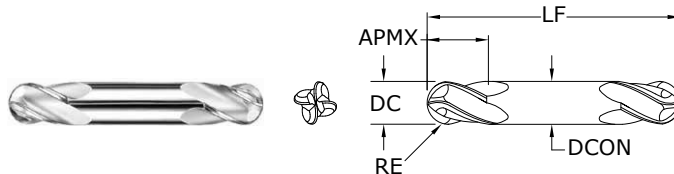
NON-FERROUS

HIGH TEMP ALLOYS

CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	EDP NO.			
				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
				31490	31482	39642	31217

*Series 14B Set

RE = 1/2 Cutting Diameter (DC)



TOLERANCES (mm)

<3 DIAMETER

DC = +0,0000/-0,0254

DCON = h_6

RE = +0,0000/-0,0127

≥3 DIAMETER

DC = +0,0000/-0,0508

DCON = h_6

RE = +0,0000/-0,0254

14MB

METRIC SERIES

STEELS

STAINLESS STEELS

CAST IRON

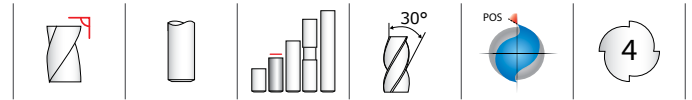
NON-FERROUS

HIGH TEMP ALLOYS

CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	EDP NO.	
				UNCOATED	Ti-NAMITE-A (AlTiN)
1,0	2,0	38,0	3,0	41406	48989
1,5	3,0	38,0	3,0	41410	48990
2,0	4,0	38,0	3,0	41414	48991
2,5	5,0	38,0	3,0	41418	48992
3,0	6,0	38,0	3,0	41422	48993
3,5	7,0	50,0	4,0	41426	48994
4,0	8,0	50,0	4,0	41430	48995
4,5	9,5	63,0	4,5	41434	48996
5,0	10,0	63,0	5,0	41438	48997
6,0	12,0	63,0	6,0	41442	48998
7,0	12,0	63,0	8,0	41446	48999
8,0	12,0	63,0	8,0	41450	49000
9,0	14,0	75,0	9,0	41454	49001
10,0	14,0	75,0	10,0	41458	49002
11,0	14,0	75,0	12,0	41462	49003
12,0	16,0	75,0	12,0	41466	49004

RE = 1/2 Cutting Diameter (DC)

4 Flute High Shear



TOLERANCES (inch)

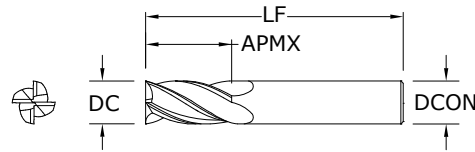
<1/8 DIAMETER

DC = +0.000/-0.001

DCON = h₆

≥1/8 DIAMETER

DC = +0.000/-0.002

DCON = h₆

54

FRACTIONAL SERIES

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

NON-FERROUS

TOLERANCES (mm)

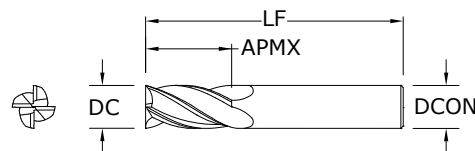
<3 DIAMETER

DC = +0,0000/-0,0254

DCON = h₆

≥3 DIAMETER

DC = +0,0000/-0,0508

DCON = h₆

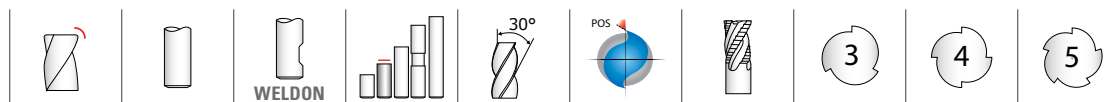
54M

METRIC SERIES

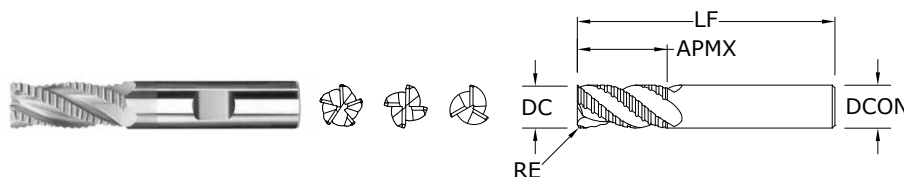
mm				EDP NO.	
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	UNCOATED	Ti-NAMITE-C (TiCN)
3,0	8,0	38,0	3,0	45477	45478
3,5	10,0	57,0	6,0	45479	45480
4,0	11,0	57,0	6,0	45481	45482
4,5	11,0	57,0	6,0	45483	45484
5,0	13,0	57,0	6,0	45485	45486
6,0	13,0	57,0	6,0	45487	45488
8,0	19,0	63,0	8,0	45489	45490
10,0	22,0	72,0	10,0	45491	45492
12,0	26,0	83,0	12,0	45493	45494
14,0	26,0	83,0	14,0	45495	45496
16,0	32,0	92,0	16,0	45497	45498
20,0	38,0	104,0	20,0	45499	45500

NON-FERROUS

Single End Roughers (Coarse Pitch)

**61**

FRACTIONAL SERIES

**TOLERANCES (inch)**

DC = +0.0000/-0.0040

DCON = h_6

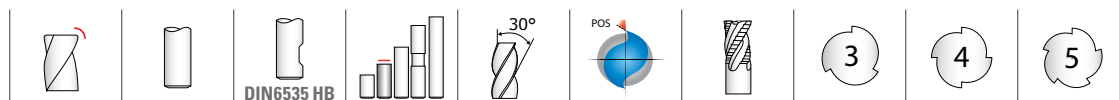
RE = +0.0050/-0.0050

STEELS

CAST IRON

inch						EDP NO.		
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	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	36122
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



DIN6535 HB

**TOLERANCES (mm)**

DC = +0,000 / -0,100

DCON = h_6

RE = +0,127/-0,127

61M

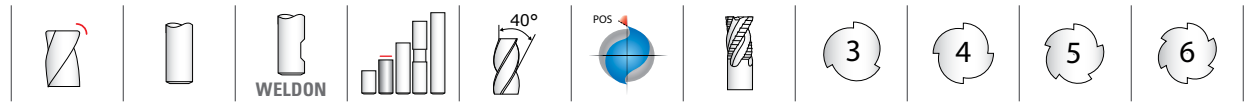
METRIC SERIES

STEELS

CAST IRON

mm						EDP NO.		
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	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

Single End Roughers (Fine Pitch)

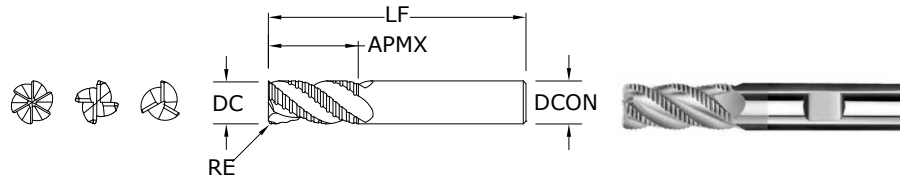


TOLERANCES (inch)

DC = +0.0000/-0.0040

DCON = h_6

RE = +0.0050/-0.0050


62
FRACTIONAL SERIES

inch						EDP NO.	
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	NO. OF FLUTES	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)
*1/4	3/4	2-1/2	1/4	.045	3	—	36210
*5/16	3/4	2-1/2	5/16	.045	3	—	36211
3/8	7/8	2-1/2	3/8	.060	3	—	36214
1/2	1	3	1/2	.060	4	—	36218
5/8	1-1/4	3-1/2	5/8	.060	4	—	36222
3/4	1-5/8	4	3/4	.060	4	36224	36226
1	1-3/4	4	1	.060	6	—	36230

*Without Flat

STAINLESS STEELS

HIGH TEMP ALLOYS

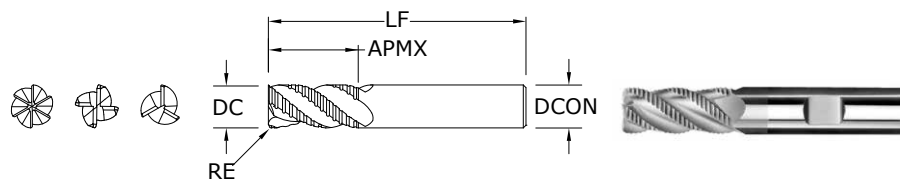


TOLERANCES (mm)

DC = +0,000 / -0,100

DCON = h_6

RE = +0,127/-0,127

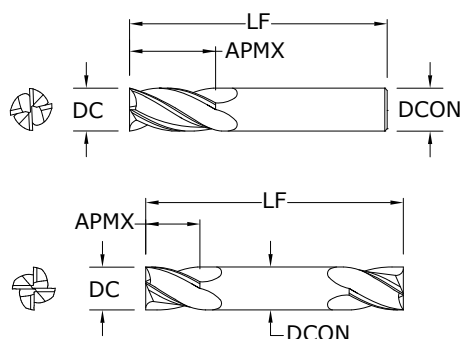

62M
METRIC SERIES

mm						EDP NO.	
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	CORNER RADIUS RE	NO. OF FLUTES	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)
6,0	19,0	63,0	6,0	1,14	3	46206	46210
8,0	19,0	63,0	8,0	1,14	3	46208	46211
10,0	22,0	72,0	10,0	1,52	3	46212	46214
12,0	26,0	83,0	12,0	1,52	4	46216	46218
16,0	32,0	92,0	16,0	1,52	4	46220	46222
20,0	38,0	104,0	20,0	1,52	4	46228	46232
25,0	44,0	104,0	25,0	1,52	5	46230	46233

STAINLESS STEELS

HIGH TEMP ALLOYS

End Mill Sets



Pictured:
Series 1 4 Flute
Single End Square
Endmill Set

CUTTING DIAMETER DC	SINGLE END LENGTH OF CUT APMX	DOUBLE END LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON
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

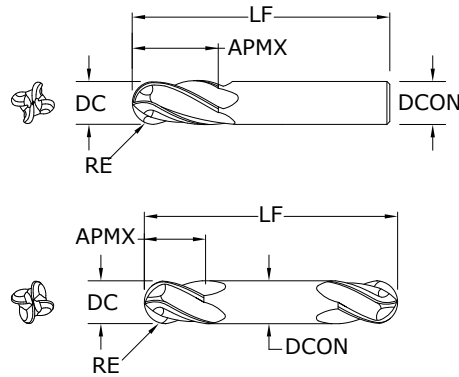
Square End

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

FRACTIONAL End Mill Sets



Pictured:
Series 1 4 Flute Single
End Ball Endmill Set

CUTTING DIAMETER DC	SINGLE END LENGTH OF CUT APMX	DOUBLE END LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON
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

RE = 1/2 Cutting Diameter (DC)

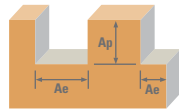
Ball End FRACTIONAL SERIES

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



2 Flute: Square & Ball End

4 Flute: Square & Ball End



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

rpm = (Vc x 3.82) / DC

ipm = Fz x number of flutes x rpm

finish cuts typically require reduced feed and cut depths (.02 x D maximum)

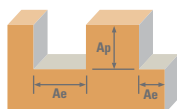
refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)

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

3 Flute: Square, Ball, Tapered

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

Tapered: Square, Radius



Series 1, 3, 5, 14, 16, 17, 23, 24, 59 Fractional								DC • in									
Hardness		Flutes		Ae x DC	Ap x DC	Vc (sfm)											
							1/64	1/32	1/16	1/8	1/4	3/8	1/2	3/4	1		
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	Profile			460	RPM	112461	56230	28115	14058	7029	4686	3514	2343	1757	
							Fz	0.00003	0.00006	0.00013	0.0003	0.0008	0.0015	0.0020	0.0024	0.0028	
				2	≤ 0.50	≤ 1.5	(368-552)	Feed (ipm)	6.7	6.7	7.3	8.4	11.2	14.1	14.1	11.2	9.8
			3	≤ 0.25	≤ 1.5	10.1		10.1	11.0	12.7	16.9	21.1	21.1	16.9	14.8		
			4	≤ 0.25	≤ 1.5	13.5		13.5	14.6	16.9	22.5	28.1	28.1	22.5	19.7		
			Slot				335	RPM	81901	40950	20475	10238	5119	3413	2559	1706	1280
						Fz	0.00003	0.00006	0.00013	0.0003	0.0008	0.0015	0.0020	0.0024	0.0028		
		2		1	≤ 1	(268-402)	Feed (ipm)	4.9	4.9	5.3	6.1	8.2	10.2	10.2	8.2	7.2	
		3	1	≤ 0.5	7.4		7.4	8.0	9.2	12.3	15.4	15.4	12.3	10.7			
		4	1	≤ 0.4	9.8		9.8	10.6	12.3	16.4	20.5	20.5	16.4	14.3			
		ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc	Profile			335	RPM	81901	40950	20475	10238	5119	3413	2559	1706	1280
								Fz	0.00002	0.00005	0.00009	0.0002	0.0006	0.0011	0.0015	0.0018	0.0021
	2				≤ 0.50	≤ 1.5	(268-402)	Feed (ipm)	3.3	4.1	3.7	4.1	6.1	7.5	7.7	6.1	5.4
	3			≤ 0.25	≤ 1.5	4.9		6.1	5.5	6.1	9.2	11.3	11.5	9.2	8.1		
	4			≤ 0.25	≤ 1.5	6.6		8.2	7.4	8.2	12.3	15.0	15.4	12.3	10.7		
	Slot						245	RPM	59898	29949	14974	7487	3744	2496	1872	1248	936
						Fz	0.00002	0.00005	0.00009	0.0002	0.0006	0.0011	0.0015	0.0018	0.0021		
			2	1	≤ 1	(196-294)	Feed (ipm)	2.4	3.0	2.7	3.0	4.5	5.5	5.6	4.5	3.9	
	3		1	≤ 0.5	3.6		4.5	4.0	4.5	6.7	8.2	8.4	6.7	5.9			
	4		1	≤ 0.4	4.8		6.0	5.4	6.0	9.0	11.0	11.2	9.0	7.9			
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2		≤ 250 Bhn or ≤ 24 HRc	Profile			315	RPM	77011	38506	19253	9626	4813	3209	2407	1604	1203
								Fz	0.00002	0.00005	0.00009	0.0002	0.0006	0.0011	0.0015	0.0018	0.0021
		2			≤ 0.50	≤ 1.5	(252-378)	Feed (ipm)	3.1	3.9	3.5	3.9	5.8	7.1	7.2	5.8	5.1
		3		≤ 0.25	≤ 1.5	4.6		5.8	5.2	5.8	8.7	10.6	10.8	8.7	7.6		
		4		≤ 0.25	≤ 1.5	6.2		7.7	6.9	7.7	11.6	14.1	14.4	11.6	10.1		
Slot						230	RPM	56230	28115	14058	7029	3514	2343	1757	1171	879	
					Fz	0.00002	0.00005	0.00009	0.0002	0.0006	0.0011	0.0015	0.0018	0.0021			
		2	1	≤ 1	(184-276)	Feed (ipm)	2.2	2.8	2.5	2.8	4.2	5.2	5.3	4.2	3.7		
3		1	≤ 0.5	3.4		4.2	3.8	4.2	6.3	7.7	7.9	6.3	5.5				
4		1	≤ 0.4	4.5		5.6	5.1	5.6	8.4	10.3	10.5	8.4	7.4				
M		STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F 440F	≤ 275 Bhn or ≤ 28 HRc	Profile			370	RPM	90458	45229	22614	11307	5654	3769	2827	1885	1413
								Fz	0.00002	0.00005	0.00009	0.0002	0.0006	0.0011	0.0015	0.0018	0.0021
	2				≤ 0.50	≤ 1.5	(296-444)	Feed (ipm)	3.6	4.5	4.1	4.5	6.8	8.3	8.5	6.8	5.9
	3			≤ 0.25	≤ 1.5	5.4		6.8	6.1	6.8	10.2	12.4	12.7	10.2	8.9		
	4			≤ 0.25	≤ 1.5	7.2		9.0	8.1	9.0	13.6	16.6	17.0	13.6	11.9		
	Slot						270	RPM	66010	33005	16502	8251	4126	2750	2063	1375	1031
						Fz	0.00002	0.00005	0.00009	0.0002	0.0006	0.0011	0.0015	0.0018	0.0021		
			2	1	≤ 1	(216-324)	Feed (ipm)	2.6	3.3	3.0	3.3	5.0	6.1	6.2	5.0	4.3	
	3		1	≤ 0.5	4.0		5.0	4.5	5.0	7.4	9.1	9.3	7.4	6.5			
	4		1	≤ 0.4	5.3		6.6	5.9	6.6	9.9	12.1	12.4	9.9	8.7			
	STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L, 17-4 PH, 15-5, 13-4, Custom 450		≤ 275 Bhn or ≤ 28 HRc	Profile			255	RPM	62342	31171	15586	7793	3896	2598	1948	1299	974
								Fz	0.00002	0.00004	0.00008	0.0002	0.0005	0.0009	0.0012	0.0014	0.0017
		2			≤ 0.50	≤ 1.5	(204-306)	Feed (ipm)	2.5	2.5	2.5	2.6	3.9	4.7	4.7	3.6	3.3
		3		≤ 0.25	≤ 1.5	3.7		3.7	3.7	4.0	5.8	7.0	7.0	5.5	5.0		
		4		≤ 0.25	≤ 1.5	5.0		5.0	5.0	5.3	7.8	9.4	9.4	7.3	6.6		
		Slot					185	RPM	45229	22614	11307	5654	2827	1885	1413	942	707
					Fz	0.00002	0.00004	0.00008	0.0002	0.0005	0.0009	0.0012	0.0014	0.0017			
	2		1	≤ 1	(148-222)	Feed (ipm)	1.8	1.8	1.8	1.9	2.8	3.4	3.4	2.6	2.4		
	3	1	≤ 0.5	2.7		2.7	2.7	2.9	4.2	5.1	5.1	4.0	3.6				
	4	1	≤ 0.4	3.6		3.6	3.6	3.8	5.7	6.8	6.8	5.3	4.8				
	K	CAST IRONS Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	Profile			335	RPM	81901	40950	20475	10238	5119	3413	2559	1706	1280
								Fz	0.00003	0.00006	0.00013	0.0003	0.0008	0.0015	0.0020	0.0024	0.0028
					2	≤ 0.50	≤ 1.5	(268-402)	Feed (ipm)	4.9	4.9	5.3	6.1	8.2	10.2	10.2	8.2
				3	≤ 0.25	≤ 1.5	7.4		7.4	8.0	9.2	12.3	15.4	15.4	12.3	10.7	
4			≤ 0.25	≤ 1.5	9.8	9.8	10.6		12.3	16.4	20.5	20.5	16.4	14.3			
Slot						245	RPM	59898	29949	14974	7487	3744	2496	1872	1248	936	
						Fz	0.00003	0.00006	0.00013	0.0003	0.0008	0.0015	0.0020	0.0024	0.0028		
			2	1	≤ 1	(196-294)	Feed (ipm)	3.6	3.6	3.9	4.5	6.0	7.5	7.5	6.0	5.2	
	3	1	≤ 0.5	5.4	5.4		5.8	6.7	9.0	11.2	11.2	9.0	7.9				
4	1	≤ 0.4	7.2	7.2	7.8		9.0	12.0	15.0	15.0	12.0	10.5					
N	ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075	≤ 150 Bhn or ≤ 88 HRb	Profile			880	RPM	215142	107571	53786	26893	13446	8964	6723	4482	3362	
							Fz	0.00006	0.00013	0.00025	0.0006	0.0016	0.0030	0.0040	0.0048	0.0056	
				2	≤ 0.50	≤ 1.5	(704-1056)	Feed (ipm)	25.8	28.0	26.9	32.3	43.0	53.8	53.8	43.0	37.6
			3	≤ 0.25	≤ 1.5	38.7		42.0	40.3	48.4	64.5	80.7	80.7	64.5	56.5		
		Slot				640		RPM	156467	78234	39117	19558	9779	6519	4890	3260	2445
						Fz	0.00006	0.00013	0.00025	0.0006	0.0016	0.0030	0.0040	0.0048	0.0056		
			2	1	≤ 1	(512-768)	Feed (ipm)	18.8	20.3	19.6	23.5	31.3	39.1	39.1	31.3	27.4	
			3	1	≤ 0.5		28.2	30.5	29.3	35.2	46.9	58.7	58.7	46.9	41.1		

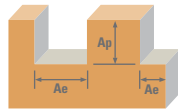
continued on next page

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

3 Flute: Square, Ball, Tapered

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

Tapered: Square, Radius



Series 1, 3, 5, 14, 16, 17, 23, 24, 59							DC • in									
Fractional	Hardness	Flutes	Ae x DC	Ap x DC	Vc (sfm)		1/64	1/32	1/16	1/8	1/4	3/8	1/2	3/4	1	
N	COPPER ALLOYS Alum Bronze, C110, Muntz Brass	≤ 140 Bhn or ≤ 3 HRc		Profile	(388-582)	485	RPM	118573	59286	29643	14822	7411	4941	3705	2470	1853
						Fz	0.00003	0.00006	0.00013	0.0003	0.0008	0.0015	0.0020	0.0024	0.0028	
						Feed (ipm)	7.1	7.1	7.7	8.9	11.9	14.8	14.8	11.9	10.4	
						2	10.7	10.7	11.6	13.3	17.8	22.2	22.2	17.8	15.6	
			3	14.2	14.2	15.4	17.8	23.7	29.6	29.6	23.7	20.8				
			4	0.00003	0.00006	0.00013	0.0003	0.0008	0.0015	0.0020	0.0024	0.0028				
			Slot	(280-420)	350	RPM	85568	42784	21392	10696	5348	3565	2674	1783	1337	
					Fz	0.00003	0.00006	0.00013	0.0003	0.0008	0.0015	0.0020	0.0024	0.0028		
					Feed (ipm)	5.1	5.1	5.6	6.4	8.6	10.7	10.7	8.6	7.5		
					2	7.7	7.7	8.3	9.6	12.8	16.0	16.0	12.8	11.2		
					3	10.3	10.3	11.1	12.8	17.1	21.4	21.4	17.1	15.0		
					4	0.00003	0.00006	0.00013	0.0003	0.0008	0.0015	0.0020	0.0024	0.0028		
	PLASTICS Polycarbonate, PVC, Polypropylene		Profile	(704-1056)	880	RPM	215142	107571	53786	26893	13446	8964	6723	4482	3362	
					Fz	0.00006	0.00013	0.00025	0.0006	0.0016	0.0030	0.0040	0.0048	0.0056		
					Feed (ipm)	25.8	28.0	26.9	32.3	43.0	53.8	53.8	43.0	37.6		
					2	38.7	42.0	40.3	48.4	64.5	80.7	80.7	64.5	56.5		
					3	51.6	55.9	53.8	64.5	86.1	107.6	107.6	86.1	75.3		
					4	0.00006	0.00013	0.00025	0.0006	0.0016	0.0030	0.0040	0.0048	0.0056		
			Slot	(512-768)	640	RPM	156467	78234	39117	19558	9779	6519	4890	3260	2445	
					Fz	0.00006	0.00013	0.00025	0.0006	0.0016	0.0030	0.0040	0.0048	0.0056		
					Feed (ipm)	18.8	20.3	19.6	23.5	31.3	39.1	39.1	31.3	27.4		
					2	28.2	30.5	29.3	35.2	46.9	58.7	58.7	46.9	41.1		
					3	37.6	40.7	39.1	46.9	62.6	78.2	78.2	62.6	54.8		
					4	0.00006	0.00013	0.00025	0.0006	0.0016	0.0030	0.0040	0.0048	0.0056		
GRAPHITE		Profile	(528-792)	660	RPM	161357	80678	40339	20170	10085	6723	5042	3362	2521		
				Fz	0.00006	0.00013	0.00025	0.0006	0.0016	0.0030	0.0040	0.0048	0.0056			
				Feed (ipm)	19.4	21.0	20.2	24.2	32.3	40.3	40.3	32.3	28.2			
				2	29.0	31.5	30.3	36.3	48.4	60.5	60.5	48.4	42.4			
				3	38.7	42.0	40.3	48.4	64.5	80.7	80.7	64.5	56.5			
				4	0.00006	0.00013	0.00025	0.0006	0.0016	0.0030	0.0040	0.0048	0.0056			
		Slot	(384-576)	480	RPM	117350	58675	29338	14669	7334	4890	3667	2445	1834		
				Fz	0.00006	0.00013	0.00025	0.0006	0.0016	0.0030	0.0040	0.0048	0.0056			
				Feed (ipm)	14.1	15.3	14.7	17.6	23.5	29.3	29.3	23.5	20.5			
				2	21.1	22.9	22.0	26.4	35.2	44.0	44.0	35.2	30.8			
				3	28.2	30.5	29.3	35.2	46.9	58.7	58.7	46.9	41.1			
				4	0.00006	0.00013	0.00025	0.0006	0.0016	0.0030	0.0040	0.0048	0.0056			
S	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, 718, Incoloy 800, Monel 400,Rene, Waspalloy	≤ 300 Bhn or ≤ 32 HRc		Profile	(52-78)	65	RPM	15891	7946	3973	1986	993	662	497	331	248
						Fz	0.00002	0.00003	0.00006	0.0002	0.0004	0.0008	0.0010	0.0012	0.0014	
						Feed (ipm)	0.6	0.5	0.5	0.7	0.7	1.1	1.0	0.8	0.7	
						2	1.0	0.7	0.7	1.1	1.0	1.6	1.5	1.2	1.0	
			3	1.3	1.0	1.0	1.4	1.4	2.1	2.0	1.6	1.4				
			4	0.00002	0.00003	0.00006	0.0002	0.0004	0.0008	0.0010	0.0012	0.0014				
			Slot	(36-54)	45	RPM	11002	5501	2750	1375	688	458	344	229	172	
					Fz	0.00002	0.00003	0.00006	0.0002	0.0004	0.0008	0.0010	0.0012	0.0014		
					Feed (ipm)	0.4	0.3	0.3	0.5	0.5	0.7	0.7	0.6	0.5		
					2	0.7	0.5	0.5	0.7	0.7	1.1	1.0	0.8	0.7		
					3	0.9	0.7	0.7	1.0	1.0	1.5	1.4	1.1	1.0		
					4	0.00002	0.00003	0.00006	0.0002	0.0004	0.0008	0.0010	0.0012	0.0014		
	TITANIUM ALLOYS Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti10V2Fe3Al, Ti5Al3Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti152 Cr3Sn3Al	≤ 350 Bhn or ≤ 38 HRc		Profile	(144-216)	180	RPM	44006	22003	11002	5501	2750	1834	1375	917	688
						Fz	0.00002	0.00004	0.00008	0.0002	0.0005	0.0009	0.0012	0.0014	0.0017	
						Feed (ipm)	1.8	1.8	1.8	2.2	2.8	3.3	3.3	2.6	2.3	
						2	2.6	2.6	2.6	3.3	4.1	5.0	5.0	3.9	3.5	
			3	3.5	3.5	3.5	4.4	5.5	6.6	6.6	5.1	4.7				
			4	0.00002	0.00004	0.00008	0.0002	0.0005	0.0009	0.0012	0.0014	0.0017				
			Slot	(104-156)	130	RPM	31782	15891	7946	3973	1986	1324	993	662	497	
					Fz	0.00002	0.00004	0.00008	0.0002	0.0005	0.0009	0.0012	0.0014	0.0017		
					Feed (ipm)	1.3	1.3	1.3	1.6	2.0	2.4	2.4	1.9	1.7		
					2	1.9	1.9	1.9	2.4	3.0	3.6	3.6	2.8	2.5		
					3	2.5	2.5	2.5	3.2	4.0	4.8	4.8	3.7	3.4		
					4	0.00002	0.00004	0.00008	0.0002	0.0005	0.0009	0.0012	0.0014	0.0017		

Bhn (Brinell) HRC (Rockwell C) HRB (Rockwell B)

rpm = (Vc x 3.82) / DC

ipm = Fz x number of flutes x rpm

reduce speed and feed for materials harder than listed

for tapered end mills, base the speed on the largest diameter contacting

the workpiece and the feed on the smallest diameter

limit cut depths of long and extra long flute mills to .05 x DC when slotting

or profiling

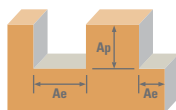
reduce feed and Ae when finish milling (.02 x DC maximum)

refer to the KYOCERA SGS APEX for complete technical information

www.kyocera-sgstool.com/apex

2 Flute: High Shear

4 Flute: High Shear



Series 52, 54 Fractional	Hardness	Flutes			Vc (sfm)	DC • in							
						1/8	1/4	3/8	1/2	3/4	1		
ALUMINUM ALLOYS 2024, 5052, 5086, 6061, 6063, 7075	≤ 150 Bhn or ≤ 88 HRb	 Profile			1360	RPM	41562	20781	13854	10390	6927	5195	
					(1088-1632)	Fz	0.00069	0.0018	0.0034	0.0046	0.0055	0.0064	
						Feed (ipm)	57.4	74.8	94.2	95.6	76.2	66.5	
						2	≤ 0.3	≤ 1.5	114.7	149.6	188.4	191.2	152.4
				4		≤ 0.3	≤ 1.5	33310	16655	11103	8328	5552	4164
		 Slot			1090	RPM	33310	16655	11103	8328	5552	4164	
					(872-1308)	Fz	0.00063	0.0017	0.0032	0.0042	0.0050	0.0059	
						Feed (ipm)	42.0	56.6	71.1	70.0	55.5	49.1	
						2	1	≤ 1	83.9	113.3	142.1	139.9	111.0
				4		1	≤ 0.25	42.6	53.5	52.6	41.8	37.0	
ALUMINUM DIE CAST ALLOYS (HIGH SILICON) A-390, A-392, B-390	≤ 125 Bhn or ≤ 77 HRb	 Profile			510	RPM	15586	7793	5195	3896	2598	1948	
					(408-612)	Fz	0.00069	0.0018	0.0034	0.0046	0.0055	0.0064	
						Feed (ipm)	21.5	28.1	35.3	35.8	28.6	24.9	
						2	≤ 0.3	≤ 1.5	43.0	56.1	70.7	71.7	57.1
				4		≤ 0.3	≤ 1.5	12530	6265	4177	3132	2088	1566
		 Slot			410	RPM	12530	6265	4177	3132	2088	1566	
					(328-492)	Fz	0.00063	0.0017	0.0032	0.0042	0.0050	0.0059	
						Feed (ipm)	15.8	21.3	26.7	26.3	20.9	18.5	
						2	1	≤ 1	31.6	42.6	53.5	52.6	41.8
				4		1	≤ 0.25	18.0	23.4	24.0	23.4	18.6	16.7
COPPER ALLOYS Aluminum Bronze, Muntz Brass, Naval, Brass, Red Brass	≤ 140 Bhn or ≤ 3 HRc	 Profile			590	RPM	18030	9015	6010	4508	3005	2254	
					(472-708)	Fz	0.00039	0.0010	0.0020	0.0026	0.0031	0.0037	
						Feed (ipm)	14.1	18.0	24.0	23.4	18.6	16.7	
						2	≤ 0.3	≤ 1.5	28.1	36.1	48.1	46.9	37.3
				4		≤ 0.3	≤ 1.5	14516	7258	4839	3629	2419	1815
		 Slot			475	RPM	14516	7258	4839	3629	2419	1815	
					(380-570)	Fz	0.00036	0.0010	0.0018	0.0024	0.0029	0.0034	
						Feed (ipm)	10.5	14.5	17.4	17.4	14.0	12.3	
						2	1	≤ 1	20.9	29.0	34.8	34.8	28.1
				4		1	≤ 0.25	7.2	9.6	9.3	7.4	6.6	
COPPER ALLOYS Beryllium Copper, C110, Manganese Bronze, Tin Bronze	≤ 200 Bhn or ≤ 23 HRc	 Profile			235	RPM	7182	3591	2394	1795	1197	898	
					(188-282)	Fz	0.00039	0.0010	0.0020	0.0026	0.0031	0.0037	
						Feed (ipm)	5.6	7.2	9.6	9.3	7.4	6.6	
						2	≤ 0.3	≤ 1.5	11.2	14.4	19.2	18.7	14.8
				4		≤ 0.3	≤ 1.5	5806	2903	1935	1452	968	726
		 Slot			190	RPM	5806	2903	1935	1452	968	726	
					(152-228)	Fz	0.00036	0.0010	0.0018	0.0024	0.0029	0.0034	
						Feed (ipm)	4.2	5.8	7.0	7.0	5.6	4.9	
						2	1	≤ 1	8.4	11.6	13.9	13.9	11.2
				4		1	≤ 0.25	16.2	21.6	26.8	26.8	21.6	18.5
PLASTICS ABS, Polycarbonate, PVC, Polypropylene		 Profile			1600	RPM	48896	24448	16299	12224	8149	6112	
					(1280-1920)	Fz	0.00110	0.0030	0.0056	0.0074	0.0089	0.0100	
						Feed (ipm)	107.6	146.7	182.5	180.9	145.1	122.2	
						2	≤ 0.3	≤ 1.5	215.1	293.4	365.1	361.8	290.1
				4		≤ 0.3	≤ 1.5	39117	19558	13039	9779	6519	4890
		 Slot			1280	RPM	39117	19558	13039	9779	6519	4890	
					(1024-1536)	Fz	0.00100	0.0027	0.0051	0.0068	0.0082	0.0095	
						Feed (ipm)	78.2	105.6	133.0	133.0	106.9	92.9	
						2	1	≤ 1	156.5	211.2	266.0	266.0	213.8
				4		1	≤ 0.25	22003	11002	7334	5501	3667	2750
PLASTICS Fiberglass, Glass Filled		 Profile			720	RPM	22003	11002	7334	5501	3667	2750	
					(576-864)	Fz	0.00082	0.0022	0.0041	0.0055	0.0065	0.0076	
						Feed (ipm)	36.1	48.4	60.1	60.5	47.7	41.8	
						2	≤ 0.3	≤ 1.5	72.2	96.8	120.3	121.0	95.3
				4		≤ 0.3	≤ 1.5	17572	8786	5857	4393	2929	2197
		 Slot			575	RPM	17572	8786	5857	4393	2929	2197	
					(460-690)	Fz	0.00075	0.0020	0.0037	0.0050	0.0060	0.0070	
						Feed (ipm)	26.4	35.1	43.3	43.9	35.1	30.8	
						2	1	≤ 1	52.7	70.3	86.7	87.9	70.3
				4		1	≤ 0.25						

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)

rpm = (Vc x 3.82) / DC

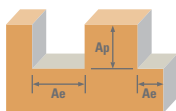
ipm = Fz x number of flutes x rpm

reduce speed and feed for materials harder than listed

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

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)

Single End Roughers (Coarse Pitch)



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

Bhn (Brinell) HRc (Rockwell C)

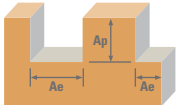
rpm = (Vc x 3.82) / DC

ipm = Fz x number of flutes x rpm

reduce speed and feed for materials harder than listed

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)

Single End Roughers (Fine Pitch)



Series 62 Fractional	Hardness	Ae x DC	Ap x DC	Vc (sfm)		DC • in				
						1/4	3/8	1/2	3/4	1
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 275 Bhn or ≤ 28 HRc	 Profile ≤ 0.5 ≤ 1.5	405 (324-486)	RPM	6188	4126	3094	2063	1547
					Fz	0.0006	0.0011	0.0015	0.0019	0.0021
					Feed (ipm)	11.1	13.6	18.6	15.7	19.5
				325 (260-390)	RPM	4966	3311	2483	1655	1242
					Fz	0.0006	0.0011	0.0015	0.0019	0.0021
					Feed (ipm)	8.9	10.9	14.9	12.6	15.6
	STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L, 17-4PH, 15-5PH, 13-4PH, Custom 450	≤ 275 Bhn or ≤ 28 HRc	 Profile ≤ 0.5 ≤ 1.5	280 (224-336)	RPM	4278	2852	2139	1426	1070
					Fz	0.0005	0.0009	0.0012	0.0015	0.0017
					Feed (ipm)	6.4	7.7	10.3	8.6	10.9
				225 (180-270)	RPM	3438	2292	1719	1146	860
					Fz	0.0005	0.0009	0.0012	0.0015	0.0017
					Feed (ipm)	5.2	6.2	8.3	6.9	8.8
S	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy 800, Monel 400, Rene, Waspalloy	≤ 300 Bhn or ≤ 32 HRc	 Profile ≤ 0.5 ≤ 1.5	70 (56-84)	RPM	1070	713	535	357	267
					Fz	0.0004	0.0008	0.0010	0.0013	0.0014
					Feed (ipm)	1.3	1.7	2.1	1.9	2.2
				56 (45-67)	RPM	856	570	428	285	214
					Fz	0.0004	0.0008	0.0010	0.0013	0.0014
					Feed (ipm)	1.0	1.4	1.7	1.5	1.8
	TITANIUM ALLOYS Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti10V2Fe3Al, Ti5Al3Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti152 Cr3Sn3Al	≤ 350 Bhn or ≤ 38 HRc	 Profile ≤ 0.5 ≤ 1.5	155 (124-186)	RPM	2368	1579	1184	789	592
					Fz	0.0005	0.0009	0.0012	0.0015	0.0017
					Feed (ipm)	3.6	4.3	5.7	4.7	6.0
				195 (156-234)	RPM	2980	1986	1490	993	745
					Fz	0.0005	0.0009	0.0012	0.0015	0.0017
					Feed (ipm)	4.5	5.4	7.2	6.0	7.6

Bhn (Brinell) HRc (Rockwell C)

rpm = (Vc x 3.82) / DC

ipm = Fz x number of flutes x rpm

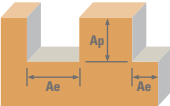
reduce speed and feed for materials harder than listed

refer to the **KYOCERA SGS APEX** for complete technical information (www.kyocera-sgstool.com/apex)

2 Flute: Square, Double, Stub, Long Reach, Ball

3 Flute: Square, Long Reach, Ball

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

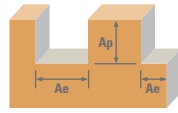
Series 1M, 3M, 5M, 14M, 16M, 17M, 59M Metric							DC • mm												
Hardness	Flutes	Ae x DC	Ap x DC	Vc (m/min)		0.4	0.75	1.5	3	6	10	12	20	25					
P CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc		Profile	2	≤ 0.50	≤ 1.5	(112-168)	140	RPM	111483	59458	29729	14864	7432	4459	3716	2230	1784	
								Fz	0.0008	0.0015	0.0031	0.007	0.019	0.040	0.048	0.064	0.070		
			Feed (mm/min)	178	178	184		208	282	357	357	285	250						
				268	268	276		312	424	535	535	428	375						
			Slot	2	1	≤ 1	(82-123)	102	RPM	81189	43301	21650	10825	5413	3248	2706	1624	1299	
								Fz	0.0008	0.0015	0.0031	0.007	0.019	0.040	0.048	0.064	0.070		
			Feed (mm/min)	130	130	134		152	206	260	260	208	182						
				195	195	201		227	309	390	390	312	273						
	P ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc		Profile	2	≤ 0.50	≤ 1.5	(82-123)	102	RPM	81189	43301	21650	10825	5413	3248	2706	1624	1299
									Fz	0.0005	0.0012	0.0022	0.006	0.014	0.029	0.036	0.048	0.052	
				Feed (mm/min)	81	104	95		130	152	188	195	156	135					
					122	156	143		195	227	283	292	234	203					
			Slot	2	1	≤ 1	(60-90)	75	RPM	59377	31668	15834	7917	3958	2375	1979	1188	950	
								Fz	0.0005	0.0012	0.0022	0.006	0.014	0.029	0.036	0.048	0.052		
			Feed (mm/min)	59	76	70		95	111	138	143	114	99						
				119	152	139		190	222	276	285	228	198						
M TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2		≤ 250 Bhn or ≤ 24 HRc		Profile	2	≤ 0.50	≤ 1.5	(77-115)	96	RPM	76342	40715	20358	10179	5089	3054	2545	1527	1221
									Fz	0.0005	0.0012	0.0022	0.006	0.014	0.029	0.036	0.048	0.052	
				Feed (mm/min)	76	98	90		122	143	177	183	147	127					
					115	147	134		183	214	266	275	220	191					
			Slot	2	1	≤ 1	(56-84)	70	RPM	55741	29729	14864	7432	3716	2230	1858	1115	892	
								Fz	0.0005	0.0012	0.0022	0.006	0.014	0.029	0.036	0.048	0.052		
			Feed (mm/min)	56	71	65		89	104	129	134	107	93						
				84	107	98		134	156	194	201	161	139						
	M STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F 440F	≤ 275 Bhn or ≤ 28 HRc		Profile	2	≤ 0.50	≤ 1.5	(90-135)	113	RPM	89671	47825	23912	11956	5978	3587	2989	1793	1435
									Fz	0.0005	0.0012	0.0022	0.006	0.014	0.029	0.036	0.048	0.052	
				Feed (mm/min)	90	115	105		143	167	208	215	172	149					
					135	172	158		215	251	312	323	258	224					
			Slot	2	1	≤ 1	(66-99)	82	RPM	65436	34899	17449	8725	4362	2617	2181	1309	1047	
								Fz	0.0005	0.0012	0.0022	0.006	0.014	0.029	0.036	0.048	0.052		
			Feed (mm/min)	65	84	77		105	122	152	157	126	109						
				98	126	115		157	183	228	236	188	163						
K CAST IRONS Gray, Malleable, Ductile		≤ 220 Bhn or ≤ 19 HRc		Profile	2	≤ 0.50	≤ 1.5	(62-93)	78	RPM	61800	32960	16480	8240	4120	2472	2060	1236	989
									Fz	0.0005	0.0010	0.0019	0.004	0.012	0.024	0.029	0.037	0.042	
				Feed (mm/min)	62	66	63		66	99	119	119	91	83					
					93	99	94		99	148	178	179	137	125					
			Slot	2	1	≤ 1	(45-68)	56	RPM	44836	23912	11956	5978	2989	1793	1495	897	717	
								Fz	0.0005	0.0010	0.0019	0.004	0.012	0.024	0.029	0.037	0.042		
			Feed (mm/min)	45	48	45		48	72	86	87	66	60						
				67	72	68		72	108	129	130	100	90						

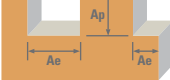
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2 Flute: Square, Double, Stub, Long Reach, Ball

3 Flute: Square, Long Reach, Ball

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



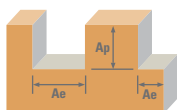
Series 1M, 3M, 5M, 14M, 16M, 17M, 59M Metric								DC • mm										
	Hardness	Flutes	Ae x DC	Ap x DC	Vc (m/min)													
						0.4	0.75	1.5	3	6	10	12	20	25				
N	ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075	 Profile	2	≤ 0.50	≤ 1.5	(215-322)	RPM	213272	113745	56872	28436	14218	8531	7109	4265	3412		
							Fz	0.0015	0.0032	0.0060	0.014	0.038	0.080	0.096	0.128	0.140		
							Feed (mm/min)	640	728	682	796	1081	1365	1365	1092	955		
		≤ 150 Bhn or ≤ 88 HRb	 Slot	3	≤ 0.25	≤ 1.5	(195)	RPM	155107	82724	41362	20681	10340	6204	5170	3102	2482	
								Fz	0.0015	0.0032	0.0060	0.014	0.038	0.080	0.096	0.128	0.140	
								Feed (mm/min)	465	529	496	579	786	993	993	794	695	
	COPPER ALLOYS Alum Bronze, C110, Muntz Brass	≤ 140 Bhn or ≤ 3 HRc	 Profile	2	≤ 0.50	≤ 1.5	(118-177)	RPM	117542	62689	31344	15672	7836	4702	3918	2351	1881	
								Fz	0.0008	0.0015	0.0031	0.007	0.019	0.040	0.048	0.064	0.070	
								Feed (mm/min)	188	188	194	219	298	376	376	301	263	
		Slot	 Slot	3	≤ 0.25	≤ 1.5	RPM	84824	45239	22620	11310	5655	3393	2827	1696	1357		
							Fz	0.0008	0.0015	0.0031	0.007	0.019	0.040	0.048	0.064	0.070		
							Feed (mm/min)	282	282	292	329	447	564	564	451	395		
	PLASTICS Polycarbonate, PVC, Polypropylene	2	1	≤ 1	(156-234)	RPM	155107	82724	41362	20681	10340	6204	5170	3102	2482			
						Fz	0.0015	0.0032	0.0060	0.014	0.038	0.080	0.096	0.128	0.140			
						Feed (mm/min)	465	529	496	579	786	993	993	794	695			
		3	1	≤ 0.5	RPM	698	794	745	869	1179	1489	1489	1191	1042				
					Fz	0.0015	0.0032	0.0060	0.014	0.038	0.080	0.096	0.128	0.140				
					Feed (mm/min)	931	1059	993	1158	1572	1985	1985	1588	1390				
	GRAPHITE	4	1	≤ 0.4	(161-241)	RPM	159954	85309	42654	21327	10664	6398	5332	3199	2559			
						Fz	0.0015	0.0032	0.0060	0.014	0.038	0.080	0.096	0.128	0.140			
						Feed (mm/min)	480	546	512	597	810	1024	1024	819	717			
		2	1	≤ 1	(117-176)	RPM	116330	62043	31021	15511	7755	4653	3878	2327	1861			
						Fz	0.0015	0.0032	0.0060	0.014	0.038	0.080	0.096	0.128	0.140			
						Feed (mm/min)	349	397	372	434	589	745	745	596	521			
S	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, 718, Incoloy 800, Monel 400, Rene, Waspalloy	≤ 300 Bhn or ≤ 32 HRc	 Profile	2	≤ 0.50	≤ 1.5	(16-24)	RPM	15753	8402	4201	2100	1050	630	525	315	252	
								Fz	0.0005	0.0007	0.0014	0.004	0.010	0.021	0.024	0.032	0.035	
								Feed (mm/min)	16	12	12	17	21	26	25	20	18	
		Slot	 Slot	3	≤ 0.25	≤ 1.5	(11-16)	RPM	24	18	18	25	32	40	38	30	26	
								Fz	0.0005	0.0007	0.0014	0.004	0.010	0.021	0.024	0.032	0.035	
								Feed (mm/min)	32	24	24	34	42	53	50	40	35	
	TITANIUM ALLOYS Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti10V2Fe3Al, Ti5Al53Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti152 Cr3Sn3Al	≤ 350 Bhn or ≤ 38 HRc	 Profile	2	≤ 0.50	≤ 1.5	(44-66)	RPM	10906	5816	2908	1454	727	436	364	218	174	
								Fz	0.0005	0.0007	0.0014	0.004	0.010	0.021	0.024	0.032	0.035	
								Feed (mm/min)	11	8	8	12	15	18	17	14	12	
		Slot	 Slot	3	1	≤ 0.5	(32-48)	RPM	16	12	12	17	22	27	26	21	18	
								Fz	0.0005	0.0007	0.0014	0.004	0.010	0.021	0.024	0.029	0.037	0.042
								Feed (mm/min)	22	16	16	23	29	37	35	28	24	
		4	1	≤ 0.4	(44-66)	RPM	43624	23266	11633	5816	2908	1745	1454	872	698			
						Fz	0.0005	0.0010	0.0019	0.004	0.012	0.024	0.029	0.037	0.042			
						Feed (mm/min)	44	47	44	47	70	84	84	65	59			
		2	1	≤ 1	(32-48)	RPM	65	70	66	70	105	126	127	97	88			
						Fz	0.0005	0.0010	0.0019	0.004	0.012	0.024	0.029	0.037	0.042			
						Feed (mm/min)	87	93	88	93	140	168	169	129	117			
		3	1	≤ 0.5	(32-48)	RPM	31506	16803	8402	4201	2100	1260	1050	630	504			
						Fz	0.0005	0.0010	0.0019	0.004	0.012	0.024	0.029	0.037	0.042			
						Feed (mm/min)	32	34	32	34	50	60	61	47	42			
		4	1	≤ 0.4	(32-48)	RPM	47	50	48	50	76	91	91	70	64			
						Fz	0.0005	0.0010	0.0019	0.004	0.012	0.024	0.029	0.037	0.042			
						Feed (mm/min)	63	67	64	67	101	121	122	93	85			

Bhn (Brinell) HRc (Rockwell C)
 rpm = (Vc x 1000) / (DC x 3.14)
 mm/min = Fz x number of flutes x rpm
 reduce speed and feed for materials harder than listed

limit cut depths of long and extra long flute mills to .05 x DC when slotting or profiling
 reduce feed and Ae when finish milling (.02 x DC maximum)
 refer to the KYOCERA SGS APEX for complete technical information
www.kyocera-sgstool.com/apex

2 Flute: High Shear

4 Flute: High Shear

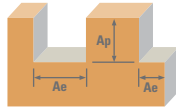


Series 52M, 54M Metric							DC • mm								
Hardness		Flutes	Ae x DC	Ap x DC	Vc (m/min)		3	6	10	12	20	25			
ALUMINUM ALLOYS 2024, 5052, 5086, 6061, 6063, 7075	≤ 150 Bhn or ≤ 88 HRb		Profile		415	RPM	43947	21973	13184	10987	6592	5274			
					(332-497)	Fz	0.0166	0.043	0.091	0.110	0.147	0.160			
						Feed (mm/min)	1459	1890	2399	2417	1938	1688			
			2	≤ 0.3	≤ 1.5		2918	3779	4799	4834	3876	3375			
				(266-399)	Fz	0.0151	0.041	0.085	0.101	0.133	0.148				
					Feed (mm/min)	1064	1444	1796	1779	1405	1251				
		2	1			≤ 1	2127	2888	3593	3557	2811	2502			
		4	1		≤ 0.25										
		ALUMINUM DIE CAST ALLOYS (HIGH SILICON) A-390, A-392, B-390	≤ 125 Bhn or ≤ 77 HRb		Profile		155	RPM	16480	8240	4944	4120	2472	1978	
							(124-187)	Fz	0.0166	0.043	0.091	0.110	0.147	0.160	
								Feed (mm/min)	547	709	900	906	727	633	
					2	≤ 0.3	≤ 1.5		1094	1417	1800	1813	1454	1266	
				(100-150)	Fz	0.0151	0.041	0.085	0.101	0.133	0.148				
					Feed (mm/min)	400	543	676	669	529	471				
	2					1	≤ 1	800	1086	1351	1338	1057	941		
	4				1	≤ 0.25									
	COPPER ALLOYS Aluminum Bronze, Muntz Brass, Naval, Brass, Red Brass			≤ 140 Bhn or ≤ 3 HRc		Profile		180	RPM	19065	9533	5720	4766	2860	2288
								(144-216)	Fz	0.0094	0.024	0.053	0.062	0.083	0.093
									Feed (mm/min)	358	458	606	591	475	426
						2	≤ 0.3	≤ 1.5		717	915	1213	1182	949	851
					(116-174)	Fz	0.0086	0.024	0.048	0.058	0.077	0.085			
						Feed (mm/min)	264	368	442	445	355	313			
		2	1				≤ 1	528	737	884	890	709	626		
		4	1			≤ 0.25									
COPPER ALLOYS Beryllium Copper, C110, Manganese Bronze, Tin Bronze		≤ 200 Bhn or ≤ 23 HRc			Profile		72	RPM	7594	3797	2278	1898	1139	911	
							(57-86)	Fz	0.0094	0.024	0.053	0.062	0.083	0.093	
								Feed (mm/min)	143	182	241	235	189	169	
					2	≤ 0.3	≤ 1.5		286	365	483	471	378	339	
			(46-69)	Fz	0.0086	0.024	0.048	0.058	0.077	0.085					
				Feed (mm/min)	106	147	177	178	142	125					
	2				1	≤ 1	211	295	354	356	284	250			
	4			1	≤ 0.25										

continued on next page

2 Flute: High Shear

4 Flute: High Shear



Series 52M, 54M Metric	Hardness	Flutes			Vc (m/min)	DC • mm							
			Ae x DC	Ap x DC		3	6	10	12	20	25		
N	PLASTICS ABS, Polycarbonate, PVC, Polypropylene				488	RPM	51702	25851	15511	12926	7755	6204	
					(390-585)	Fz	0.0264	0.072	0.149	0.178	0.237	0.250	
			2	≤ 0.3		≤ 1.5	Feed (mm/min)	2730	3723	4622	4601	3676	3102
			4	≤ 0.3		≤ 1.5		5460	7445	9244	9203	7352	6204
					390	RPM	41362	20681	12409	10340	6204	4963	
					(312-468)	Fz	0.0240	0.065	0.136	0.163	0.210	0.238	
			2	1		≤ 1	Feed (mm/min)	1985	2689	3375	3371	2606	2363
			4	1		≤ 0.25		3971	5377	6750	6742	5212	4725
	PLASTICS Fiberglass, Glass Filled				219	RPM	23266	11633	6980	5816	3490	2792	
					(176-263)	Fz	0.0197	0.053	0.109	0.132	0.173	0.190	
			2	≤ 0.3		≤ 1.5	Feed (mm/min)	917	1233	1522	1536	1208	1061
			4	≤ 0.3		≤ 1.5		1833	2466	3043	3071	2415	2122
					175	RPM	18580	9290	5574	4645	2787	2230	
					(140-210)	Fz	0.0180	0.048	0.101	0.120	0.160	0.175	
			2	1		≤ 1	Feed (mm/min)	669	892	1126	1115	892	780
			4	1		≤ 0.25		1338	1784	2252	2230	1784	1561

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)

rpm = (Vc x 1000) / (DC x 3.14)

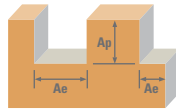
mm/min = Fz x number of flutes x rpm

reduce speed and feed for materials harder than listed

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

refer to the **KYOCERA SGS APEX** for complete technical information (www.kyocera-sgstool.com/apex)

Single End Roughers (Coarse Pitch)



Series 61M	Metric	Hardness			Vc (m/min)	DC • mm						
			Ae x DC	Ap x DC		6	10	12	20	25		
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc		≤ 0.5	≤ 1.5	152	RPM	8078	4847	4039	2424	1939
						(122-183)	Fz	0.014	0.029	0.034	0.045	0.050
						Feed (mm/min)	339	422	549	436	485	
				1	≤ 1	122	RPM	6463	3878	3231	1939	1551
						(98-146)	Fz	0.014	0.029	0.034	0.045	0.050
						Feed (mm/min)	271	337	439	349	388	
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc		≤ 0.5	≤ 1.5	111	RPM	5897	3538	2949	1769	1415
						(89-134)	Fz	0.010	0.021	0.026	0.035	0.038
						Feed (mm/min)	177	223	307	248	269	
				1	≤ 1	90	RPM	4766	2860	2383	1430	1144
						(72-108)	Fz	0.010	0.021	0.026	0.035	0.038
						Feed (mm/min)	143	180	248	200	217	
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250 Bhn or ≤ 24 HRc		≤ 0.5	≤ 1.5	105	RPM	5574	3344	2787	1672	1338
						(84-126)	Fz	0.014	0.024	0.036	0.048	0.053
						Feed (mm/min)	234	241	401	321	355	
				1	≤ 1	84	RPM	4443	2666	2222	1333	1066
						(67-101)	Fz	0.014	0.024	0.036	0.048	0.053
						Feed (mm/min)	187	192	320	256	283	
K	CAST IRONS Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc		≤ 0.5	≤ 1.5	111	RPM	5897	3538	2949	1769	1415
						(89-134)	Fz	0.019	0.040	0.048	0.064	0.070
						Feed (mm/min)	336	425	566	453	495	
				1	≤ 1	90	RPM	4766	2860	2383	1430	1144
						(72-108)	Fz	0.019	0.040	0.048	0.064	0.070
						Feed (mm/min)	272	343	458	366	400	

Bhn (Brinell) HRc (Rockwell C)

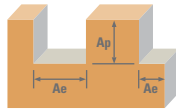
rpm = (Vc x 1000) / (DC x 3.14)

mm/min = Fz x number of flutes x rpm

reduce speed and feed for materials harder than listed

refer to the **KYOCERA SGS APEX** for complete technical information (www.kyocera-sgstool.com/apex)

Single End Roughers (Fine Pitch)



Series 62M	Metric	Hardness			Vc (m/min)	DC • mm						
			Ae x DC	Ap x DC		6	10	12	20	25		
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 275 Bhn or ≤ 28 HRC		≤ 0.5	≤ 1.5	123	RPM	6544	3926	3272	1963	1570
						(99-148)	Fz	0.014	0.029	0.036	0.051	0.053
							Feed (mm/min)	283	345	471	398	495
				1	≤ 1	99	RPM	5251	3151	2626	1575	1260
						(79-119)	Fz	0.014	0.029	0.036	0.051	0.053
							Feed (mm/min)	227	277	378	319	397
	STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L, 17-4PH, 15-5PH, 13-4PH, Custom 450	≤ 275 Bhn or ≤ 28 HRC		≤ 0.5	≤ 1.5	85	RPM	4524	2714	2262	1357	1086
						(68-102)	Fz	0.012	0.024	0.029	0.040	0.043
							Feed (mm/min)	163	195	261	217	277
				1	≤ 1	69	RPM	3635	2181	1818	1091	872
						(55-82)	Fz	0.012	0.024	0.029	0.040	0.043
							Feed (mm/min)	131	157	209	174	222
S	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy 800, Monel 400, Rene, Waspalloy	≤ 300 Bhn or ≤ 32 HRC		≤ 0.5	≤ 1.5	21	RPM	1131	679	565	339	271
						(17-26)	Fz	0.010	0.021	0.024	0.035	0.035
							Feed (mm/min)	33	43	54	47	57
				1	≤ 1	17	RPM	905	543	452	271	217
						(14-20)	Fz	0.010	0.021	0.024	0.035	0.035
							Feed (mm/min)	26	35	43	38	46
	TITANIUM ALLOYS Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti10V2Fe3Al, Ti5Al53Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti152 Cr3Sn3Al	≤ 350 Bhn or ≤ 38 HRC		≤ 0.5	≤ 1.5	47	RPM	2504	1503	1252	751	601
						(38-57)	Fz	0.012	0.024	0.029	0.040	0.043
							Feed (mm/min)	90	108	144	120	153
				1	≤ 1	59	RPM	3151	1890	1575	945	756
						(48-71)	Fz	0.012	0.024	0.029	0.040	0.043
							Feed (mm/min)	113	136	181	151	193

Bhn (Brinell) HRc (Rockwell C)

rpm = (Vc x 1000) / (DC x 3.14)

mm/min = Fz x number of flutes x rpm

reduce speed and feed for materials harder than listed

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)

General Application Drills



Hole Making

GENERAL APPLICATION DRILLS	SERIES	DESCRIPTION	PAGE	S&F PAGE
2 Flute	101	2 Flute Slow Spiral	340	348
Short Length Self Centering (DIN6539)	108M Plus	2 Flute Short Length DIN 6539	345	350
Straight Flute	106	Straight Flute 140 Point Geometry	352	355
3 Flute with 150 Point Geometry	103	3 Flute 150 Point Geometry	356	360
GENERAL APPLICATION COUNTERSINKS	SERIES	DESCRIPTION	PAGE	S&F PAGE
Combined Drill & Countersink	301	2 Flute Straight Flute Combined Drill and Countersink Fractional	362	364
	301M	2 Flute Straight Flute Combined Drill and Countersink Metric	363	366
Single Flute Countersink	601	Single Flute Fractional	368	369
3 Flute Countersink	603	3 Flute Fractional	371	372
6 Flute Countersink	606	6 Flute Fractional	374	375
GENERAL APPLICATION REAMERS	SERIES	DESCRIPTION	PAGE	S&F PAGE
Straight Flute Accu-Reamer	200	Accu-Reamer	378	380
Straight Flute Reamer	201M	Metric Reamer	382	383

Speed & Feed Recommendations listed after each series

Taladrado

BROCAS DE USO GENERAL	SERIE	DESCRIPCIÓN	PÁGINA	S&F PÁGINA
2 filos	101	2 filos, espiral de avance lento	340	348
Autocentrante de longitud corta (DIN6539)	108M Plus	2 filos, longitud corta, DIN 6539	345	350
Filo recto	106	Filo recto, geometría de 140 puntos	352	355
3 filos con geometría de 150 puntos	103	3 filos, geometría de 150 puntos	356	360

BROCAS DE USO AVELLANADORES	SERIE	DESCRIPCIÓN	PÁGINA	S&F PÁGINA
Broca y avellanador combinados	301	2 filos, filo recto, broca y avellanador combinados, fraccional	362	364
	301M	2 filos, filo recto, broca y avellanador combinados, métrico	363	366
Avellanador de filo único	601	Filo único, fraccional	368	369
Avellanador de 3 filos	603	3 filos, fraccional	371	372
Avellanador de 6 filos	606	6 filos, fraccional	374	375

BROCAS DE USO ESCARIADORES	SERIE	DESCRIPCIÓN	PÁGINA	S&F PÁGINA
Escariador Accu de filo recto	200	Escariador Accu	378	380
Escariador de filo recto	201M	Escariador métrico	382	383

Recomendaciones de velocidades y avances mostradas tras cada serie

Outils de perçage

FORETS UNIVERSELS	SÉRIES	DESCRIPTION	PAGE	S&F PAGE
2 dents	101	2 dents à spirale lente	340	348
Court autocentrant (DIN 6539)	108M Plus	2 dents court DIN 6539	345	350
Denture droite	106	Denture droite à angle de pointe 140°	352	355
3 dents à angle de pointe 150°	103	3 dents à angle de pointe 150°	356	360

FORETS À FRAISER	SÉRIES	DESCRIPTION	PAGE	S&F PAGE
Foret et foret à fraiser combinés	301	2 dents denture droite foret et foret à fraiser combinés (fractionnel)	362	364
	301M	2 dents denture droite foret et foret à fraiser combinés (métrique)	363	366
Foret à fraiser à dent simple	601	Foret à dent simple (fractionnel)	368	369
Foret à fraiser 3 dents	603	3 dents (fractionnel)	371	372
Foret à fraiser 6 dents	606	6 dents (fractionnel)	374	375

FORETS À ALÉSOIRS	SÉRIES	DESCRIPTION	PAGE	S&F PAGE
Alésoir denture droite Accu-Reamer	200	Alésoir Accu-Reamer	378	380
Alésoir denture droite	201M	Alésoir (métrique)	382	383

Recommandations de vitesse et avance indiquées après chaque série

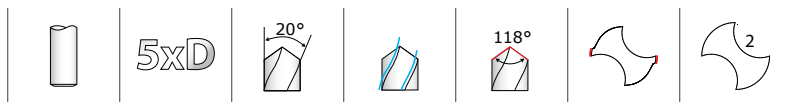
STANDARD-BOHRER	SERIE	BESCHREIBUNG	SEITE	S&F SEITE
2 Schneiden	101	2 Schneiden mit kleinem Spanwinkel	340	348
Kurze Bauform Selbstzentrierung (DIN 6539)	108M Plus	2 Schneiden Kurze Bauform DIN 6539	345	350
Gerade Schneiden	106	Gerade Schneiden Spitzengeometrie 140	352	355
3 Schneiden mit Spitzengeometrie 150	103	3 Schneiden Spitzengeometrie 150	356	360

STANDARD-BOHRER	SERIE	BESCHREIBUNG	SEITE	S&F SEITE
Senkbohrer	301	Zölliger Senkbohrer mit 2 geraden Schneiden	362	364
	301M	Metrischer Senkbohrer mit 2 geraden Schneiden	363	366
Senker mit 1 Schneide	601	Zölliger Bohrer mit 1 Schneide	368	369
Senkbohrer mit 1 Schneide	603	Zölliger Bohrer mit 3 Schneiden	371	372
Senkbohrer mit 6 Schneiden	606	Zölliger Bohrer mit 6 Schneiden	374	375

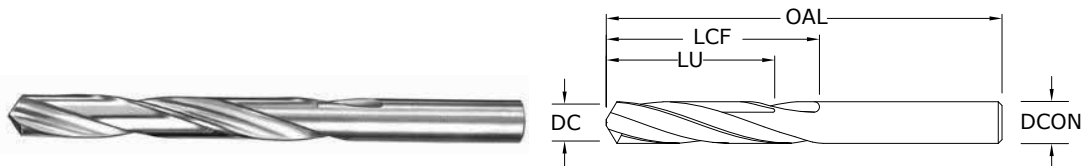
STANDARD-BOHRER	SERIE	BESCHREIBUNG	SEITE	S&F SEITE
Reibahlen mit gerader Schneide	200	Accu-Reamer	378	380
Reibahle mit gerader Schneide	201M	Metrische Reibahle	382	383

Empfehlungen für Drehzahl & Vorschub im Anhang zu jeder Serie

2 Flute Drills • Metric: DIN 338



Pictured:
Series 101 Drill Set



101

FRACTIONAL & METRIC SERIES



inch & mm						EDP NO.	
DECIMAL DC/DCON	METRIC DC/DCON	FRACTIONAL/ LETTER/WIRE DC	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	UNCOATED	Ti-NAMITE-A (AITiN)
0.0135	0,340 mm	#80	3/4	3/16	—	51080	57076
0.0145	0,370 mm	#79	3/4	3/16	—	51079	57077
0.0156	0,400 mm	1/64	3/4	3/16	—	51101	57078
0.0160	0,410 mm	#78	3/4	3/16	—	51078	57079
0.0180	0,460 mm	#77	3/4	3/16	—	51077	57080
0.0200	0,510 mm	#76	7/8	1/4	—	51076	57081
0.0210	0,530 mm	#75	7/8	1/4	—	51075	57082
0.0225	0,570 mm	#74	7/8	1/4	—	51074	57083
0.0240	0,610 mm	#73	7/8	1/4	—	51073	57084
0.0250	0,640 mm	#72	1	5/16	—	51072	57085
0.0260	0,660 mm	#71	1	5/16	—	51071	57086
0.0276	0,700 mm		28,0	9,0	—	61001	68268
0.0280	0,710 mm	#70	1-1/4	1/2	—	51070	57087
0.0292	0,740 mm	#69	1-1/4	1/2	—	51069	57088
0.0310	0,790 mm	#68	1-1/4	1/2	—	51068	57089
0.0312	0,790 mm	1/32	1-1/4	1/2	—	51102	57090
0.0315	0,800 mm		30,0	10,0	—	61003	68269
0.0320	0,810 mm	#67	1-1/4	1/2	—	51067	57091
0.0330	0,840 mm	#66	1-1/4	1/2	—	51066	57092
0.0350	0,890 mm	#65	1-3/8	5/8	1/2	51065	57093
0.0354	0,900 mm		32,0	11,0	8,0	61005	68270
0.0360	0,910 mm	#64	1-3/8	5/8	1/2	51064	57094
0.0370	0,940 mm	#63	1-3/8	5/8	1/2	51063	57095
0.0380	0,970 mm	#62	1-3/8	5/8	1/2	51062	57096
0.0390	0,990 mm	#61	1-3/8	5/8	1/2	51061	57097
0.0394	1,000 mm		34,0	12,0	9,0	61007	68271
0.0400	1,020 mm	#60	1-1/2	3/4	39/64	51060	57098
0.0410	1,040 mm	#59	1-1/2	3/4	39/64	51059	57099
0.0420	1,070 mm	#58	1-1/2	3/4	39/64	51058	57100
0.0430	1,090 mm	#57	1-1/2	3/4	39/64	51057	57101
0.0433	1,000 mm		36,0	14,0	11,0	61052	68294
0.0465	1,180 mm	#56	1-1/2	3/4	39/64	51056	57102
0.0469	1,190 mm	3/64	1-1/2	3/4	39/64	51103	57103
0.0472	1,200 mm		38,0	16,0	12,0	61053	68295
0.0512	1,300 mm		38,0	16,0	12,0	61054	68296
0.0520	1,320 mm	#55	1-1/2	3/4	39/64	51055	57104
0.0550	1,400 mm	#54	1-1/2	3/4	39/64	51054	57105
0.0551	1,400 mm		40,0	18,0	14,0	61055	68297
0.0591	1,500 mm		40,0	18,0	14,0	61009	68272
0.0595	1,510 mm	#53	1-1/2	3/4	39/64	51053	57106
0.0625	1,590 mm	*1/16	1-1/2	3/4	39/64	51104	57107
0.0630	1,600 mm		43,0	20,0	16,0	61056	68298
0.0635	1,610 mm	#52	1-1/2	3/4	39/64	51052	57108
0.0669	1,700 mm		43,0	20,0	17,0	61057	68299

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TOLERANCES (inch)

DC = +0.0000/-0.0005

TOLERANCES (mm)

DC = +0.0000/-0.0127

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

2 Flute Drills • Metric: DIN 338

101

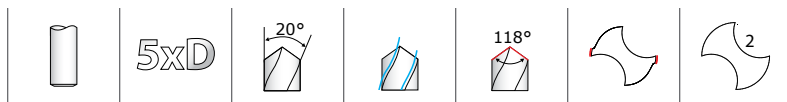
FRACTIONAL & METRIC SERIES

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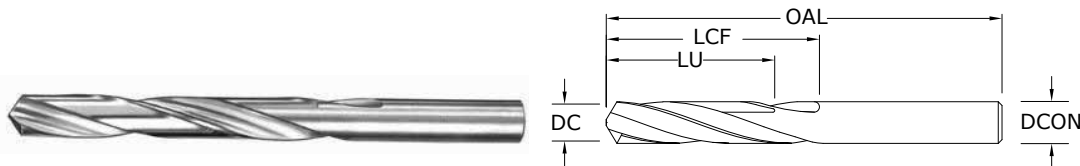
DECIMAL DC/DCON	METRIC DC/DCON	inch & mm		FLUTE LENGTH LCF	USABLE LENGTH LU	EDP NO.	
		FRACTIONAL/ LETTER/WIRE DC	OVERALL LENGTH OAL			UNCOATED	TI-NAMITE-A (AITiN)
0.0670	1,700 mm	#51	1-1/2	3/4	39/64	51051	57109
0.0700	1,780 mm	#50	1-3/4	7/8	45/64	51050	57110
0.0709	1,800 mm		46,0	22,0	17,0	61058	68300
0.0730	1,850 mm	#49	1-3/4	7/8	45/64	51049	57111
0.0748	1,900 mm		46,0	22,0	17,0	61059	68301
0.0760	1,930 mm	#48	1-3/4	7/8	45/64	51048	57112
0.0781	1,980 mm	5/64	1-3/4	7/8	45/64	51105	57113
0.0785	1,990 mm	#47	1-3/4	7/8	45/64	51047	57114
0.0787	2,000 mm		49,0	24,0	19,0	61011	68273
0.0810	2,060 mm	#46	1-3/4	7/8	45/64	51046	57115
0.0820	2,080 mm	#45	1-3/4	7/8	45/64	51045	57116
0.0827	2,100 mm		49,0	24,0	19,0	61060	68302
0.0860	2,180 mm	#44	2	1	51/64	51044	57117
0.0866	2,200 mm		53,0	27,0	21,0	61061	68303
0.0890	2,260 mm	#43	2	1	51/64	51043	57118
0.0906	2,300 mm		53,0	27,0	21,0	61062	68304
0.0935	2,370 mm	#42	2	1	51/64	51042	57119
0.0938	2,380 mm	3/32	2	1	51/64	51106	57120
0.0945	2,400 mm		57,0	30,0	24,0	61063	68305
0.0960	2,440 mm	#41	2	1	51/64	51041	57121
0.0980	2,490 mm	#40	2	1	51/64	51040	57122
0.0984	2,500 mm		57,0	30,0	24,0	61013	68274
0.0995	2,530 mm	#39	2-1/4	1-1/4	1	51039	57123
0.1015	2,580 mm	#38	2-1/4	1-1/4	1	51038	57124
0.1024	2,600 mm		57,0	30,0	24,0	61064	68306
0.1040	2,640 mm	#37	2-1/4	1-1/4	1	51037	57125
0.1063	2,700 mm		61,0	33,0	26,0	61065	68307
0.1065	2,710 mm	#36	2-1/4	1-1/4	1	51036	57126
0.1094	2,780 mm	7/64	2-1/4	1-1/4	1	51107	57127
0.1100	2,790 mm	#35	2-1/4	1-1/4	1	51035	57128
0.1102	2,800 mm		61,0	33,0	26,0	61066	68308
0.1110	2,820 mm	#34	2-1/4	1-1/4	1	51034	57129
0.1130	2,870 mm	#33	2-1/4	1-1/4	1	51033	57130
0.1142	2,900 mm		61,0	33,0	26,0	61067	68309
0.1160	2,950 mm	#32	2-1/4	1-1/4	1	51032	57131
0.1181	3,000 mm		61,0	33,0	26,0	61015	68275
0.1200	3,050 mm	#31	2-1/4	1-1/4	1	51031	57132
0.1220	3,100 mm		65,0	36,0	28,0	61068	68310
0.1250	3,180 mm	*1/8	2-1/4	1-1/4	1	51108	57133
0.1260	3,200 mm		65,0	36,0	28,0	61069	68311
0.1285	3,260 mm	#30	2-1/4	1-1/4	1	51030	57134
0.1299	3,300 mm		65,0	36,0	28,0	61070	68312
0.1339	3,400 mm		70,0	39,0	31,0	61071	68313
0.1360	3,450 mm	#29	2-1/2	1-3/8	1-7/64	51029	57135
0.1378	3,500 mm		70,0	39,0	31,0	61017	68276
0.1405	3,570 mm	#28	2-1/2	1-3/8	1-7/64	51028	57136
0.1406	3,570 mm	9/64	2-1/2	1-3/8	1-7/64	51109	57137
0.1417	3,600 mm		70,0	39,0	31,0	61072	68314
0.1440	3,660 mm	#27	2-1/2	1-3/8	1-7/64	51027	57138
0.1457	3,700 mm		70,0	39,0	31,0	61073	68315
0.1470	3,730 mm	#26	2-1/2	1-3/8	1-7/64	51026	57139
0.1495	3,800 mm	#25	2-1/2	1-3/8	1-7/64	51025	57140
0.1496	3,800 mm		75,0	43,0	34,0	61074	68316
0.1520	3,860 mm	#24	2-1/2	1-3/8	1-7/64	51024	57141

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2 Flute Drills • Metric: DIN 338



Pictured:
Series 101 Drill Set



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FRACTIONAL & METRIC SERIES



CONTINUED

DECIMAL DC/DCON	METRIC DC/DCON	inch & mm		FLUTE LENGTH LCF	USABLE LENGTH LU	EDP NO.	
		FRACTIONAL/ LETTER/WIRE DC	OVERALL LENGTH OAL			UNCOATED	Ti-NAMITE-A (AITiN)
0.1535	3,900 mm		75,0	43,0	34,0	61075	68317
0.1540	3,910 mm	#23	2-1/2	1-3/8	1-7/64	51023	57142
0.1562	3,970 mm	5/32	2-1/2	1-3/8	1-7/64	51110	57143
0.1570	3,990 mm	#22	2-1/2	1-3/8	1-7/64	51022	57144
0.1575	4,000 mm		75,0	43,0	34,0	61019	68277
0.1590	4,040 mm	#21	2-1/2	1-3/8	1-7/64	51021	57145
0.1610	4,090 mm	#20	2-1/2	1-3/8	1-7/64	51020	57146
0.1614	4,100 mm		75,0	43,0	34,0	61076	68318
0.1654	4,200 mm		75,0	43,0	34,0	61077	68319
0.1660	4,220 mm	#19	2-3/4	1-5/8	1-19/64	51019	57147
0.1693	4,300 mm		80,0	47,0	37,0	61078	68320
0.1695	4,310 mm	#18	2-3/4	1-5/8	1-19/64	51018	57148
0.1719	4,370 mm	11/64	2-3/4	1-5/8	1-19/64	51111	57149
0.1730	4,390 mm	#17	2-3/4	1-5/8	1-19/64	51017	57150
0.1732	4,400 mm		80,0	47,0	37,0	61079	68321
0.1770	4,500 mm	#16	2-3/4	1-5/8	1-19/64	51016	57151
0.1772	4,500 mm		80,0	47,0	37,0	61021	68278
0.1800	4,570 mm	#15	2-3/4	1-5/8	1-19/64	51015	57152
0.1811	4,600 mm		80,0	47,0	37,0	61080	68322
0.1820	4,620 mm	#14	2-3/4	1-5/8	1-19/64	51014	57153
0.1850	4,700 mm		80,0	47,0	37,0	61081	68323
0.1850	4,700 mm	#13	2-3/4	1-5/8	1-19/64	51013	57154
0.1875	4,760 mm	*3/16	2-3/4	1-5/8	1-19/64	51112	57155
0.1890	4,800 mm		86,0	52,0	41,0	61082	68324
0.1890	4,800 mm	#12	2-3/4	1-5/8	1-19/64	51012	57156
0.1910	4,850 mm	#11	2-3/4	1-5/8	1-19/64	51011	57157
0.1929	4,900 mm		86,0	52,0	41,0	61083	68325
0.1935	4,910 mm	#10	2-3/4	1-5/8	1-19/64	51010	57158
0.1960	4,980 mm	#9	3	1-3/4	1-13/32	51009	57159
0.1969	5,000 mm		86,0	52,0	41,0	61023	68279
0.1990	5,050 mm	#8	3	1-3/4	1-13/32	51008	57160
0.2008	5,010 mm		86,0	52,0	41,0	61084	68326
0.2010	5,110 mm	#7	3	1-3/4	1-13/32	51007	57161
0.2031	5,160 mm	13/64	3	1-3/4	1-13/32	51113	57162
0.2040	5,180 mm	#6	3	1-3/4	1-13/32	51006	57163
0.2047	5,200 mm		86,0	52,0	41,0	61085	68327
0.2055	5,220 mm	#5	3	1-3/4	1-13/32	51005	57164
0.2087	5,300 mm		86,0	52,0	41,0	61086	68328
0.2090	5,310 mm	#4	3	1-3/4	1-13/32	51004	57165
0.2126	5,400 mm		93,0	57,0	45,0	61087	68329
0.2130	5,410 mm	#3	3	1-3/4	1-13/32	51003	57166
0.2165	5,500 mm		93,0	57,0	1-13/32	61025	68280
0.2188	5,560 mm	7/32	3	1-3/4	1-13/32	51114	57167
0.2205	5,600 mm		93,0	57,0	45,0	61088	68330

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TOLERANCES (inch)

DC = +0.0000/-0.0005

TOLERANCES (mm)

DC = +0.0000/-0.0127

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

2 Flute Drills • Metric: DIN 338

101

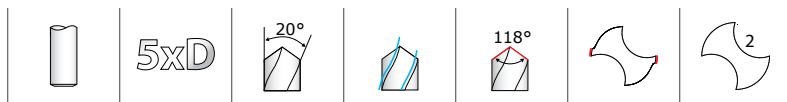
FRACTIONAL & METRIC SERIES

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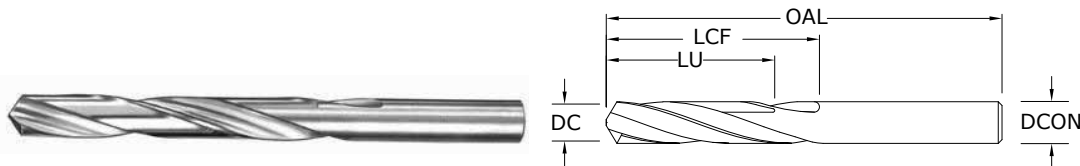
DECIMAL DC/DCON	METRIC DC/DCON	inch & mm		FLUTE LENGTH LCF	USABLE LENGTH LU	EDP NO.	
		FRACTIONAL/ LETTER/WIRE DC	OVERALL LENGTH OAL			UNCOATED	Ti-NAMITE-A (AITiN)
0.2210	5,610 mm	#2	3	1-3/4	1-13/32	51002	57168
0.2244	5,700 mm		93,0	57,0	45,0	61089	68331
0.2280	5,790 mm	#1	3	1-3/4	1-13/32	51001	57169
0.2283	5,800 mm		93,0	57,0	45,0	61090	68332
0.2323	5,900 mm		93,0	57,0	45,0	61091	68333
0.2340	5,940 mm	A	3-1/4	2	1-39/64	51201	57170
0.2344	5,950 mm	15/64	3-1/4	2	1-39/64	51115	57171
0.2362	6,000 mm		93,0	57,0	45,0	61027	68281
0.2380	6,050 mm	B	3-1/4	2	1-39/64	51202	57172
0.2402	6,100 mm		101,0	63,0	50,0	61092	68334
0.2420	6,150 mm	C	3-1/4	2	1-39/64	51203	57173
0.2441	6,200 mm		101,0	63,0	50,0	61093	68335
0.2460	6,250 mm	D	3-1/4	2	1-39/64	51204	57174
0.2480	6,300 mm		101,0	63,0	50,0	61094	68336
0.2500	6,350 mm	*1/4	3-1/4	2	1-39/64	51116	57176
0.2520	6,400 mm		101,0	63,0	50,0	61095	68337
0.2559	6,500 mm		101,0	63,0	50,0	61029	68282
0.2570	6,530 mm	F	3-1/4	2	1-39/64	51206	57177
0.2598	6,600 mm		101,0	63,0	50,0	61096	68338
0.2610	6,630 mm	G	3-1/2	2-1/8	1-45/64	51207	57178
0.2638	6,700 mm		101,0	63,0	50,0	61097	68339
0.2656	6,750 mm	17/64	3-1/2	2-1/8	1-45/64	51117	57179
0.2660	6,760 mm	H	3-1/2	2-1/8	1-45/64	51208	57180
0.2677	6,800 mm		109,0	69,0	55,0	61098	68340
0.2717	6,900 mm		109,0	69,0	55,0	61099	68341
0.2720	6,910 mm	I	3-1/2	2-1/8	1-45/64	51209	57181
0.2756	7,000 mm		109,0	69,0	55,0	61031	68283
0.2770	7,040 mm	J	3-1/2	2-1/8	1-45/64	51210	57182
0.2795	7,100 mm		109,0	69,0	55,0	61100	68342
0.2810	7,140 mm	K	3-1/2	2-1/8	1-45/64	51211	57183
0.2812	7,140 mm	9/32	3-1/2	2-1/8	1-45/64	51118	57184
0.2835	7,200 mm		109,0	69,0	55,0	61101	68343
0.2874	7,300 mm		109,0	69,0	55,0	61102	68344
0.2900	7,370 mm	L	3-1/2	2-1/8	1-45/64	51212	57185
0.2913	7,400 mm		109,0	69,0	55,0	61103	68345
0.2950	7,490 mm	M	3-3/4	2-3/8	1-29/32	51213	57186
0.2953	7,500 mm		109,0	69,0	55,0	61033	68284
0.2969	7,540 mm	19/64	3-3/4	2-3/8	1-29/32	51119	57187
0.2992	7,600 mm		117,0	75,0	60,0	61104	68346
0.3020	7,670 mm	N	3-3/4	2-3/8	1-29/32	51214	57188
0.3031	7,700 mm		117,0	75,0	60,0	61105	68347
0.3071	7,800 mm		117,0	75,0	60,0	61106	68348
0.3110	7,900 mm		117,0	75,0	60,0	61107	68349
0.3125	7,940 mm	*5/16	3-3/4	2-3/8	1-29/32	51120	57189
0.3150	8,000 mm		117,0	75,0	60,0	61035	68285
0.3160	8,030 mm	O	3-3/4	2-3/8	1-29/32	51215	57190
0.3189	8,100 mm		117,0	75,0	60,0	61108	68350
0.3228	8,200 mm		117,0	75,0	60,0	61109	68351
0.3230	8,200 mm	P	3-3/4	2-3/8	1-29/32	51216	57191
0.3268	8,300 mm		117,0	75,0	60,0	61110	68352
0.3281	8,330 mm	21/64	4	2-1/2	2	51121	57192
0.3307	8,400 mm		117,0	75,0	60,0	61111	68353
0.3320	8,430 mm	Q	4	2-1/2	2	51217	57193
0.3346	8,500 mm		117,0	75,0	60,0	61037	68286

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2 Flute Drills • Metric: DIN 338



Pictured:
Series 101 Drill Set



101

FRACTIONAL & METRIC SERIES

CONTINUED

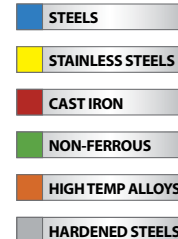
inch & mm						EDP NO.	
DECIMAL DC/DCON	METRIC DC/DCON	FRACTIONAL/ LETTER/WIRE DC	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	UNCOATED	Ti-NAMITE-A (AITiN)
0.3386	8,600 mm		125,0	81,0	64,0	61112	68354
0.3390	8,610 mm	R	4	2-1/2	2	51218	57194
0.3425	8,700 mm		125,0	81,0	64,0	61113	68355
0.3438	8,730 mm	11/32	4	2-1/2	2	51122	57195
0.3465	8,800 mm		125,0	81,0	64,0	61114	68356
0.3480	8,840 mm	S	4	2-1/2	2	51219	57196
0.3504	8,900 mm		125,0	81,0	64,0	61115	68357
0.3543	9,000 mm		125,0	81,0	64,0	61039	68287
0.3580	9,090 mm	T	4-1/4	2-3/4	2-13/64	51220	57197
0.3583	9,100 mm		125,0	81,0	64,0	61116	68358
0.3594	9,130 mm	23/64	4-1/4	2-3/4	2-13/64	51123	57198
0.3622	9,200 mm		125,0	81,0	64,0	61117	68359
0.3661	9,300 mm		125,0	81,0	64,0	61118	68360
0.3680	9,350 mm	U	4-1/4	2-3/4	2-13/64	51221	57199
0.3701	9,400 mm		125,0	81,0	64,0	61119	68361
0.3740	9,500 mm		125,0	81,0	64,0	61041	68288
0.3750	9,530 mm	*3/8	4-1/4	2-3/4	2-13/64	51124	57200
0.3770	9,580 mm	V	4-1/4	2-3/4	2-13/64	51222	57201
0.3780	9,600 mm		133,0	87,0	69,0	61120	68362
0.3819	9,700 mm		133,0	87,0	69,0	61121	68363
0.3858	9,800 mm		133,0	87,0	69,0	61122	68364
0.3860	9,800 mm	W	4-1/2	2-7/8	2-19/64	51223	57202
0.3898	9,900 mm		133,0	87,0	69,0	61123	68365
0.3906	9,920 mm	25/64	4-1/2	2-7/8	2-19/64	51125	57203
0.3937	10,000 mm		133,0	87,0	69,0	61043	68289
0.3970	10,080 mm	X	4-1/2	2-7/8	2-19/64	51224	57204
0.4016	10,010 mm		133,0	87,0	69,0	61124	68366
0.4040	10,260 mm	Y	4-1/2	2-7/8	2-19/64	51225	57205
0.4062	10,320 mm	13/32	4-1/2	2-7/8	2-19/64	51126	57206
0.4130	10,490 mm	Z	4-1/2	2-7/8	2-19/64	51226	57207
0.4134	10,500 mm		133,0	87,0	69,0	61045	68290
0.4219	10,720 mm	27/64	4-1/2	2-7/8	2-19/64	51127	57208
0.4331	11,000 mm		142,0	94,0	75,0	61047	68291
0.4375	11,110 mm	7/16	4-1/2	2-7/8	2-19/64	51128	57209
0.4528	11,500 mm		142,0	94,0	75,0	61049	68292
0.4531	11,510 mm	29/64	4-3/4	3	2-13/32	51129	57210
0.4688	11,910 mm	15/32	4-3/4	3	2-13/32	51130	57211
0.4724	12,000 mm		151,0	101,0	80,0	61051	68293
0.4844	12,300 mm	31/64	4-3/4	3	2-13/32	51131	57212
0.5000	12,700 mm	1/2	4-3/4	3	2-13/32	51132	57213
*Series 101 Set						61175	57351

TOLERANCES (inch)

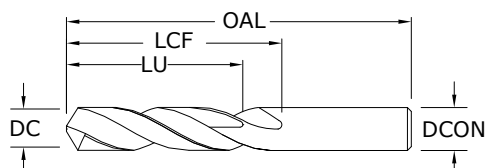
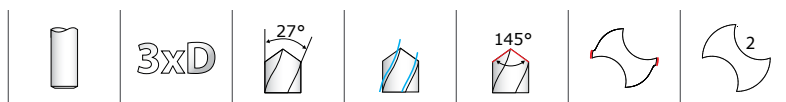
DC = +0.0000/-0.0005

TOLERANCES (mm)

DC = +0.0000/-0.0127



Short Length Self Centering Drills • DIN 6539



108M Plus
METRIC SERIES

TOLERANCES (mm)

≤3 DIAMETER

DC = +0,000/-0,010

DCON = h_6

>3-6 DIAMETER

DC = +0,000/-0,012

DCON = h_6

>6-10 DIAMETER

DC = +0,000/-0,015

DCON = h_6

>10-16 DIAMETER

DC = +0,000/-0,018

DCON = h_6

STEELS

STAINLESS STEELS

CAST IRON

NON-FERROUS

HIGH TEMP ALLOYS

HARDENED STEELS

mm						EDP NO.	
DECIMAL DC/DCON	METRIC DC/DCON	LETTER/WIRE DC	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	UNCOATED	Ti-NAMITE-A (AlTiN)
0.0197	0,500 mm		20,0	3,0	—	62001	68643
0.0217	0,550 mm		21,0	3,5	—	62003	68644
0.0236	0,600 mm		21,0	3,5	—	62005	68645
0.0256	0,650 mm		22,0	4,0	—	62007	68646
0.0276	0,700 mm		23,0	4,5	—	62009	68647
0.0295	0,750 mm		23,0	4,5	—	62011	68648
0.0315	0,800 mm		24,0	5,0	—	62013	68649
0.0335	0,850 mm		24,0	5,0	—	62015	68650
0.0354	0,900 mm		25,0	5,5	4,0	62017	68651
0.0374	0,950 mm		25,0	5,5	4,0	62019	68652
0.0394	1,000 mm		26,0	6,0	4,7	62021	68653
0.0413	1,050 mm		26,0	6,0	4,7	62023	68654
0.0433	1,100 mm		28,0	7,0	5,4	62025	68655
0.0453	1,150 mm		28,0	7,0	5,4	62027	68656
0.0472	1,200 mm		30,0	8,0	6,0	62029	68657
0.0492	1,250 mm		30,0	8,0	6,0	62031	68658
0.0512	1,300 mm		30,0	8,0	6,0	62033	68659
0.0531	1,350 mm		32,0	9,0	7,0	62035	68660
0.0551	1,400 mm		32,0	9,0	7,0	62037	68661
0.0571	1,450 mm		32,0	9,0	7,0	62039	68662
0.0591	1,500 mm		32,0	9,0	7,0	62041	68663
0.0630	1,600 mm		34,0	10,0	7,0	62043	68664
0.0669	1,700 mm		34,0	10,0	7,0	62045	68665
0.0709	1,800 mm		36,0	11,0	8,0	62047	68666
0.0748	1,900 mm		36,0	11,0	8,0	62049	68667
0.0748	2,000 mm		38,0	12,0	9,0	62051	68668
0.0827	2,100 mm		38,0	12,0	9,0	62053	68669
0.0866	2,200 mm		40,0	13,0	10,0	62055	68670
0.0906	2,300 mm		40,0	13,0	10,0	62057	68671
0.0945	2,400 mm		43,0	14,0	11,0	62059	68672
0.0984	2,500 mm		43,0	14,0	11,0	62061	68673
0.1024	2,600 mm		43,0	14,0	11,0	62063	68674
0.1063	2,700 mm		46,0	16,0	12,0	62065	68675
0.1102	2,800 mm		46,0	16,0	12,0	62067	68676

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Short Length Self Centering Drills • DIN 6539

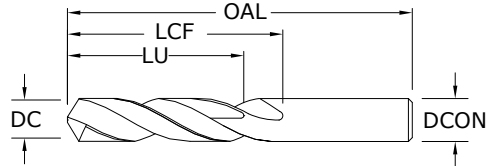


3xD



108M Plus

METRIC SERIES



CONTINUED

mm						EDP NO.	
DECIMAL DC/DCON	METRIC DC/DCON	LETTER/WIRE DC	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	UNCOATED	TI-NAMITE-A (AlTiN)
0.1142	2,900 mm		46,0	16,0	12,0	62069	68677
0.1181	3,000 mm		46,0	16,0	12,0	62071	68678
0.1220	3,100 mm		49,0	18,0	14,0	62073	68679
0.1260	3,200 mm		49,0	18,0	14,0	62075	68680
0.1299	3,300 mm		49,0	18,0	14,0	62077	68681
0.1339	3,400 mm		52,0	20,0	15,0	62079	68682
0.1378	3,500 mm		52,0	20,0	15,0	62081	68683
0.1417	3,600 mm		52,0	20,0	15,0	62083	68684
0.1457	3,700 mm		52,0	20,0	15,0	62085	68685
0.1496	3,800 mm		55,0	22,0	17,0	62087	68686
0.1535	3,900 mm		55,0	22,0	17,0	62089	68687
0.1575	4,000 mm		55,0	22,0	17,0	62091	68688
0.1614	4,100 mm		55,0	22,0	17,0	62093	68689
0.1654	4,200 mm		55,0	22,0	17,0	62095	68690
0.1693	4,300 mm		58,0	24,0	18,0	62097	68691
0.1732	4,400 mm		58,0	24,0	18,0	62099	68692
0.1772	4,500 mm		58,0	24,0	18,0	62101	68693
0.1811	4,600 mm		58,0	24,0	18,0	62103	68694
0.1850	4,700 mm	#13	58,0	24,0	18,0	62105	68695
0.1890	4,800 mm	#12	62,0	26,0	20,0	62107	68696
0.1929	4,900 mm		62,0	26,0	20,0	62109	68697
0.1969	5,000 mm		62,0	26,0	20,0	62111	68698
0.2008	5,100 mm		62,0	26,0	20,0	62113	68699
0.2047	5,200 mm		62,0	26,0	20,0	62115	68700
0.2087	5,300 mm		62,0	26,0	20,0	62117	68701
0.2126	5,400 mm		66,0	28,0	21,0	62119	68702
0.2165	5,500 mm		66,0	28,0	21,0	62121	68703
0.2205	5,600 mm		66,0	28,0	21,0	62123	68704
0.2244	5,700 mm		66,0	28,0	21,0	62125	68705
0.2283	5,800 mm		66,0	28,0	21,0	62127	68706
0.2323	5,900 mm		66,0	28,0	21,0	62129	68707
0.2362	6,000 mm		66,0	28,0	21,0	62131	68708

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TOLERANCES (mm)

≤3 DIAMETER

DC = +0,000/-0,010

DCON = h₆

>3-6 DIAMETER

DC = +0,000/-0,012

DCON = h₆

>6-10 DIAMETER

DC = +0,000/-0,015

DCON = h₆

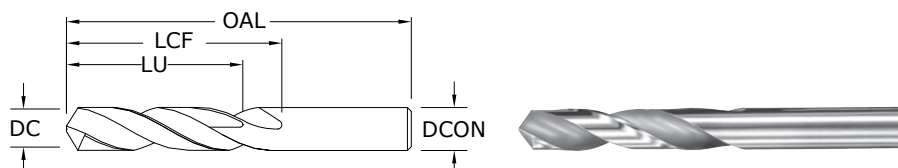
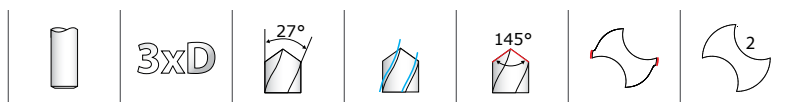
>10-16 DIAMETER

DC = +0,000/-0,018

DCON = h₆

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

Short Length Self Centering Drills • DIN 6539



108M Plus

METRIC SERIES

TOLERANCES (mm)

≤3 DIAMETER

DC = +0,000/-0,010

DCON = h_6

>3-6 DIAMETER

DC = +0,000/-0,012

DCON = h_6

>6-10 DIAMETER

DC = +0,000/-0,015

DCON = h_6

>10-16 DIAMETER

DC = +0,000/-0,018

DCON = h_6

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

mm						EDP NO.	
DECIMAL DC/DCON	METRIC DC/DCON	LETTER/WIRE DC	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	UNCOATED	Ti-NAMITE-A (AlTiN)
0.2402	6,100 mm		70,0	31,0	23,0	62133	68709
0.2441	6,200 mm		70,0	31,0	23,0	62135	68710
0.2480	6,300 mm		70,0	31,0	23,0	62137	68711
0.2520	6,400 mm		70,0	31,0	23,0	62139	68712
0.2559	6,500 mm		70,0	31,0	23,0	62141	68713
0.2598	6,800 mm		70,0	31,0	23,0	62142	68603
0.2756	7,000 mm		74,0	34,0	25,0	62143	68718
0.2953	7,500 mm		74,0	34,0	25,0	62145	68723
0.3071	7,800 mm		79,0	37,0	27,0	62146	68604
0.3150	8,000 mm		79,0	37,0	27,0	62147	68728
0.3346	8,500 mm		79,0	37,0	27,0	62149	68733
0.3543	9,000 mm		84,0	40,0	29,0	62151	68738
0.3740	9,500 mm		84,0	40,0	29,0	62153	68743
0.3858	9,800 mm		89,0	43,0	31,0	62154	68606
0.3937	10,000 mm		89,0	43,0	31,0	62155	68748
0.4016	10,200 mm		89,0	43,0	31,0	62156	68607
0.4134	10,500 mm		89,0	43,0	31,0	62066	68753
0.4331	11,000 mm		95,0	47,0	33,0	62157	68758
0.4528	11,500 mm		95,0	47,0	33,0	62084	68763
0.4646	11,800 mm		102,0	51,0	35,0	62158	68608
0.4724	12,000 mm		102,0	51,0	35,0	62159	68768
0.4921	12,500 mm		102,0	51,0	35,0	62102	68773
0.5118	13,000 mm		102,0	51,0	35,0	62112	68778
0.5433	13,800 mm		107,0	54,0	37,0	62164	68609
0.5512	14,000 mm		107,0	54,0	37,0	62116	68780
0.5709	14,500 mm		111,0	56,0	38,0	62166	68611
0.5827	14,800 mm		111,0	56,0	38,0	62167	68612
0.5906	15,000 mm		111,0	56,0	38,0	62168	68613
0.6221	15,800 mm		115,0	58,0	38,0	62170	68614
0.6299	16,000 mm		115,0	58,0	38,0	62171	68616

CONTINUED

2 Flute Drills

Series 101 Fractional	Hardness	Vc (sfm)		DC • in						
				1/64	1/32	1/16	1/8	1/4	3/8	1/2
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	265 (212-318)	RPM	64787	32394	16197	8098	4049	2699	2025
			Fr	0.00021	0.0004	0.0008	0.0017	0.0033	0.0050	0.0067
			Feed (ipm)	13.5	13.5	13.5	13.5	13.5	13.5	13.5
		125 (100-150)	RPM	30560	15280	7640	3820	1910	1273	955
			Fr	0.00020	0.0004	0.0008	0.0016	0.0031	0.0047	0.0063
			Feed (ipm)	6.0	6.0	6.0	6.0	6.0	6.0	6.0
		85 (68-102)	RPM	20781	10390	5195	2598	1299	866	649
			Fr	0.00011	0.0002	0.0004	0.0008	0.0017	0.0025	0.0034
			Feed (ipm)	2.2	2.2	2.2	2.2	2.2	2.2	2.2
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	230 (184-276)	RPM	56230	28115	14058	7029	3514	2343	1757
			Fr	0.00019	0.0004	0.0007	0.0015	0.0030	0.0045	0.0060
			Feed (ipm)	10.5	10.5	10.5	10.5	10.5	10.5	10.5
		145 (116-174)	RPM	35450	17725	8862	4431	2216	1477	1108
			Fr	0.00019	0.0004	0.0007	0.0015	0.0030	0.0045	0.0060
			Feed (ipm)	6.6	6.6	6.6	6.6	6.6	6.6	6.6
		60 (48-72)	RPM	14669	7334	3667	1834	917	611	458
			Fr	0.00008	0.0002	0.0003	0.0007	0.0013	0.0020	0.0026
			Feed (ipm)	1.2	1.2	1.2	1.2	1.2	1.2	1.2
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	85 (68-102)	RPM	20781	10390	5195	2598	1299	866	649
			Fr	0.00011	0.0002	0.0004	0.0009	0.0018	0.0027	0.0035
			Feed (ipm)	2.3	2.3	2.3	2.3	2.3	2.3	2.3
		55 (44-66)	RPM	13446	6723	3362	1681	840	560	420
			Fr	0.00005	0.0001	0.0002	0.0004	0.0008	0.0012	0.0017
			Feed (ipm)	0.7	0.7	0.7	0.7	0.7	0.7	0.7
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F 440F	210 (168-252)	RPM	51341	25670	12835	6418	3209	2139	1604
			Fr	0.00015	0.0003	0.0006	0.0012	0.0024	0.0036	0.0048
			Feed (ipm)	7.7	7.7	7.7	7.7	7.7	7.7	7.7
		110 (88-132)	RPM	26893	13446	6723	3362	1681	1121	840
			Fr	0.00009	0.0002	0.0004	0.0007	0.0015	0.0022	0.0030
			Feed (ipm)	2.5	2.5	2.5	2.5	2.5	2.5	2.5
	STAINLESS STEELS (DIFFICULT) 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	65 (52-78)	RPM	15891	7946	3973	1986	993	662	497
			Fr	0.00010	0.0002	0.0005	0.0009	0.0018	0.0025	0.0035
			Feed (ipm)	1.7	1.7	1.7	1.7	1.7	1.7	1.7
		55 (44-66)	RPM	13446	6723	3362	1681	840	560	420
			Fr	0.00010	0.0002	0.0004	0.0008	0.0015	0.0023	0.0031
			Feed (ipm)	1.3	1.3	1.3	1.3	1.3	1.3	1.3
K	CAST IRONS Gray, Malleable, Ductile	280 (224-336)	RPM	68454	34227	17114	8557	4278	2852	2139
			Fr	0.00026	0.0005	0.0010	0.0020	0.0041	0.0061	0.0082
			Feed (ipm)	17.5	17.5	17.5	17.5	17.5	17.5	17.5
		250 (200-300)	RPM	61120	30560	15280	7640	3820	2547	1910
			Fr	0.00025	0.0005	0.0010	0.0020	0.0041	0.0061	0.0081
			Feed (ipm)	15.5	15.5	15.5	15.5	15.5	15.5	15.5

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2 Flute Drills

Series 101 Fractional	Hardness	Vc (sfm)	DC • in									
			1/64	1/32	1/16	1/8	1/4	3/8	1/2			
N	ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075	≤ 80 Bhn or ≤ 47 HRb (432-648)	540	RPM	132019	66010	33005	16502	8251	5501	4126	
			Fr	0.00030	0.0006	0.0012	0.0024	0.0048	0.0073	0.0097		
			Feed (ipm)	40.0	40.0	40.0	40.0	40.0	40.0	40.0		
		≤ 150 Bhn or ≤ 88 HRb (364-546)	455	RPM	111238	55619	27810	13905	6952	4635	3476	
			Fr	0.00031	0.0006	0.0013	0.0025	0.0050	0.0076	0.0101		
			Feed (ipm)	35.0	35.0	35.0	35.0	35.0	35.0	35.0		
	COPPER ALLOYS Alum Bronze, C110, Muntz Brass	≤ 140 Bhn or ≤ 3 HRc (152-228)	190	RPM	46451	23226	11613	5806	2903	1935	1452	
			Fr	0.00015	0.0003	0.0006	0.0012	0.0024	0.0036	0.0048		
			Feed (ipm)	7.0	7.0	7.0	7.0	7.0	7.0	7.0		
		≤ 200 Bhn or ≤ 23 HRc (140-210)	175	RPM	42784	21392	10696	5348	2674	1783	1337	
			Fr	0.00015	0.0003	0.0006	0.0012	0.0024	0.0036	0.0048		
			Feed (ipm)	6.4	6.4	6.4	6.4	6.4	6.4	6.4		
PLASTICS Polycarbonate, PVC	500 (400-600)	RPM	122240	61120	30560	15280	7640	5093	3820			
		Fr	0.00031	0.0006	0.0012	0.0025	0.0050	0.0075	0.0099			
		Feed (ipm)	38.0	38.0	38.0	38.0	38.0	38.0	38.0			
S	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy 800, Monel 400, Rene, Waspaloy	≤ 220 Bhn or ≤ 19 HRc (32-48)	40	RPM	9779	4890	2445	1222	611	407	306	
			Fr	0.00010	0.0002	0.0004	0.0008	0.0016	0.0025	0.0033		
			Feed (ipm)	1.0	1.0	1.0	1.0	1.0	1.0	1.0		
		≤ 320 Bhn or ≤ 34 HRc (20-30)	25	RPM	6112	3056	1528	764	382	255	191	
			Fr	0.00010	0.0002	0.0004	0.0008	0.0016	0.0024	0.0031		
			Feed (ipm)	0.6	0.6	0.6	0.6	0.6	0.6	0.6		
		≤ 425 Bhn or ≤ 45 HRc (16-24)	20	RPM	4890	2445	1222	611	306	204	153	
			Fr	0.00004	0.0001	0.0002	0.0003	0.0007	0.0010	0.0013		
			Feed (ipm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2		
		TITANIUM ALLOYS (DIFFICULT) Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V	≤ 275 Bhn or ≤ 28 HRc (68-102)	85	RPM	20781	10390	5195	2598	1299	866	649
				Fr	0.00020	0.0004	0.0008	0.0016	0.0032	0.0049	0.0065	
				Feed (ipm)	4.2	4.2	4.2	4.2	4.2	4.2	4.2	
	≤ 350 Bhn or ≤ 38 HRc (52-78)		65	RPM	15891	7946	3973	1986	993	662	497	
			Fr	0.00011	0.0002	0.0004	0.0009	0.0017	0.0026	0.0034		
			Feed (ipm)	1.7	1.7	1.7	1.7	1.7	1.7	1.7		
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 440 Bhn or ≤ 47 HRc (44-66)	55	RPM	13446	6723	3362	1681	840	560	420	
			Fr	0.00010	0.0002	0.0004	0.0008	0.0015	0.0023	0.0031		
			Feed (ipm)	1.3	1.3	1.3	1.3	1.3	1.3	1.3		
H	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 475 Bhn or ≤ 50 HRc (32-48)	40	RPM	9779	4890	2445	1222	611	407	306	
			Fr	0.00005	0.0001	0.0002	0.0004	0.0008	0.0012	0.0016		
			Feed (ipm)	0.5	0.5	0.5	0.5	0.5	0.5	0.5		

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)

rpm = Vc x 3.82 / DC

ipm = Fr x rpm

reduce speed and feed 30 percent when using uncoated drills

reduce speed and feed for materials harder than listed

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)

2 Flute Drills

Short Length Self Centering Drills • DIN 6539

Series 101M, 108M Metric	Hardness	Vc (m/min)	DC • mm							
			1	3	6	8	10	12	16	
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	81	RPM	25690	8563	4282	3211	2569	2141	1606
		(65-97)	Fr	0.014	0.041	0.082	0.109	0.136	0.163	0.218
			Feed (mm/min)	350	350	350	350	350	350	350
		38	RPM	12118	4039	2020	1515	1212	1010	757
		(30-46)	Fr	0.012	0.036	0.072	0.096	0.120	0.144	0.191
			Feed (mm/min)	145	145	145	145	145	145	145
		26	RPM	8240	2747	1373	1030	824	687	515
		(21-31)	Fr	0.007	0.020	0.040	0.053	0.067	0.080	0.107
			Feed (mm/min)	55	55	55	55	55	55	55
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	70	RPM	22297	7432	3716	2787	2230	1858	1394
		(56-84)	Fr	0.012	0.036	0.073	0.097	0.121	0.145	0.194
			Feed (mm/min)	270	270	270	270	270	270	270
		44	RPM	14057	4686	2343	1757	1406	1171	879
		(35-53)	Fr	0.012	0.036	0.073	0.097	0.121	0.145	0.194
			Feed (mm/min)	170	170	170	170	170	170	170
		18	RPM	5816	1939	969	727	582	485	364
		(15-22)	Fr	0.005	0.015	0.030	0.040	0.050	0.060	0.080
			Feed (mm/min)	29	29	29	29	29	29	29
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	26	RPM	8240	2747	1373	1030	824	687	515
		(21-31)	Fr	0.007	0.020	0.040	0.053	0.067	0.080	0.107
			Feed (mm/min)	55	55	55	55	55	55	55
		17	RPM	5332	1777	889	666	533	444	333
		(13-20)	Fr	0.003	0.010	0.020	0.027	0.034	0.041	0.054
			Feed (mm/min)	18	18	18	18	18	18	18
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F 440F	64	RPM	20358	6786	3393	2545	2036	1696	1272
		(51-77)	Fr	0.010	0.029	0.059	0.079	0.098	0.118	0.157
			Feed (mm/min)	200	200	200	200	200	200	200
		34	RPM	10664	3555	1777	1333	1066	889	666
		(27-40)	Fr	0.006	0.017	0.034	0.045	0.056	0.068	0.090
			Feed (mm/min)	60	60	60	60	60	60	60
	STAINLESS STEELS (DIFFICULT) 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	20	RPM	6301	2100	1050	788	630	525	394
		(16-24)	Fr	0.007	0.021	0.043	0.057	0.071	0.086	0.114
			Feed (mm/min)	45	45	45	45	45	45	45
		17	RPM	5332	1777	889	666	533	444	333
		(13-20)	Fr	0.007	0.020	0.039	0.053	0.066	0.079	0.105
			Feed (mm/min)	35	35	35	35	35	35	35
K	CAST IRONS Gray, Malleable, Ductile	85	RPM	27144	9048	4524	3393	2714	2262	1696
		(68-102)	Fr	0.016	0.049	0.097	0.130	0.162	0.195	0.259
			Feed (mm/min)	440	440	440	440	440	440	440
		76	RPM	24235	8078	4039	3029	2424	2020	1515
		(61-91)	Fr	0.017	0.050	0.099	0.132	0.165	0.198	0.264
			Feed (mm/min)	400	400	400	400	400	400	400

continued on next page

2 Flute Drills

Short Length Self Centering Drills • DIN 6539

	Series 101M, 108M Metric	Hardness	Vc (m/min)	DC • mm								
				1	3	6	8	10	12	16		
N	ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075	≤ 80 Bhn or ≤ 47 HRb	165 (132-198)	RPM	52348	17449	8725	6544	5235	4362	3272	
				Fr	0.020	0.060	0.120	0.160	0.200	0.240	0.319	
				Feed (mm/min)	1045	1045	1045	1045	1045	1045	1045	
		≤ 150 Bhn or ≤ 88 HRb	139 (111-166)	RPM	44108	14703	7351	5514	4411	3676	2757	
				Fr	0.020	0.060	0.120	0.160	0.200	0.239	0.319	
				Feed (mm/min)	880	880	880	880	880	880	880	
	COPPER ALLOYS Alum Bronze, C110, Muntz Brass	≤ 140 Bhn or ≤ 3 HRc	58 (46-69)	RPM	18419	6140	3070	2302	1842	1535	1151	
				Fr	0.010	0.030	0.060	0.080	0.100	0.121	0.161	
				Feed (mm/min)	185	185	185	185	185	185	185	
		≤ 200 Bhn or ≤ 23 HRc	53 (43-64)	RPM	16965	5655	2827	2121	1696	1414	1060	
				Fr	0.010	0.030	0.060	0.080	0.100	0.120	0.160	
				Feed (mm/min)	170	170	170	170	170	170	170	
	PLASTICS Polycarbonate, PVC		152 (122-183)	RPM	48471	16157	8078	6059	4847	4039	3029	
				Fr	0.020	0.060	0.120	0.160	0.200	0.240	0.320	
				Feed (mm/min)	970	970	970	970	970	970	970	
	S	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy 800, Monel 400, Rene, Waspaloy	≤ 220 Bhn or ≤ 19 HRc	12 (10-15)	RPM	3878	1293	646	485	388	323	242
					Fr	0.006	0.019	0.039	0.052	0.064	0.077	0.103
					Feed (mm/min)	25	25	25	25	25	25	25
≤ 320 Bhn or ≤ 34 HRc			8 (6-9)	RPM	2424	808	404	303	242	202	151	
				Fr	0.006	0.019	0.037	0.050	0.062	0.074	0.099	
				Feed (mm/min)	15	15	15	15	15	15	15	
		≤ 425 Bhn or ≤ 45 HRc	6 (5-7)	RPM	1939	646	323	242	194	162	121	
				Fr	0.005	0.015	0.031	0.041	0.052	0.062	0.083	
				Feed (mm/min)	10	10	10	10	10	10	10	
		≤ 275 Bhn or ≤ 28 HRc	26 (21-31)	RPM	8240	2747	1373	1030	824	687	515	
				Fr	0.013	0.040	0.080	0.107	0.133	0.160	0.214	
				Feed (mm/min)	110	110	110	110	110	110	110	
TITANIUM ALLOYS (DIFFICULT) Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V		≤ 350 Bhn or ≤ 38 HRc	20 (16-24)	RPM	6301	2100	1050	788	630	525	394	
				Fr	0.007	0.021	0.043	0.057	0.071	0.086	0.114	
				Feed (mm/min)	45	45	45	45	45	45	45	
		≤ 440 Bhn or ≤ 47 HRc	17 (13-20)	RPM	5332	1777	889	666	533	444	333	
				Fr	0.007	0.020	0.039	0.053	0.066	0.079	0.105	
				Feed (mm/min)	35	35	35	35	35	35	35	
H	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 475 Bhn or ≤ 50 HRc	12 (10-15)	RPM	3878	1293	646	485	388	323	242	
				Fr	0.003	0.009	0.019	0.025	0.031	0.037	0.050	
				Feed (mm/min)	12	12	12	12	12	12	12	

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)

rpm = (Vc x 1000) / (DC x 3.14)

mm/min = Fr x rpm

reduce speed and feed 30 percent when using uncoated drills

reduce speed and feed for materials harder than listed

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)

Straight Flute Drills • Metric: DIN 6539



3xD

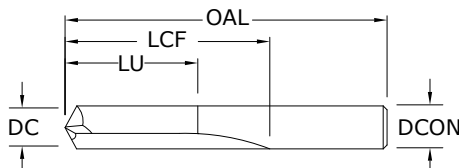


140°



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FRACTIONAL & METRIC SERIES



DECIMAL DC/DCON	METRIC DC/DCON	inch & mm		FLUTE LENGTH LCF	USABLE LENGTH LU	EDP NO.	
		FRACTIONAL/ LETTER/WIRE DC	OVERALL LENGTH OAL			UNCOATED	Ti-NAMITE-A (AITiN)
0.0394	1,000 mm		26,0	6,0	4,5	66001	66002
0.0400	1,020 mm	#60	1-1/2	1/2	13/32	56060	56269
0.0410	1,040 mm	#59	1-1/2	1/2	13/32	56059	56268
0.0420	1,070 mm	#58	1-1/2	1/2	13/32	56058	56267
0.0430	1,090 mm	#57	1-1/2	1/2	13/32	56057	56266
0.0465	1,180 mm	#56	1-1/2	1/2	13/32	56056	56265
0.0469	1,190 mm	3/64	1-1/2	1/2	13/32	56103	56135
0.0520	1,320 mm	#55	1-1/2	1/2	13/32	56055	56264
0.0550	1,400 mm	#54	1-1/2	1/2	13/32	56054	56263
0.0591	1,500 mm		32,0	9,0	7,0	66003	66004
0.0595	1,510 mm	#53	1-1/2	1/2	13/32	56053	56262
0.0625	1,590 mm	1/16	1-1/2	5/8	1/2	56104	56136
0.0635	1,610 mm	#52	1-11/16	11/16	35/64	56052	56261
0.0670	1,700 mm	#51	1-11/16	11/16	35/64	56051	56260
0.0700	1,780 mm	#50	1-11/16	11/16	35/64	56050	56259
0.0730	1,850 mm	#49	1-11/16	11/16	35/64	56049	56258
0.0760	1,930 mm	#48	1-11/16	11/16	35/64	56048	56257
0.0781	1,980 mm	5/64	1-11/16	11/16	35/64	56105	56137
0.0785	1,990 mm	#47	1-3/4	3/4	39/64	56047	56256
0.0787	2,000 mm		38,0	12,0	9,0	66005	66006
0.0810	2,060 mm	#46	1-3/4	3/4	39/64	56046	56255
0.0820	2,080 mm	#45	1-3/4	3/4	39/64	56045	56254
0.0860	2,180 mm	#44	1-3/4	3/4	39/64	56044	56253
0.0890	2,260 mm	#43	1-3/4	3/4	39/64	56043	56252
0.0935	2,370 mm	#42	1-3/4	3/4	39/64	56042	56251
0.0938	2,380 mm	3/32	1-3/4	3/4	39/64	56106	56138
0.0960	2,440 mm	#41	1-13/16	13/16	21/32	56041	56250
0.0980	2,490 mm	#40	1-13/16	13/16	21/32	56040	56249
0.0984	2,500 mm		43,0	14,0	11,0	66007	66008
0.0995	2,530 mm	#39	1-13/16	13/16	21/32	56039	56248
0.1015	2,580 mm	#38	1-13/16	13/16	21/32	56038	56247
0.1040	2,640 mm	#37	1-13/16	13/16	21/32	56037	56246
0.1065	2,710 mm	#36	1-13/16	13/16	21/32	56036	56245
0.1094	2,780 mm	7/64	1-13/16	13/16	21/32	56107	56139
0.1100	2,790 mm	#35	1-7/8	7/8	45/64	56035	56244
0.1110	2,820 mm	#34	1-7/8	7/8	45/64	56034	56243

TOLERANCES (inch)

DC = +0.0000/-0.0005

DCON = h₆

TOLERANCES (mm)

DC = +0.0000/-0.0127

DCON = h₆

STEELS

CAST IRON

HARDENED STEELS

continued on next page

Straight Flute Drills • Metric: DIN 6539

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FRACTIONAL & METRIC SERIES

CONTINUED

DECIMAL DC / DCON	METRIC DC / DCON	inch & mm				EDP NO.	
		FRACTIONAL/ LETTER/WIRE DC	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	UNCOATED	TI-NAMITE-A (AITiN)
0.1130	2,870 mm	#33	1-7/8	7/8	45/64	56033	56242
0.1160	2,950 mm	#32	1-7/8	7/8	45/64	56032	56241
0.1181	3,000 mm		46,0	16,0	12,0	66009	66010
0.1200	3,050 mm	#31	1-7/8	7/8	45/64	56031	56240
0.1250	3,180 mm	1/8	1-7/8	7/8	45/64	56108	56140
0.1285	3,260 mm	#30	1-15/16	15/16	3/4	56030	56239
0.1360	3,450 mm	#29	1-15/16	15/16	3/4	56029	56238
0.1378	3,500 mm		52,0	20,0	15,0	66011	66012
0.1405	3,570 mm	#28	1-15/16	15/16	3/4	56028	56237
0.1406	3,570 mm	9/64	1-15/16	15/16	3/4	56109	56141
0.1440	3,660 mm	#27	2-1/16	1	51/64	56027	56236
0.1470	3,730 mm	#26	2-1/16	1	51/64	56026	56235
0.1495	3,800 mm	#25	2-1/16	1	51/64	56025	56234
0.1520	3,860 mm	#24	2-1/16	1	51/64	56024	56233
0.1540	3,910 mm	#23	2-1/16	1	51/64	56023	56232
0.1562	3,970 mm	5/32	2-1/16	1	51/64	56110	56142
0.1570	3,990 mm	#22	2-1/8	1-1/16	55/64	56022	56231
0.1575	4,000 mm		55,0	22,0	17,0	66013	66014
0.1590	4,040 mm	#21	2-1/8	1-1/16	55/64	56021	56230
0.1610	4,090 mm	#20	2-1/8	1-1/16	55/64	56020	56229
0.1660	4,220 mm	#19	2-1/8	1-1/16	55/64	56019	56228
0.1695	4,310 mm	#18	2-1/8	1-1/16	55/64	56018	56227
0.1719	4,370 mm	11/64	2-1/8	1-1/16	55/64	56111	56143
0.1730	4,390 mm	#17	2-3/16	1-1/8	29/32	56017	56226
0.1770	4,500 mm	#16	2-3/16	1-1/8	29/32	56016	56225
0.1772	4,500 mm		58,0	24,0	18,0	66015	66016
0.1800	4,570 mm	#15	2-3/16	1-1/8	29/32	56015	56224
0.1820	4,620 mm	#14	2-3/16	1-1/8	29/32	56014	56223
0.1850	4,700 mm	#13	2-3/16	1-1/8	29/32	56013	56222
0.1875	4,760 mm	3/16	2-3/16	1-1/8	29/32	56112	56144
0.1890	4,800 mm	#12	2-3/16	1-1/8	29/32	56012	56221
0.1910	4,850 mm	#11	2-3/16	1-1/8	29/32	56011	56220
0.1935	4,910 mm	#10	2-3/16	1-1/8	29/32	56010	56219
0.1960	4,980 mm	#9	2-1/4	1-3/16	61/64	56009	56218
0.1969	5,000 mm		62,0	26,0	20,0	66017	66018
0.1990	5,050 mm	#8	2-1/4	1-3/16	61/64	56008	56217
0.2010	5,110 mm	#7	2-1/4	1-3/16	61/64	56007	56216
0.2031	5,160 mm	13/64	2-1/4	1-3/16	61/64	56113	56145
0.2040	5,180 mm	#6	2-3/8	1-1/4	1	56006	56215
0.2055	5,220 mm	#5	2-3/8	1-1/4	1	56005	56214
0.2090	5,310 mm	#4	2-3/8	1-1/4	1	56004	56213
0.2130	5,410 mm	#3	2-3/8	1-1/4	1	56003	56212
0.2165	5,500 mm		66,0	28,0	21,0	66019	66020
0.2188	5,560 mm	7/32	2-3/8	1-1/4	1	56114	56146
0.2210	5,610 mm	#2	2-7/16	1-5/16	1-3/64	56002	56211
0.2280	5,790 mm	#1	2-7/16	1-5/16	1-3/64	56001	56210

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Straight Flute Drills • Metric: DIN 6539

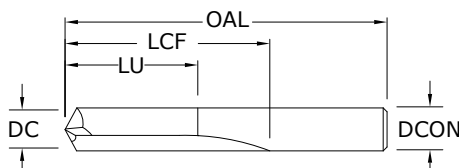


3xD



106

FRACTIONAL & METRIC SERIES



DECIMAL DC/DCON	METRIC DC/DCON	inch & mm				EDP NO.	
		FRACTIONAL/ LETTER/WIRE DC	OVERALL LENGTH OAL	FLUTE LENGTH LCF	USABLE LENGTH LU	UNCOATED	Ti-NAMITE-A (AITiN)
0.2344	5,950 mm	15/64	2-7/16	1-5/16	1-3/64	56115	56147
0.2362	6,000 mm		66,0	28,0	21,0	66021	66045
0.2500	6,350 mm	1/4	2-1/2	1-3/8	1-7/64	56116	56148
0.2559	6,500 mm		70,0	31,0	23,0	66022	66046
0.2656	6,750 mm	17/64	2-5/8	1-7/16	1-7/64	56117	56149
0.2756	7,000 mm		74,0	34,0	25,0	66023	66024
0.2812	7,140 mm	9/32	2-11/16	1-1/2	1-13/64	56118	56150
0.2953	7,500 mm		74,0	34,0	25,0	66025	66026
0.2969	7,540 mm	19/64	2-3/4	1-9/16	1-1/4	56119	56151
0.3125	7,940 mm	5/16	2-13/16	1-5/8	1-19/64	56120	56152
0.3150	8,000 mm		79,0	37,0	27,0	66027	66028
0.3281	8,330 mm	21/64	2-15/16	1-11/16	1-23/64	56121	56153
0.3346	8,500 mm		79,0	37,0	27,0	66029	66030
0.3438	8,730 mm	11/32	3	1-11/16	1-23/64	56122	56154
0.3543	9,000 mm		84,0	40,0	29,0	66031	66032
0.3594	9,130 mm	23/64	3-1/16	1-3/4	1-13/32	56123	56155
0.3740	9,500 mm		84,0	40,0	29,0	66033	66034
0.3750	9,530 mm	3/8	3-1/8	1-13/16	1-29/64	56124	56156
0.3906	9,920 mm	25/64	3-1/4	1-7/8	1-1/2	56125	56157
0.3937	10,000 mm		89,0	43,0	31,0	66035	66036
0.4062	10,320 mm	13/32	3-5/16	1-15/16	1-35/64	56126	56158
0.4134	10,500 mm		89,0	43,0	31,0	66037	66038
0.4219	10,720 mm	27/64	3-3/8	2	1-39/64	56127	56159
0.4331	11,000 mm		95,0	47,0	33,0	66039	66040
0.4375	11,110 mm	7/16	3-7/16	2-1/16	1-21/32	56128	56160
0.4528	11,500 mm		95,0	47,0	33,0	66041	66042
0.4531	11,510 mm	29/64	3-9/16	2-1/8	1-45/64	56129	56161
0.4688	11,910 mm	15/32	3-5/8	2-1/8	1-45/64	56130	56162
0.4724	12,000 mm		102,0	51,0	35,0	66043	66044
0.4844	12,300 mm	31/64	3-11/16	2-3/16	1-3/4	56131	56163
0.5000	12,700 mm	1/2	3-3/4	2-1/4	1-51/64	56132	56164

TOLERANCES (inch)

DC = +0.0000/-0.0005

DCON = h₆

TOLERANCES (mm)

DC = +0.0000/-0.0127

DCON = h₆

STEELS

CAST IRON

HARDENED STEELS

Straight Flute Drills

Series 106 Fractional	Hardness	Vc (sfm)	DC • in							
			1/16	1/8	3/16	1/4	3/8	1/2		
P	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 500 Bhn or ≤ 52 HRc	60	RPM	3667	1834	1222	917	611	458
		(48-72)	Fr	0.0004	0.0007	0.0011	0.0014	0.0021	0.0028	
			Feed (ipm)	1.3	1.3	1.3	1.3	1.3	1.3	
		≤ 615 Bhn or ≤ 58 HRc	50	RPM	3056	1528	1019	764	509	382
		(40-60)	Fr	0.0004	0.0008	0.0012	0.0016	0.0024	0.0031	
			Feed (ipm)	1.2	1.2	1.2	1.2	1.2	1.2	
K	CAST IRONS Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	250	RPM	15280	7640	5093	3820	2547	1910
		(200-300)	Fr	0.0010	0.0020	0.0030	0.0041	0.0061	0.0081	
			Feed (ipm)	15.5	15.5	15.5	15.5	15.5	15.5	
		≤ 330 Bhn or ≤ 36 HRc	195	RPM	11918	5959	3973	2980	1986	1490
		(156-234)	Fr	0.0010	0.0020	0.0030	0.0040	0.0060	0.0081	
			Feed (ipm)	12.0	12.0	12.0	12.0	12.0	12.0	
H	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 500 Bhn or ≤ 52 HRc	60	RPM	3667	1834	1222	917	611	458
		(48-72)	Fr	0.0004	0.0007	0.0011	0.0014	0.0021	0.0028	
			Feed (ipm)	1.3	1.3	1.3	1.3	1.3	1.3	
		≤ 615 Bhn or ≤ 58 HRc	50	RPM	3056	1528	1019	764	509	382
		(40-60)	Fr	0.0004	0.0008	0.0012	0.0016	0.0024	0.0031	
			Feed (ipm)	1.2	1.2	1.2	1.2	1.2	1.2	

Bhn (Brinell) HRc (Rockwell C)

rpm = Vc x 3.82 / DC

ipm = Fr x rpm

reduce speed and feed 30 percent when using uncoated drills

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)

Series 106M Metric		Hardness	Vc (m/min)	DC • mm						
				1	3	6	8	10	12	
P	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 500 Bhn or ≤ 52 HRc	18	RPM	5816	1939	969	727	582	485
			(15-22)	Fr	0.006	0.018	0.035	0.047	0.058	0.070
				Feed (mm/min)	34	34	34	34	34	34
		≤ 615 Bhn or ≤ 58 HRc	15	RPM	4847	1616	808	606	485	404
			(12-18)	Fr	0.006	0.017	0.033	0.045	0.056	0.067
				Feed (mm/min)	27	27	27	27	27	27
K	CAST IRONS Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	76	RPM	24235	8078	4039	3029	2424	2020
			(61-91)	Fr	0.016	0.048	0.096	0.128	0.160	0.192
				Feed (mm/min)	395	395	395	395	395	395
		≤ 330 Bhn or ≤ 36 HRc	59	RPM	18904	6301	3151	2363	1890	1575
			(48-71)	Fr	0.016	0.048	0.096	0.128	0.160	0.192
				Feed (mm/min)	305	305	305	305	305	305
H	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 500 Bhn or ≤ 52 HRc	18	RPM	5816	1939	969	727	582	485
			(15-22)	Fr	0.006	0.018	0.035	0.047	0.058	0.070
				Feed (mm/min)	34	34	34	34	34	34
		≤ 615 Bhn or ≤ 58 HRc	15	RPM	4847	1616	808	606	485	404
			(12-18)	Fr	0.006	0.017	0.033	0.045	0.056	0.067
				Feed (mm/min)	27	27	27	27	27	27

Bhn (Brinell) HRc (Rockwell C)

rpm = (Vc x 1000) / (DC x 3.14)

mm/min = Fr x rpm

reduce speed and feed 30 percent when using uncoated drills

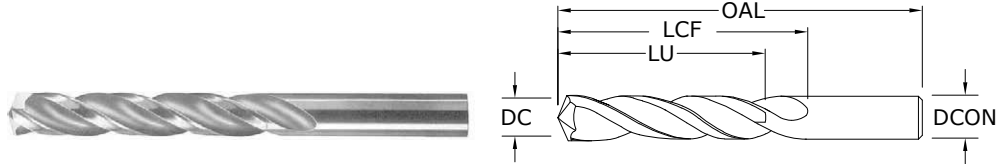
refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)

3 Flute Drills • Metric: DIN 6539

3xD
(mm)5xD
(inch)

103

FRACTIONAL & METRIC SERIES



DECIMAL DC/DCON	METRIC DC/DCON	inch & mm		FLUTE LENGTH LCF	USABLE LENGTH LU	EDP NO.	
		FRACTIONAL/ LETTER/WIRE DC	OVERALL LENGTH OAL			UNCOATED	Ti-NAMITE-A (AITiN)
0.1065	2,710 mm	#36	2-1/4	1-1/4	1	53036	58011
0.1094	2,780 mm	7/64	2-1/4	1-1/4	1	53107	58012
0.1100	2,790 mm	#35	2-1/4	1-1/4	1	53035	58013
0.1110	2,820 mm	#34	2-1/4	1-1/4	1	53034	58014
0.1130	2,870 mm	#33	2-1/4	1-1/4	1	53033	58015
0.1160	2,950 mm	#32	2-1/4	1-1/4	1	53032	58016
0.1181	3,000 mm		46,0	16,0	12,0	63000	68965
0.1200	3,050 mm	#31	2-1/4	1-1/4	1	53031	58017
0.1220	3,100 mm		49,0	18,0	14,0	63044	68966
0.1250	3,180 mm	1/8	2-1/4	1-1/4	1	53108	58018
0.1260	3,200 mm		49,0	18,0	14,0	63045	68967
0.1285	3,260 mm	#30	2-1/4	1-1/4	1	53030	58019
0.1299	3,300 mm		49,0	18,0	14,0	63001	68968
0.1339	3,400 mm		52,0	20,0	15,0	63046	68969
0.1360	3,450 mm	#29	2-1/2	1-3/8	1-7/64	53029	58020
0.1378	3,500 mm		52,0	20,0	15,0	63002	68970
0.1405	3,570 mm	#28	2-1/2	1-3/8	1-7/64	53028	58021
0.1406	3,570 mm	9/64	2-1/2	1-3/8	1-7/64	53109	58022
0.1417	3,600 mm		52,0	20,0	15,0	63047	68971
0.1440	3,660 mm	#27	2-1/2	1-3/8	1-7/64	53027	58023
0.1457	3,700 mm		52,0	20,0	15,0	63003	68972
0.1470	3,730 mm	#26	2-1/2	1-3/8	1-7/64	53026	58024
0.1495	3,800 mm	#25	2-1/2	1-3/8	1-7/64	53025	58025
0.1496	3,800 mm		55,0	22,0	17,0	63048	68973
0.1520	3,860 mm	#24	2-1/2	1-3/8	1-7/64	53024	58026
0.1535	3,900 mm		55,0	22,0	17,0	63049	68974
0.1540	3,910 mm	#23	2-1/2	1-3/8	1-7/64	53023	58027
0.1562	3,970 mm	5/32	2-1/2	1-3/8	1-7/64	53110	58028
0.1570	3,990 mm	#22	2-1/2	1-3/8	1-7/64	53022	58029
0.1575	4,000 mm		55,0	22,0	17,0	63004	68975
0.1590	4,040 mm	#21	2-1/2	1-3/8	1-7/64	53021	58030
0.1610	4,090 mm	#20	2-1/2	1-3/8	1-7/64	53020	58031
0.1614	4,100 mm		55,0	22,0	17,0	63050	68976
0.1654	4,200 mm		55,0	22,0	17,0	63005	68977
0.1660	4,220 mm	#19	2-3/4	1-5/8	1-19/64	53019	58032
0.1693	4,300 mm		58,0	24,0	18,0	63051	68978
0.1695	4,310 mm	#18	2-3/4	1-5/8	1-19/64	53018	58033
0.1719	4,370 mm	11/64	2-3/4	1-5/8	1-19/64	53111	58034
0.1730	4,390 mm	#17	2-3/4	1-5/8	1-19/64	53017	58035
0.1732	4,400 mm		58,0	24,0	18,0	63052	68979

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TOLERANCES (inch)

DC = +0.0000/-0.0005

DCON = h₆

TOLERANCES (mm)

DC = +0.0000/-0.0127

DCON = h₆

STEELS

CAST IRON

NON-FERROUS

HARDENED STEELS

3 Flute Drills • Metric: DIN 6539

103

FRACTIONAL & METRIC SERIES

CONTINUED

DECIMAL DC / DCON	METRIC DC / DCON	inch & mm		FLUTE LENGTH LCF	USABLE LENGTH LU	EDP NO.	
		FRACTIONAL/ LETTER/WIRE DC	OVERALL LENGTH OAL			UNCOATED	Ti-NAMITE-A (AITiN)
0.1770	4,500 mm	#16	2-3/4	1-5/8	1-19/64	53016	58036
0.1772	4,500 mm		58,0	24,0	18,0	63006	68980
0.1800	4,570 mm	#15	2-3/4	1-5/8	1-19/64	53015	58037
0.1811	4,600 mm		58,0	24,0	18,0	63053	68981
0.1820	4,620 mm	#14	2-3/4	1-5/8	1-19/64	53014	58038
0.1850	4,700 mm	#13	2-3/4	1-5/8	1-19/64	53013	58039
0.1850	4,700 mm		58,0	24,0	18,0	63054	68982
0.1875	4,760 mm	3/16	2-3/4	1-5/8	1-19/64	53112	58040
0.1890	4,800 mm	#12	2-3/4	1-5/8	1-19/64	53012	58041
0.1890	4,800 mm		62,0	26,0	20,0	63055	68983
0.1910	4,850 mm	#11	2-3/4	1-5/8	1-19/64	53011	58042
0.1929	4,900 mm		62,0	26,0	20,0	63056	68984
0.1935	4,910 mm	#10	2-3/4	1-5/8	1-19/64	53010	58043
0.1960	4,980 mm	#9	3	1-3/4	1-13/32	53009	58044
0.1969	5,000 mm		62,0	26,0	20,0	63007	68985
0.1990	5,050 mm	#8	3	1-3/4	1-13/32	53008	58045
0.2008	5,100 mm		62,0	26,0	20,0	63057	68986
0.2010	5,110 mm	#7	3	1-3/4	1-13/32	53007	58046
0.2031	5,160 mm	13/64	3	1-3/4	1-13/32	53113	58047
0.2040	5,180 mm	#6	3	1-3/4	1-13/32	53006	58048
0.2047	5,200 mm		62,0	26,0	20,0	63008	68987
0.2055	5,220 mm	#5	3	1-3/4	1-13/32	53005	58049
0.2087	5,300 mm		62,0	26,0	20,0	63058	68988
0.2090	5,310 mm	#4	3	1-3/4	1-13/32	53004	58050
0.2126	5,400 mm		66,0	28,0	21,0	63059	68989
0.2130	5,410 mm	#3	3	1-3/4	1-13/32	53003	58051
0.2165	5,500 mm		66,0	28,0	21,0	63009	68990
0.2188	5,560 mm	7/32	3	1-3/4	1-13/32	53114	58052
0.2205	5,600 mm		66,0	28,0	21,0	63060	68991
0.2210	5,610 mm	#2	3	1-3/4	1-13/32	53002	58053
0.2244	5,700 mm		66,0	28,0	21,0	63061	68992
0.2280	5,790 mm	#1	3	1-3/4	1-13/32	53001	58054
0.2283	5,800 mm		66,0	28,0	21,0	63062	68993
0.2323	5,900 mm		66,0	28,0	21,0	63063	68994
0.2340	5,940 mm	A	3-1/4	2	1-39/64	53201	58055
0.2344	5,950 mm	15/64	3-1/4	2	1-39/64	53115	58056
0.2362	6,000 mm		66,0	28,0	21,0	63010	68995
0.2380	6,050 mm	B	3-1/4	2	1-39/64	53202	58057
0.2402	6,100 mm		70,0	31,0	23,0	63064	68996
0.2420	6,150 mm	C	3-1/4	2	1-39/64	53203	58058
0.2441	6,200 mm		70,0	31,0	23,0	63011	68997
0.2460	6,250 mm	D	3-1/4	2	1-39/64	53204	58059
0.2480	6,300 mm		70,0	31,0	23,0	63065	68998
0.2500	6,350 mm	1/4	3-1/4	2	1-39/64	53116	58061
0.2520	6,400 mm		70,0	31,0	23,0	63066	68999
0.2559	6,500 mm		70,0	31,0	23,0	63012	69000
0.2570	6,530 mm	F	3-1/4	2	1-39/64	53206	58062
0.2598	6,600 mm		70,0	31,0	23,0	63067	69001
0.2610	6,630 mm	G	3-1/2	2-1/8	1-45/64	53207	58063
0.2638	6,700 mm		70,0	31,0	23,0	63068	69002

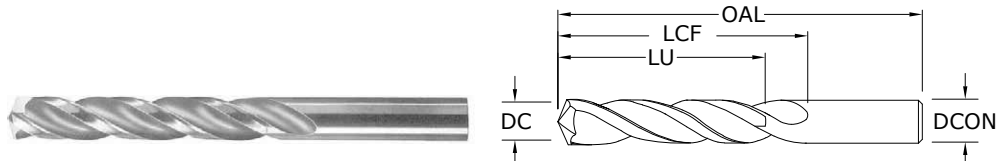
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3 Flute Drills • Metric: DIN 6539

3xD
(mm)5xD
(inch)

103

FRACTIONAL & METRIC SERIES



CONTINUED

DECIMAL DC/DCON	METRIC DC/DCON	inch & mm		FLUTE LENGTH LCF	USABLE LENGTH LU	EDP NO.	
		FRACTIONAL/ LETTER/WIRE DC	OVERALL LENGTH OAL			UNCOATED	TI-NAMITE-A (AITIN)
0.2656	6,750 mm	17/64	3-1/2	2-1/8	1-45/64	53117	58064
0.2660	6,760 mm	H	3-1/2	2-1/8	1-45/64	53208	58065
0.2677	6,800 mm		74,0	34,0	25,0	63013	69003
0.2717	6,900 mm		74,0	34,0	25,0	63069	69004
0.2720	6,910 mm	I	3-1/2	2-1/8	1-45/64	53209	58066
0.2756	7,000 mm		74,0	34,0	25,0	63014	69005
0.2770	7,040 mm	J	3-1/2	2-1/8	1-45/64	53210	58067
0.2795	7,100 mm		74,0	34,0	25,0	63070	69006
0.2810	7,140 mm	K	3-1/2	2-1/8	1-45/64	53211	58068
0.2812	7,140 mm	9/32	3-1/2	2-1/8	1-45/64	53118	58069
0.2835	7,200 mm		74,0	34,0	25,0	63015	69007
0.2874	7,300 mm		74,0	34,0	25,0	63071	69008
0.2900	7,370 mm	L	3-1/2	2-1/8	1-45/64	53212	58070
0.2913	7,400 mm		74,0	34,0	25,0	63072	69009
0.2950	7,490 mm	M	3-3/4	2-3/8	1-29/32	53213	58071
0.2953	7,500 mm		74,0	34,0	25,0	63016	69010
0.2969	7,540 mm	19/64	3-3/4	2-3/8	1-29/32	53119	58072
0.2992	7,600 mm		79,0	37,0	27,0	63073	69011
0.3020	7,670 mm	N	2-3/8	2-3/8	1-29/32	53214	58073
0.3031	7,700 mm		79,0	37,0	27,0	63074	69012
0.3071	7,800 mm		79,0	37,0	27,0	63075	69013
0.3110	7,900 mm		79,0	37,0	27,0	63076	69014
0.3125	7,940 mm	5/16	3-3/4	2-3/8	1-29/32	53120	58074
0.3150	8,000 mm		79,0	37,0	27,0	63017	69015
0.3160	8,030 mm	O	3-3/4	2-3/8	1-29/32	53215	58075
0.3189	8,100 mm		79,0	37,0	27,0	63077	69016
0.3228	8,200 mm		79,0	37,0	27,0	63018	69017
0.3230	8,200 mm	P	3-3/4	2-3/8	1-29/32	53216	58076
0.3268	8,300 mm		79,0	37,0	27,0	63078	69018
0.3281	8,330 mm	21/64	4	2-1/2	2	53121	58077
0.3307	8,400 mm		79,0	37,0	27,0	63019	69019
0.3320	8,430 mm	Q	4	2-1/2	2	53217	58078
0.3346	8,500 mm		79,0	37,0	27,0	63020	69020
0.3386	8,600 mm		84,0	40,0	29,0	63021	69021
0.3390	8,610 mm	R	4	2-1/2	2	53218	58079
0.3425	8,700 mm		84,0	40,0	29,0	63079	69022
0.3438	8,730 mm	11/32	4	2-1/2	2	53122	58080
0.3465	8,800 mm		84,0	40,0	29,0	63022	69023
0.3480	8,840 mm	S	4	2-1/2	2	53219	58081
0.3504	8,900 mm		84,0	40,0	29,0	63080	69024
0.3543	9,000 mm		84,0	40,0	29,0	63023	69025
0.3580	9,090 mm	T	4-1/4	2-3/4	2-13/64	53220	58082

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TOLERANCES (inch)

DC = +0.0000/-0.0005

DCON = h₆

TOLERANCES (mm)

DC = +0.0000/-0.0127

DCON = h₆

STEELS

CAST IRON

NON-FERROUS

HARDENED STEELS

3 Flute Drills • Metric: DIN 6539

103

FRACTIONAL & METRIC SERIES

CONTINUED

DECIMAL DC / DCON	METRIC DC / DCON	inch & mm		FLUTE LENGTH LCF	USABLE LENGTH LU	EDP NO.	
		FRACTIONAL/ LETTER/WIRE DC	OVERALL LENGTH OAL			UNCOATED	Ti-NAMITE-A (AITiN)
0.3583	9,100 mm		84,0	40,0	29,0	63081	69026
0.3594	9,130 mm	23/64	4-1/4	2-3/4	2-13/64	53123	58083
0.3622	9,200 mm		84,0	40,0	29,0	63024	69027
0.3661	9,300 mm		84,0	40,0	29,0	63082	69028
0.3680	9,350 mm	U	4-1/4	2-3/4	2-13/64	53221	58084
0.3701	9,400 mm		84,0	40,0	29,0	63083	69029
0.3740	9,500 mm		84,0	40,0	29,0	63025	69030
0.3750	9,530 mm	3/8	4-1/4	2-3/4	2-13/64	53124	58085
0.3770	9,580 mm	V	4-1/4	2-3/4	2-13/64	53222	58086
0.3780	9,600 mm		89,0	43,0	31,0	63084	69031
0.3819	9,700 mm		89,0	43,0	31,0	63085	69032
0.3858	9,800 mm		89,0	43,0	31,0	63086	69033
0.3860	9,800 mm	W	4-1/2	2-7/8	2-19/64	53223	58087
0.3898	9,900 mm		89,0	43,0	31,0	63087	69034
0.3906	9,920 mm	25/64	4-1/2	2-7/8	2-19/64	53125	58088
0.3937	10,000 mm		89,0	43,0	31,0	63026	69035
0.3970	10,080 mm	X	4-1/2	2-7/8	2-19/64	53224	58089
0.3976	10,100 mm		89,0	43,0	31,0	63088	69036
0.4016	10,200 mm		89,0	43,0	31,0	63027	69037
0.4040	10,260 mm	Y	4-1/2	2-7/8	2-19/64	53225	58090
0.4062	10,320 mm	13/32	4-1/2	2-7/8	2-19/64	53126	58091
0.4094	10,400 mm		89,0	43,0	31,0	63028	69038
0.4130	10,490 mm	Z	4-1/2	2-7/8	2-19/64	53226	58092
0.4134	10,500 mm		89,0	43,0	31,0	63029	69039
0.4213	10,700 mm		95,0	47,0	33,0	63030	69040
0.4219	10,720 mm	27/64	4-1/2	2-7/8	2-19/64	53127	58093
0.4252	10,800 mm		95,0	47,0	33,0	63031	69041
0.4331	11,000 mm		95,0	47,0	33,0	63032	69042
0.4375	11,110 mm	7/16	4-1/2	2-7/8	2-19/64	53128	58094
0.4528	11,500 mm		95,0	47,0	33,0	63033	69043
0.4531	11,510 mm	29/64	4-3/4	3	2-13/32	53129	58095
0.4688	11,910 mm	15/32	4-3/4	3	2-13/32	53130	58096
0.4724	12,000 mm		102,0	51,0	35,0	63034	69044
0.4844	12,300 mm	31/64	4-3/4	3	2-13/32	53131	58097
0.4921	12,500 mm		102,0	51,0	35,0	63035	69045
0.5000	12,700 mm	1/2	4-3/4	3	2-13/32	53132	58098
0.5039	12,800 mm		102,0	51,0	35,0	63036	69046
0.5118	13,000 mm		102,0	51,0	35,0	63089	69047
0.5156	13,100 mm	33/64	4-3/4	3	2-13/32	53135	58099
0.5157	13,100 mm		102,0	51,0	35,0	63037	69048
0.5315	13,500 mm		107,0	54,0	37,0	63090	69049
0.5512	14,000 mm		107,0	54,0	37,0	63038	69050
0.5625	14,290 mm	9/16	4-3/4	3	2-13/32	53136	58100
0.5630	14,300 mm		111,0	56,0	38,0	63039	69051
0.5709	14,500 mm		111,0	56,0	38,0	63040	69052
0.5906	15,000 mm		111,0	56,0	38,0	63091	69053
0.6250	15,880 mm	5/8	5-3/4	3-1/2	2-51/64	53133	58101
0.6875	17,460 mm	11/16	5-3/4	3-1/2	2-51/64	53137	58102
0.6890	17,500 mm		123,0	62,0	40,0	63041	69054
0.7500	19,050 mm	3/4	5-3/4	4-1/4	3 13/32	53134	58103
0.7677	19,500 mm		131,0	66,0	42,0	63042	69055
0.7874	20,000 mm		131,0	66,0	42,0	63043	69056

3 Flute Drills

Series 103 Fractional	Hardness	Vc (sfm)	DC • in						
				1/8	1/4	3/8	1/2	5/8	3/4
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	295	RPM	9015	4508	3005	2254	1803	1503
		≤ 175 Bhn or ≤ 7 HRc	Fr	0.0026	0.0051	0.0077	0.0102	0.0128	0.0153
		(236-354)	Feed (ipm)	23.0	23.0	23.0	23.0	23.0	23.0
		260	RPM	7946	3973	2649	1986	1589	1324
		≤ 300 Bhn or ≤ 32 HRc	Fr	0.0023	0.0045	0.0068	0.0091	0.0113	0.0136
		(208-312)	Feed (ipm)	18.0	18.0	18.0	18.0	18.0	18.0
		150	RPM	4584	2292	1528	1146	917	764
		≤ 425 Bhn or ≤ 45 HRc	Fr	0.0013	0.0026	0.0039	0.0052	0.0065	0.0079
		(120-180)	Feed (ipm)	6.0	6.0	6.0	6.0	6.0	6.0
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	230	RPM	7029	3514	2343	1757	1406	1171
		≤ 275 Bhn or ≤ 28 HRc	Fr	0.0019	0.0038	0.0058	0.0077	0.0096	0.0115
		(184-276)	Feed (ipm)	13.5	13.5	13.5	13.5	13.5	13.5
		145	RPM	4431	2216	1477	1108	886	739
		≤ 375 Bhn or ≤ 40 HRc	Fr	0.0019	0.0038	0.0058	0.0077	0.0096	0.0115
		(116-174)	Feed (ipm)	8.5	8.5	8.5	8.5	8.5	8.5
		115	RPM	3514	1757	1171	879	703	586
		≤ 425 Bhn or ≤ 45 HRc	Fr	0.0005	0.0010	0.0015	0.0020	0.0026	0.0031
		(92-138)	Feed (ipm)	1.8	1.8	1.8	1.8	1.8	1.8
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	85	RPM	2598	1299	866	649	520	433
		≤ 250 Bhn or ≤ 24 HRc	Fr	0.0013	0.0026	0.0039	0.0052	0.0065	0.0079
		(68-102)	Feed (ipm)	3.4	3.4	3.4	3.4	3.4	3.4
		65	RPM	1986	993	662	497	397	331
		≤ 375 Bhn or ≤ 40 HRc	Fr	0.0007	0.0013	0.0020	0.0026	0.0033	0.0039
		(52-78)	Feed (ipm)	1.3	1.3	1.3	1.3	1.3	1.3
K	CAST IRONS Gray, Malleable, Ductile	250	RPM	7640	3820	2547	1910	1528	1273
		≤ 220 Bhn or ≤ 19 HRc	Fr	0.0026	0.0052	0.0079	0.0105	0.0131	0.0157
		(200-300)	Feed (ipm)	20.0	20.0	20.0	20.0	20.0	20.0
		195	RPM	5959	2980	1986	1490	1192	993
		≤ 330 Bhn or ≤ 36 HRc	Fr	0.0026	0.0052	0.0078	0.0104	0.0130	0.0156
		(156-234)	Feed (ipm)	15.5	15.5	15.5	15.5	15.5	15.5
N	ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075	540	RPM	16502	8251	5501	4126	3300	2750
		≤ 80 Bhn or ≤ 47 HRb	Fr	0.0032	0.0064	0.0096	0.0128	0.0161	0.0193
		(432-648)	Feed (ipm)	53.0	53.0	53.0	53.0	53.0	53.0
		455	RPM	13905	6952	4635	3476	2781	2317
		≤ 150 Bhn or ≤ 88 HRb	Fr	0.0032	0.0065	0.0097	0.0129	0.0162	0.0194
		(364-546)	Feed (ipm)	45.0	45.0	45.0	45.0	45.0	45.0
	COPPER ALLOYS Alum Bronze, C110, Muntz Brass	305	RPM	9321	4660	3107	2330	1864	1553
		≤ 140 Bhn or ≤ 3 HRc	Fr	0.0019	0.0039	0.0058	0.0077	0.0097	0.0116
		(244-366)	Feed (ipm)	18.0	18.0	18.0	18.0	18.0	18.0
		160	RPM	4890	2445	1630	1222	978	815
		≤ 200 Bhn or ≤ 23 HRc	Fr	0.0016	0.0033	0.0049	0.0065	0.0082	0.0098
		(128-192)	Feed (ipm)	8.0	8.0	8.0	8.0	8.0	8.0
H	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2		Feed (ipm)	1.3	1.3	1.3	1.3	1.3	1.3
		50	RPM	1528	764	509	382	306	255
		≤ 475 Bhn or ≤ 50 HRc	Fr	0.0007	0.0013	0.0020	0.0026	0.0033	0.0039
		(40-60)	Feed (ipm)	1.0	1.0	1.0	1.0	1.0	1.0

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)

rpm = Vc x 3.82 / DC

ipm = Fr x rpm

reduce speed and feed 30 percent when using uncoated drills

reduce speed and feed for materials harder than listed

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)

3 Flute Drills

Series 103M Metric	Hardness	Vc (m/min)	DC • mm						
			3	6	10	12	16	20	
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	90	RPM	9533	4766	2860	2383	1787	1430
		≤ 175 Bhn or ≤ 7 HRc	Fr	0.062	0.124	0.206	0.248	0.330	0.413
		(72-108)	Feed (mm/min)	590	590	590	590	590	590
		79	RPM	8402	4201	2520	2100	1575	1260
		≤ 300 Bhn or ≤ 32 HRc	Fr	0.055	0.110	0.183	0.219	0.292	0.365
		(63-95)	Feed (mm/min)	460	460	460	460	460	460
		46	RPM	4847	2424	1454	1212	909	727
		≤ 425 Bhn or ≤ 45 HRc	Fr	0.032	0.064	0.107	0.128	0.171	0.213
		(37-55)	Feed (mm/min)	155	155	155	155	155	155
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	70	RPM	7432	3716	2230	1858	1394	1115
		≤ 275 Bhn or ≤ 28 HRc	Fr	0.046	0.093	0.155	0.186	0.248	0.309
		(56-84)	Feed (mm/min)	345	345	345	345	345	345
		44	RPM	4686	2343	1406	1171	879	703
		≤ 375 Bhn or ≤ 40 HRc	Fr	0.046	0.092	0.153	0.184	0.245	0.306
		(35-53)	Feed (mm/min)	215	215	215	215	215	215
		35	RPM	3716	1858	1115	929	697	557
		≤ 450 Bhn or ≤ 48 HRc	Fr	0.012	0.024	0.040	0.048	0.065	0.081
		(28-42)	Feed (mm/min)	45	45	45	45	45	45
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	26	RPM	2747	1373	824	687	515	412
		≤ 250 Bhn or ≤ 24 HRc	Fr	0.031	0.062	0.103	0.124	0.165	0.206
		(21-31)	Feed (mm/min)	85	85	85	85	85	85
		20	RPM	2100	1050	630	525	394	315
		≤ 375 Bhn or ≤ 40 HRc	Fr	0.017	0.033	0.056	0.067	0.089	0.111
		(16-24)	Feed (mm/min)	35	35	35	35	35	35
K	CAST IRONS Gray, Malleable, Ductile	76	RPM	8078	4039	2424	2020	1515	1212
		≤ 220 Bhn or ≤ 19 HRc	Fr	0.063	0.126	0.210	0.253	0.337	0.421
		(61-91)	Feed (mm/min)	510	510	510	510	510	510
		59	RPM	6301	3151	1890	1575	1181	945
		≤ 330 Bhn or ≤ 36 HRc	Fr	0.052	0.105	0.175	0.209	0.279	0.349
		(48-71)	Feed (mm/min)	330	330	330	330	330	330
N	ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075	165	RPM	17449	8725	5235	4362	3272	2617
		≤ 80 Bhn or ≤ 47 HRb	Fr	0.078	0.156	0.260	0.312	0.416	0.520
		(132-198)	Feed (mm/min)	1360	1360	1360	1360	1360	1360
		139	RPM	14703	7351	4411	3676	2757	2205
		≤ 150 Bhn or ≤ 7 HRc	Fr	0.078	0.156	0.261	0.313	0.417	0.521
		(111-166)	Feed (mm/min)	1150	1150	1150	1150	1150	1150
	COPPER ALLOYS Alum Bronze, C110, Muntz Brass	93	RPM	9856	4928	2957	2464	1848	1478
		≤ 140 Bhn or ≤ 3 HRc	Fr	0.047	0.094	0.157	0.189	0.252	0.315
		(74-112)	Feed (mm/min)	465	465	465	465	465	465
		49	RPM	5170	2585	1551	1293	969	776
		≤ 200 Bhn or ≤ 23 HRc	Fr	0.039	0.077	0.129	0.155	0.206	0.258
		(39-59)	Feed (mm/min)	200	200	200	200	200	200
H	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	15	RPM	1616	808	485	404	303	242
		≤ 475 Bhn or ≤ 50 HRc	Fr	0.015	0.031	0.052	0.062	0.083	0.103
		(12-18)	Feed (mm/min)	25	25	25	25	25	25

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)

rpm = (Vc x 1000) / (DC x 3.14)

mm/min = Fr x rpm

reduce speed and feed 30 percent when using uncoated drills

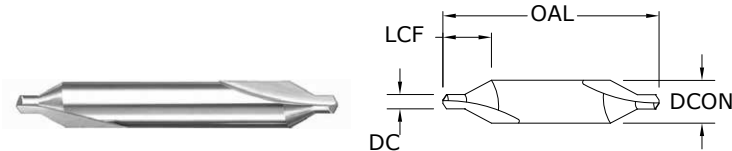
reduce speed and feed for materials harder than listed

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)

Combined Drill & Countersink



301
FRACTIONAL SERIES



Pictured:
Series 301 Set



SIZE	inch				EDP NO.	
	DRILL DIAMETER DC	BODY DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	UNCOATED	Ti-NAMITE-A (AlTiN)
*00	.025	1/8	1-1/2	.312	57005	57015
*0	1/32	1/8	1-1/2	.312	57006	57016
*1	3/64	1/8	1-1/2	.375	57007	57017
*2	5/64	3/16	1-7/8	.562	57008	57018
*3	7/64	1/4	2	.625	57009	57019
*4	1/8	5/16	2-1/8	.750	57010	57020
*5	3/16	7/16	2-3/4	.875	57011	57021
*6	7/32	1/2	3	.938	57012	57022
*Series 301 Set	—	—	—	—	57075	—

TOLERANCES (inch)

DC = +0.003/–0.000
DCON = –0.0001/–0.0005

STEELS

STAINLESS STEELS

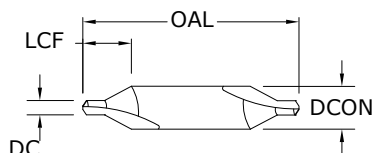
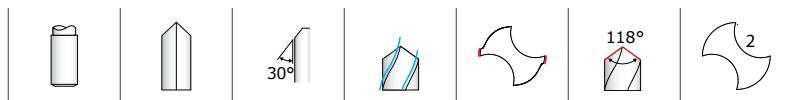
CAST IRON

NON-FERROUS

HIGH TEMP ALLOYS

HARDENED STEELS

Combined Drill & Countersink



301M
METRIC SERIES

TOLERANCES (mm)

DC = +0,076/-0,000
DCON = -0,0025/-0,0127

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

mm				EDP NO.	
DRILL DIAMETER DC	BODY DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	UNCOATED	Ti-NAMITE-A (AlTiN)
0,5	3,15	25,0	7,1	67005	67035
0,8	3,15	25,0	7,1	67007	67037
1	3,15	31,5	8,3	67009	67039
1,25	3,15	31,5	9,9	67011	67041
1,6	4,0	35,5	12,7	67013	67043
2	5,0	40,0	14,7	67015	67045
2,5	6,3	45,0	15,9	67017	67047
3,15	8,0	50,0	19,4	67019	67049
4	10,0	56,0	21,4	67021	67051
5	12,5	63,0	23,0	67023	67053

Combined Drill & Countersink

Series 301 Fractional	Hardness	Vc (sfm)	DC • in						
			1/32	5/64	1/8	3/16	7/32		
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	265	RPM	8098	5399	3239	2314	2025	
		≤ 175 Bhn or ≤ 7 HRc (212-318)	Fr	0.00068	0.0010	0.0017	0.0024	0.0027	
			Feed (ipm)	5.5	5.5	5.5	5.5	5.5	
		125	RPM	3820	2547	1528	1091	955	
		≤ 300 Bhn or ≤ 32 HRc (100-150)	Fr	0.00065	0.0010	0.0016	0.0023	0.0026	
			Feed (ipm)	2.5	2.5	2.5	2.5	2.5	
		85	RPM	2598	1732	1039	742	649	
		≤ 425 Bhn or ≤ 45 HRc (68-102)	Fr	0.00038	0.0006	0.0010	0.0013	0.0015	
			Feed (ipm)	1.0	1.0	1.0	1.0	1.0	
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	230	RPM	7029	4686	2812	2008	1757	
		≤ 275 Bhn or ≤ 28 HRc (184-276)	Fr	0.00064	0.0010	0.0016	0.0022	0.0026	
			Feed (ipm)	4.5	4.5	4.5	4.5	4.5	
		145	RPM	4431	2954	1772	1266	1108	
		≤ 375 Bhn or ≤ 40 HRc (116-174)	Fr	0.00059	0.0009	0.0015	0.0021	0.0023	
			Feed (ipm)	2.6	2.6	2.6	2.6	2.6	
		60	RPM	1834	1222	733	524	458	
		≤ 425 Bhn or ≤ 45 HRc (48-72)	Fr	0.00027	0.0004	0.0007	0.0010	0.0011	
			Feed (ipm)	0.5	0.5	0.5	0.5	0.5	
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	85	RPM	2598	1732	1039	742	649	
		≤ 250 Bhn or ≤ 24 HRc (68-102)	Fr	0.00035	0.0005	0.0009	0.0012	0.0014	
			Feed (ipm)	0.9	0.9	0.9	0.9	0.9	
		55	RPM	1681	1121	672	480	420	
		≤ 375 Bhn or ≤ 40 HRc (44-66)	Fr	0.00016	0.0002	0.0004	0.0006	0.0006	
			Feed (ipm)	0.3	0.3	0.3	0.3	0.3	
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F 440F	210	RPM	6418	4278	2567	1834	1604	
		≤ 250 Bhn or ≤ 24 HRc (168-252)	Fr	0.00048	0.0007	0.0012	0.0017	0.0019	
			Feed (ipm)	3.1	3.1	3.1	3.1	3.1	
		110	RPM	3362	2241	1345	960	840	
		≤ 330 Bhn or ≤ 36 HRc (88-132)	Fr	0.00028	0.0004	0.0007	0.0010	0.0011	
			Feed (ipm)	0.9	0.9	0.9	0.9	0.9	
	STAINLESS STEELS (DIFFICULT) 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	65	RPM	1986	1324	795	568	497	
		≤ 275 Bhn or ≤ 28 HRc (52-78)	Fr	0.00036	0.0005	0.0009	0.0013	0.0014	
			Feed (ipm)	0.7	0.7	0.7	0.7	0.7	
		55	RPM	1681	1121	672	480	420	
		≤ 375 Bhn or ≤ 40 HRc (44-66)	Fr	0.00032	0.0005	0.0008	0.0011	0.0013	
			Feed (ipm)	0.5	0.5	0.5	0.5	0.5	
K	CAST IRONS Gray, Malleable, Ductile	280	RPM	8557	5705	3423	2445	2139	
		≤ 220 Bhn or ≤ 19 HRc (224-336)	Fr	0.00084	0.0013	0.0021	0.0029	0.0034	
			Feed (ipm)	7.2	7.2	7.2	7.2	7.2	
		250	RPM	7640	5093	3056	2183	1910	
		≤ 330 Bhn or ≤ 36 HRc (200-300)	Fr	0.00084	0.0013	0.0021	0.0029	0.0034	
			Feed (ipm)	6.4	6.4	6.4	6.4	6.4	

continued on next page

Combined Drill & Countersink

Series 301 Fractional	Hardness	Vc (sfm)		DC • in				
				1/32	5/64	1/8	3/16	7/32
N	ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075	540 (432-648)	RPM	16502	11002	6601	4715	4126
			Fr	0.00100	0.0015	0.0025	0.0035	0.0040
			Feed (ipm)	16.5	16.5	16.5	16.5	16.5
		455 (364-546)	RPM	13905	9270	5562	3973	3476
			Fr	0.00100	0.0015	0.0025	0.0035	0.0040
			Feed (ipm)	13.9	13.9	13.9	13.9	13.9
	COPPER ALLOYS Alum Bronze, C110, Muntz Brass	190 (152-228)	RPM	5806	3871	2323	1659	1452
			Fr	0.00048	0.0007	0.0012	0.0017	0.0019
			Feed (ipm)	2.8	2.8	2.8	2.8	2.8
		175 (140-210)	RPM	5348	3565	2139	1528	1337
			Fr	0.00048	0.0007	0.0012	0.0017	0.0019
			Feed (ipm)	2.6	2.6	2.6	2.6	2.6
S	PLASTICS Polycarbonate, PVC	500 (400-600)	RPM	15280	10187	6112	4366	3820
			Fr	0.00100	0.0015	0.0025	0.0035	0.0040
			Feed (ipm)	15.3	15.3	15.3	15.3	15.3
	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy 800, Monel 400, Rene, Waspaloy	40 (32-48)	RPM	1222	815	489	349	306
			Fr	0.00036	0.0005	0.0009	0.0013	0.0014
			Feed (ipm)	0.4	0.4	0.4	0.4	0.4
		25 (20-30)	RPM	764	509	306	218	191
			Fr	0.00033	0.0005	0.0008	0.0011	0.0013
			Feed (ipm)	0.3	0.3	0.3	0.3	0.3
		20 (16-24)	RPM	611	407	244	175	153
			Fr	0.00016	0.0002	0.0004	0.0006	0.0007
			Feed (ipm)	0.1	0.1	0.1	0.1	0.1
	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V	85 (68-102)	RPM	2598	1732	1039	742	649
			Fr	0.00064	0.0010	0.0016	0.0022	0.0026
			Feed (ipm)	1.7	1.7	1.7	1.7	1.7
		65 (52-78)	RPM	1986	1324	795	568	497
			Fr	0.00036	0.0005	0.0009	0.0013	0.0014
			Feed (ipm)	0.7	0.7	0.7	0.7	0.7
H	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	40 (32-48)	RPM	1222	815	489	349	306
			Fr	0.00016	0.0002	0.0004	0.0006	0.0007
			Feed (ipm)	0.2	0.2	0.2	0.2	0.2

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)

rpm = Vc x 3.82 / DCON

ipm = Fr x rpm

reduce speed and feed 30 percent when using uncoated drills

reduce speed and feed for materials harder than listed

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)

Combined Drill & Countersink

Series 301M Metric		Hardness	Vc (m/min)	DC • mm					
				1	1.6	2.5	4	5	
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	81	RPM	8155	6422	4078	2569	2055
		(65-97)	Fr	0.017	0.022	0.034	0.054	0.068	
			Feed (mm/min)	139	139	139	139	139	
		≤ 300 Bhn or ≤ 32 HRc	38	RPM	3847	3029	1923	1212	969
		(30-46)	Fr	0.016	0.020	0.032	0.051	0.064	
			Feed (mm/min)	62	62	62	62	62	
		≤ 425 Bhn or ≤ 45 HRc	26	RPM	2616	2060	1308	824	659
		(21-31)	Fr	0.010	0.013	0.020	0.032	0.039	
			Feed (mm/min)	26	26	26	26	26	
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc	70	RPM	7078	5574	3539	2230	1784
		(56-84)	Fr	0.016	0.020	0.032	0.051	0.063	
			Feed (mm/min)	113	113	113	113	113	
		≤ 375 Bhn or ≤ 40 HRc	44	RPM	4462	3514	2231	1406	1125
		(35-53)	Fr	0.015	0.019	0.030	0.048	0.060	
			Feed (mm/min)	67	67	67	67	67	
		≤ 425 Bhn or ≤ 45 HRc	18	RPM	1847	1454	923	582	465
		(15-22)	Fr	0.007	0.009	0.014	0.022	0.028	
			Feed (mm/min)	13	13	13	13	13	
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250 Bhn or ≤ 24 HRc	26	RPM	2616	2060	1308	824	659
		(21-31)	Fr	0.009	0.012	0.018	0.029	0.036	
			Feed (mm/min)	24	24	24	24	24	
≤ 375 Bhn or ≤ 40 HRc		17	RPM	1693	1333	846	533	427	
(13-20)		Fr	0.004	0.005	0.008	0.013	0.016		
		Feed (mm/min)	7	7	7	7	7		
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F 440F	≤ 250 Bhn or ≤ 24 HRc	64	RPM	6463	5089	3231	2036	1629
		(51-77)	Fr	0.012	0.015	0.024	0.038	0.048	
			Feed (mm/min)	78	78	78	78	78	
		≤ 330 Bhn or ≤ 36 HRc	34	RPM	3385	2666	1693	1066	853
		(27-40)	Fr	0.007	0.009	0.014	0.023	0.028	
			Feed (mm/min)	24	24	24	24	24	
	STAINLESS STEELS (DIFFICULT) 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	≤ 275 Bhn or ≤ 28 HRc	20	RPM	2000	1575	1000	630	504
		(16-24)	Fr	0.009	0.011	0.018	0.029	0.036	
			Feed (mm/min)	18	18	18	18	18	
		≤ 375 Bhn or ≤ 40 HRc	17	RPM	1693	1333	846	533	427
		(13-20)	Fr	0.008	0.011	0.017	0.026	0.033	
			Feed (mm/min)	14	14	14	14	14	
K	CAST IRONS Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	85	RPM	8617	6786	4309	2714	2171
		(68-102)	Fr	0.021	0.027	0.042	0.067	0.083	
			Feed (mm/min)	181	181	181	181	181	
		≤ 330 Bhn or ≤ 36 HRc	76	RPM	7694	6059	3847	2424	1939
		(61-91)	Fr	0.021	0.027	0.042	0.067	0.084	
			Feed (mm/min)	162	162	162	162	162	

continued on next page

Combined Drill & Countersink

Series 301M Metric	Hardness	Vc (m/min)		DC • mm				
				1	1.6	2.5	4	5
N	ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075	165	RPM	16619	13087	8309	5235	4188
		≤ 80 Bhn or ≤ 47 HRb	Fr	0.025	0.032	0.050	0.079	0.099
		(132-198)	Feed (mm/min)	415	415	415	415	415
		139	RPM	14003	11027	7001	4411	3529
		≤ 150 Bhn or ≤ 88 HRc	Fr	0.025	0.032	0.050	0.079	0.099
		(111-166)	Feed (mm/min)	350	350	350	350	350
	COPPER ALLOYS Alum Bronze, C110, Muntz Brass	58	RPM	5847	4605	2924	1842	1474
		≤ 140 Bhn or ≤ 3 HRc	Fr	0.012	0.015	0.024	0.038	0.048
		(46-69)	Feed (mm/min)	70	70	70	70	70
		53	RPM	5386	4241	2693	1696	1357
		≤ 200 Bhn or ≤ 23 HRc	Fr	0.012	0.015	0.024	0.038	0.048
		(43-64)	Feed (mm/min)	65	65	65	65	65
	PLASTICS Polycarbonate, PVC	152	RPM	15388	12118	7694	4847	3878
		(122-183)	Fr	0.025	0.032	0.050	0.079	0.099
			Feed (mm/min)	385	385	385	385	385
S	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy 800, Monel 400, Rene, Waspaloy	12	RPM	1231	969	616	388	310
		≤ 220 Bhn or ≤ 19 HRc	Fr	0.009	0.011	0.018	0.028	0.035
		(10-15)	Feed (mm/min)	11	11	11	11	11
		8	RPM	769	606	385	242	194
		≤ 320 Bhn or ≤ 34 HRc	Fr	0.008	0.010	0.016	0.025	0.031
		(6-9)	Feed (mm/min)	6	6	6	6	6
	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V	6	RPM	616	485	308	194	155
		≤ 425 Bhn or ≤ 45 HRc	Fr	0.003	0.004	0.006	0.010	0.013
		(5-7)	Feed (mm/min)	2	2	2	2	2
		26	RPM	2616	2060	1308	824	659
		≤ 275 Bhn or ≤ 28 HRc	Fr	0.016	0.020	0.032	0.051	0.064
		(21-31)	Feed (mm/min)	42	42	42	42	42
H	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	20	RPM	2000	1575	1000	630	504
		≤ 350 Bhn or ≤ 38 HRc	Fr	0.009	0.011	0.018	0.029	0.036
		(16-24)	Feed (mm/min)	18	18	18	18	18
		17	RPM	1693	1333	846	533	427
		≤ 440 Bhn or ≤ 47 HRc	Fr	0.008	0.011	0.017	0.026	0.033
		(13-20)	Feed (mm/min)	14	14	14	14	14
		12	RPM	1231	969	616	388	310
		≤ 475 Bhn or ≤ 50 HRc	Fr	0.004	0.005	0.008	0.013	0.016
		(10-15)	Feed (mm/min)	5	5	5	5	5

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)

rpm = (Vc x 1000) / (DCON x 3.14)

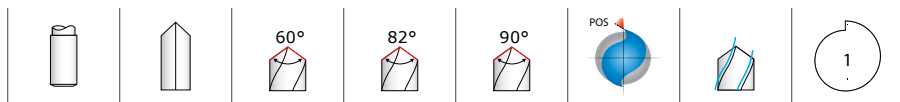
mm/min = Fr x rpm

reduce speed and feed 30 percent when using uncoated drills

reduce speed and feed for materials harder than listed

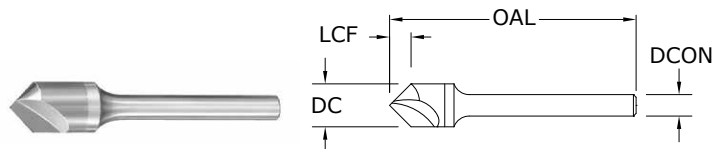
refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)

Single Flute Countersink



601

FRACTIONAL SERIES



inch				EDP NO.		
CUTTING DIAMETER DC	SHANK DIAMETER DCON	OVERALL LENGTH OAL	FLUTE LENGTH LCF	UNCOATED 60°	UNCOATED 82°	UNCOATED 90°
1/8	1/8	1-1/2	.062	—	—	74201
1/8	1/8	1-1/2	.072	—	74101	—
1/8	1/8	1-1/2	.108	74001	—	—
3/16	3/16	2	.094	—	—	74204
3/16	3/16	2	.108	—	74104	—
3/16	3/16	2	.163	74004	—	—
1/4	1/4	2	.125	—	—	74207
1/4	1/4	2	.144	—	74107	—
1/4	1/4	2	.217	74007	—	—
*3/8	1/4	2-11/16	.188	—	—	74210
*3/8	1/4	2-11/16	.216	—	74110	—
*3/8	1/4	2-13/16	.325	74010	—	—
*1/2	1/4	2-3/4	.250	—	—	74213
*1/2	1/4	2-3/4	.288	—	74113	—
*1/2	1/4	2-7/8	.433	74013	—	—
*5/8	3/8	2-57/64	.313	—	—	74216
*5/8	3/8	2-57/64	.360	—	74116	—
*5/8	3/8	3	.541	74016	—	—
*3/4	1/2	2-57/64	.375	—	—	74219
*3/4	1/2	2-57/64	.431	—	74119	—
*3/4	1/2	3	.650	74019	—	—
*1	1/2	3	.500	—	—	74222
*1	1/2	3	.575	—	74122	—
*1	1/2	3-1/4	.866	74022	—	—

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

TOLERANCES (inch)

1/8–1/4 DIAMETER

DC = +0.0000/–0.0005

3/8–1 DIAMETER

DC = +0.003/–0.000

Included Angle +1°/–1°

STEELS

STAINLESS STEELS

CAST IRON

NON-FERROUS

HIGH TEMP ALLOYS

HARDENED STEELS

Single Flute Countersink

Series 601 Fractional	Hardness	Vc (sfm)		DC • in						
				1/8	3/16	1/4	3/8	1/2	3/4	1
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	125 (100-150)	RPM	3820	2547	1910	1273	955	637	478
			Fr	0.0005	0.0008	0.0010	0.0016	0.0021	0.0031	0.0042
			Feed (ipm)	2.0	2.0	2.0	2.0	2.0	2.0	2.0
		60 (48-72)	RPM	1834	1222	917	611	458	306	229
			Fr	0.0005	0.0007	0.0010	0.0015	0.0020	0.0029	0.0039
			Feed (ipm)	0.9	0.9	0.9	0.9	0.9	0.9	0.9
		45 (36-54)	RPM	1375	917	688	458	344	229	172
			Fr	0.0003	0.0004	0.0006	0.0009	0.0012	0.0017	0.0023
			Feed (ipm)	0.4	0.4	0.4	0.4	0.4	0.4	0.4
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	95 (76-114)	RPM	2903	1935	1452	968	726	484	363
			Fr	0.0004	0.0007	0.0009	0.0013	0.0018	0.0027	0.0036
			Feed (ipm)	1.3	1.3	1.3	1.3	1.3	1.3	1.3
		60 (48-72)	RPM	1834	1222	917	611	458	306	229
			Fr	0.0004	0.0007	0.0009	0.0013	0.0017	0.0026	0.0035
			Feed (ipm)	0.8	0.8	0.8	0.8	0.8	0.8	0.8
		35 (28-42)	RPM	1070	713	535	357	267	178	134
			Fr	0.0003	0.0004	0.0006	0.0008	0.0011	0.0017	0.0022
			Feed (ipm)	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	35 (28-42)	RPM	1070	713	535	357	267	178	134
			Fr	0.0003	0.0004	0.0006	0.0008	0.0011	0.0017	0.0022
			Feed (ipm)	0.3	0.3	0.3	0.3	0.3	0.3	0.3
		25 (20-30)	RPM	764	509	382	255	191	127	96
			Fr	0.0001	0.0002	0.0003	0.0004	0.0005	0.0008	0.0010
			Feed (ipm)	0.1	0.1	0.1	0.1	0.1	0.1	0.1
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F 440F	53 (42-64)	RPM	1620	1080	810	540	405	270	202
			Fr	0.0003	0.0005	0.0006	0.0009	0.0012	0.0019	0.0025
			Feed (ipm)	0.5	0.5	0.5	0.5	0.5	0.5	0.5
		46 (37-55)	RPM	1406	937	703	469	351	234	176
			Fr	0.0002	0.0003	0.0004	0.0006	0.0009	0.0013	0.0017
			Feed (ipm)	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	STAINLESS STEELS (DIFFICULT) 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	28 (22-34)	RPM	856	570	428	285	214	143	107
			Fr	0.0004	0.0005	0.0007	0.0011	0.0014	0.0021	0.0028
			Feed (ipm)	0.3	0.3	0.3	0.3	0.3	0.3	0.3
		21 (17-25)	RPM	642	428	321	214	160	107	80
			Fr	0.0002	0.0002	0.0003	0.0005	0.0006	0.0009	0.0012
			Feed (ipm)	0.1	0.1	0.1	0.1	0.1	0.1	0.1
K	CAST IRONS Gray, Malleable, Ductile	105 (84-126)	RPM	3209	2139	1604	1070	802	535	401
			Fr	0.0006	0.0009	0.0012	0.0018	0.0024	0.0036	0.0047
			Feed (ipm)	1.9	1.9	1.9	1.9	1.9	1.9	1.9
		75 (60-90)	RPM	2292	1528	1146	764	573	382	287
			Fr	0.0006	0.0009	0.0012	0.0018	0.0024	0.0037	0.0049
			Feed (ipm)	1.4	1.4	1.4	1.4	1.4	1.4	1.4

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Single Flute Countersink

	Series 601 Fractional	Hardness	Vc (sfm)	DC • in							
	1/8			3/16	1/4	3/8	1/2	3/4	1		
N	ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075	≤ 80 Bhn or ≤ 47 HRb	225	RPM	6876	4584	3438	2292	1719	1146	860
		(180-270)	Fr	0.0008	0.0011	0.0015	0.0023	0.0030	0.0045	0.0061	
			Feed (ipm)	5.2	5.2	5.2	5.2	5.2	5.2	5.2	
		≤ 150 Bhn or ≤ 88 HRb	190	RPM	5806	3871	2903	1935	1452	968	726
		(152-228)	Fr	0.0008	0.0011	0.0015	0.0023	0.0030	0.0045	0.0061	
			Feed (ipm)	4.4	4.4	4.4	4.4	4.4	4.4	4.4	
	COPPER ALLOYS Alum Bronze, C110, Muntz Brass	≤ 140 Bhn or ≤ 3 HRc	95	RPM	2903	1935	1452	968	726	484	363
		(76-114)	Fr	0.0004	0.0006	0.0008	0.0011	0.0015	0.0023	0.0030	
			Feed (ipm)	1.1	1.1	1.1	1.1	1.1	1.1	1.1	
		≤ 200 Bhn or ≤ 23 HRc	80	RPM	2445	1630	1222	815	611	407	306
		(64-96)	Fr	0.0004	0.0006	0.0008	0.0012	0.0016	0.0025	0.0033	
			Feed (ipm)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
S	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy 800, Monel 400, Rene, Waspaloy	≤ 220 Bhn or ≤ 19 HRc	18	RPM	550	367	275	183	138	92	69
		(14-22)	Fr	0.0002	0.0003	0.0004	0.0005	0.0007	0.0011	0.0015	
			Feed (ipm)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
		≤ 320 Bhn or ≤ 34 HRc	14	RPM	428	285	214	143	107	71	53
		(11-17)	Fr	0.0002	0.0004	0.0005	0.0007	0.0009	0.0014	0.0019	
			Feed (ipm)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
	≤ 425 Bhn or ≤ 45 HRc	12	RPM	367	244	183	122	92	61	46	
	(10-14)	Fr	0.0003	0.0004	0.0005	0.0008	0.0011	0.0016	0.0022		
		Feed (ipm)	0.1	0.1	0.1	0.1	0.1	0.1	0.1		
	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V	≤ 275 Bhn or ≤ 28 HRc	36	RPM	1100	733	550	367	275	183	138
		(29-43)	Fr	0.0005	0.0007	0.0009	0.0014	0.0018	0.0027	0.0036	
			Feed (ipm)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
≤ 350 Bhn or ≤ 38 HRc		28	RPM	856	570	428	285	214	143	107	
(22-34)		Fr	0.0004	0.0005	0.0007	0.0011	0.0014	0.0021	0.0028		
		Feed (ipm)	0.3	0.3	0.3	0.3	0.3	0.3	0.3		
≤ 440 Bhn or ≤ 47 HRc	21	RPM	642	428	321	214	160	107	80		
(17-25)	Fr	0.0002	0.0002	0.0003	0.0005	0.0006	0.0009	0.0012			
	Feed (ipm)	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
H	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 475 Bhn or ≤ 50 HRc	20	RPM	611	407	306	204	153	102	76
		(16-24)	Fr	0.0002	0.0002	0.0003	0.0005	0.0007	0.0010	0.0013	
			Feed (ipm)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)

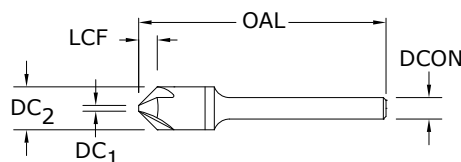
rpm = Vc x 3.82 / DC

ipm = Fr x rpm

reduce speed and feed for materials harder than listed

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)

3 Flute Countersink



603
FRACTIONAL SERIES

TOLERANCES (inch)

1/8–1/4 DIAMETER

DC = +0.0000/–0.0005

3/8–1 DIAMETER

DC = +0.003/–0.000

Included Angle +1°/–1°

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

CUTTING DIAMETER DC ₂	SHANK DIAMETER DCON	inch			EDP NO.		
		OVERALL LENGTH OAL	FLUTE LENGTH LCF	TIP DIAMETER DC ₁	UNCOATED 60°	UNCOATED 82°	UNCOATED 90°
1/8	1/8	1-1/2	.040	.045	—	—	74225
1/8	1/8	1-1/2	.046	.045	—	74125	—
1/8	1/8	1-1/2	.074	.040	74025	—	—
3/16	3/16	2	.061	.065	—	—	74228
3/16	3/16	2	.070	.065	—	74128	—
3/16	3/16	2	.119	.050	74028	—	—
1/4	1/4	2	.075	.100	—	—	74231
1/4	1/4	2	.086	.100	—	74131	—
1/4	1/4	2	.165	.060	74031	—	—
*3/8	1/4	2-11/16	.144	.088	—	—	74234
*3/8	1/4	2-11/16	.165	.088	—	74134	—
*3/8	1/4	2-13/16	.255	.080	74034	—	—
*1/2	1/4	2-3/4	.199	.102	—	—	74237
*1/2	1/4	2-3/4	.229	.102	—	74137	—
*1/2	1/4	2-7/8	.352	.093	74037	—	—
*5/8	3/8	2-57/64	.254	.118	—	—	74240
*5/8	3/8	2-57/64	.292	.118	—	74140	—
*5/8	3/8	3	.448	.108	74040	—	—
*3/4	1/2	2-57/64	.309	.133	—	—	74243
*3/4	1/2	2-57/64	.355	.133	—	74143	—
*3/4	1/2	3	.543	.123	74043	—	—
*1	1/2	3	.426	.148	—	—	74246
*1	1/2	3	.490	.148	—	74146	—
*1	1/2	3-1/4	.747	.138	74046	—	—

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

NOTE: DC₁ dimension varies based on angle. Contact your KSPT representative or consult KYOCERA SGS APEX for dimension information.

3 Flute Countersink

Series 603 Fractional	Hardness	Vc (sfm)	DC • in								
			1/8	3/16	1/4	3/8	1/2	3/4	1		
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	125	RPM	3820	2547	1910	1273	955	637	478
			(100-150)	Fr	0.0008	0.0012	0.0016	0.0024	0.0031	0.0047	0.0063
				Feed (ipm)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
		≤ 300 Bhn or ≤ 32 HRc	60	RPM	1834	1222	917	611	458	306	229
			(48-72)	Fr	0.0007	0.0011	0.0014	0.0021	0.0028	0.0043	0.0057
				Feed (ipm)	1.3	1.3	1.3	1.3	1.3	1.3	1.3
		≤ 425 Bhn or ≤ 45 HRc	45	RPM	1375	917	688	458	344	229	172
			(36-54)	Fr	0.0004	0.0007	0.0009	0.0013	0.0017	0.0026	0.0035
				Feed (ipm)	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc	95	RPM	2903	1935	1452	968	726	484	363
			(76-114)	Fr	0.0007	0.0010	0.0014	0.0021	0.0028	0.0041	0.0055
				Feed (ipm)	2.0	2.0	2.0	2.0	2.0	2.0	2.0
		≤ 375 Bhn or ≤ 40 HRc	60	RPM	1834	1222	917	611	458	306	229
			(48-72)	Fr	0.0007	0.0010	0.0013	0.0020	0.0026	0.0039	0.0052
				Feed (ipm)	1.2	1.2	1.2	1.2	1.2	1.2	1.2
		≤ 425 Bhn or ≤ 45 HRc	35	RPM	1070	713	535	357	267	178	134
			(28-42)	Fr	0.0004	0.0006	0.0007	0.0011	0.0015	0.0022	0.0030
				Feed (ipm)	0.4	0.4	0.4	0.4	0.4	0.4	0.4
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250 Bhn or ≤ 24 HRc	35	RPM	1070	713	535	357	267	178	134
			(28-42)	Fr	0.0004	0.0006	0.0007	0.0011	0.0015	0.0022	0.0030
				Feed (ipm)	0.4	0.4	0.4	0.4	0.4	0.4	0.4
		≤ 375 Bhn or ≤ 40 HRc	25	RPM	764	509	382	255	191	127	96
			(20-30)	Fr	0.0003	0.0004	0.0005	0.0008	0.0010	0.0016	0.0021
				Feed (ipm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F 440F	≤ 250 Bhn or ≤ 24 HRc	53	RPM	1620	1080	810	540	405	270	202
			(42-64)	Fr	0.0004	0.0006	0.0009	0.0013	0.0017	0.0026	0.0035
				Feed (ipm)	0.7	0.7	0.7	0.7	0.7	0.7	0.7
		≤ 330 Bhn or ≤ 36 HRc	46	RPM	1406	937	703	469	351	234	176
			(37-55)	Fr	0.0004	0.0005	0.0007	0.0011	0.0014	0.0021	0.0028
				Feed (ipm)	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	STAINLESS STEELS (DIFFICULT) 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	≤ 275 Bhn or ≤ 28 HRc	28	RPM	856	570	428	285	214	143	107
			(22-34)	Fr	0.0005	0.0007	0.0009	0.0014	0.0019	0.0028	0.0037
				Feed (ipm)	0.4	0.4	0.4	0.4	0.4	0.4	0.4
		≤ 375 Bhn or ≤ 40 HRc	21	RPM	642	428	321	214	160	107	80
			(17-25)	Fr	0.0002	0.0002	0.0003	0.0005	0.0006	0.0009	0.0012
				Feed (ipm)	0.1	0.1	0.1	0.1	0.1	0.1	0.1
K	CAST IRONS Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	105	RPM	3209	2139	1604	1070	802	535	401
			(84-126)	Fr	0.0009	0.0014	0.0018	0.0027	0.0036	0.0054	0.0072
				Feed (ipm)	2.9	2.9	2.9	2.9	2.9	2.9	2.9
		≤ 330 Bhn or ≤ 36 HRc	75	RPM	2292	1528	1146	764	573	382	287
			(60-90)	Fr	0.0009	0.0014	0.0018	0.0027	0.0037	0.0055	0.0073
				Feed (ipm)	2.1	2.1	2.1	2.1	2.1	2.1	2.1

continued on next page

3 Flute Countersink

Series 603 Fractional	Hardness	Vc (sfm)		DC • in						
				1/8	3/16	1/4	3/8	1/2	3/4	1
N	ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075	225 (180-270)	RPM	6876	4584	3438	2292	1719	1146	860
			Fr	0.0011	0.0017	0.0023	0.0034	0.0045	0.0068	0.0091
			Feed (ipm)	7.8	7.8	7.8	7.8	7.8	7.8	7.8
		190 (152-228)	RPM	5806	3871	2903	1935	1452	968	726
			Fr	0.0011	0.0017	0.0022	0.0034	0.0045	0.0067	0.0090
			Feed (ipm)	6.5	6.5	6.5	6.5	6.5	6.5	6.5
	COPPER ALLOYS Alum Bronze, C110, Muntz Brass	95 (76-114)	RPM	2903	1935	1452	968	726	484	363
			Fr	0.0006	0.0009	0.0012	0.0018	0.0023	0.0035	0.0047
			Feed (ipm)	1.7	1.7	1.7	1.7	1.7	1.7	1.7
		80 (64-96)	RPM	2445	1630	1222	815	611	407	306
			Fr	0.0006	0.0009	0.0011	0.0017	0.0023	0.0034	0.0046
			Feed (ipm)	1.4	1.4	1.4	1.4	1.4	1.4	1.4
S	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy 800, Monel 400, Rene, Waspaloy	18 (14-22)	RPM	550	367	275	183	138	92	69
			Fr	0.0004	0.0005	0.0007	0.0011	0.0015	0.0022	0.0029
			Feed (ipm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2
		14 (11-17)	RPM	428	285	214	143	107	71	53
			Fr	0.0002	0.0004	0.0005	0.0007	0.0009	0.0014	0.0019
			Feed (ipm)	0.1	0.1	0.1	0.1	0.1	0.1	0.1
		12 (10-14)	RPM	367	244	183	122	92	61	46
			Fr	0.0003	0.0004	0.0005	0.0008	0.0011	0.0016	0.0022
			Feed (ipm)	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V	36 (29-43)	RPM	1100	733	550	367	275	183	138
			Fr	0.0007	0.0011	0.0015	0.0022	0.0029	0.0044	0.0058
			Feed (ipm)	0.8	0.8	0.8	0.8	0.8	0.8	0.8
		28 (22-34)	RPM	856	570	428	285	214	143	107
			Fr	0.0006	0.0009	0.0012	0.0018	0.0023	0.0035	0.0047
			Feed (ipm)	0.5	0.5	0.5	0.5	0.5	0.5	0.5
H	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	20 (16-24)	RPM	611	407	306	204	153	102	76
			Fr	0.0002	0.0002	0.0003	0.0005	0.0007	0.0010	0.0013
			Feed (ipm)	0.1	0.1	0.1	0.1	0.1	0.1	0.1
			RPM							
			Fr							
			Feed (ipm)							

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)

rpm = Vc x 3.82 / DC

ipm = Fr x rpm

reduce speed and feed for materials harder than listed

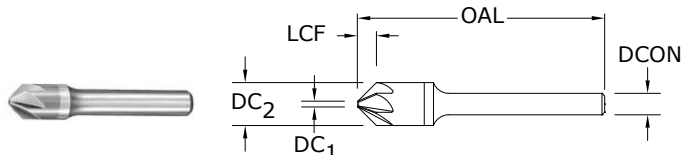
refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)

6 Flute Countersink



606

FRACTIONAL SERIES



CUTTING DIAMETER DC ₂	SHANK DIAMETER DCON	inch			EDP NO.		
		OVERALL LENGTH OAL	FLUTE LENGTH LCF	TIP DIAMETER DC ₁	UNCOATED 60°	UNCOATED 82°	UNCOATED 90°
1/8	1/8	1-1/2	.050	.025	—	—	74249
1/8	1/8	1-1/2	.058	.025	—	74149	—
1/8	1/8	1-1/2	.087	.025	74049	—	—
3/16	3/16	2	.076	.035	—	—	74252
3/16	3/16	2	.088	.035	—	74152	—
3/16	3/16	2	.132	.035	74052	—	—
1/4	1/4	2	.100	.050	—	—	74255
1/4	1/4	2	.115	.050	—	74155	—
1/4	1/4	2	.173	.050	74055	—	—
*3/8	1/4	2-11/16	.148	.080	—	—	74258
*3/8	1/4	2-11/16	.170	.080	—	74158	—
*3/8	1/4	2-13/16	.255	.080	74058	—	—
*1/2	1/4	2-3/4	.180	.140	—	—	74261
*1/2	1/4	2-3/4	.207	.140	—	74161	—
*1/2	1/4	2-7/8	.312	.140	74061	—	—
*5/8	3/8	2-57/64	.228	.170	—	—	74264
*5/8	3/8	2-57/64	.262	.170	—	74164	—
*5/8	3/8	3	.394	.170	74064	—	—
*3/4	1/2	2-57/64	.275	.200	—	—	74267
*3/4	1/2	2-57/64	.316	.200	—	74167	—
*3/4	1/2	3	.476	.200	74067	—	—
*1	1/2	3	.380	.240	—	—	74270
*1	1/2	3	.437	.240	—	74170	—
*1	1/2	3-1/4	.658	.240	74070	—	—

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

NOTE: DC₁ dimension varies based on angle. Contact your KSPT representative or consult KYOCERA SGS APEX for dimension information.

TOLERANCES (inch)

1/8-1/4 DIAMETER

DC = +0.0000/-0.0005

3/8-1 DIAMETER

DC = +0.003/-0.000

Included Angle +1°/-1°

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

6 Flute Countersink

Series 606 Fractional				DC • in							
Hardness		Vc (sfm)		1/8	3/16	1/4	3/8	1/2	3/4	1	
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	125	RPM	3820	2547	1910	1273	955	637	478
			(100-150)	Fr	0.0010	0.0016	0.0021	0.0031	0.0042	0.0063	0.0084
				Feed (ipm)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
		≤ 300 Bhn or ≤ 32 HRc	60	RPM	1834	1222	917	611	458	306	229
				Fr	0.0010	0.0015	0.0020	0.0029	0.0039	0.0059	0.0079
			(48-72)	Feed (ipm)	1.8	1.8	1.8	1.8	1.8	1.8	1.8
		≤ 425 Bhn or ≤ 45 HRc	45	RPM	1375	917	688	458	344	229	172
				Fr	0.0006	0.0009	0.0012	0.0017	0.0023	0.0035	0.0047
			(36-54)	Feed (ipm)	0.8	0.8	0.8	0.8	0.8	0.8	0.8
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc	95	RPM	2903	1935	1452	968	726	484	363
				Fr	0.0009	0.0013	0.0018	0.0027	0.0036	0.0054	0.0072
			(76-114)	Feed (ipm)	2.6	2.6	2.6	2.6	2.6	2.6	2.6
		≤ 375 Bhn or ≤ 40 HRc	60	RPM	1834	1222	917	611	458	306	229
				Fr	0.0009	0.0014	0.0019	0.0028	0.0037	0.0056	0.0074
			(48-72)	Feed (ipm)	1.7	1.7	1.7	1.7	1.7	1.7	1.7
		≤ 425 Bhn or ≤ 45 HRc	35	RPM	1070	713	535	357	267	178	134
				Fr	0.0006	0.0008	0.0011	0.0017	0.0022	0.0034	0.0045
			(28-42)	Feed (ipm)	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250 Bhn or ≤ 24 HRc	35	RPM	1070	713	535	357	267	178	134
				Fr	0.0006	0.0008	0.0011	0.0017	0.0022	0.0034	0.0045
			(28-42)	Feed (ipm)	0.6	0.6	0.6	0.6	0.6	0.6	0.6
		≤ 375 Bhn or ≤ 40 HRc	25	RPM	764	509	382	255	191	127	96
				Fr	0.0003	0.0004	0.0005	0.0008	0.0010	0.0016	0.0021
			(20-30)	Feed (ipm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F 440F	≤ 250 Bhn or ≤ 24 HRc	53	RPM	1620	1080	810	540	405	270	202
				Fr	0.0006	0.0009	0.0012	0.0019	0.0025	0.0037	0.0049
			(42-64)	Feed (ipm)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
		≤ 330 Bhn or ≤ 36 HRc	46	RPM	1406	937	703	469	351	234	176
				Fr	0.0005	0.0007	0.0010	0.0015	0.0020	0.0030	0.0040
			(37-55)	Feed (ipm)	0.7	0.7	0.7	0.7	0.7	0.7	0.7
	STAINLESS STEELS (DIFFICULT) 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	≤ 275 Bhn or ≤ 28 HRc	28	RPM	856	570	428	285	214	143	107
				Fr	0.0007	0.0011	0.0014	0.0021	0.0028	0.0042	0.0056
			(22-34)	Feed (IPM)	0.6	0.6	0.6	0.6	0.6	0.6	0.6
		≤ 375 Bhn or ≤ 40 HRc	21	RPM	642	428	321	214	160	107	80
				Fr	0.0003	0.0005	0.0006	0.0009	0.0012	0.0019	0.0025
			(17-25)	Feed (IPM)	0.2	0.2	0.2	0.2	0.2	0.2	0.2

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6 Flute Countersink

Series 606 Fractional			DC • in							
	Hardness	Vc (sfm)		1/8	3/16	1/4	3/8	1/2	3/4	1
K	CAST IRONS Gray, Malleable, Ductile	105 (84-126)	RPM	3209	2139	1604	1070	802	535	401
			Fr	0.0012	0.0018	0.0024	0.0036	0.0049	0.0073	0.0097
			Feed (ipm)	3.9	3.9	3.9	3.9	3.9	3.9	3.9
		75 (60-90)	RPM	2292	1528	1146	764	573	382	287
			Fr	0.0012	0.0018	0.0024	0.0037	0.0049	0.0073	0.0098
			Feed (ipm)	2.8	2.8	2.8	2.8	2.8	2.8	2.8
N	ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075	225 (180-270)	RPM	6876	4584	3438	2292	1719	1146	860
			Fr	0.0015	0.0022	0.0030	0.0045	0.0060	0.0090	0.0120
			Feed (ipm)	10.3	10.3	10.3	10.3	10.3	10.3	10.3
		190 (152-228)	RPM	5806	3871	2903	1935	1452	968	726
			Fr	0.0015	0.0022	0.0030	0.0045	0.0060	0.0090	0.0120
			Feed (ipm)	8.7	8.7	8.7	8.7	8.7	8.7	8.7
	COPPER ALLOYS Alum Bronze, C110, Muntz Brass	95 (76-114)	RPM	2903	1935	1452	968	726	484	363
			Fr	0.0008	0.0011	0.0015	0.0023	0.0030	0.0045	0.0061
			Feed (ipm)	2.2	2.2	2.2	2.2	2.2	2.2	2.2
		80 (64-96)	RPM	2445	1630	1222	815	611	407	306
			Fr	0.0008	0.0012	0.0016	0.0023	0.0031	0.0047	0.0062
			Feed (ipm)	1.9	1.9	1.9	1.9	1.9	1.9	1.9

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6 Flute Countersink

Series 606 Fractional	Hardness	Vc (sfm)		DC • in						
				1/8	3/16	1/4	3/8	1/2	3/4	1
S	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy 800, Monel 400, Rene, Waspaloy	18 (14-22)	RPM	550	367	275	183	138	92	69
			Fr	0.0005	0.0008	0.0011	0.0016	0.0022	0.0033	0.0044
			Feed (ipm)	0.3	0.3	0.3	0.3	0.3	0.3	0.3
		14 (11-17)	RPM	428	285	214	143	107	71	53
			Fr	0.0005	0.0007	0.0009	0.0014	0.0019	0.0028	0.0037
			Feed (ipm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2
		12 (10-14)	RPM	367	244	183	122	92	61	46
			Fr	0.0003	0.0004	0.0005	0.0008	0.0011	0.0016	0.0022
			Feed (ipm)	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V	36 (29-43)	RPM	1100	733	550	367	275	183	138
			Fr	0.0009	0.0014	0.0018	0.0027	0.0036	0.0055	0.0073
			Feed (ipm)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
		28 (22-34)	RPM	856	570	428	285	214	143	107
			Fr	0.0007	0.0011	0.0014	0.0021	0.0028	0.0042	0.0056
			Feed (ipm)	0.6	0.6	0.6	0.6	0.6	0.6	0.6
		21 (17-25)	RPM	642	428	321	214	160	107	80
			Fr	0.0003	0.0005	0.0006	0.0009	0.0012	0.0019	0.0025
			Feed (ipm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2
H	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	20 (16-24)	RPM	611	407	306	204	153	102	76
			Fr	0.0003	0.0005	0.0007	0.0010	0.0013	0.0020	0.0026
			Feed (ipm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)

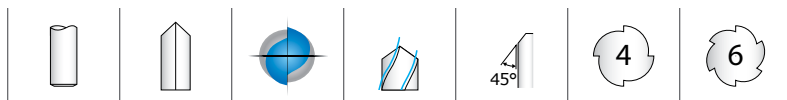
rpm = Vc x 3.82 / DC

ipm = Fr x rpm

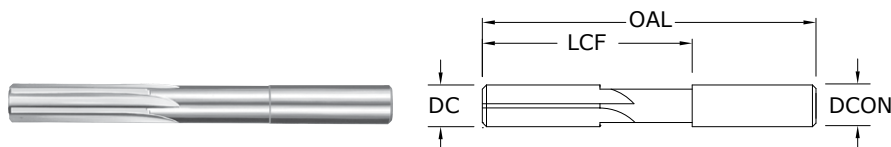
reduce speed and feed for materials harder than listed

refer to the **KYOCERA SGS APEX** for complete technical information (www.kyocera-sgstool.com/apex)

Straight Flute Accu-Reamer

**200**

FRACTIONAL SERIES



inch					EDP NO.
CUTTING DIAMETER DC	SHANK DIAMETER DCON	MAXIMUM REAM LENGTH LCF	OVERALL LENGTH OAL	NO. OF FLUTES	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

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TOLERANCES (inch)

DC = +0.0002/-0.0000

DCON = +0.0002/-0.0000

STEELS

STAINLESS STEELS

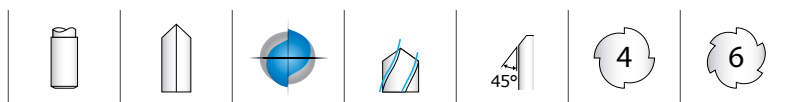
CAST IRON

NON-FERROUS

HIGH TEMP ALLOYS

HARDENED STEELS

Straight Flute Accu-Reamer


200

FRACTIONAL SERIES

CONTINUED

inch				NO. OF FLUTES
CUTTING DIAMETER DC	SHANK DIAMETER DCON	MAXIMUM REAM LENGTH LCF	OVERALL LENGTH OAL	
.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 – .1562	5/32	1-1/2	2-1/2	4
.1563 – .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 – .2812	9/32	2-1/4	3-1/4	6
.2813 – .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 – .4062	13/32	2-7/8	4	6
.4063 – .4219	27/64	2-7/8	4	6
.4220 – .4375	7/16	2-7/8	4	6
.4376 – .4531	29/64	2-7/8	4	6
.4532 – .4688	15/32	2-7/8	4	6
.4689 – .4844	31/64	2-7/8	4	6
.4845 – .5000	1/2	2-7/8	4	6

SER 200 Metric reamers can be ordered to specific diameters according to the size range of Cutting Diameter DC. Please order as:

- 200. Then the size of the cut diameter in decimal format.
- i.e. 200.0492
- Description: Series 200 size 0.0492
- For Metric sizes convert to decimal inches (i.e. $\div 25.4$)
- The above sample would be a 1.25mm size ($1.25 \div 25.4 = 0.0492$)

All other dimensions are fractional as per table including the Shank

Straight Flute Accu-Reamer

Series 200 Fractional	Hardness	Vc (sfm)		DC • in						
				1/16	1/8	3/16	1/4	5/16	3/8	1/2
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	150	RPM	9168	4584	3056	2292	1834	1528	1146
		≤ 175 Bhn or ≤ 7 HRc (120-180)	Fr	0.0018	0.0035	0.0053	0.0071	0.0088	0.0106	0.0141
			Feed (ipm)	16.5	16.0	16.2	16.3	16.1	16.2	16.2
		75	RPM	4584	2292	1528	1146	917	764	573
		≤ 300 Bhn or ≤ 32 HRc (60-90)	Fr	0.0016	0.0031	0.0047	0.0062	0.0078	0.0093	0.0124
			Feed (ipm)	7.3	7.1	7.2	7.1	7.2	7.1	7.1
		55	RPM	3362	1681	1121	840	672	560	420
		≤ 425 Bhn or ≤ 45 HRc (44-66)	Fr	0.0009	0.0019	0.0028	0.0037	0.0046	0.0056	0.0074
			Feed (ipm)	3.0	3.2	3.1	3.1	3.1	3.1	3.1
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	115	RPM	7029	3514	2343	1757	1406	1171	879
		≤ 275 Bhn or ≤ 28 HRc (92-138)	Fr	0.0015	0.0030	0.0045	0.0060	0.0075	0.0090	0.0120
			Feed (ipm)	10.5	10.5	10.5	10.5	10.5	10.5	10.5
		70	RPM	4278	2139	1426	1070	856	713	535
		≤ 375 Bhn or ≤ 40 HRc (56-84)	Fr	0.0015	0.0030	0.0045	0.0060	0.0075	0.0090	0.0120
			Feed (ipm)	6.4	6.4	6.4	6.4	6.4	6.4	6.4
		45	RPM	2750	1375	917	688	550	458	344
		≤ 425 Bhn or ≤ 45 HRc (36-54)	Fr	0.0009	0.0019	0.0028	0.0037	0.0046	0.0056	0.0074
			Feed (ipm)	2.5	2.6	2.6	2.5	2.5	2.6	2.5
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	40	RPM	2445	1222	815	611	489	407	306
		≤ 250 Bhn or ≤ 24 HRc (32-48)	Fr	0.0010	0.0020	0.0029	0.0039	0.0049	0.0059	0.0078
			Feed (ipm)	2.4	2.4	2.4	2.4	2.4	2.4	2.4
		25	RPM	1528	764	509	382	306	255	191
		≤ 375 Bhn or ≤ 40 HRc (20-30)	Fr	0.0006	0.0013	0.0019	0.0025	0.0031	0.0038	0.0050
			Feed (ipm)	0.9	1.0	1.0	1.0	0.9	1.0	1.0
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F 440F	75	RPM	4584	2292	1528	1146	917	764	573
		≤ 250 Bhn or ≤ 24 HRc (60-90)	Fr	0.0010	0.0020	0.0029	0.0039	0.0049	0.0059	0.0078
			Feed (ipm)	4.6	4.6	4.4	4.5	4.5	4.5	4.5
		55	RPM	3362	1681	1121	840	672	560	420
		≤ 330 Bhn or ≤ 36 HRc (44-66)	Fr	0.0008	0.0015	0.0023	0.0030	0.0038	0.0045	0.0060
			Feed (ipm)	2.7	2.5	2.6	2.5	2.6	2.5	2.5
	STAINLESS STEELS (DIFFICULT) 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	35	RPM	2139	1070	713	535	428	357	267
		≤ 275 Bhn or ≤ 28 HRc (28-42)	Fr	0.0010	0.0020	0.0029	0.0039	0.0049	0.0059	0.0078
			Feed (ipm)	2.1	2.1	2.1	2.1	2.1	2.1	2.1
		25	RPM	1528	764	509	382	306	255	191
		≤ 375 Bhn or ≤ 40 HRc (20-30)	Fr	0.0006	0.0013	0.0019	0.0025	0.0031	0.0038	0.0050
			Feed (ipm)	0.9	1.0	1.0	1.0	0.9	1.0	1.0
K	CAST IRONS Gray, Malleable, Ductile	125	RPM	7640	3820	2547	1910	1528	1273	955
		≤ 220 Bhn or ≤ 19 HRc (100-150)	Fr	0.0020	0.0040	0.0060	0.0081	0.0101	0.0121	0.0161
			Feed (ipm)	15.3	15.3	15.3	15.5	15.4	15.4	15.4
		95	RPM	5806	2903	1935	1452	1161	968	726
		≤ 330 Bhn or ≤ 36 HRc (76-114)	Fr	0.0020	0.0040	0.0060	0.0081	0.0101	0.0121	0.0161
			Feed (ipm)	11.6	11.6	11.6	11.8	11.7	11.7	11.7

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Straight Flute Accu-Reamer

	Series 200 Fractional	Hardness	Vc (sfm)	DC • in							
	1/16			1/8	3/16	1/4	5/16	3/8	1/2		
N	ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075	≤ 80 Bhn or ≤ 47 HRb	270	RPM	16502	8251	5501	4126	3300	2750	2063
			(216-324)	Fr	0.0025	0.0050	0.0075	0.0100	0.0125	0.0150	0.0200
				Feed (ipm)	41.3	41.3	41.3	41.3	41.3	41.3	41.3
		≤ 150 Bhn or ≤ 88 HRb	230	RPM	14058	7029	4686	3514	2812	2343	1757
			(184-276)	Fr	0.0025	0.0050	0.0075	0.0100	0.0125	0.0150	0.0200
				Feed (ipm)	35.1	35.1	35.1	35.1	35.1	35.1	35.1
	COPPER ALLOYS Alum Bronze, C110, Muntz Brass	≤ 140 Bhn or ≤ 3 HRc	115	RPM	7029	3514	2343	1757	1406	1171	879
			(92-138)	Fr	0.0013	0.0026	0.0038	0.0051	0.0064	0.0077	0.0102
				Feed (ipm)	9.1	9.1	8.9	9.0	9.0	9.0	9.0
		≤ 200 Bhn or ≤ 23 HRc	95	RPM	5806	2903	1935	1452	1161	968	726
			(76-114)	Fr	0.0013	0.0026	0.0038	0.0051	0.0064	0.0077	0.0102
				Feed (ipm)	7.5	7.5	7.4	7.4	7.4	7.5	7.4
S	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy 800, Monel 400, Rene, Waspaloy	≤ 220 Bhn or ≤ 19 HRc	20	RPM	1222	611	407	306	244	204	153
			(16-24)	Fr	0.0008	0.0015	0.0023	0.0030	0.0038	0.0045	0.0060
				Feed (ipm)	1.0	0.9	0.9	0.9	0.9	0.9	0.9
		≤ 320 Bhn or ≤ 34 HRc	15	RPM	917	458	306	229	183	153	115
			(12-18)	Fr	0.0006	0.0013	0.0019	0.0025	0.0031	0.0038	0.0050
				Feed (ipm)	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V	≤ 425 Bhn or ≤ 45 HRc	10	RPM	611	306	204	153	122	102	76
			(8-12)	Fr	0.0004	0.0007	0.0011	0.0015	0.0018	0.0022	0.0029
				Feed (ipm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2
		≤ 275 Bhn or ≤ 28 HRc	45	RPM	2750	1375	917	688	550	458	344
			(36-54)	Fr	0.0015	0.0030	0.0045	0.0060	0.0075	0.0090	0.0120
				Feed (ipm)	4.1	4.1	4.1	4.1	4.1	4.1	4.1
H	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 475 Bhn or ≤ 50 HRc	35	RPM	2139	1070	713	535	428	357	267
			(28-42)	Fr	0.0010	0.0020	0.0029	0.0039	0.0049	0.0059	0.0078
				Feed (ipm)	2.1	2.1	2.1	2.1	2.1	2.1	2.1
		≤ 440 Bhn or ≤ 47 HRc	25	RPM	1528	764	509	382	306	255	191
			(20-30)	Fr	0.0006	0.0013	0.0019	0.0025	0.0031	0.0038	0.0050
				Feed (ipm)	0.9	1.0	1.0	1.0	0.9	1.0	1.0
H	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 475 Bhn or ≤ 50 HRc	20	RPM	1222	611	407	306	244	204	153
			(16-24)	Fr	0.0004	0.0008	0.0012	0.0016	0.0019	0.0023	0.0031
				Feed (ipm)	0.5	0.5	0.5	0.5	0.5	0.5	0.5
		≤ 655 Bhn or ≤ 60 HRc	14	RPM	856	428	285	214	171	143	107
			(11-17)	Fr	0.0003	0.0007	0.0011	0.0014	0.0018	0.0021	0.0028
				Feed (ipm)	0.3	0.3	0.3	0.3	0.3	0.3	0.3

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)

rpm = Vc x 3.82 / DC

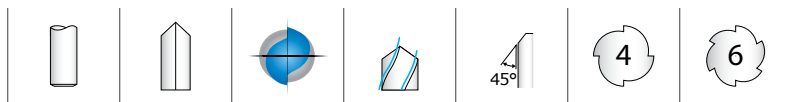
ipm = Fr x rpm

increase speed and feed 30 percent when using coated reamers

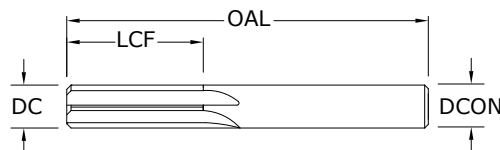
reduce speed and feed for materials harder than listed

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)

Straight Flute Reamer



201M
METRIC SERIES



CUTTING DIAMETER DC	SHANK DIAMETER DCON	mm		NO. OF FLUTES	EDP NO. UNCOATED
		MAXIMUM REAM LENGTH LCF	OVERALL LENGTH OAL		
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

TOLERANCES (mm)

1-6 DIAMETER

DC = +0,008/-0,000

>6-10 DIAMETER

DC = +0,010/-0,000

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

Straight Flute Reamer

Series 201M Metric	Hardness	Vc (m/min)	DC • mm							
			1	2	3	4	6	8	10	
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	46 or ≤ 7 HRc (37-55)	RPM	14541	7271	4847	3635	2424	1818	1454
			Fr	0.028	0.056	0.085	0.113	0.169	0.226	0.282
			Feed (mm/min)	410	410	410	410	410	410	410
		23 or ≤ 32 HRc (18-27)	RPM	7271	3635	2424	1818	1212	909	727
			Fr	0.025	0.050	0.074	0.099	0.149	0.198	0.248
			Feed (mm/min)	180	180	180	180	180	180	180
		17 or ≤ 45 HRc (13-20)	RPM	5332	2666	1777	1333	889	666	533
			Fr	0.015	0.030	0.044	0.059	0.089	0.119	0.148
			Feed (mm/min)	79	79	79	79	79	79	79
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	35 or ≤ 28 HRc (28-42)	RPM	11148	5574	3716	2787	1858	1394	1115
			Fr	0.024	0.048	0.072	0.096	0.144	0.192	0.240
			Feed (mm/min)	268	268	268	268	268	268	268
		21 or ≤ 40 HRc (17-26)	RPM	6786	3393	2262	1696	1131	848	679
			Fr	0.024	0.048	0.072	0.096	0.144	0.192	0.240
			Feed (mm/min)	163	163	163	163	163	163	163
		14 or ≤ 45 HRc (11-16)	RPM	4362	2181	1454	1091	727	545	436
			Fr	0.015	0.030	0.045	0.060	0.089	0.119	0.149
			Feed (mm/min)	65	65	65	65	65	65	65
	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	12 or ≤ 24 HRc (10-15)	RPM	3878	1939	1293	969	646	485	388
			Fr	0.015	0.031	0.046	0.062	0.093	0.124	0.155
			Feed (mm/min)	60	60	60	60	60	60	60
		8 or ≤ 40 HRc (6-9)	RPM	2424	1212	808	606	404	303	242
			Fr	0.010	0.020	0.030	0.040	0.059	0.079	0.099
			Feed (mm/min)	24	24	24	24	24	24	24
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F 440F	23 or ≤ 24 HRc (18-27)	RPM	7271	3635	2424	1818	1212	909	727
			Fr	0.015	0.030	0.045	0.059	0.089	0.119	0.149
			Feed (mm/min)	108	108	108	108	108	108	108
		17 or ≤ 36 HRc (13-20)	RPM	5332	2666	1777	1333	889	666	533
			Fr	0.012	0.024	0.036	0.048	0.072	0.096	0.120
			Feed (mm/min)	64	64	64	64	64	64	64
	STAINLESS STEELS (DIFFICULT) 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	11 or ≤ 28 HRc (9-13)	RPM	3393	1696	1131	848	565	424	339
			Fr	0.015	0.029	0.044	0.059	0.088	0.118	0.147
			Feed (mm/min)	50	50	50	50	50	50	50
		8 or ≤ 40 HRc (6-9)	RPM	2424	1212	808	606	404	303	242
			Fr	0.010	0.020	0.030	0.040	0.059	0.079	0.099
			Feed (mm/min)	24	24	24	24	24	24	24

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Straight Flute Reamer

Series 201M Metric	Hardness	Vc (m/min)	DC • mm								
			1	2	3	4	6	8	10		
K	CAST IRONS Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	38	RPM	12118	6059	4039	3029	2020	1515	1212
		(30-46)	Fr	0.032	0.064	0.097	0.129	0.193	0.257	0.322	
			Feed (mm/min)	390	390	390	390	390	390	390	
		≤ 330 Bhn or ≤ 36 HRc	29	RPM	9209	4605	3070	2302	1535	1151	921
		(23-35)	Fr	0.032	0.064	0.096	0.128	0.192	0.256	0.320	
			Feed (mm/min)	295	295	295	295	295	295	295	
N	ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075	≤ 80 Bhn or ≤ 47 HRb	82	RPM	26174	13087	8725	6544	4362	3272	2617
		(66-99)	Fr	0.040	0.080	0.120	0.160	0.240	0.320	0.400	
			Feed (mm/min)	1047	1047	1047	1047	1047	1047	1047	
		≤ 150 Bhn or ≤ 88 HRb	70	RPM	22297	11148	7432	5574	3716	2787	2230
		(56-84)	Fr	0.040	0.080	0.120	0.160	0.240	0.320	0.400	
			Feed (mm/min)	892	892	892	892	892	892	892	
	COPPER ALLOYS Alum Bronze, C110, Muntz Brass	≤ 140 Bhn or ≤ 3 HRc	35	RPM	11148	5574	3716	2787	1858	1394	1115
		(28-42)	Fr	0.020	0.041	0.061	0.081	0.122	0.163	0.204	
			Feed (mm/min)	227	227	227	227	227	227	227	
		≤ 200 Bhn or ≤ 23 HRc	29	RPM	9209	4605	3070	2302	1535	1151	921
		(23-35)	Fr	0.020	0.041	0.061	0.082	0.122	0.163	0.204	
			Feed (mm/min)	188	188	188	188	188	188	188	

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Straight Flute Reamer

Series 201M Metric	Hardness	Vc (m/min)	DC • mm							
			1	2	3	4	6	8	10	
S	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy 800, Monel 400, Rene, Waspaloy	6	RPM	1939	969	646	485	323	242	194
		(5-7)	Fr	0.012	0.024	0.036	0.047	0.071	0.095	0.119
			Feed (mm/min)	23	23	23	23	23	23	23
		5	RPM	1454	727	485	364	242	182	145
		(4-5)	Fr	0.010	0.021	0.031	0.041	0.062	0.083	0.103
			Feed (mm/min)	15	15	15	15	15	15	15
		3	RPM	969	485	323	242	162	121	97
		(2-4)	Fr	0.006	0.012	0.019	0.025	0.037	0.050	0.062
			Feed (mm/min)	6	6	6	6	6	6	6
	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V	14	RPM	4362	2181	1454	1091	727	545	436
		(11-16)	Fr	0.024	0.048	0.072	0.096	0.144	0.193	0.241
			Feed (mm/min)	105	105	105	105	105	105	105
		11	RPM	3393	1696	1131	848	565	424	339
		(9-13)	Fr	0.015	0.029	0.044	0.059	0.088	0.118	0.147
			Feed (mm/min)	50	50	50	50	50	50	50
		8	RPM	2424	1212	808	606	404	303	242
		(6-9)	Fr	0.010	0.020	0.030	0.040	0.059	0.079	0.099
			Feed (mm/min)	24	24	24	24	24	24	24
H	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	6	RPM	1939	969	646	485	323	242	194
		(5-7)	Fr	0.006	0.012	0.019	0.025	0.037	0.050	0.062
			Feed (mm/min)	12	12	12	12	12	12	12
		4	RPM	1272	636	424	318	212	159	127
		(3-5)	Fr	0.006	0.013	0.019	0.025	0.038	0.050	0.063
			Feed (mm/min)	8	8	8	8	8	8	8

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)

rpm = (Vc x 1000) / (DC x 3.14)

mm/min = Fr x rpm

increase speed and feed 30 percent when using coated reamers

reduce speed and feed for materials harder than listed

refer to the KYOCERA SGS APEX for complete technical information (www.kyocera-sgstool.com/apex)

Routers



Routing

HIGH PERFORMANCE ROUTERS	SERIES	DESCRIPTION	PAGE	S&F PAGE
Carbon Composite	20-CCR	Multi-Flute Carbon Composite Fractional	390	392
	20M-CCR	Multi-Flute Carbon Composite Metric	390	393
	20-CCR-LHC	Multi-Flute Carbon Composite Left Hand Cut Fractional	391	392
	20M-CCR-LHC	Multi-Flute Carbon Composite Left Hand Cut Metric	391	393
Coarse Cut Carbon Composite	31-CCR	Multi-Flute Coarse Composite Fractional	394	395
	31M-CCR	Multi-Flute Coarse Composite Metric	394	395
Compression	25	Multi-Flute Compression Fractional	397	398
	25M	Multi-Flute Compression Metric	397	399
GENERAL APPLICATION ROUTERS	SERIES	DESCRIPTION	PAGE	S&F PAGE
Up Cut	21	2 Flute Up Cut Fractional	400	402
	21M	2 Flute Up Cut Metric	400	403
Down Cut	22	2 Flute Down Cut Fractional	401	402
	22M	2 Flute Down Cut Metric	401	403

Speed & Feed Recommendations listed after each series

Ranurado

RANURADORES DE ALTO RENDIMIENTO	SERIE	DESCRIPCIÓN	PÁGINA	S&F PÁGINA
Compuesto de carbono	20-CCR	Filo múltiple, compuesto de carbono, fraccional	390	392
	20M-CCR	Filo múltiple, compuesto de carbono, métrico	390	393
	20-CCR-LHC	Filo múltiple, carbon composite corte hélice izquierda fraccional	391	392
	20M-CCR-LHC	Filo múltiple, carbo composite corte hélice izquierda métrico	391	393
Compuesto de carbono de corte grueso	31-CCR	Filo múltiple, compuesto grueso, fraccional	394	395
	31M-CCR	Filo múltiple, compuesto grueso, métrico	394	395
Compresión	25	Filo múltiple, compresión, fraccional	397	398
	25M	Filo múltiple, compresión, métrico	397	399

RANURADORES DE USO GENERAL	SERIE	DESCRIPCIÓN	PÁGINA	S&F PÁGINA
Corte ascendente	21	2 filos, corte ascendente, fraccional	400	402
	21M	2 filos, corte ascendente, métrico	400	403
Corte descendente	22	2 filos, corte descendente, fraccional	401	402
	22M	2 filos, corte descendente, métrico	401	403

Recomendaciones de velocidades y avances mostradas tras cada serie

Détourage

FRAISES A DETOURER HAUTE PERFORMANCE	SÈRIES	DESCRIPTION	PAGE	S&F PAGE
Composites carbone	20-CCR	Multi-dents pour composites carbone (fractionnel)	390	392
	20M-CCR	Multi-dents pour composites carbone (métrique)	390	393
	20-CCR-LHC	Multi-dents carbon composite coupe à gauche (fractionnel)	391	392
	20M-CCR-LHC	Multi-dents carbon composite coupe à gauche (métrique)	391	393
Pour composites carbone coupe grossière	31-CCR	Multi-dents pour composites grossiers (fractionnel)	394	395
	31M-CCR	Multi-dents pour composites grossiers (métrique)	394	395
Compression	25	Multi-dents de compression (fractionnel)	397	398
	25M	Multi-dents de compression (métrique)	397	399

FRAISES À DÉTOURER UNIVERSELLES	SÈRIES	DESCRIPTION	PAGE	S&F PAGE
Coupe ascendante	21	2 dents coupe ascendante (fractionnel)	400	402
	21M	2 dents coupe ascendante (métrique)	400	403
Coupe descendante	22	2 dents coupe descendante (fractionnel)	401	402
	22M	2 dents coupe descendante (métrique)	401	403

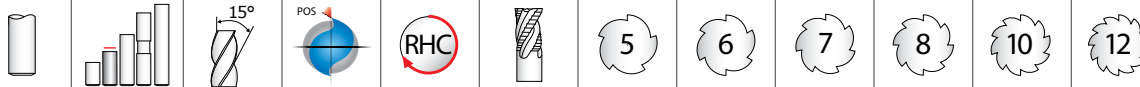
Recommandations de vitesse et avance indiquées après chaque série

HOCHLEISTUNGS-KONTURENFRÄSER	SERIE	BESCHREIBUNG	SEITE	S&F SEITE
Kohlefaserverbundwerkstoff	20-CCR	Zölliger Konturenfräser für Kohlefaserverbundwerkstoff	390	392
	20M-CCR	Konturenfräser für Kohlefaserverbundwerkstoff	390	393
	20-CCR-LHC	Mehrschneider Carbon Composite Links geschnittene zöllig	391	392
	20M-CCR-LHC	Mehrschneider Carbon Composite Links geschnittene metrisch	391	393
Grobschnitt Kohlefaserverbundwerkstoff	31-CCR	Zölliger Konturenfräser für Verbundkunststoff	394	395
	31M-CCR	Konturenfräser für Verbundkunststoff	394	395
Gegenläufiger Drall	25	Zölliger Gegenläufiger Konturenfräser	397	398
	25M	Gegenläufiger Konturenfräser	397	399

STANDARD-KONTURENFRÄSER	SERIE	BESCHREIBUNG	SEITE	S&F SEITE
Rechtsspirale	21	Zölliger VHM-Fräser mit 2 Schneiden (ziehend)	400	402
	21M	VHM-Fräser mit 2 Schneiden (ziehend)	400	403
Linksspirale	22	Zölliger VHM-Fräser mit 2 Schneiden (drückend)	401	402
	22M	VHM-Fräser mit 2 Schneiden (drückend)	401	403

Empfehlungen für Drehzahl & Vorschub im Anhang zu jeder Serie

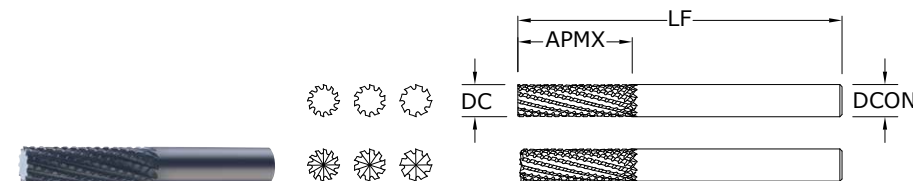
Carbon Composite



20-CCR

FRACTIONAL SERIES

- Multi-flute design and positive geometry to shear with minimal pressure and delamination
- Unique clearance grind minimizes contact between tool diameter and workpiece eliminating friction
- Left hand flutes engineered to control the fibers within CFRP, preventing excessive fiber breakout
- Excels at trimming and profiling difficult and abrasive fiber filled plastics



inch						EDP NO.	
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	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

TOLERANCES (inch)

DC = +.000/-0.005

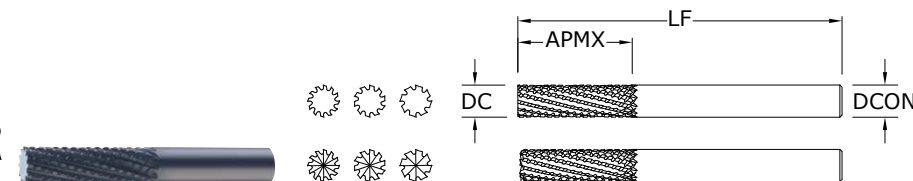
DCON = h₆

NON-FERROUS

20M-CCR

METRIC SERIES

- Multi-flute design and positive geometry to shear with minimal pressure and delamination
- Unique clearance grind minimizes contact between tool diameter and workpiece eliminating friction
- Left hand flutes engineered to control the fibers within CFRP, preventing excessive fiber breakout
- Excels at trimming and profiling difficult and abrasive fiber filled plastics



mm						EDP NO.		
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	NO. OF FLUTES	END STYLE	UNCOATED	Ti-NAMITE-B (TiB ₂)	Di-NAMITE (Diamond)
2,0	6,0	38,0	3,0	5	End Cutting	82930	83100	83070
3,0	10,0	38,0	3,0	6	End Cutting	82931	83101	83071
4,0	12,0	50,0	4,0	7	End Cutting	82932	83102	83072
5,0	15,0	50,0	6,0	8	End Cutting	82933	83103	83073
6,0	25,0	63,0	6,0	8	No End Cutting	82966	83104	83027
6,0	25,0	63,0	6,0	8	End Cutting	82967	83105	83026
8,0	25,0	63,0	8,0	10	No End Cutting	82968	83106	83029
8,0	25,0	63,0	8,0	10	End Cutting	82969	83107	83028
10,0	28,0	63,0	10,0	12	No End Cutting	82970	83108	83042
10,0	28,0	63,0	10,0	12	End Cutting	82971	83109	83041
12,0	38,0	89,0	12,0	12	No End Cutting	82972	83110	83044
12,0	38,0	89,0	12,0	12	End Cutting	82973	83111	83043

TOLERANCES (mm)

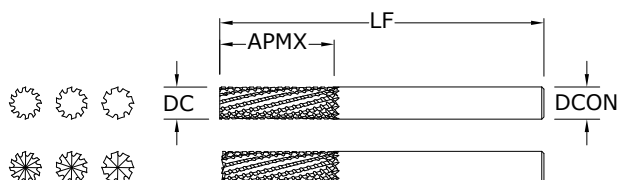
DC = +0,000/-0,130

DCON = h₆

NON-FERROUS



Carbon Composite



TOLERANCES (inch)

DC = +.000/- .005

DCON = h_6

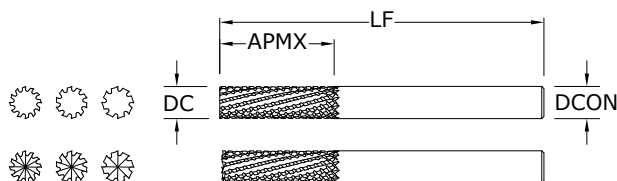
NON-FERROUS

inch						EDP NO.	
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	NO. OF FLUTES	END STYLE	UNCOATED	Di-NAMITE (Diamond)
1/4	1	2-1/2	1/4	8	No End Cutting	73070	73078
1/4	1	2-1/2	1/4	8	End Cutting	73071	73079
5/16	1	2-1/2	5/16	10	No End Cutting	73072	73080
5/16	1	2-1/2	5/16	10	End Cutting	73073	73081
3/8	1-1/8	2-1/2	3/8	12	No End Cutting	73074	73082
3/8	1-1/8	2-1/2	3/8	12	End Cutting	73075	73083

20-CCR-LHC

FRACTIONAL SERIES

- Multi-flute design and positive geometry to shear with minimal pressure and delamination
- Unique clearance grind minimizes contact between tool diameter and workpiece eliminating friction
- Left hand flutes engineered to control the fibers within CFRP, preventing excessive fiber breakout
- Excels at trimming and profiling difficult and abrasive fiber filled plastics



TOLERANCES (mm)

DC = +0,000/-0,130

DCON = h_6

NON-FERROUS

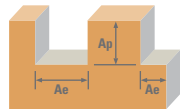
mm						EDP NO.	
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	NO. OF FLUTES	END STYLE	UNCOATED	Di-NAMITE (Diamond)
6,0	25,0	63,0	6,0	8	No End Cutting	83220	83230
6,0	25,0	63,0	6,0	8	End Cutting	83221	83231
8,0	25,0	63,0	8,0	10	No End Cutting	83222	83232
8,0	25,0	63,0	8,0	10	End Cutting	83223	83233
10,0	28,0	63,0	10,0	12	No End Cutting	83224	83234
10,0	28,0	63,0	10,0	12	End Cutting	83225	83235

20M-CCR-LHC

METRIC SERIES

- Multi-flute design and positive geometry to shear with minimal pressure and delamination
- Unique clearance grind minimizes contact between tool diameter and workpiece eliminating friction
- Left hand flutes engineered to control the fibers within CFRP, preventing excessive fiber breakout
- Excels at trimming and profiling difficult and abrasive fiber filled plastics

Carbon Composite



Series 20 Fractional			Vc (sfm)	DC • in						
	Ae x DC	Ap x DC			1/4	5/16	3/8	1/2		
N	CFRP, AFRP (CARBON FIBER, ARAMID FIBER)		1	≤ 1	400 (320-480)	RPM	6112	4890	4075	3056
						Fr	0.0049	0.0094	0.0135	0.0180
						Feed (ipm)	30	46	55	55
			≤ 0.5	≤ 1.5	500 (400-600)	RPM	7640	6112	5093	3820
						Fr	0.0049	0.0094	0.0135	0.0180
						Feed (ipm)	38	58	69	69
			≤ 0.05	≤ 2	825 (660-990)	RPM	12606	10085	8404	6303
						Fr	0.0111	0.0215	0.0309	0.0413
						Feed (ipm)	140	217	260	260
	GFRP (FIBERGLASS)		1	≤ 1	320 (256-384)	RPM	4890	3912	3260	2445
						Fr	0.0049	0.0095	0.0135	0.0180
						Feed (ipm)	24	37	44	44
			≤ 0.5	≤ 1.5	400 (320-480)	RPM	6112	4890	4075	3056
						Fr	0.0049	0.0095	0.0135	0.0180
						Feed (ipm)	30	46	55	55
			≤ 0.05	≤ 2	660 (528-792)	RPM	10085	8068	6723	5042
						Fr	0.0110	0.0214	0.0311	0.0414
						Feed (ipm)	111	173	209	209
	CARBON, GRAPHITE		1	≤ 1	480 (384-576)	RPM	7334	5868	4890	3667
						Fr	0.0064	0.0124	0.0180	0.0240
						Feed (ipm)	47	73	88	88
			≤ 0.5	≤ 1.5	600 (480-720)	RPM	9168	7334	6112	4584
						Fr	0.0064	0.0124	0.0180	0.0240
						Feed (ipm)	59	91	110	110
			≤ 0.05	≤ 2	990 (792-1188)	RPM	15127	12102	10085	7564
						Fr	0.0147	0.0287	0.0412	0.0549
						Feed (ipm)	223	347	415	415
	PLASTICS		1	≤ 1	665 (640-690)	RPM	10161	8129	6774	5081
						Fr	0.0077	0.0150	0.0217	0.0241
						Feed (ipm)	78	122	147	147
			≤ 0.5	≤ 1.5	1000 (800-1200)	RPM	15280	12224	10187	7640
						Fr	0.0077	0.0150	0.0217	0.0241
						Feed (ipm)	118	183	221	184
			≤ 0.05	≤ 2	1650 (1320-1980)	RPM	25212	20170	16808	12606
						Fr	0.0147	0.0287	0.0413	0.0551
						Feed (ipm)	370	579	694	694

HSM (high speed machining)

rpm = Vc x 3.82 / DC

ipm = Fr x rpm

adjust parameters based on resin type and fiber structure

reduce speed when overheating causes melting or damage to resin

reduce feed if delamination or fraying occur

finish cuts typically required reduced feed and cutting depths

rates shown are for use without coolant; rates may be increased with coolant

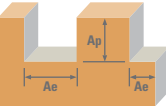
dust collection is vital when machining dry

diamond coating will increase tool life in graphite and composite materials

refer to the KYOCERA SGS APEX for complete technical information

www.kyocera-sgstool.com/apex

Carbon Composite

Series 20M Metric				Vc (m/min)	DC • mm						
	Ae x DC	Ap x DC			3	6	8	10	12		
N	CFRP, AFRP (CARBON FIBER, ARAMID FIBER)		1	≤ 1	120 (96-164)	RPM	12722	6361	4771	3817	3181
						Fr	0.055	0.113	0.243	0.366	0.439
						Feed (mm/min)	700	720	1160	1395	1395
			≤ 0.5	≤ 1.5	150 (120-180)	RPM	15903	7951	5963	4771	3976
						Fr	0.055	0.113	0.243	0.366	0.439
						Feed (mm/min)	875	900	1450	1744	1744
			≤ 0.05	≤ 2	250 (200-300)	RPM	26504	13252	9939	7951	6626
						Fr	0.126	0.260	0.556	0.833	1.000
						Feed (mm/min)	3350	3450	5527	6625	6625
	GFRP (FIBERGLASS)		1	≤ 1	100 (80-120)	RPM	10602	5301	3976	3181	2650
						Fr	0.054	0.111	0.236	0.357	0.428
						Feed (mm/min)	570	587	940	1135	1135
			≤ 0.5	≤ 1.5	120 (96-164)	RPM	12722	6361	4771	3817	3181
						Fr	0.054	0.111	0.236	0.357	0.428
						Feed (mm/min)	684	704	1128	1362	1362
			≤ 0.05	≤ 2	200 (160-240)	RPM	21203	10602	7951	6361	5301
						Fr	0.124	0.261	0.557	1.011	1.213
						Feed (mm/min)	2629	2765	4430	6430	6430
	CARBON, GRAPHITE		1	≤ 1	145 (116-174)	RPM	15372	7686	5765	4612	3843
						Fr	0.069	0.152	0.323	0.482	0.579
						Feed (mm/min)	1061	1165	1860	2224	2224
			≤ 0.5	≤ 1.5	185 (148-222)	RPM	19613	9807	7355	5884	4903
						Fr	0.069	0.152	0.323	0.482	0.579
						Feed (mm/min)	1353	1486	2373	2838	2838
			≤ 0.05	≤ 2	300 (240-360)	RPM	31805	15903	11927	9542	7951
						Fr	0.159	0.348	0.740	1.109	1.331
						Feed (mm/min)	5057	5535	8820	10580	10580
	PLASTICS		1	≤ 1	245 (196-294)	RPM	25974	12987	9740	7792	6494
						Fr	0.069	0.150	0.319	0.477	0.572
						Feed (mm/min)	1792	1945	3107	3717	3717
			≤ 0.5	≤ 1.5	305 (244-366)	RPM	32335	16168	12126	9701	8084
						Fr	0.069	0.150	0.319	0.477	0.572
						Feed (mm/min)	2231	2421	3868	4627	4627
			≤ 0.05	≤ 2	505 (404-606)	RPM	53538	26769	20077	16062	13385
						Fr	0.159	0.344	0.732	1.097	1.316
						Feed (mm/min)	8513	9220	14690	17617	17617

HSM (high speed machining)
 $\text{rpm} = (\text{Vc} \times 1000) / (\text{DC} \times 3.14)$
 $\text{mm/min} = \text{Fr} \times \text{rpm}$
 adjust parameters based on resin type and fiber structure
 reduce speed when overheating causes melting or damage to resin
 reduce feed if delamination or fraying occur

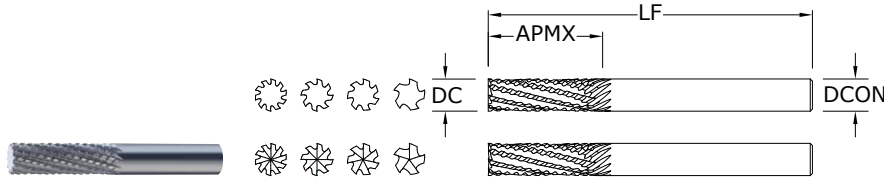
finish cuts typically required reduced feed and cutting depths
 rates shown are for use without coolant; rates may be increased with coolant
 dust collection is vital when machining dry
 diamond coating will increase tool life in graphite and composite materials
 refer to the **KYOCERA SGS APEX** for complete technical information
www.kyocera-sgstool.com/apex

Coarse Cut Carbon Composite



31-CCR FRACTIONAL SERIES

- Fewer, deeper flutes to prevent clogging in heavy routing
- Unique clearance grind minimizes contact between tool diameter and workpiece eliminating friction
- Left hand flutes engineered to control the fibers within CFRP, preventing excessive fiber breakout
- Excels at trimming and profiling difficult and abrasive fiber filled plastics



inch						EDP NO.	
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	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

TOLERANCES (inch)

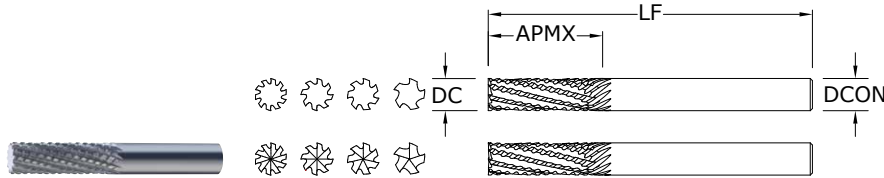
DC = +.000/- .005

DCON = h₆

NON-FERROUS

31M-CCR METRIC SERIES

- Fewer, deeper flutes to prevent clogging in heavy routing
- Unique clearance grind minimizes contact between tool diameter and workpiece eliminating friction
- Left hand flutes engineered to control the fibers within CFRP, preventing excessive fiber breakout
- Excels at trimming and profiling difficult and abrasive fiber filled plastics



mm						EDP NO.		
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	NO. OF FLUTES	END STYLE	UNCOATED	Ti-NAMITE-B (TiB ₂)	Di-NAMITE (Diamond)
6,0	25,0	63,0	6,0	5	End Cutting	82974	83200	82982
6,0	25,0	63,0	6,0	5	No End Cutting	82975	83201	82983
8,0	25,0	63,0	8,0	7	End Cutting	82976	83202	82984
8,0	25,0	63,0	8,0	7	No End Cutting	82977	83203	82985
10,0	28,0	63,0	10,0	8	End Cutting	82978	83204	82986
10,0	28,0	63,0	10,0	8	No End Cutting	82979	83205	82987
12,0	38,0	89,0	12,0	10	End Cutting	82980	83206	82988
12,0	38,0	89,0	12,0	10	No End Cutting	82981	83207	82989

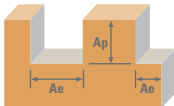
TOLERANCES (mm)

DC = +0,000/-0,130

DCON = h₆

NON-FERROUS

Coarse Cut Carbon Composite

Series 31 Fractional				Vc (sfm)	DC • in					
		Ae x DC	Ap x DC			1/4	5/16	3/8	1/2	
N	CFRP, AFRP (CARBON FIBER, ARAMID FIBER)		1	≤ 1	400	RPM	6112	4890	4075	3056
					(320-480)	Fr	0.0029	0.0065	0.0088	0.0147
						Feed (ipm)	18	32	36	45
			≤ 0.5	≤ 1.5	500	RPM	7640	6112	5093	3820
					(400-600)	Fr	0.0029	0.0065	0.0088	0.0147
						Feed (ipm)	23	40	45	56
			≤ 0.05	≤ 2	825	RPM	12606	10085	8404	6303
					(660-990)	Fr	0.0069	0.0151	0.0206	0.0344
						Feed (ipm)	87	152	173	217
	GFRP (FIBERGLASS)		1	≤ 1	320	RPM	4890	3912	3260	2445
					(256-384)	Fr	0.0031	0.0066	0.0089	0.0147
						Feed (ipm)	15	26	29	36
			≤ 0.5	≤ 1.5	400	RPM	6112	4890	4075	3056
					(320-480)	Fr	0.0031	0.0066	0.0089	0.0147
						Feed (ipm)	19	33	36	45
			≤ 0.05	≤ 2	660	RPM	10085	8068	6723	5042
					(528-792)	Fr	0.0069	0.0150	0.0205	0.0343
						Feed (ipm)	70	121	138	173
	CARBON, GRAPHITE		1	≤ 1	480	RPM	7334	5868	4890	3667
					(384-576)	Fr	0.0040	0.0087	0.0119	0.0199
						Feed (ipm)	29	51	58	73
			≤ 0.5	≤ 1.5	600	RPM	9168	7334	6112	4584
					(480-720)	Fr	0.0040	0.0087	0.0119	0.0199
						Feed (ipm)	36	64	73	91
			≤ 0.05	≤ 2	990	RPM	15127	12102	10085	7564
					(792-1188)	Fr	0.0092	0.0201	0.0275	0.0459
						Feed (ipm)	139	243	277	347
	PLASTICS		1	≤ 1	800	RPM	12224	9779	8149	6112
					(640-690)	Fr	0.0040	0.0087	0.0119	0.0200
						Feed (ipm)	49	85	97	122
			≤ 0.5	≤ 1.5	1000	RPM	15280	12224	10187	7640
					(800-1200)	Fr	0.0040	0.0087	0.0119	0.0200
						Feed (ipm)	61	106	121	153
			≤ 0.05	≤ 2	1650	RPM	25212	20170	16808	12606
					(1320-1980)	Fr	0.0092	0.0201	0.0275	0.0459
						Feed (ipm)	232	405	462	578

HSM (high speed machining)

rpm = Vc x 3.82 / DC

ipm = Fr x rpm

adjust parameters based on resin type and fiber structure

reduce speed when overheating causes melting or damage to resin

reduce feed if delamination or fraying occur

finish cuts typically required reduced feed and cutting depths

rates shown are for use without coolant; rates may be increased with coolant

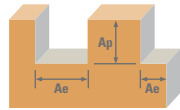
dust collection is vital when machining dry

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www.kyocera-sgstool.com/apex

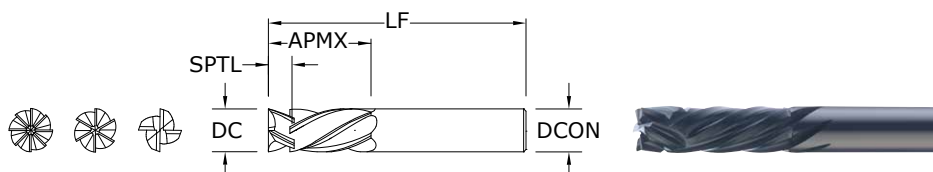
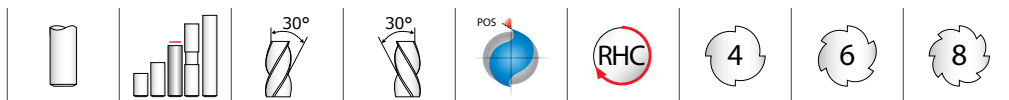
Coarse Cut Carbon Composite



Series 31M Metric			Vc (m/min)	DC • mm						
	Ae x DC	Ap x DC		6	8	10	12			
N	CFRP, AFRP (CARBON FIBER, ARAMID FIBER)		1	≤ 1	120	RPM	6361	4771	3817	3181
					(96-164)	Fr	0.071	0.170	0.244	0.366
						Feed (mm/min)	450	810	930	1165
			≤ 0.5	≤ 1.5	150	RPM	7951	5963	4771	3976
					(120-180)	Fr	0.071	0.170	0.244	0.366
						Feed (mm/min)	563	1013	1163	1456
			≤ 0.05	≤ 2	250	RPM	13252	9939	7951	6626
					(200-300)	Fr	0.162	0.388	0.555	0.832
						Feed (mm/min)	2150	3860	4415	5515
	GFRP (FIBERGLASS)		1	≤ 1	100	RPM	5301	3976	3181	2650
					(80-120)	Fr	0.069	0.165	0.237	0.357
						Feed (mm/min)	365	655	755	945
			≤ 0.5	≤ 1.5	120	RPM	6361	4771	3817	3181
					(96-164)	Fr	0.069	0.165	0.237	0.357
						Feed (mm/min)	438	786	906	1134
			≤ 0.05	≤ 2	200	RPM	10602	7951	6361	5301
					(160-240)	Fr	0.163	0.390	0.557	0.834
						Feed (mm/min)	1725	3100	3540	4420
CARBON, GRAPHITE		1	≤ 1	145	RPM	7686	5765	4612	3843	
				(116-174)	Fr	0.095	0.226	0.321	0.483	
					Feed (mm/min)	728	1300	1480	1855	
		≤ 0.5	≤ 1.5	185	RPM	9807	7355	5884	4903	
				(148-222)	Fr	0.095	0.226	0.321	0.483	
					Feed (mm/min)	929	1659	1888	2367	
		≤ 0.05	≤ 2	300	RPM	15903	11927	9542	7951	
				(240-360)	Fr	0.217	0.517	0.739	1.111	
					Feed (mm/min)	3450	6170	7050	8830	
PLASTICS		1	≤ 1	245	RPM	12987	9740	7792	6494	
				(196-294)	Fr	0.094	0.223	0.318	0.477	
					Feed (mm/min)	1215	2175	2475	3100	
		≤ 0.5	≤ 1.5	305	RPM	16168	12126	9701	8084	
				(244-366)	Fr	0.094	0.223	0.318	0.477	
					Feed (mm/min)	1513	2708	3081	3859	
		≤ 0.05	≤ 2	505	RPM	26769	20077	16062	13385	
				(404-606)	Fr	0.215	0.512	0.731	1.098	
					Feed (mm/min)	5760	10280	11745	14700	

HSM (high speed machining)
 $\text{rpm} = (\text{Vc} \times 1000) / (\text{DC} \times 3.14)$
 $\text{mm/min} = \text{Fr} \times \text{rpm}$
 adjust parameters based on resin type and fiber structure
 reduce speed when overheating causes melting or damage to resin
 reduce feed if delamination or fraying occur

finish cuts typically required reduced feed and cutting depths
 rates shown are for use without coolant; rates may be increased with coolant
 dust collection is vital when machining dry
 diamond coating will increase tool life in graphite and composite materials
 refer to the **KYOCERA SGS APEX** for complete technical information
www.kyocera-sgstool.com/apex



TOLERANCES (inch)

DC = +.000/- .003

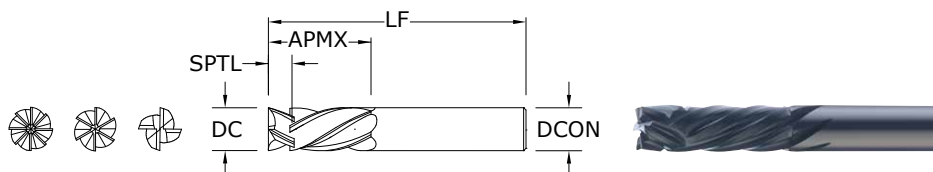
DCON = h_6

NON-FERROUS

inch						EDP NO.	
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	SPLIT LENGTH SPTL	NO. OF FLUTES	UNCOATED	Di-NAMITE (Diamond)
1/4	1	2-1/2	1/4	11/64	4	72970	72971
5/16	1	2-1/2	5/16	7/32	4	72972	72973
3/8	1-1/8	2-1/2	3/8	17/64	6	72974	72975
1/2	1-1/2	3-1/2	1/2	23/64	8	72976	72977

25
FRACTIONAL SERIES

- Compression-style helixes direct cutting forces inward, eliminating fiber breakout and delamination
- Primary/secondary relief grind for reduced friction and pressure
- Rigid, heavy core



TOLERANCES (mm)

DC = +0,000/- 0,080

DCON = h_6

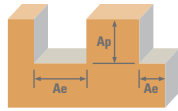
NON-FERROUS

mm						EDP NO.	
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	SPLIT LENGTH SPTL	NO. OF FLUTES	UNCOATED	Di-NAMITE (Diamond)
6,0	25,0	63,0	6,0	4,10	4	82990	82991
8,0	25,0	63,0	8,0	5,58	4	82992	82993
10,0	28,0	63,0	10,0	7,05	6	82994	82995
12,0	38,0	89,0	12,0	8,60	8	82996	82997

25M
METRIC SERIES

- Compression-style helixes direct cutting forces inward, eliminating fiber breakout and delamination
- Primary/secondary relief grind for reduced friction and pressure
- Rigid, heavy core

Compression



Series 25 Fractional				Vc (sfm)		DC • in				
		1/4	5/16			3/8	1/2			
N	CFRP, AFRP (CARBON FIBER, ARAMID FIBER)	 Profile	≤ 0.5	≤ 1.5	500	RPM	7640	6112	5093	3820
					(400-600)	Fz	0.0016	0.0030	0.0040	0.0048
						Feed (ipm)	49	73	122	147
		 HSM	≤ 0.05	≤ 2	825	RPM	12606	10085	8404	6303
					(660-990)	Fz	0.0037	0.0069	0.0092	0.0110
						Feed (ipm)	187	278	464	555
	GFRP (FIBERGLASS)	 Profile	≤ 0.5	≤ 1.5	400	RPM	6112	4890	4075	3056
					(320-480)	Fz	0.0016	0.0030	0.0040	0.0048
						Feed (ipm)	39	59	98	117
		 HSM	≤ 0.05	≤ 2	660	RPM	10085	8068	6723	5042
					(528-792)	Fz	0.0037	0.0069	0.0092	0.0110
						Feed (ipm)	149	223	371	444
	CARBON, GRAPHITE	 Profile	≤ 0.5	≤ 1.5	600	RPM	9168	7334	6112	4584
					(480-720)	Fz	0.0020	0.0038	0.0050	0.0060
						Feed (ipm)	73	111	183	220
		 HSM	≤ 0.05	≤ 2	990	RPM	15127	12102	10085	7564
					(792-1188)	Fz	0.0046	0.0086	0.0115	0.0138
						Feed (ipm)	278	416	696	835
	PLASTICS	 Profile	≤ 0.5	≤ 1.5	1000	RPM	15280	12224	10187	7640
					(800-1200)	Fz	0.0020	0.0038	0.0050	0.0060
						Feed (ipm)	122	186	306	367
		 HSM	≤ 0.05	≤ 2	1650	RPM	25212	20170	16808	12606
					(1320-1980)	Fz	0.0046	0.0086	0.0115	0.0138
						Feed (ipm)	464	694	1160	1392
MACHINABLE CERAMICS MACHINABLE GLASS	 Profile	≤ 0.5	≤ 1.5	50	RPM	764	611	509	382	
				(40-60)	Fz	0.0008	0.0015	0.0020	0.0024	
					Feed (ipm)	2.4	3.7	6.1	7.3	
	 HSM	≤ 0.05	≤ 2	85	RPM	1299	1039	866	649	
				(68-102)	Fz	0.0018	0.0034	0.0046	0.0055	
					Feed (ipm)	9.4	14.1	23.9	28.6	

HSM (high speed machining)

$\text{rpm} = \text{Vc} \times 3.82 / \text{DC}$

$\text{ipm} = \text{Fz} \times \text{number of flutes} \times \text{rpm}$

adjust parameters based on resin type and fiber structure

reduce speed when overheating causes melting or damage to resin

reduce feed if delamination or fraying occur

finish cuts typically required reduced feed and cutting depths

rates shown are for use without coolant; rates may be increased with coolant

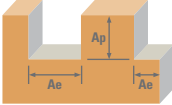
dust collection is vital when machining dry

diamond coating will increase tool life in graphite and composite materials

refer to the **KYOCERA SGS APEX** for complete technical information

www.kyocera-sgstool.com/apex

Compression



Series 25M Metric		Ae x DC	Ap x DC	Vc (m/min)	DC • mm				
					6	8	10	12	
CFRP, AFRP (CARBON FIBER, ARAMID FIBER)	Profile 	≤ 0.5	≤ 1.5	150	RPM	7951	5963	4771	3976
				(96-164)	Fz	0.040	0.065	0.075	0.100
					Feed (mm/min)	1272	1550	2147	3181
	HSM 	≤ 0.05	≤ 2	250	RPM	13252	9939	7951	6626
				(200-300)	Fz	0.095	0.145	0.175	0.235
					Feed (mm/min)	5036	5765	8349	12457
GFRP (FIBERGLASS)	Profile 	≤ 0.5	≤ 1.5	120	RPM	6361	4771	3817	3181
				(96-164)	Fz	0.040	0.065	0.075	0.100
					Feed (mm/min)	1018	1240	1717	2544
	HSM 	≤ 0.05	≤ 2	200	RPM	10602	7951	6361	5301
				(160-240)	Fz	0.095	0.145	0.175	0.235
					Feed (mm/min)	4029	4612	6679	9966
N CARBON, GRAPHITE	Profile 	≤ 0.5	≤ 1.5	185	RPM	9807	7355	5884	4903
				(148-222)	Fz	0.050	0.080	0.095	0.125
					Feed (mm/min)	1961	2354	3354	4903
	HSM 	≤ 0.05	≤ 2	300	RPM	15903	11927	9542	7951
				(240-360)	Fz	0.115	0.185	0.220	0.290
					Feed (mm/min)	7315	8826	12595	18447
PLASTICS	Profile 	≤ 0.5	≤ 1.5	305	RPM	16168	12126	9701	8084
				(244-366)	Fz	0.050	0.080	0.095	0.125
					Feed (mm/min)	3234	3880	5529	8084
	HSM 	≤ 0.05	≤ 2	505	RPM	26769	20077	16062	13385
				(404-606)	Fz	0.115	0.185	0.220	0.290
					Feed (mm/min)	12314	14857	21201	31052
MACHINABLE CERAMICS MACHINABLE GLASS	Profile 	≤ 0.5	≤ 1.5	15	RPM	795	596	477	398
				(12-18)	Fz	0.020	0.035	0.045	0.050
					Feed (mm/min)	64	83	129	159
	HSM 	≤ 0.05	≤ 2	25	RPM	1325	994	795	663
				(20-30)	Fz	0.045	0.075	0.085	0.115
					Feed (mm/min)	239	298	406	610

HSM (high speed machining)

$\text{rpm} = (\text{Vc} \times 1000) / (\text{DC} \times 3.14)$

$\text{mm/min} = \text{Fz} \times \text{number of flutes} \times \text{rpm}$

adjust parameters based on resin type and fiber structure

reduce speed when overheating causes melting or damage to resin

reduce feed if delamination or fraying occur

finish cuts typically required reduced feed and cutting depths

rates shown are for use without coolant; rates may be increased with coolant

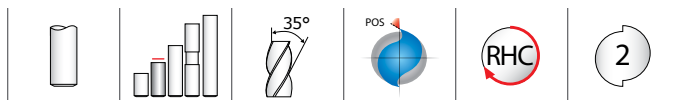
dust collection is vital when machining dry

diamond coating will increase tool life in graphite and composite materials

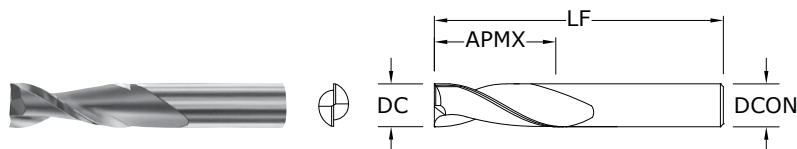
refer to the **KYOCERA SGS APEX** for complete technical information

(www.kyocera-sgstool.com/apex)

Up Cut

**21**

FRACTIONAL SERIES



inch				EDP NO.
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	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

TOLERANCES (inch)

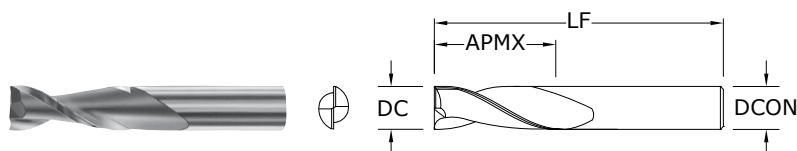
DC = +.000/- .003

DCON = h₆

NON-FERROUS

21M

METRIC SERIES



mm				EDP NO.
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	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

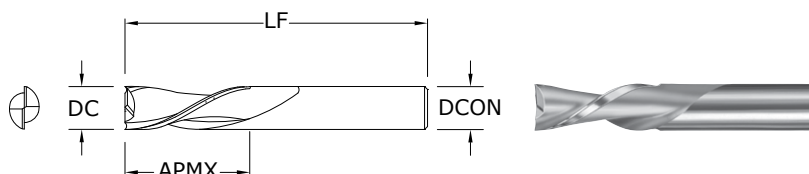
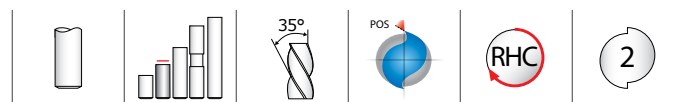
TOLERANCES (mm)

DC = +0,000/-0,080

DCON = h₆

NON-FERROUS

Down Cut

**22**

FRACTIONAL SERIES

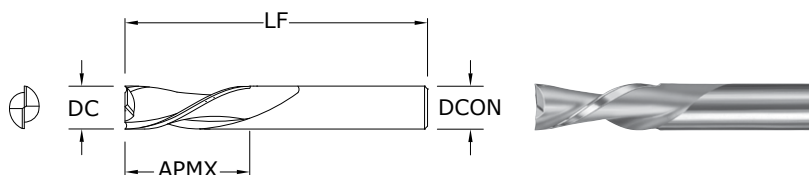
TOLERANCES (inch)

DC = +.000/-0.003

DCON = h_6

NON-FERROUS

inch				EDP NO.
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	UNCOATED
1/8	1/2	2	1/4	91001
5/32	5/8	2-1/2	1/4	91005
3/16	3/4	2-1/2	1/4	91009
1/4	3/4	2-1/2	1/4	91013
1/4	1	2-1/2	1/4	91017
5/16	1	2-1/2	5/16	91021
5/16	1	3	1/2	91025
3/8	1	2-1/2	3/8	91029
3/8	1-1/4	3	1/2	91033
1/2	1-1/4	3	1/2	91037
1/2	1-1/2	3-1/2	1/2	91041
1/2	2	4	1/2	91045
5/8	2	4-1/2	5/8	91049
3/4	2	4-1/2	3/4	91053

**22M**

METRIC SERIES

TOLERANCES (mm)

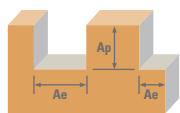
DC = +0,000/-0,080

DCON = h_6

NON-FERROUS

mm				EDP NO.
CUTTING DIAMETER DC	LENGTH OF CUT APMX	OVERALL LENGTH LF	SHANK DIAMETER DCON	UNCOATED
3,0	13,0	50,0	6,0	91101
4,0	16,0	63,0	6,0	91107
5,0	19,0	63,0	6,0	91109
6,0	25,0	63,0	6,0	91113
8,0	25,0	63,0	8,0	91121
10,0	31,0	75,0	10,0	91129
12,0	31,0	75,0	12,0	91137

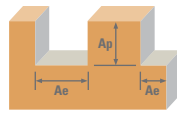
Up Cut Down Cut



Series 21, 22 Fractional				Vc (sfm)	DC • in						
		Ae x DC	Ap x DC		1/8	1/4	3/8	1/2	3/4		
HARDWOODS		1	≤ 1	1550	RPM	47368	23684	15789	11842	7895	
				(1240-1860)	Fz	0.0008	0.0015	0.0025	0.0030	0.0045	
					Feed (ipm)	76	71	79	71	71	
		≤ 0.5	≤ 1.5	1550	RPM	47368	23684	15789	11842	7895	
				(1240-1860)	Fz	0.0008	0.0015	0.0025	0.0030	0.0045	
					Feed (ipm)	76	71	79	71	71	
	SOFTWOODS		1	≤ 1	1950	RPM	59592	29796	19864	14898	9932
					(1560-2340)	Fz	0.0010	0.0020	0.0030	0.0035	0.0055
						Feed (ipm)	119	119	119	104	109
			≤ 0.5	≤ 1.5	1950	RPM	59592	29796	19864	14898	9932
					(1560-2340)	Fz	0.0010	0.0020	0.0030	0.0035	0.0055
						Feed (ipm)	119	119	119	104	109
PLYWOODS		1	≤ 1	1950	RPM	59592	29796	19864	14898	9932	
				(1560-2340)	Fz	0.0013	0.0025	0.0040	0.0050	0.0075	
					Feed (ipm)	155	149	159	149	149	
		≤ 0.5	≤ 1.5	1950	RPM	59592	29796	19864	14898	9932	
				(1560-2340)	Fz	0.0013	0.0025	0.0040	0.0050	0.0075	
					Feed (ipm)	155	149	159	149	149	
N PLASTICS		1	≤ 1	1950	RPM	59592	29796	19864	14898	9932	
				(1560-2340)	Fz	0.0008	0.0017	0.0025	0.0035	0.0050	
					Feed (ipm)	95	101	99	104	99	
		≤ 0.5	≤ 1.5	1950	RPM	59592	29796	19864	14898	9932	
				(1560-2340)	Fz	0.0008	0.0017	0.0025	0.0035	0.0050	
					Feed (ipm)	95	101	99	104	99	

rpm = Vc x 3.82 / DC
ipm = Fz x 2 x rpm

Up Cut Down Cut



Series 21M, 22M Metric				Vc (m/min)		DC • mm					
		Ae x DC	Ap x DC			3	6	10	12	20	
HARDWOODS		1	≤ 1	470	RPM	49828	24914	14948	12457	7474	
				(376-564)	Fz	0.020	0.040	0.065	0.075	0.115	
					Feed (mm/min)	1993	1993	1943	1869	1719	
		≤ 0.5	≤ 1.5	470	RPM	49828	24914	8155	4241	1509	
				(376-564)	Fz	0.020	0.040	0.065	0.075	0.115	
					Feed (mm/min)	1993	1993	1060	636	347	
	SOFTWOODS		1	≤ 1	600	RPM	63610	31805	19083	15903	9542
					(480-720)	Fz	0.025	0.050	0.075	0.090	0.140
						Feed (mm/min)	3181	3181	2862	2862	2672
		≤ 0.5	≤ 1.5	600	RPM	63610	31805	19083	15903	303467	
				(480-720)	Fz	0.025	0.050	0.075	0.090	0.140	
					Feed (mm/min)	3181	3181	2862	2862	84971	
PLYWOODS		1	≤ 1	600	RPM	63610	31805	19083	15903	9542	
				(480-720)	Fz	0.030	0.065	0.100	0.125	0.190	
					Feed (mm/min)	3817	4135	3817	3976	3626	
		≤ 0.5	≤ 1.5	600	RPM	63610	31805	19083	15903	303467	
				(480-720)	Fz	0.030	0.065	0.100	0.125	0.190	
					Feed (mm/min)	3817	4135	3817	3976	115318	
N PLASTICS		1	≤ 1	600	RPM	63610	31805	19083	15903	9542	
				(480-720)	Fz	0.020	0.040	0.065	0.090	0.125	
					Feed (mm/min)	2544	2544	2481	2862	2385	
		≤ 0.5	≤ 1.5	600	RPM	63610	31805	19083	15903	9542	
				(480-720)	Fz	0.020	0.040	0.065	0.090	0.125	
					Feed (mm/min)	2544	2544	2481	2862	2385	

rpm = (Vc x 1000) / (DC x 3.14)
mm/min = Fz x 2 x rpm

EDP Number Index

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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 ³ /min) = width of cut x depth of cut x ipm	mrr – milling – (cm ³ /min) = (width of cut x depth of cut x mm/min) / 1000
cutting time – drilling – (minutes) = length / ipm	cutting time – drilling – (minutes) = length / mm/min

sfm	surface feet per minute
rpm	revolutions per minute
ipm	feed rate in inches per minutes
ipr	inches per revolution
mmr	millimeters per revolution
mm/min	feed rate in millimeters per minute
mrr	material removal rate
	on flat surface

GENERAL FORMULAS	
coolant pressure: 1 Bar = 14.5 Pounds per Square Inch (PSI)	
calculation of coolant pressure: Pounds Per Square Inch (PSI) = (Horsepower of Pump x 1.460) / Gallons per Minute (GPM)	
1 Liter = 0.254 Gallons	
inch = millimeters / 25.4	millimeters = inch x 25.4
inch tap drill sizes = major diameter – ((1.299 x % of thread) / threads per inch)	
metric tap drill sizes = major diameter – (1.082 x pitch x % of thread)	
inch thread forming drill size: maximum diameter = basic major diameter – (3/8 x number of threads per inch)	
inch thread forming drill size: minimum diameter = basic major diameter – (1/2 x number of threads per inch)	
metric thread forming drill size: maximum diameter = basic major diameter – (.375 x pitch)	
metric thread forming drill size: minimum diameter = basic major diameter – (.500 x pitch)	

Decimal Equivalents

Fraction • Number • Letter • Metric Sizes

INCH	METRIC	DECIMAL EQUIVALENT	INCH	METRIC	DECIMAL EQUIVALENT	INCH	METRIC	DECIMAL EQUIVALENT	INCH	METRIC	DECIMAL EQUIVALENT	INCH	METRIC	DECIMAL EQUIVALENT	INCH	METRIC	DECIMAL EQUIVALENT
—	0,10	0.0039	—	1,60	0.0630	9/64	3,57	0.1406	#1	5,79	0.2280	R	8,61	0.3390	—	13,00	0.5118
—	0,20	0.0079	#52	1,61	0.0635	—	3,60	0.1417	—	5,80	0.2283	—	8,70	0.3425	33/64	13,10	0.5156
—	0,25	0.0098	—	1,65	0.0650	#27	3,66	0.1440	—	5,90	0.2323	11/32	8,73	0.3438	17/32	13,49	0.5312
—	0,30	0.0118	#51	1,70	0.0669	—	3,70	0.1457	A	5,94	0.2340	—	8,75	0.3445	—	13,50	0.5315
#80	0,34	0.0135	—	1,75	0.0689	#26	3,73	0.1470	15/64	5,95	0.2344	—	8,80	0.3465	35/64	13,89	0.5469
—	0,35	0.0138	#50	1,78	0.0700	—	3,75	0.1476	—	6,00	0.2362	S	8,84	0.3480	—	14,00	0.5512
#79	0,37	0.0145	—	1,80	0.0709	#25	3,80	0.1495	B	6,05	0.2380	—	8,90	0.3504	9/16	14,29	0.5625
1/64	0,40	0.0156	#49	1,85	0.0728	—	3,80	0.1496	—	6,10	0.2402	—	9,00	0.3543	—	14,50	0.5709
#78	0,41	0.0160	—	1,90	0.0748	#24	3,86	0.1520	C	6,15	0.2420	T	9,09	0.3580	37/64	14,68	0.5781
—	0,45	0.0177	#48	1,93	0.0760	—	3,90	0.1535	—	6,20	0.2441	—	9,10	0.3583	—	15,00	0.5906
#77	0,46	0.0180	—	1,95	0.0768	#23	3,91	0.1540	D	6,25	0.2461	23/64	9,13	0.3594	19/32	15,08	0.5938
—	0,50	0.0197	5/64	1,98	0.0781	5/32	3,97	0.1562	—	6,30	0.2480	—	9,20	0.3622	39/64	15,48	0.6094
#76	0,51	0.0200	#47	1,99	0.0785	#22	3,99	0.1570	E	6,35	0.2500	—	9,25	0.3642	—	15,50	0.6102
#75	0,53	0.0210	—	2,00	0.0787	—	4,00	0.1575	1/4	6,35	0.2500	—	9,30	0.3661	5/8	15,88	0.6250
—	0,55	0.0217	—	2,05	0.0807	#21	4,04	0.1590	—	6,40	0.2520	U	9,35	0.3680	—	16,00	0.6299
#74	0,57	0.0225	#46	2,06	0.0810	#20	4,09	0.1610	—	6,50	0.2559	—	9,40	0.3701	41/64	16,27	0.6406
—	0,60	0.0236	#45	2,08	0.0820	—	4,10	0.1614	F	6,53	0.2570	—	9,50	0.3740	—	16,50	0.6496
#73	0,61	0.0240	—	2,10	0.0827	—	4,20	0.1654	—	6,60	0.2598	3/8	9,53	0.3750	21/32	16,67	0.6562
#72	0,64	0.0250	—	2,15	0.0846	#19	4,22	0.1660	G	6,63	0.2610	V	9,56	0.3770	—	17,00	0.6693
—	0,65	0.0256	#44	2,18	0.0860	—	4,25	0.1673	—	6,70	0.2638	—	9,60	0.3780	43/64	17,07	0.6719
#71	0,66	0.0260	—	2,20	0.0866	—	4,30	0.1693	17/64	6,75	0.2656	—	9,70	0.3819	11/16	17,46	0.6875
—	0,70	0.0276	—	2,25	0.0886	#18	4,31	0.1695	H	6,76	0.2660	—	9,75	0.3839	—	17,50	0.6890
#70	0,71	0.0280	#43	2,26	0.0890	11/64	4,37	0.1719	—	6,80	0.2677	W	9,80	0.3858	45/64	17,86	0.7031
#69	0,74	0.0292	—	2,30	0.0906	#17	4,39	0.1730	—	6,90	0.2717	—	9,90	0.3898	—	18,00	0.7087
—	0,75	0.0295	—	2,35	0.0925	—	4,40	0.1732	I	6,91	0.2720	25/64	9,92	0.3906	23/32	18,26	0.7188
#68	0,79	0.0310	#42	2,37	0.0935	#16	4,50	0.1770	—	7,00	0.2756	—	10,00	0.3937	—	18,50	0.7283
1/32	0,79	0.0313	3/32	2,38	0.0938	—	4,50	0.1772	J	7,04	0.2770	X	10,08	0.3970	47/64	18,65	0.7344
—	0,80	0.0315	—	2,40	0.0945	#15	4,57	0.1800	—	7,10	0.2795	—	10,10	0.3976	—	19,00	0.7480
#67	0,81	0.0320	#41	2,44	0.0960	—	4,60	0.1811	K	7,14	0.2810	—	10,20	0.4016	3/4	19,05	0.7500
#66	0,84	0.0330	—	2,45	0.0965	#14	4,62	0.1820	9/32	7,14	0.2812	Y	10,26	0.4040	49/64	19,45	0.7656
—	0,85	0.0335	#40	2,50	0.0984	#13	4,70	0.1850	—	7,20	0.2835	—	10,30	0.4055	—	19,50	0.7677
#65	0,89	0.0350	#39	2,53	0.0995	—	4,75	0.1870	—	7,25	0.2854	13/32	10,32	0.4062	25/32	19,84	0.7812
—	0,90	0.0354	#38	2,58	0.1015	3/16	4,76	0.1875	—	7,30	0.2874	—	10,40	0.4094	—	20,00	0.7874
#64	0,91	0.0360	—	2,60	0.1024	#12	4,80	0.1890	L	7,37	0.2900	Z	10,49	0.4130	51/64	20,24	0.7969
#63	0,94	0.0370	#37	2,64	0.1040	#11	4,85	0.1910	—	7,40	0.2913	—	10,50	0.4134	—	20,50	0.8071
—	0,95	0.0374	—	2,70	0.1063	—	4,90	0.1929	M	7,49	0.2950	—	10,60	0.4173	13/16	20,64	0.8125
#62	0,97	0.0380	#36	2,71	0.1065	#10	4,91	0.1935	—	7,50	0.2953	—	10,70	0.4213	—	21,00	0.8268
#61	0,99	0.0390	—	2,75	0.1083	#9	4,98	0.1960	19/64	7,54	0.2969	27/64	10,72	0.4219	53/64	21,03	0.8281
—	1,00	0.0394	7/64	2,78	0.1094	—	5,00	0.1969	—	7,60	0.2992	—	10,80	0.4252	27/32	21,43	0.8438
#60	1,02	0.0400	#35	2,79	0.1100	#8	5,05	0.1990	N	7,67	0.3020	—	10,90	0.4291	—	21,50	0.8465
#59	1,04	0.0410	—	2,80	0.1102	—	5,10	0.2008	—	7,70	0.3031	—	11,00	0.4331	55/64	21,84	0.8594
—	1,05	0.0413	#34	2,82	0.1110	#7	5,11	0.2010	—	7,75	0.3051	—	11,10	0.4370	—	22,00	0.8661
#58	1,07	0.0420	#33	2,87	0.1130	13/64	5,16	0.2031	—	7,80	0.3071	7/16	11,11	0.4375	7/8	22,23	0.8750
#57	1,09	0.0430	—	2,90	0.1142	#6	5,18	0.2040	—	7,90	0.3110	—	11,20	0.4409	—	22,50	0.8858
—	1,10	0.0433	#32	2,95	0.1160	—	5,20	0.2047	5/16	7,94	0.3125	—	11,30	0.4449	57/64	22,62	0.8906
—	1,15	0.0453	—	3,00	0.1181	#5	5,22	0.2055	—	8,00	0.3150	—	11,40	0.4488	—	23,00	0.9055
#56	1,18	0.0465	#31	3,05	0.1200	—	5,25	0.2067	O	8,03	0.3160	—	11,50	0.4528	29/32	23,02	0.9062
3/64	1,19	0.0469	—	3,10	0.1220	—	5,3	0.2087	—	8,10	0.3189	29/64	11,51	0.4531	59/64	23,42	0.9219
—	1,20	0.0472	1/8	3,18	0.1250	#4	5,31	0.2090	—	8,20	0.3228	—	11,60	0.4567	—	23,50	0.9252
—	1,25	0.0492	—	3,20	0.1260	—	5,40	0.2126	P	8,20	0.3230	—	11,70	0.4606	15/16	23,81	0.9375
—	1,30	0.0512	—	3,25	0.1280	#3	5,41	0.2130	—	8,25	0.3248	—	11,80	0.4646	—	24,00	0.9449
#55	1,32	0.0520	#30	3,26	0.1285	—	5,50	0.2165	—	8,30	0.3268	—	11,90	0.4685	61/64	24,21	0.9531
—	1,35	0.0531	—	3,30	0.1299	7/32	5,56	0.2188	21/64	8,33	0.3281	15/32	11,91	0.4688	—	24,50	0.9646
#54	1,40	0.0550	—	3,40	0.1339	—	5,60	0.2205	—	8,40	0.3307	—	12,00	0.4724	31/32	24,61	0.9688
#53	1,51	0.0595	#29	3,45	0.1360	#2	5,61	0.2210	Q	8,43	0.3320	31/64	12,30	0.4844	—	25,00	0.9843
—	1,55	0.0610	—	3,50	0.1378	—	5,70	0.2244	—	8,50	0.3346	—	12,50	0.4921	63/64	25,00	0.9844
1/16	1,59	0.0625	#28	3,57	0.1405	—	5,75	0.2264	—	8,60	0.3386	1/2	12,70	0.5000	1	25,40	1.0000

Hardness Conversion Chart

ROCKWELL HARDNESS (HRb)	ROCKWELL HARDNESS (HRC)	BRINELL HARDNESS (HB)	VICKERS HARDNESS (HV)	TENSILE STRENGTH (N/mm2)	PSI (1000lb/in2)
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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