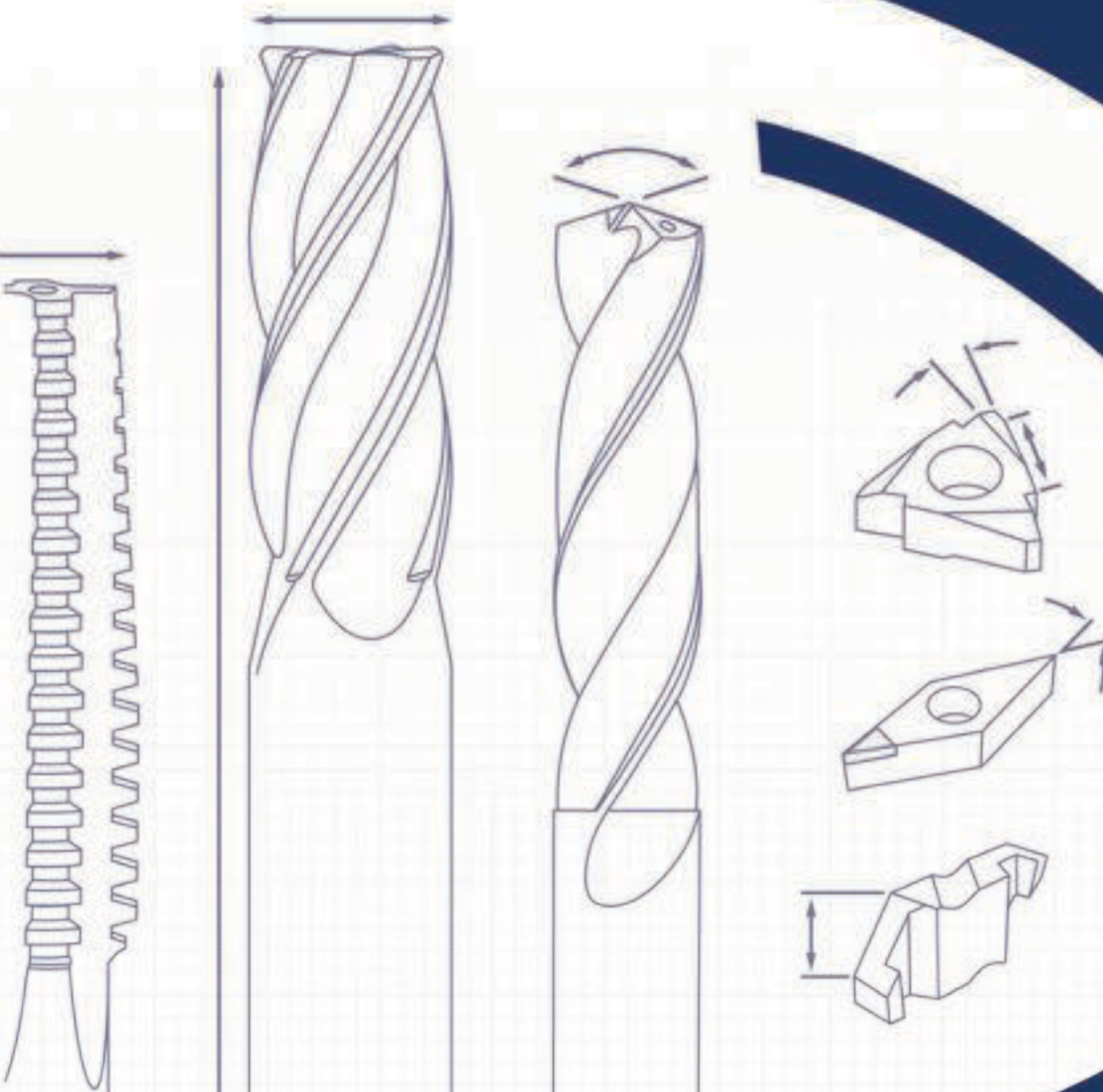


GWOS

TOOL GROUP

MILLING
SPECIALTY
HOLEMAKING
THREADING
INSERTS



GWS



TOOL GROUP

GWS Tool Group is a North American-based, vertically integrated manufacturer of highly engineered custom, standard, and modified standard cutting tools, primarily servicing the aerospace and defense, power generation, automotive and medical sectors.

GWS Tool Group has acquired multiple businesses in the course of its growth which now serve as the respective manufacturing divisions for the company.

The continued expansion of GWS Tool Group by way of acquisitions and constant investment in the business' capabilities has created an explosive value proposition for customers to leverage in all advanced machining environments. We remain committed to the expansion of this value proposition always and in all ways.



Acquisitions Effectuated



Florida – Founded in 1984, GW Schultz Tool had been known as a premier manufacturer of solid round carbide cutting tools. They became the custom endmill manufacturing division for GWS Tool Group in 2014.



Indiana – Founded in 1958, CGI Tool (formerly Carbide Grinding Company) became the manufacturer of our most complex and tight tolerance carbide, PCD and CBN insert tooling solutions in 2017.



Michigan – Founded in 1995, Alliance CNC now serves as our designer and builder of application-specific, tight tolerance drills, reamers, and micro-tools. Acquired in 2018, other products include our PAC Reamers and ECO Drills.



Massachusetts – Founded in 1980, Benchmark Carbide now serves as the production division for a great deal of the GWS catalog round tool and standard high-performance endmills since 2018.



Arizona – Founded in 1996, Intrepid Tool Industries (ITI) now serves as the provider of carbide, HSS, and PCD cutting tools for the aerospace sector, including threaded shank and/or brazed construction drills, reamers and countersinks since 2020.



Illinois – Founded in 1986, North American Tool Corporation (NATC) now serves as our manufacturer of special taps, dies, and gages. These include solid carbide thread mills, high-speed steel taps and thread gages since 2020.



North Carolina – Founded in 1993, STF Precision now serves as the leading manufacturer of diamond-tipped cutting tools, including polycrystalline diamond tools (PCD) and single-crystal diamond tools (SCD) for GWS since 2020.



Illinois – Founded in 1976, Taurus Tool & Engineering now serves as a manufacturer of our precision custom cutting tools, primarily in the categories of both HSS and carbide hole making and milling tools since 2021.



Illinois – Founded in 1978, CJT Koolcarb Inc. now serves as a leader in the manufacturing of carbide and carbide-tipped drills and reamers for industries such as aerospace and automotive for GWS since 2021.



ON, AB, Canada – Founded in 1965, Indexable now serves as our fully vertically integrated production facility of ceramic materials and inserts, including whisker ceramics, silicon nitride and white ceramics since 2021.



California – Monster Tool Company was founded in 1992, and quickly built the reputation as a cost and service leader in carbide tooling that includes end mills, drills, reamers and burrs.



Wisconsin – Founded in 1992, Carbide Tools Mfg. Inc is committed to providing high quality special carbide round tools supported by state-of-the-art grinding equipment, and in-house PVD coating technology.

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U.P. - Ultimate Performance | A.P. - Advanced Performance | GP - General Purpose

CORE CAPABILITIES

CUSTOM TOOLS



Specially designed cutting tools are required for a variety of reasons; whether it's a little extra length for reach, or specialized forms and tight tolerances to meet difficult part requirements. At GWS, we have built our capabilities around the necessity for high precision and fast expedient service. By combining talented engineering and design staff with the latest in automation technology, GWS can output custom tooling for high production facilities in as little as a few hours.

MILLING



We have a large portfolio of stocked standard solid carbide end mills, designed for metal cutting applications in an array of industries including Medical, Aerospace, Automotive, Heavy industry, and General Engineering. If one of our high performance series like our Hurrimill or Alumigator end mills aren't the best fit for your application, we'll help you find the perfect cutting tool by building it custom for you.

SPECIALTY



The GWS Specialty section encompasses an array of unique metalworking solutions. From routers and burrs, to carbide blanks and the GWS Armory series of tools for defense systems machining, GWS has you covered.



HOLEMAKING

GWS offers an extensive range of high performance and holemaking solutions. From solid carbide drills to brazed carbide-tip drills, we have the right tool for your application. Need custom drilling solutions? We can quickly create a custom drill perfectly tailored for your application in no time.



THREADING

The threading solutions category includes everything from thread mills and unique special taps to gages, dies, extensions and drill/tap combos. Be it an odd H-limit or a unique thread form such as ACME or British Pipe, we've got you covered. If we don't have it, we can make in as little as 24 hours.



TURNING INSERTS

GWS offers a complete insert solution for our customers via a vast standard and custom indexable insert platform. From patented ceramic turning inserts to custom PCD and PCBN inserts, we can provide the perfect insert for your application. Be it custom or standard, GWS has a variety of grades and designs available in carbide, PCD, PCBN and ceramic to enhance productivity and extend tool life.















TOOL RECONDITIONING

Material costs, manufacturing process time, volume shipping and inventory reductions prove the cost savings of a GWS Re grind. Our cost savings are data-driven, not anecdotal.













ICON GUIDE

TOOL SPECIFICATIONS

APPLICATION ICONS

 Slotting	 Chamfering
 Ramping	 Countersinking
 Side Milling	 Pocketing
 Light Milling	 Contouring
 Drilling	 Blind
 Helical	 Through

COATING ICONS

 Zirconium Nitride - Ideal for non-ferrous applications and resists BUE	 FX1 - High performance nano composite coating with extreme high hardness and high heat resistance for hardened steels and Ni Alloys
 Titanium Nitride - A general purpose coating that adds lubricity and wear resistance	 FX2 - High performance nano composite coating with extreme high hardness and high heat resistance ideal for use with form tools
 Titanium Carbon Nitride - A performance coating ideally suited for HSS tools	 FX3 - An AlCrN-based nano layered coating with high hardness and heat resistance that performs in wet or dry applications
 Titanium Aluminum Nitride - Performance coating with high hardness and oxidation temperature ideal for carbide tools	 FX5 - AlTiN-based PVD nanolayer coating with high hardness and heat resistance ideal for holemaking and drilling operations
 Aluminum Titanium Nitride - Performance coating with high hardness and increased oxidation temperature ideal for carbide tools	 FX5m - AlTiN-based PVD nanolayer coating with high hardness and heat resistance designed for micro-tools
 AlCrN - Aluminum Chromium Nitride - High performance coating with high hardness and increased oxidation temperature ideal for exotic materials in wet or dry environments	 FX7 - A high performance coating for steels, stainless steels, hardened steels and titanium in wet or dry applications

FEATURE ICONS

	Helix Angle		Point Angle
	Number of flutes		Coolant Through
	Corner Chamfer		8-Facet
	Ball Nose		External Thread
	Corner Radius		Piloted
	Square		New Product
	Non-Center Cutting		Speed & Feed
	Reduced Neck		Threaded Shank
	Coolant-Through		Wiper Flat
	h6 Shank		Carbide
	Weldon Flat		Brazed Carbide-Tip
	Chip Breakers		High Speed Steel
	Left Hand Cut & Helix		PCD
	Coolant-Through		

MATERIAL OVERVIEW

ISO MATERIALS



NEXT GENERATION OF
PERFORMANCE END MILLS
FOR ALUMINUM ALLOYS



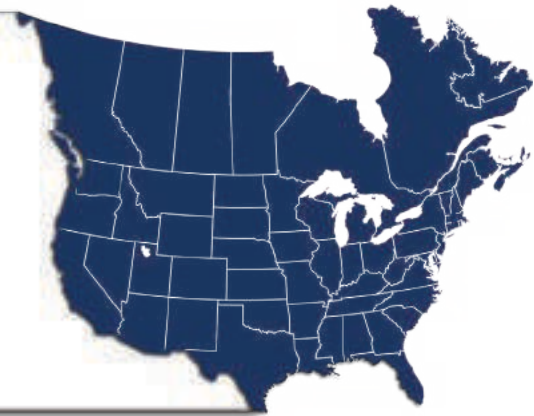
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ISO		Material	Condition	Tensile Strength	Hardness HB
P	1	Non-Alloyed Steel, Free Cutting Steel, Cast Steel	Annealed (<.25% C)	420	125
			Annealed (≥.25% C)	650	190
			Quenched & Tempere (>.55% C)	850	250
			Annealed (≥.55% C)	750	220
			Quenched & Tempered	1000	300
	2	Low Carbon Steel, Medium Carbon Steel, Cast Steel	Annealed	600	200
				930	275
			Quenched & Tempered	1000	300
				1200	350
3	High Carbon Steel, Alloy Steel, Tool Steel	Annealed	680	200	
		Quenched & Tempered	1100	325	
M	1	Stainless Steel	Ferritic/Martensitic	680	
			Martensitic	820	
			Austenitic	600	200
	2	PH Stainless Steel			240
					180
K	1	Grey Cast Iron (GG)	Ferritic		160
			Pearlitic		250
	2	Cast Iron Nodular (GGG)	Ferritic/Pearlitic		180
			Pearlitic		260
N	1	Aluminum Wrought Alloy	Not Cureable		60
			Cured		100
	2	Aluminum Cast, High Silicon Aluminum	Not Cureable (<12% Si)		75
			Cured		90
			High Temp. (>12% Si)		130
S	1	High Temp. Alloys, HRSA	Annealed (Fe based)		200
			Cured (Fe based)		280
			Annealed (Ni or Co based)		250
			Cured (Ni or Co based)		350
			Cast (Ni or Co based)		320
	2	Titanium, Titanium Alloys		RM 400	
			Alpha+beta alloys cured	RM 1050	
H	1	Hardened Steel (H13, S7, A2)	Hardened		45-55 HRC
	2	Hardened Steel (D2, CPM, M2)	Hardened		55-60 HRC

FIND A DISTRIBUTOR

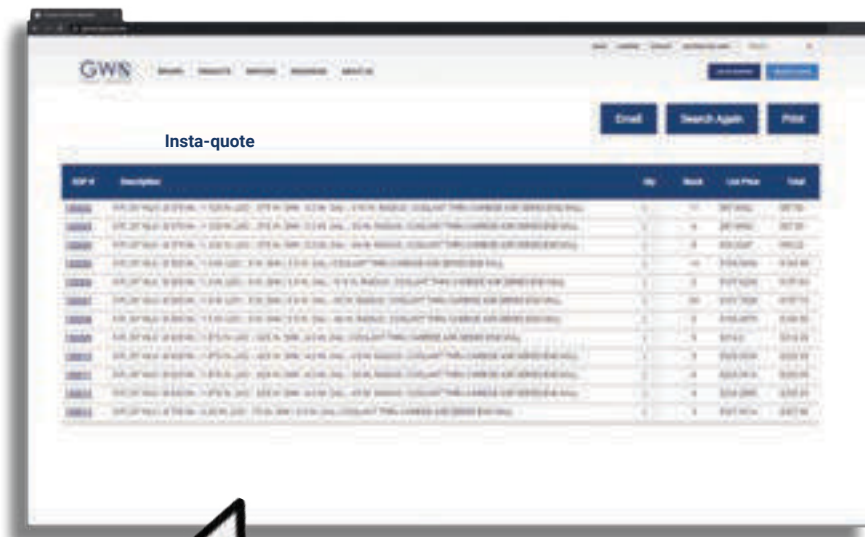
Interested in ordering GWS cutting tools?

You can easily search for an authorized distributor by visiting our website and get your order started quickly.



STOCK AND PRICING

Use the GWS Insta-quote tool to get instant pricing and availability on up to 250 tools at one time. You can then print, save, or email your quote directly from our site.



LITERATURE

Need to get the latest product brochures or catalog from GWS?

You can download all of our latest literature like brochures and catalogs for milling, holemaking, threading and insert tooling.



THREAD TAP DESIGNER

Design a custom thread tap or thread mill and get a customized quote in no time.

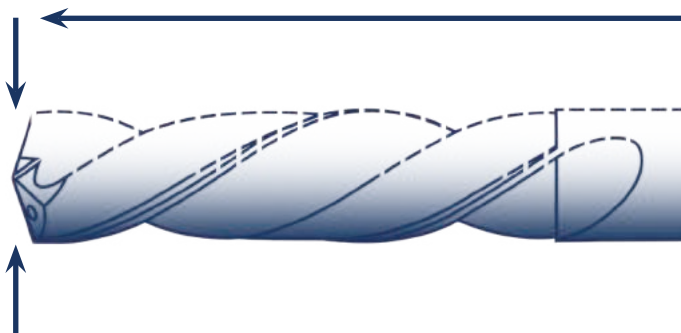
Simply enter in your desired specifications and watch your custom tap come to life.



MODIFY A STOCK TOOL

Creating a custom tool has never been this easy.

From our website product page, simply click the "Modify" button and adjust whatever tool parameters you need. Click submit and you are done! A GWS representative will send you a quote for your request within 24 hours.



CUSTOM TOOLS

CUSTOMIZED TOOLS TO FIT ANY APPLICATION

Specialty cutting tools come in a variety of shapes and sizes. Every application is different and GWS Tool Group is prepared to help you with your particular situation. The information is basic and will enable us to design the best tool for your application. From the beginning, GWS Tool Group has specialized in custom design and we look forward to working with you in creating a unique tool that meets and often exceeds your expectations.

Minimum order quantities for Specialty/Custom tools may be required. Please call **877-497-8665** for more information. If possible, please provide us with a 3D solid model, CAD drawing or sketch, including the profile you need to cut, along with any additional information you have for your custom tool design.

Typical lead times

1 Week	2 Weeks	3 Weeks	4 Weeks	6 Weeks
Standard or modified standard end mills, inserts & drills. Modify existing stock <ul style="list-style-type: none"> • Flat • Undercut • Radius • SAFE-LOCK® 	Standard or modified standard end mills with material in stock. Repeat special/custom with program and material.	Repeat specials with material in stock.	Repeat orders of special tools without material in stock.	Special/custom requiring pre-form materials that are not in stock.



REQUEST A CUSTOM TOOL



Online at www.gwstoolgroup.com



Over the phone 877-497-8665



Email your sketches to
Sales@gwstoolgroup.com

THREE WAYS TO REQUEST CUSTOM

1. Fill out and submit one of our many preformatted custom tool quote forms from our website.
2. Upload a drawing, sketch or file using our drawing upload feature on gwstoolgroup.com. An engineer will promptly receive and quote your request.
3. Send an email or call us with your request, and one of our specialists will take care of the rest.



TOOL RECONDITIONING

THE GWS TOOL RECONDITIONING PROGRAM

INTRO

MILLING

SPECIALTY

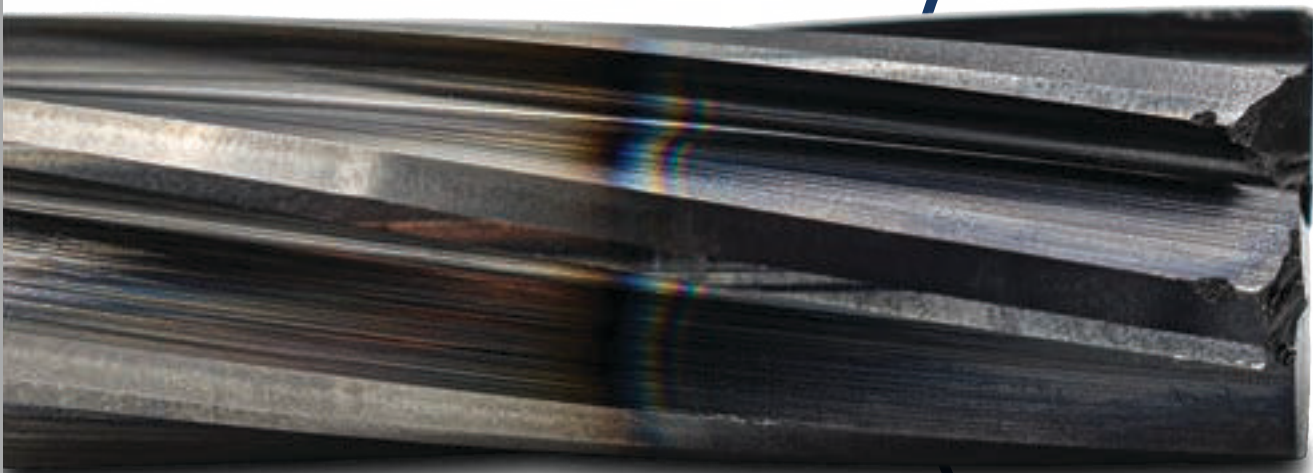
HOLEMAKING

THREADING

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Reduced tooling costs

***Geometries on our regrinds
are superior to others***

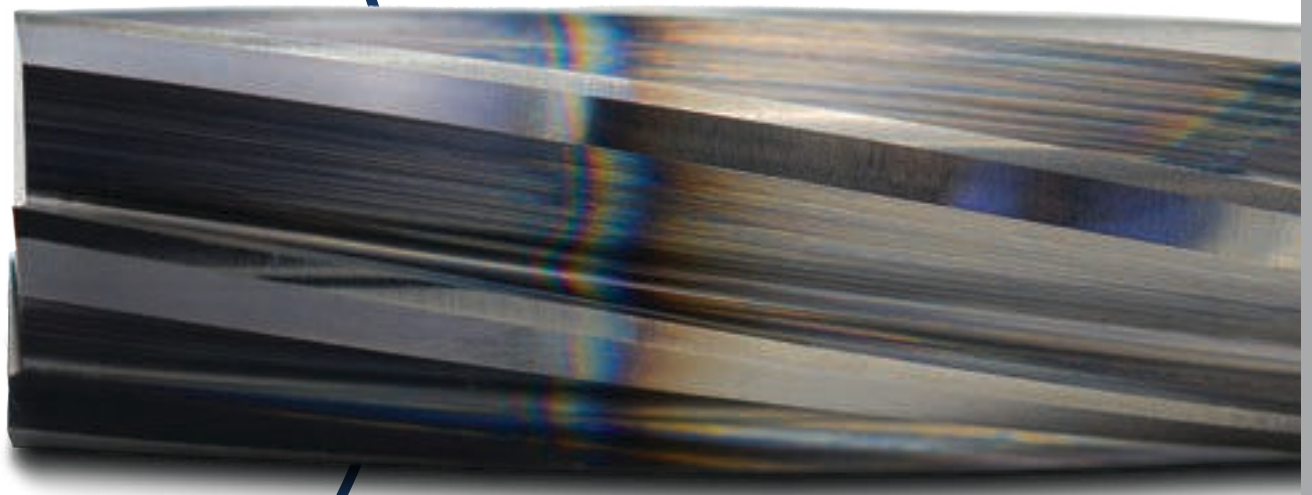


***Round & insert tooling
Carbide, PCD, Ceramic, CBN***

***Free or reduced shipping
based on quantity***

*Reduces inventory
and unnecessary waste*


Inventory management programs



Available to regrind non-GWS tools

*Custom etching on regrinds ensures
the operator has the correct tools*

GET YOUR
REGRIND STARTED

 CALL 877-497-8665



GENERAL PURPOSE

When versatility and utility are a necessity for your application, look to GWS General Purpose series cutting tools to get the job done right the first time. The capability you need for everyday applications combined with our expertly designed and manufactured cutting tools ensures success.



ADVANCED PERFORMANCE

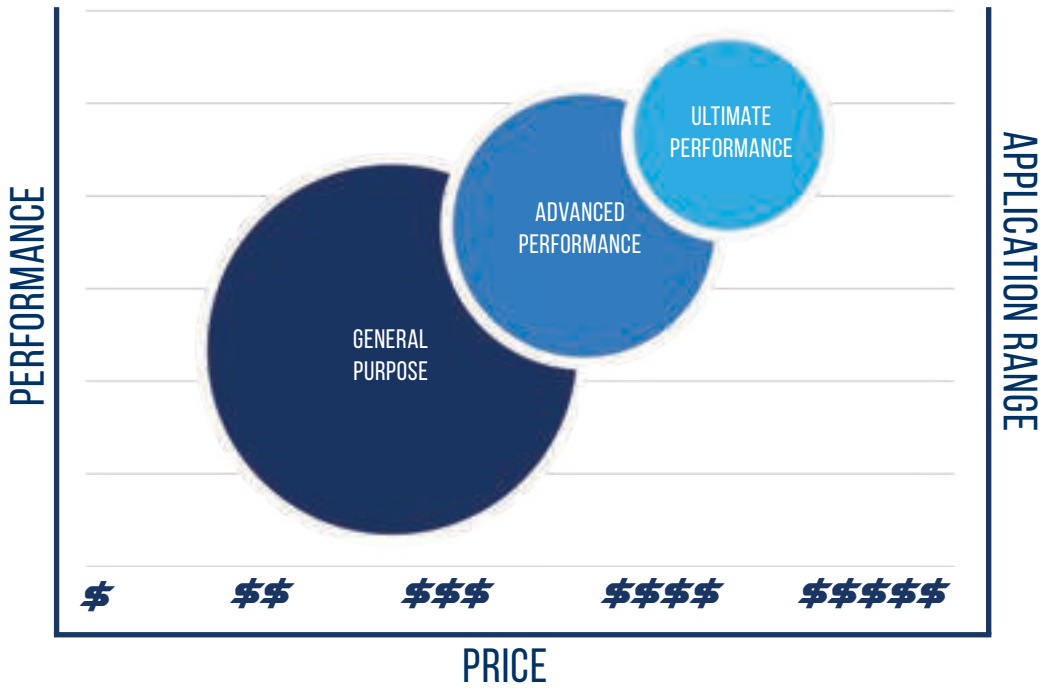
When a blend of high performance and cost-efficiency is desired, look no further than our Advanced Performance line. The tools in this category build upon general purpose tool offerings, with enhanced substrates, geometry, and coating technologies ideally suited for achieving greater tool life in production machining environments.



ULTIMATE PERFORMANCE

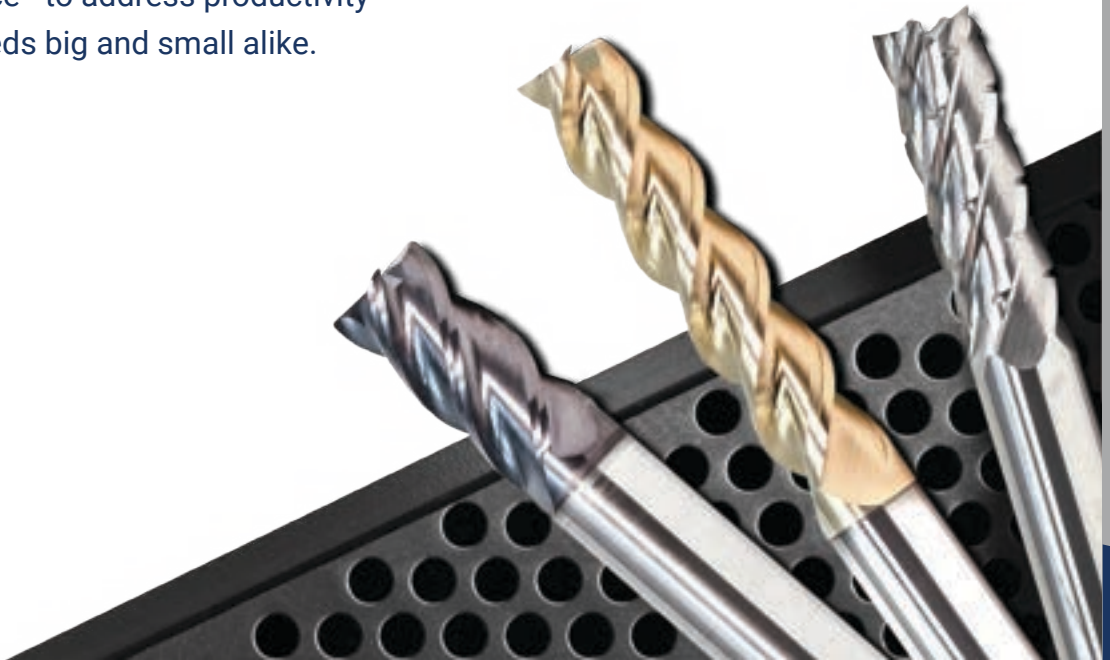
When nothing less than the best will do, you need cutting tools that yield only the best in performance. The Ultimate Performance series of cutting tools from GWS feature the finest substrates carbide, application specific geometries and a multitude of advanced coatings that align with the intended work material.

BRAND OVERVIEW



CHOICE

The GWS catalog of products provides our customers with choice - to address productivity and performance needs big and small alike.



APPLICATION GUIDE

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	Series	Brand	Material	Coating	Features	Product Page	Tech Page
1030		Hurrimill	Carbide	FX1	HGW4 4FL SQ & CR Hurrimill	47	176
1032		Hurrimill	Carbide	FX1	HGW4BN | 4FL | Ball Nose | Hurrimill	50	176
1035		Hurrimill	Carbide	FX1	HGW5 | 5FL | SQ & CR | Hurrimill	51	177
1040		Hurrimill	Carbide	FX1	HGW7 | 7FL | SQ & CR | Hurrimill	54	178
1031		Hurrimill	Carbide	FX1	SRF4 | 4FL | Square | Chamfer	57	179
1034		Hurrimill	Carbide	FX7	AT4 | 4FL | SQ & CR | Drill and Mill	58	180
1050		DM2	Carbide	FX1	DM2 | 2FL | Ball Nose | Die/Mold	60	182
2052		TiFeed	Carbide	AlTiN	TF | 5-7FL | Corner Radius | High Feed	61	202
2053		TiFeed	Carbide	AlTiN	TF | 5-7FL | Corner Radius | Coolant-Through | High Feed	62	202
2150		Hexamill	Carbide	FX7m	HXM | Multi Flute | Square | Metric	63	181
1010		Alumigator	Carbide	Bright, NF1	ART | 3FL | Chip Breaker | Radius | Alumigator	64	183
1015		Alumigator	Carbide	Bright, NF1	AST | 3FL | Chip Breaker | SQ & CR | Slotting Tool	64	183
1020		Alumigator	Carbide	Bright, NF1	AFT | 3FL | SQ & CR | Finishing Tool	67	183
1025		Alumigator	Carbide	Bright, NF1	GWA3 | 3FL | Square	69	195
1026		Alumigator	Carbide	Bright, NF1	GWA3 | 3FL | Necked | Square	70	195
1500		Alumigator	Carbide	Bright, NF1	ASR5 | 5FL | Chip Breaker | SQ & CR | Coolant-Through	71	184
1502		Alumigator	Carbide	Bright, NF1	ASR5 | 5FL | Chip Breaker | SQ & CR | Solid	72	184
2010		Performance AL	Carbide	Bright, NF1	250 | 2FL | SQ & CR	73	195

● Best ○ Good

	P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
	1010, 1018	1035, 1045	4140, 4340	300-400	PH	Gray	Ductile, Nodular	6061, 7075	Castings	HRSA	Ti Alloy	44-48 HRC	50-60 HRC
1030	○	●	●		○	●	●			●		●	○
1032	○	●	●		○	●	●			●		●	○
1035	○	●	●		○	●	●			●		●	○
1040	○	●	●		○	●	●			●		●	○
1031	○	●	●		○	●	●			●		●	○
1034	●	●	●	●	○	●	●	○		○	○	○	
1050		●	●				○			○	●	●	●
2052				●	●					○	●		
2053				●	●					○	●		
2150	○	○	○	●	●	○	○			○	●	○	
1010								●	●				
1015								●	●				
1020								●	●				
1025								●	●				
1026								●	●				
1500								●	●				
1502								●	●				
2010								●	●				

APPLICATION GUIDE

INTRO

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	Series	Brand	Material	Coating	Features	Product Page	Tech Page
2012		Performance AL	Carbide	Bright, NF1	Fusion 4FL Multi SQ	76	195
2014		Performance AL	Carbide	Bright, NF1	250 | 2FL | Necked | Ball	78	195
2015		Performance AL	Carbide	Bright, NF1	250BN | 2FL | Ball	79	195
2030		Performance AL	Carbide	Bright, NF1	350 | 3FL | SQ & CR	80	195
2031		Performance AL	Carbide	Bright, NF1	350WF | 3FL | SQ & CR | Wiper Flats	83	195
2032		Performance AL	Carbide	Bright, NF1	350 | 3FL | Necked | SQ & CR	84	195
2045		Performance AL	Carbide	Bright, NF1	350BN | 3FL | Ball	86	195
2047		Performance AL	Carbide	Bright, NF1	350BN | 3FL | Necked | Ball	87	195
2100		PYSTL	Carbide	FX3	438 | 4FL | SQ & CR | PYSTL	88	185
2105		PYSTL	Carbide	FX3	438RN | 4FL | Necked | SQ & CR | PYSTL	92	185
2115		PYSTL	Carbide	FX3	438 | 4FL | Ball Nose | PYSTL	95	185
2117		PYSTL	Carbide	FX3	438CB | 4FL | Radius | Chip Breaker | PYSTL	96	185
2205		PYSTL	Carbide	FX3	538 | 5FL | SQ & CR | PYSTL	97	186
2213		PYSTL	Carbide	FX3	538RN | 5FL | Necked | SQ & CR | PYSTL	101	186
2215		PYSTL	Carbide	FX3	738 | 7FL | SQ & CR | PYSTL	104	187
2004		Alpha4	Carbide	FX2	Alpha4 | 4FL | Multi Length | Radius	106	188
2004R		Alpha4	Carbide	FX2	Alpha4 | 4FL | Multi Length | Radius | Necked	108	188
2005		Alpha5	Carbide	FX2	Alpha5 | 5FL | Multi Length | Radius	110	189

● Best ○ Good

	P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
	1010, 1018	1035, 1045	4140, 4340	300-400	PH	Gray	Ductile, Nodular	6061, 7075	Castings	HRSA	Ti Alloy	44-48 HRC	50-60 HRC
2012								●	●				
2014								●	●				
2015								●	●				
2030								●	●				
2031								●	●				
2032								●	●				
2045								●	●				
2047								●	●				
2100	●	●	○	○	●	○	○				●		
2105	●	●	○	○	●	○	○				●		
2115	●	●	○	○	●	○	○				●		
2117	●	●	○	○	●	○	○				●		
2205	●	●	○	○	●	○	○				●		
2213	●	●	○	○	●	○	○				●		
2215	●	●	○	○	●	○	○				●		
2004	●	●	●	○	○	●	●					○	
2004R	●	●	●	○	○	●	●						
2005	●	●	●	○	○	●	●					○	

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	Series	Brand	Material	Coating	Features	Product Page	Tech Page
2005R		Alpha5	Carbide	FX2	Alpha5 5FL Multi Length Radius Necked	112	189
2006		Alpha6	Carbide	FX2	Alpha6 | 6FL | Multi Length | Radius	114	190
1130		Fusion	Carbide	AlTiN, FX2	Fusion | 4FL | Multi | SQ	115	191
270		Performance NI	Carbide	FX3	815 | Multi Flute | SQ & CR | HSRA	120	192
280		Performance TI	Carbide	FX3	840 | Multi Flute | SQ & CR | Titanium	121	193
1103		Atomic	Carbide	Bright, AlTiN	3FL | Chamfer | Micro	123	194
1104		Atomic	Carbide	Bright, AlTiN	4FL | Chamfer | Micro	124	194
2140		Attacker	Carbide	AlTiN	4FL | Chip Breaker | CR	127	196
2141		Attacker	Carbide	AlTiN	4FL | Chip Breaker | Ball	128	196
2142		Attacker	Carbide	AlTiN	3FL | Chip Breaker | CR	125	196
2143		Attacker	Carbide	AlTiN	3FL | Chip Breaker | Ball	126	196
2133		Aggressor	Carbide	Bright, FX2	AGG-C | 3FL | CF | Coarse Pitch Rougher	129	197
2134		Aggressor	Carbide	Bright, FX2	AGG-F | 4-5FL | CF | Fine Pitch Rougher	130	198
2135		Aggressor	Carbide	Bright, NF1	AGG-M | 3-5FL | CF | Med Pitch Rougher	131	198
202		GP	Carbide	Bright, TiN, TiAlN	2FL | Multi | SQ	132	199
202M		GP	Carbide	Bright, TiN, TiAlN	2FL | Multi | SQ | Metric	134	199
202D		GP	Carbide	Bright, TiN, TiAlN	2FL | Multi | SQ | DE	135	199
204		GP	Carbide	Bright, TiN, TiAlN	2FL | Multi | CR	136	199

● Best ○ Good

	P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
	1010, 1018	1035, 1045	4140, 4340	300-400	PH	Gray	Ductile, Nodular	6061, 7075	Castings	HRSA	Ti Alloy	44-48 HRC	50-60 HRC
2005R	●	●	●	○	○	●	●					○	
2006	●	●	●	○	○	●	●					○	
1130	●	●	●	○	○	●	●			○	●		
270						○	○			●		●	●
280				○	○						●		
1103	●	●	●	○	○	●	●	●	●		○	○	
1104	●	●	●	○	○	●	●	●	●		○	○	
2140	●	●	●	○	○	●	●	●	●	○		○	
2141	●	●	●	○	○	●	●	●	●	○		○	
2142	●	●	●	○	○	●	●	●	●	○		○	
2143	●	●	●	○	○	●	●	●	●	○		○	
2133								●	●				
2134	●	●	●	○	○	●	●			○	○	○	
2135	●	●	●			●	●			○			
202	○	○	○			○	○	○	○			○	
202M	○	○	○			○	○	○	○			○	
202D	○	○	○			○	○	○	○			○	
204	○	○	○			○	○	○	○			○	

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219		GP	Carbide	Bright, TiN, TiAlN	2FL Multi Ball	138	199
219M		GP	Carbide	Bright, TiN, TiAlN	2FL Multi Ball Metric	140	199
219D		GP	Carbide	Bright, TiN, TiAlN	2FL | Multi | Ball | Metric | DE	141	199
205		GP	Carbide	Bright, TiN, TiAlN	3FL | Multi | SQ	142	199
205D		GP	Carbide	Bright, TiN, TiAlN	3FL | Multi | SQ | DE	143	199
222		GP	Carbide	Bright, TiN, TiAlN	3FL | Multi | Ball	144	199
203		GP	Carbide	Bright, TiN, TiAlN	4FL | Multi | SQ	145	199
203M		GP	Carbide	Bright, TiN, TiAlN	4FL | Multi | SQ | Metric	148	199
203D		GP	Carbide	Bright, TiN, TiAlN	4FL | Multi | SQ | DE	149	199
206		GP	Carbide	Bright, TiN, TiAlN	4FL | Multi | CR	150	199
220		GP	Carbide	Bright, TiN, TiAlN	4FL | Multi | Ball	152	199
220M		GP	Carbide	Bright, TiN, TiAlN	4FL | Multi | Ball | Metric	154	199
220D		GP	Carbide	Bright, TiN, TiAlN	4FL | Multi | Ball | DE	155	199
250		GP	Carbide	Bright, TiN, TiAlN	2FL | SQ | Micro	156	200
251		GP	Carbide	Bright, TiN, TiAlN	2FL | CR | Micro	157	200
252		GP	Carbide	Bright, TiN, TiAlN	2FL | Ball | Micro	160	200
254		GP	Carbide	Bright, TiN, TiAlN	4FL | SQ | Micro	162	200
255		GP	Carbide	Bright, TiN, TiAlN	4FL | CR | Micro	165	200

● Best ○ Good

	P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
	1010, 1018	1035, 1045	4140, 4340	300-400	PH	Gray	Ductile, Nodular	6061, 7075	Castings	HRSA	Ti Alloy	44-48 HRC	50-60 HRC
219	○	○	○			○	○	○	○			○	
219M	○	○	○			○	○	○	○			○	
219D	○	○	○			○	○	○	○			○	
205	○	○	○			○	○	○	○			○	
205D	○	○	○			○	○	○	○			○	
222	○	○	○			○	○	○	○			○	
203	○	○	○			○	○	○	○			○	
203M	○	○	○			○	○	○	○			○	
203D	○	○	○			○	○	○	○			○	
206	○	○	○			○	○	○	○			○	
220	○	○	○			○	○	○	○			○	
220M	○	○	○			○	○	○	○			○	
220D	○	○	○			○	○	○	○			○	
250	○	○	○			○	○	○	○			○	
251	○	○	○			○	○	○	○			○	
252	○	○	○			○	○	○	○			○	
254	○	○	○			○	○	○	○			○	
255	○	○	○			○	○	○	○			○	

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256		GP	Carbide	Bright, TiN, TiAlN	4FL Ball Micro	168	200
207		GP	Carbide	Bright, TiN, TiAlN	2 FL Drill/Mill 60°, 82°, 90°.	170	N/A
208		GP	Carbide	Bright, TiN, TiAlN	4 FL | Drill/Mill | 60°, 82°, 90°.	171	N/A
209		GP	Carbide	Bright, TiN, TiAlN	2&4 FL | Chamfer Tool | 60°, 82°, 90°.	172	201
209D		GP	Carbide	Bright, TiN, TiAlN	2&4 FL | Chamfer Tool | 60°, 82°, 90°. | DE	173	201
Specialty							
780		GP	Carbide	Bright, TiN, TiAlN	Diamond Cut Routers	205	N/A
787		GP	Carbide	Bright, TiN, TiAlN	2&3FL | Straight Flute | Router	207	248
713		GP	Carbide	Bright	Engraving | 30° 60°, 90°	208	248
710		GP	Carbide	Bright	Ground Split Blanks	209	N/A
310		GP	Carbide	Bright	Various Shapes | Various End Cuts | Sets	210	249
312		GP	Carbide	Bright	ID Grinding	223	N/A
312P		GP	Carbide	Bright	Piloted | Die Trimmer	224	N/A
SPC		GP	Carbide	Bright	SQ Blanks | Round Blanks | Rod | Ctr Tips	225	N/A
Holemaking							
4050		PAC Reamer	Carbide	FX5	PAC | FL | Inch & Metric | Reamer	253	370
4005		PAC Drill	Carbide	FX5	PAC | 2FL | 140° | 5xD | Solid | Inch & Metric	255	371
4105		PAC Drill	Carbide	FX5	PAC | 2FL | 140° | 5xD | Coolant | Inch & Metric	256	372

● Best ○ Good

	P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
	1010, 1018	1035, 1045	4140, 4340	300-400	PH	Gray	Ductile, Nodular	6061, 7075	Castings	HRSA	Ti Alloy	44-48 HRC	50-60 HRC
256	○	○	○			○	○	○	○			○	
207	○	○	○			○	○	○	○			○	
208	○	○	○			○	○	○	○			○	
209	○	○	○			○	○	○	○			○	
209D	○	○	○			○	○	○	○			○	
780								○	○			○	
787								○	○			○	
713	○	○	○	○	○	○	○	○	○	○	○	○	○
710													
310	○	○	○	○	○	○	○	○	○			○	
312	○	○	○	○	○	○	○			○	○	○	○
312P	○	○	○	○	○	○	○			○	○	○	○
SPC													
4050	●	●	○	○	○	●						○	
4005	●	●	○	○	○	●	●	●	●				
4105	●	●	○	○	○	●	●	●	●				

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	Series	Brand	Material	Coating	Features	Product Page	Tech Page
4060		HexaDrill	Carbide	FX5m	HXD 2FL Micro Hexalobe	257	369
4001		Aperture	Carbide	FX2	2FL | 140° | 4xD | Solid	258	373
113		Durapoint	Carbide	TiCN	2FL | Stub	260	363
114		Durapoint	Carbide	TiCN	2FL | 140° | Stub	263	363
118		Durapoint	Carbide	TiN, TiAlN	2FL | 140° | Jobber	266	363
116		Durapoint	Carbide	TiN, TiAlN	2FL | 140° | Jobber	268	363
155		Durapoint	Carbide	Bright	2FL | Straight Flute	270	363
153		Durapoint	Carbide	Bright	2FL | Short | Straight Flute	271	363
154		Durapoint	Carbide	Bright	2FL | Long | Straight Flute	273	363
294		Kooltivist	Carbide	TiN, TiAlN	2FL | Stub | Coolant	275	364
293		Kooltivist	Carbide	TiN, TiAlN	2FL | Jobber | Coolant	278	364
292		Kooltivist	Carbide	TiN, TiAlN	2FL | Jobber | Coolant	281	364
174		Koolcarb	Carbide	Bright	2FL | Intermediate | Coolant | Straight Flute	282	364
175		Koolcarb	Carbide	Bright	2FL | X-Long | Coolant | Straight Flute	283	364
4221		Aerospace	Carbide	PCD	D-PCD | 2FL | PCD | Double Angle	284	N/A
4210		Aerospace	Carbide	Bright	DRS | 2FL | 4-Facet	285	N/A
4211		Aerospace	Carbide	Bright	DRS | 2FL | Threaded Shank	286	N/A
4205		Aerospace	Carbide	Bright	DGR | 1FL | 4" & 6"	287	N/A

● Best ○ Good

	P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
	1010, 1018	1035, 1045	4140, 4340	300-400	PH	Gray	Ductile, Nodular	6061, 7075	Castings	HRSA	Ti Alloy	44-48 HRC	50-60 HRC
4060	○	○	○	●	●	○	○			○	●	○	
4001	○	○	○	○	○	●	●					○	
113	●	●	○	○									
114	○	●	●	●	●	●	●	●	●	●	●	○	○
118	○	●	●	●	●	●	●	●	●	●	●	○	○
116	●	●	○	○									
155				○	○					●	●	●	○
153						●	●	●	●				
154						●	●	●	●				
294	●	●	●	●	●	●	●	○	○	●	●	●	○
293	●	●	●	●	●	●	●	○	○	●	●	●	○
292	●	●	●	●	●	●	●		○	●	●	●	○
174			○	●	●	●	●	○	○		○		
175			○	●	●	●	●	○	○		○		
4221								○	○				
4210								○	○				
4211								○	○				
4205								○	○				

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	Series	Brand	Material	Coating	Features	Product Page	Tech Page
4206		Aerospace	Carbide	Bright	DGRT 1FL 1.5" & 2.5" Threaded Shank	288	N/A
4207		Aerospace	Carbide	Bright	DRM | 4FL | 4" & 6"	289	N/A
4208		Aerospace	Carbide	Bright	DRMT | 4FL | 1.5" & 2.5" | Threaded Shank	290	N/A
4215		Aerospace	Carbide	Bright	CS | Threaded Shank | Piloted	291	N/A
4218		Aerospace	B-Carbide	Bright	HT | Threaded Shank | Brazed Carbide	292	N/A
4219		Aerospace	HSS	Bright	RSF | HSS Body | HSS Pilots	293	N/A
4220		Aerospace	Carbide	Bright	RSF-SC | Carbide Body | HSS Pilots	294	N/A
402		GP	Carbide	Bright	2FL | 82°, 90°, 100°, 120°, 140° | Spotting	295	373
400		GP	Carbide	Bright	2FL | Spade	296	373
450		GP	Carbide	Bright	2FL | Jobber | Twist	297	374
460		GP	Carbide	Bright	2FL | Screw Machine	300	374
470		GP	Carbide	Bright	2FL | Jobber | Straight Flute	303	374
453		GP	Carbide	Bright	3FL | Twist	306	374
300		GP	Carbide	Bright	2FL | 60°, 82°, 90° | Combo	307	373
500		GP	Carbide	Bright	4-6FL | Straight Flute | 45° Chamfer	309	375
550		GP	Carbide	Bright	4-6FL | Slow Spiral | 45° Chamfer	317	375
331		GP	Carbide	Bright	1FL | 60-120° | Single & Dbl End	318	376
333		GP	Carbide	Bright	3FL | 60-120°	320	376

● Best ○ Good

	P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
	1010, 1018	1035, 1045	4140, 4340	300-400	PH	Gray	Ductile, Nodular	6061, 7075	Castings	HRSA	Ti Alloy	44-48 HRC	50-60 HRC
4206								○	○				
4207								○	○				
4208								○	○				
4215								○	○				
4218								○	○				
4219								○	○				
4220								○	○				
402	○	○	○			○	○	○	○				
400	○	○	○			○	○	○	○			○	
450	○	○	○			○	○	○	○			○	
460	○	○	○			○	○	○	○			○	
470	○	○	○			○	○	○	○			○	
453	○	○	○			○	○	○	○			○	
300	○	○	○			○	○	○	○			○	
500	○	○	○	○	○	○	○	○	○	○	○	○	
550	○	○	○	○	○	○	○	○	○	○	○	○	
331	○	○	○			○	○	○	○			○	
333	○	○	○			○	○	○	○			○	

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334		GP	Carbide	Bright	4FL 60-120° Single & Dbl End	322	376
336		GP	Carbide	Bright	6FL 60-120° Single & Dbl End	324	376
601		GP	Carbide	Bright	Lock-Down Flat | CR	326	377
110		GP	Carbide-Tip	Bright	2FL | 118° | Screw Machine	329	363
115		GP	Carbide-Tip	Bright	2FL | 135° | Screw Machine	331	363
120		GP	Carbide-Tip	Bright	2FL | 118° | Jobber	333	363
125		GP	Carbide-Tip	Bright	2FL | 135° | Jobber	337	363
129		GP	Carbide-Tip	Bright	2FL | 135° | 12" Extension	339	363
130		GP	Carbide-Tip	Bright	2FL | 118° | Taper | Tang	341	363
150		GP	Carbide-Tip	Bright	2FL | 118° | Regular | Straight Flute	343	363
162		GP	Carbide-Tip	Bright	2FL | Regular | Spherical Point	345	363
170		GP	Carbide-Tip	Bright	2FL | 125° | Long | Coolant | Straight Flute	346	364
171		GP	Carbide-Tip	Bright	2FL | 125° | Jobber | Coolant | Straight Flute	348	364
172		GP	Carbide-Tip	Bright	2FL | 125° | X-Long | Coolant | Straight Flute	350	364
176		GP	Carbide-Tip	TiN	2FL | 130° | Jobber | Coolant | Straight Flute	351	364
290		GP	Carbide-Tip	Bright	2FL | 125° | Long | Coolant | Reduced Shank	352	364
295		GP	Carbide-Tip	Bright	2FL | 125° | Short | Coolant	353	364
296		GP	Carbide-Tip	TiN	2FL | 135° | Stub | Coolant | Reduced Shank	355	364

● Best ○ Good

	P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
	1010, 1018	1035, 1045	4140, 4340	300-400	PH	Gray	Ductile, Nodular	6061, 7075	Castings	HRSA	Ti Alloy	44-48 HRC	50-60 HRC
334	○	○	○			○	○	○	○			○	
336	○	○	○			○	○	○	○			○	
601	○	○	○	○	○	○	○	○	○	○	○	○	
110						○	○	○	○			○	
115						○	○	○	○			○	
120						○	○	○	○			○	
125						○	○	○	○			○	
129								○	○		○	○	
130						○	○	○	○			○	
150						●	○					●	●
163													
170		○				○	○	○	○			○	
171		○				○	○	○	○			○	
172		○				○	○	○	○			○	
176	○	○				○	○		○	○		○	
290	○	○				○	○		○	○		○	
295	○	○				○	○		○	○		○	
296	○			○				○	○			○	

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297		GP	Carbide-Tip	TiN	2FL 135° Stub Coolant Common Shank	357	364
Threading							
180		Advanced Performance	Carbide	Bright, TiAlN	Thread Mill | 2xD	381	482
181		Advanced Performance	Carbide	Bright, TiAlN	Thread Mill | 2xD | Coolant	382	482
180M		Advanced Performance	Carbide	Bright, TiAlN	Thread Mill | 2xD | Metric	383	482
181M		Advanced Performance	Carbide	Bright, TiAlN	Thread Mill | 2xD | Coolant | Metric	384	482
182		Advanced Performance	Carbide	Bright, TiAlN	Thread Mill | NPT/NPTF	385	482
184		Advanced Performance	Carbide	AlCrN	Thread Mill | NPT/NPTF | Exotics	386	482
185		Advanced Performance	Carbide	NF1	Thread Mill | NPT/NPTF | AL	387	482
186		Advanced Performance	Carbide	NF1	Thread Mill | 2xD | Coolant | AL	388	482
186M		Advanced Performance	Carbide	NF1	Thread Mill | 2xD | Coolant | Metric | AL	389	482
187		Advanced Performance	Carbide	Bright, TiAlN	Thread Mill | Single Point	390	482
189		Advanced Performance	Carbide	AlCrN	Thread Mill | LHC/LHS | Exotics	391	482
189M		Advanced Performance	Carbide	AlCrN	Thread Mill | LHC/LHS | Metric | Exotics	392	482
126		GP	Carbide	Bright, TiN, TiCN	Hand Tap	393	N/A
126M		GP	Carbide	Bright, TiN, TiCN	Hand Tap | Metric	394	N/A
128		GP	Carbide	Bright, TiN, TiCN	Spiral Point Tap	395	N/A
128M		GP	Carbide	Bright, TiN, TiCN	Spiral Point Tap | Metric	396	N/A

● Best ○ Good

	P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
	1010, 1018	1035, 1045	4140, 4340	300-400	PH	Gray	Ductile, Nodular	6061, 7075	Castings	HRSA	Ti Alloy	44-48 HRC	50-60 HRC
297	○			○				○	○				
180	●	●	●	○	○	●	●	○				○	
181	●	●	○	○	●	●	●	○		○	○	○	
180M	●	●	○	○	○	●	●	○				○	
181M	●	●	○	○	●	●	●	○		○	○	○	
182	●	●	○	○	○	●	●	○				○	
184	○	○	○	●	●	○	○	○		●	●	○	○
185								●	●				
186								●	●				
186M								●	●				
187	●	●	○	○	○	●	●					○	
189	○	○	○	●	●	○	○			●	●	○	○
189M	○	○	○	●	●	○	○			●	●	○	○
126	○	○	○			○	○	○	○			○	
126M	○	○	○			○	○	○	○			○	
128	○	○	○			○	○	○	○			○	
128M	○	○	○			○	○	○	○			○	

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127		GP	Carbide	Bright, TiN, TiCN	Pipe Tap	397	N/A
101		GP	HSS	Bright, TiN, TiCN	Hand Tap	398	N/A
103		GP	HSS	Bright, TiN, TiCN	Hand Tap | Dbl Lead	403	N/A
101M		GP	HSS	Bright, TiN, TiCN	Hand Tap | Metric	404	N/A
107		GP	HSS	Bright, TiN, TiCN	Spiral Flute Tap	407	N/A
107M		GP	HSS	Bright, TiN, TiCN	Spiral Flute Tap | Metric	409	N/A
105		GP	HSS	Bright, TiN, TiCN	Spiral Point Tap	410	N/A
105M		GP	HSS	Bright, TiN, TiCN	Spiral Point Tap | Metric	412	N/A
104		GP	HSS	Bright, TiN, TiCN	Forming Tap	414	N/A
104M		GP	HSS	Bright, TiN, TiCN	Forming Tap | Metric	416	N/A
131		GP	HSS	Bright, TiN, TiCN	Pipe Tap | NPT/F	417	N/A
131F		GP	HSS	Bright, TiN, TiCN	Pipe Tap | NPTF	418	N/A
131I		GP	HSS	Bright, TiN, TiCN	Pipe Tap | NPSI	419	N/A
132		GP	HSS	Bright, TiN, TiCN	Pipe Tap | Spiral Flute	420	N/A
133		GP	HSS	Bright, TiN, TiCN	Pipe Tap | Interrupted Thread	421	N/A
134		GP	HSS	Bright, TiN, TiCN	Pipe Tap | British Standard | BSPP | 55Mod	422	N/A
135		GP	HSS	Bright, TiN, TiCN	Pipe Tap | British Standard | BSPT | 55Mod	423	N/A
136P		GP	HSS	Bright, TiN, TiCN	Pipe Tap | British Standard | BSPP | 55Full	424	N/A

● Best ○ Good

	P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
	1010, 1018	1035, 1045	4140, 4340	300-400	PH	Gray	Ductile, Nodular	6061, 7075	Castings	HRSA	Ti Alloy	44-48 HRC	50-60 HRC
127	○	○	○			○	○	○	○			○	
101	○	○	○			○	○	○	○			○	
103	○	○	○			○	○	○	○			○	
101M	○	○	○			○	○	○	○			○	
107	○	○	○			○	○	○	○			○	
107M	○	○	○			○	○	○	○			○	
105	○	○	○			○	○	○	○			○	
105M	○	○	○			○	○	○	○			○	
104	○	○	○			○	○	○	○			○	
104M	○	○	○			○	○	○	○			○	
131	○	○	○			○	○	○	○			○	
131F	○	○	○			○	○	○	○			○	
131I	○	○	○			○	○	○	○			○	
132	○	○	○			○	○	○	○			○	
133	○	○	○			○	○	○	○			○	
134	○	○	○			○	○	○	○			○	
135	○	○	○			○	○	○	○			○	
136P	○	○	○			○	○	○	○			○	

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	Series	Brand	Material	Coating	Features	Product Page	Tech Page
136		GP	HSS	Bright, TiN, TiCN	Pipe Tap British Standard BSPT 55Full	425	N/A
137		GP	HSS	Bright, TiN, TiCN	Pipe Tap | British Standard | BSF/BSW | 55Mod	426	N/A
164		GP	HSS	Bright, TiN, TiCN	Hand Tap | Left Hand	427	N/A
164M		GP	HSS	Bright, TiN, TiCN	Hand Tap | Left Hand | Metric	429	N/A
165		GP	HSS	Bright, TiN, TiCN	Spiral Point Tap | Left Hand	430	N/A
166		GP	HSS	Bright, TiN, TiCN	Hand Tap | Screw Thread Insert (STI)	431	N/A
167		GP	HSS	Bright, TiN, TiCN	Spiral Point Tap | Screw Thread Insert (STI)	432	N/A
170		GP	HSS	Bright, TiN, TiCN	Conduit Tap | Metric | PG7 | PG48	433	N/A
168		GP	HSS	Bright, TiN, TiCN	Hand Tap | ACME	434	N/A
168T		GP	HSS	Bright, TiN, TiCN	Hand Tap | ACME | Tandem	435	N/A
169		GP	HSS	Bright, TiN, TiCN	Hand Tap | ACME | Left hand	436	N/A
169T		GP	HSS	Bright, TiN, TiCN	Hand Tap | ACME | Tandem | Left Hand	437	N/A
101L		GP	HSS	Bright, TiN, TiCN	Hand Tap | Pulley/Extended	438	N/A
105L		GP	HSS	Bright, TiN, TiCN	Spiral Point Tap | Pulley/Extended	440	N/A
108M		GP	HSS	Bright, TiN, TiCN	Hand Tap | Pulley/Extended | Metric	441	N/A
109M		GP	HSS	Bright, TiN, TiCN	Spiral Point Tap | Pulley/Ext | Metric	442	N/A
156		GP	HSS	Bright, TiN	Combo Drill/Tap	443	N/A
156M		GP	HSS	Bright, TiN	Combo Drill/Tap | Metric	444	N/A

● Best ○ Good

	P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
	1010, 1018	1035, 1045	4140, 4340	300-400	PH	Gray	Ductile, Nodular	6061, 7075	Castings	HRSA	Ti Alloy	44-48 HRC	50-60 HRC
136	○	○	○			○	○	○	○			○	
137	○	○	○			○	○	○	○			○	
164	○	○	○			○	○	○	○			○	
164M	○	○	○			○	○	○	○			○	
165	○	○	○			○	○	○	○			○	
166	○	○	○			○	○	○	○			○	
167	○	○	○			○	○	○	○			○	
170	○	○	○			○	○	○	○			○	
168	○	○	○			○	○	○	○			○	
168T	○	○	○			○	○	○	○			○	
169	○	○	○			○	○	○	○			○	
169T	○	○	○			○	○	○	○			○	
101L	○	○	○			○	○	○	○			○	
105L	○	○	○			○	○	○	○			○	
108M	○	○	○			○	○	○	○			○	
109M	○	○	○			○	○	○	○			○	
156	○	○	○			○	○	○	○			○	
156M	○	○	○			○	○	○	○			○	

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	Series	Brand	Material	Coating	Features	Product Page	Tech Page
157		GP	HSS	Bright, TiN	Combo Drill/Tap NPTF	445	N/A
158		GP	HSS	Bright, TiN	Combo Drill/Tap | Hex	446	N/A
158M		GP	HSS	Bright, TiN	Combo Drill/Tap | Hex | Metric	447	N/A
141		GP	HSS	Bright	Round Die	448	N/A
141P		GP	HSS	Bright	Round Die | Metric	450	N/A
141M		GP	HSS	Bright	Round Die | Metric	451	N/A
142		GP	HSS	Bright	Round Die | Left Hand	452	N/A
142M		GP	HSS	Bright	Round Die | Metric | Left Hand	453	N/A
143		GP	HSS	Bright	Round Die | BSPT	454	N/A
117-119H		GP	HSS	N/A	Tap Extensions | ANSI | Inch	455 - 460	N/A
195		GP	HSS	N/A	Gages | Plug Gage | Taperlock	461	N/A
195M		GP	HSS	N/A	Gages | Plug Gage | Taperlock | Metric	464	N/A
190		GP	HSS	N/A	Gages | Plug Gage | Reversible	466	N/A
190M		GP	HSS	N/A	Gages | Plug Gage | Reversible | Metric	467	N/A
191		GP	HSS	N/A	Gages | Plug Gage | STI	468	N/A
192		GP	HSS	N/A	Gages | Plug Gage | NPT & NPTF	470	N/A
194		GP	HSS	N/A	Gages | Plug Gage | Pipe Thread | BSPT & BSPP	472	N/A
196		GP	HSS	N/A	Gages | Ring Gage	473	N/A

● Best ○ Good

	P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
	1010, 1018	1035, 1045	4140, 4340	300-400	PH	Gray	Ductile, Nodular	6061, 7075	Castings	HRSA	Ti Alloy	44-48 HRC	50-60 HRC
157	○	○	○			○	○	○	○			○	
158	○	○	○			○	○	○	○			○	
158M	○	○	○			○	○	○	○			○	
141	○	○	○			○	○	○	○			○	
141P	○	○	○			○	○	○	○			○	
141M	○	○	○			○	○	○	○			○	
142	○	○	○			○	○	○	○			○	
142M	○	○	○			○	○	○	○			○	
143	○	○	○			○	○	○	○			○	
117-119H													
195													
195M													
190													
190M													
191													
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194													
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	Series	Brand	Material	Coating	Features	Product Page	Tech Page
196M		GP	HSS	N/A	Gages Ring Gage Metric	476	N/A
197		GP	HSS	N/A	Gages | Ring Gage | NPT & NPTF	478	N/A
193P		GP	HSS	N/A	Gages | Ring Gage | 6 Step | NPTF	479	N/A
Inserts							
65XX	 ISO PCD	Ultimate Performance	PCD	N/A	Inserts | Single Tip | PCD | ISO	509 - 511	541
68XX	 ISO PCBN	Ultimate Performance	PCBN	N/A	Inserts | Full Top | CBN | ISO	512	541
68XX	 ISO PCBN	Ultimate Performance	PCBN	N/A	Inserts | Solid | CBN | ISO	512	541
68XX	 ISO PCBN	Ultimate Performance	PCBN | PCD	N/A	Inserts | Cartridge | CBN & PCD | ISO	516	541
6XXX	 ISO Ceramic	Ultimate Performance	Ceramic	N/A	Inserts | Round | Dog Bone | ISO	517	539
61XX	 ISO Ceramic	AlloyCat®	Ceramic	N/A	Inserts | V-Bottom | Dog Bone | CG88 Grade	525	539

● Best ○ Good

	P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
	1010, 1018	1035, 1045	4140, 4340	300-400	PH	Gray	Ductile, Nodular	6061, 7075	Castings	HRSA	Ti Alloy	44-48 HRC	50-60 HRC
196M													
197													
193P													
65XX								●	●				
68XX						●	●					●	●
68XX						●	●					●	●
68XX						●	●	●	●			●	●
6XX						●	●			●		●	
61XX						●	●			●		●	

MILLING

From material specific milling cutters to general purpose end mills for general engineering, we have you covered with the sizes, lengths and application-specific geometry you need.

Custom Comes Standard - If we don't have the perfect tool on the shelf, we can build it for you.





ULTIMATE PERFORMANCE

Solid Carbide End Mills For Alloy Steels, HRSA, Hardened Steel



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FEATURES/DESCRIPTION	APPLICATION	FEATURES								
<p>Variable Helix, Unequal Index</p> <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance Ideal for hardened steel, die steel and HRSA 4-flute variable helix design Ideal for High Efficiency Milling SafeLock® shank available upon request 		<table border="1"> <tr> <td>CARBIDE</td> <td>VAR</td> </tr> <tr> <td>4FL</td> <td>RAD</td> </tr> <tr> <td>SQ</td> <td>P176</td> </tr> <tr> <td>h6</td> <td>FX1</td> </tr> </table>	CARBIDE	VAR	4FL	RAD	SQ	P176	h6	FX1
CARBIDE	VAR									
4FL	RAD									
SQ	P176									
h6	FX1									

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	●	●		○	●	●			●		●	○

● Best ○ Good

Series 1030 HGW4 | 4FL | Square and Radius | Hurrimill

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	EDP
1/8	1/4	1-1/2	1/8	-	120432
1/8	1/4	1-1/2	1/8	0.005	120542
1/8	1/4	1-1/2	1/8	0.015	121556
1/8	1/4	1-1/2	1/8	0.030	121557
1/8	1/2	1-1/2	1/8	-	119342
1/8	1/2	1-1/2	1/8	0.005	119333
1/8	1/2	1-1/2	1/8	0.015	121425
1/8	1/2	1-1/2	1/8	0.030	121426
3/16	5/16	2	3/16	-	120433
3/16	5/16	2	3/16	0.005	120543
3/16	5/16	2	3/16	0.015	121558
3/16	5/16	2	3/16	0.030	121559
3/16	5/8	2	3/16	-	119343
3/16	5/8	2	3/16	0.005	119334
3/16	5/8	2	3/16	0.015	121427
3/16	5/8	2	3/16	0.030	121428
3/16	3/4	2	3/16	-	120151
3/16	3/4	2	3/16	0.005	120159
3/16	3/4	2	3/16	0.015	121518
3/16	3/4	2	3/16	0.030	121519
3/16	3/4	2	3/16	0.060	120550
1/4	5/16	2	1/4	-	121555
1/4	5/16	2	1/4	0.005	121560
1/4	5/16	2	1/4	0.010	121561
1/4	5/16	2	1/4	0.015	121562
1/4	5/16	2	1/4	0.030	121563
1/4	5/16	2	1/4	0.060	121564
1/4	1/2	2	1/4	-	120434
1/4	1/2	2	1/4	0.005	121565
1/4	1/2	2	1/4	0.010	120544
1/4	1/2	2	1/4	0.015	121566
1/4	1/2	2	1/4	0.030	121567
1/4	1/2	2	1/4	0.060	121568
1/4	3/4	2-1/2	1/4	-	119344
1/4	3/4	2-1/2	1/4	0.005	121429
1/4	3/4	2-1/2	1/4	0.010	119335
1/4	3/4	2-1/2	1/4	0.015	121430
1/4	3/4	2-1/2	1/4	0.030	120697
1/4	3/4	2-1/2	1/4	0.060	120473
1/4	1-1/8	3	1/4	-	120152
1/4	1-1/8	3	1/4	0.005	121521
1/4	1-1/8	3	1/4	0.010	120160
1/4	1-1/8	3	1/4	0.015	121522
1/4	1-1/8	3	1/4	0.030	121523
1/4	1-1/8	3	1/4	0.060	121524

*bold numbers are EDPs for ordering

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Solid Carbide End Mills For Alloy Steels, HRSA, Hardened Steel



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Series 1030		HGW4 4FL Square and Radius Hurrimill			
Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	EDP
5/16	1/2	2	5/16	-	120435
5/16	1/2	2	5/16	0.010	120545
5/16	1/2	2	5/16	0.015	121569
5/16	1/2	2	5/16	0.030	121570
5/16	1/2	2	5/16	0.060	121571
5/16	13/16	2-1/2	5/16	-	119345
5/16	13/16	2-1/2	5/16	0.010	119336
5/16	13/16	2-1/2	5/16	0.015	121432
5/16	13/16	2-1/2	5/16	0.030	121433
5/16	13/16	2-1/2	5/16	0.060	121434
5/16	1-1/8	3	5/16	-	120153
5/16	1-1/8	3	5/16	0.010	120161
5/16	1-1/8	3	5/16	0.015	121525
5/16	1-1/8	3	5/16	0.030	121526
5/16	1-1/8	3	5/16	0.060	121527
3/8	7/16	2	3/8	-	122483
3/8	7/16	2	3/8	0.015	121572
3/8	7/16	2	3/8	0.030	121573
3/8	7/16	2	3/8	0.060	121574
3/8	5/8	2	3/8	-	120436
3/8	5/8	2	3/8	0.015	120546
3/8	5/8	2	3/8	0.030	121575
3/8	5/8	2	3/8	0.060	121576
3/8	7/8	2-1/2	3/8	-	119346
3/8	7/8	2-1/2	3/8	0.010	119315
3/8	7/8	2-1/2	3/8	0.015	119337
3/8	7/8	2-1/2	3/8	0.030	121435
3/8	7/8	2-1/2	3/8	0.060	121488
3/8	1-1/8	3	3/8	-	120154
3/8	1-1/8	3	3/8	0.010	120162
3/8	1-1/8	3	3/8	0.015	121528
3/8	1-1/8	3	3/8	0.030	121529
3/8	1-1/8	3	3/8	0.060	121530
3/8	1-1/8	3	3/8	0.090	121531
3/8	1-1/8	3	3/8	0.120	121532
1/2	5/8	2-1/2	1/2	-	120437
1/2	5/8	2-1/2	1/2	0.015	120547
1/2	5/8	2-1/2	1/2	0.030	120551
1/2	5/8	2-1/2	1/2	0.060	121577
1/2	5/8	2-1/2	1/2	0.090	121578
1/2	5/8	2-1/2	1/2	0.120	121579
1/2	1	3	1/2	-	119347
1/2	1	3	1/2	0.015	119338
1/2	1	3	1/2	0.020	121516
1/2	1	3	1/2	0.030	119546
1/2	1	3	1/2	0.060	120076
1/2	1	3	1/2	0.090	121489
1/2	1	3	1/2	0.120	121490
1/2	1-1/4	3	1/2	-	121515
1/2	1-1/4	3	1/2	0.015	121491
1/2	1-1/4	3	1/2	0.030	121492
1/2	1-1/4	3	1/2	0.060	121493
1/2	1-1/4	3	1/2	0.090	121494
1/2	1-1/4	3	1/2	0.120	121495
1/2	1-1/2	3	1/2	-	122282
1/2	1-1/2	3	1/2	0.015	121496
1/2	1-1/2	3	1/2	0.030	121497
1/2	1-1/2	3	1/2	0.060	121498
1/2	1-1/2	3	1/2	0.090	121499
1/2	1-1/2	3	1/2	0.120	121500
1/2	1-3/4	4	1/2	-	121517
1/2	1-3/4	4	1/2	0.015	121533
1/2	1-3/4	4	1/2	0.030	121534
1/2	1-3/4	4	1/2	0.060	121535
1/2	1-3/4	4	1/2	0.090	121536
1/2	1-3/4	4	1/2	0.120	121537
1/2	2	4	1/2	-	120155
1/2	2	4	1/2	0.015	120163
1/2	2	4	1/2	0.030	121538
1/2	2	4	1/2	0.060	121539
1/2	2	4	1/2	0.090	121540
1/2	2	4	1/2	0.120	121541
5/8	3/4	3	5/8	-	120438
5/8	3/4	3	5/8	0.015	121580
5/8	3/4	3	5/8	0.020	120548
5/8	3/4	3	5/8	0.030	121581

*bold numbers are EDPs for ordering

ULTIMATE PERFORMANCE

Solid Carbide End Mills For Alloy Steels, HRSA, Hardened Steel



Series 1030 HGW4 | 4FL | Square and Radius | Hurrimill

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	EDP
5/8	3/4	3	5/8	0.060	121582
5/8	3/4	3	5/8	0.090	121583
5/8	3/4	3	5/8	0.120	121584
5/8	1-1/4	3-1/2	5/8	-	119348
5/8	1-1/4	3-1/2	5/8	0.015	121502
5/8	1-1/4	3-1/2	5/8	0.020	119339
5/8	1-1/4	3-1/2	5/8	0.030	121503
5/8	1-1/4	3-1/2	5/8	0.060	121504
5/8	1-1/4	3-1/2	5/8	0.090	121505
5/8	1-1/4	3-1/2	5/8	0.120	121506
5/8	2-1/4	5	5/8	-	120156
5/8	2-1/4	5	5/8	0.015	121542
5/8	2-1/4	5	5/8	0.020	120164
5/8	2-1/4	5	5/8	0.030	121543
5/8	2-1/4	5	5/8	0.060	121544
5/8	2-1/4	5	5/8	0.090	121545
5/8	2-1/4	5	5/8	0.120	121546
3/4	7/8	3	3/4	-	120439
3/4	7/8	3	3/4	0.015	121585
3/4	7/8	3	3/4	0.030	120486
3/4	7/8	3	3/4	0.060	121586
3/4	7/8	3	3/4	0.090	121587
3/4	7/8	3	3/4	0.120	121588
3/4	1-1/2	4	3/4	-	119349
3/4	1-1/2	4	3/4	0.015	121507
3/4	1-1/2	4	3/4	0.030	119340
3/4	1-1/2	4	3/4	0.060	121508
3/4	1-1/2	4	3/4	0.090	121509
3/4	1-1/2	4	3/4	0.120	121510
3/4	2-1/4	5	3/4	-	119722
3/4	2-1/4	5	3/4	0.015	121547
3/4	2-1/4	5	3/4	0.030	119723
3/4	2-1/4	5	3/4	0.060	121548
3/4	2-1/4	5	3/4	0.090	121549
3/4	2-1/4	5	3/4	0.120	121550
1	1	4	1	-	120440
1	1	4	1	0.015	121589
1	1	4	1	0.030	120549
1	1	4	1	0.060	121590
1	1	4	1	0.090	121591
1	1	4	1	0.120	121592
1	1-1/2	4	1	-	119350
1	1-1/2	4	1	0.015	121511
1	1-1/2	4	1	0.030	119341
1	1-1/2	4	1	0.060	121512
1	1-1/2	4	1	0.090	121513
1	1-1/2	4	1	0.120	121514
1	2-1/4	5	1	-	120158
1	2-1/4	5	1	0.015	121551
1	2-1/4	5	1	0.030	120166
1	2-1/4	5	1	0.060	121552
1	2-1/4	5	1	0.090	121553
1	2-1/4	5	1	0.120	121554

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

ULTIMATE PERFORMANCE

Solid Carbide End Mills For Alloy Steels, HRSA, Hardened Steel



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Variable Helix, Unequal Index</p> <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance Ideal for hardened steel, die steel and HRSA 4-flute variable helix design for slotting and profile milling Ideal for High Efficiency Milling SafeLock® shank available upon request 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	●	●		○	●	●			●		●	○

● Best ○ Good

Series 1032 HGW4BN | 4FL | Ball Nose | Hurrimill

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	EDP
1/8	1/4	1-1/2	1/8	122963
1/8	1/2	1-1/2	1/8	120360
3/16	5/16	2	3/16	123087
3/16	5/8	2	3/16	120361
3/16	3/4	2	3/16	123098
1/4	5/16	2	1/4	123088
1/4	1/2	2	1/4	122983
1/4	3/4	2-1/2	1/4	120362
1/4	1-1/8	3	1/4	123099
5/16	1/2	2	5/16	123089
5/16	13/16	2-1/2	5/16	120363
5/16	1-1/8	3	5/16	123100
3/8	5/8	2	3/8	123090
3/8	7/8	2-1/2	3/8	120364
3/8	1-1/8	3	3/8	122969
1/2	5/8	2-1/2	1/2	123091
1/2	1	3	1/2	120526
1/2	1-1/4	3	1/2	123095
1/2	1-1/2	3	1/2	123096
1/2	1-3/4	4	1/2	122971
1/2	2	4	1/2	123101
5/8	3/4	3	5/8	123092
5/8	1-1/4	3-1/2	5/8	120365
5/8	2-1/4	5	5/8	123102
3/4	7/8	3	3/4	123093
3/4	1-1/2	4	3/4	120366
3/4	2-1/4	5	3/4	123103
1	1	4	1	123094
1	1-1/2	4	1	123097
1	2-1/4	5	1	123104

*bold numbers are EDPs for ordering

ULTIMATE PERFORMANCE

Solid Carbide End Mills For Alloy Steels, HRSA, Hardened Steel



INTRO

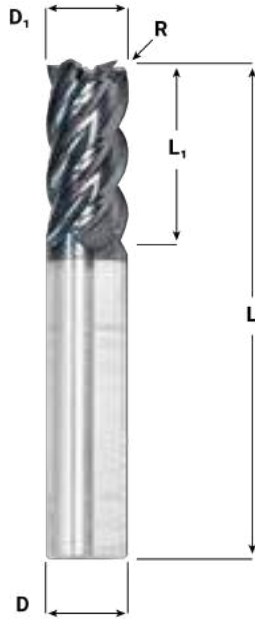
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES								
<p>Variable Helix, Unequal Index</p> <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance Ideal for hardened steel, die steel and HRSA 5-flute variable helix design for both slotting and profile milling Ideal for High Efficiency Milling SafeLock® shank available upon request 		<table border="1"> <tr> <td>CARBIDE</td> <td>VAR</td> </tr> <tr> <td>5FL</td> <td>RAD</td> </tr> <tr> <td>SQ</td> <td>P177</td> </tr> <tr> <td>h6</td> <td>FX1</td> </tr> </table>	CARBIDE	VAR	5FL	RAD	SQ	P177	h6	FX1
CARBIDE	VAR									
5FL	RAD									
SQ	P177									
h6	FX1									

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	●	●		○	●	●			●		●	○

● Best ○ Good

Series 1035 HGW5 | 5FL | Square and Radius | Hurrimill

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	EDP
1/8	1/4	1-1/2	1/8	-	120979
1/8	1/4	1-1/2	1/8	0.005	120988
1/8	1/4	1-1/2	1/8	0.015	121373
1/8	1/4	1-1/2	1/8	0.030	121374
1/8	1/2	1-1/2	1/8	-	120954
1/8	1/2	1-1/2	1/8	0.005	120945
1/8	1/2	1-1/2	1/8	0.015	121298
1/8	1/2	1-1/2	1/8	0.030	121299
3/16	5/16	2	3/16	-	120980
3/16	5/16	2	3/16	0.005	120989
3/16	5/16	2	3/16	0.015	121375
3/16	5/16	2	3/16	0.030	121376
3/16	5/8	2	3/16	-	120955
3/16	5/8	2	3/16	0.005	120946
3/16	5/8	2	3/16	0.015	121300
3/16	5/8	2	3/16	0.030	121301
3/16	3/4	2	3/16	-	120963
3/16	3/4	2	3/16	0.005	120971
3/16	3/4	2	3/16	0.015	121341
3/16	3/4	2	3/16	0.030	121342
3/16	3/4	2	3/16	0.060	121343
1/4	5/16	2	1/4	-	120184
1/4	5/16	2	1/4	0.005	121472
1/4	5/16	2	1/4	0.010	121481
1/4	5/16	2	1/4	0.015	121482
1/4	5/16	2	1/4	0.030	121483
1/4	5/16	2	1/4	0.060	121484
1/4	1/2	2	1/4	-	120981
1/4	1/2	2	1/4	0.005	121377
1/4	1/2	2	1/4	0.010	120990
1/4	1/2	2	1/4	0.015	121380
1/4	1/2	2	1/4	0.030	121381
1/4	1/2	2	1/4	0.060	121382
1/4	3/4	2-1/2	1/4	-	120956
1/4	3/4	2-1/2	1/4	0.005	121302
1/4	3/4	2-1/2	1/4	0.010	120947
1/4	3/4	2-1/2	1/4	0.015	121303
1/4	3/4	2-1/2	1/4	0.030	121304
1/4	3/4	2-1/2	1/4	0.060	121305
1/4	1-1/8	3	1/4	-	120964
1/4	1-1/8	3	1/4	0.005	121344
1/4	1-1/8	3	1/4	0.010	120972
1/4	1-1/8	3	1/4	0.015	121345
1/4	1-1/8	3	1/4	0.030	121346
1/4	1-1/8	3	1/4	0.060	121347

*bold numbers are EDPs for ordering

ULTIMATE PERFORMANCE

Solid Carbide End Mills For Alloy Steels, HRSA, Hardened Steel



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Series 1035		HGW5 | 5FL | Square and Radius | Hurrimill			
Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	EDP
5/16	1/2	2	5/16	-	120982
5/16	1/2	2	5/16	0.010	120991
5/16	1/2	2	5/16	0.015	121383
5/16	1/2	2	5/16	0.030	121385
5/16	1/2	2	5/16	0.060	121386
5/16	13/16	2-1/2	5/16	-	120957
5/16	13/16	2-1/2	5/16	0.010	120948
5/16	13/16	2-1/2	5/16	0.015	121312
5/16	13/16	2-1/2	5/16	0.030	121313
5/16	13/16	2-1/2	5/16	0.060	121314
5/16	1-1/8	3	5/16	-	120965
5/16	1-1/8	3	5/16	0.010	120973
5/16	1-1/8	3	5/16	0.015	121348
5/16	1-1/8	3	5/16	0.030	121349
5/16	1-1/8	3	5/16	0.060	121350
3/8	7/16	2	3/8	-	122484
3/8	7/16	2	3/8	0.015	121485
3/8	7/16	2	3/8	0.030	121486
3/8	7/16	2	3/8	0.060	121487
3/8	5/8	2	3/8	-	120983
3/8	5/8	2	3/8	0.015	120992
3/8	5/8	2	3/8	0.030	121387
3/8	5/8	2	3/8	0.060	121388
3/8	7/8	2-1/2	3/8	-	120958
3/8	7/8	2-1/2	3/8	0.010	120481
3/8	7/8	2-1/2	3/8	0.015	120949
3/8	7/8	2-1/2	3/8	0.030	121315
3/8	7/8	2-1/2	3/8	0.060	121316
3/8	1-1/8	3	3/8	-	120966
3/8	1-1/8	3	3/8	0.010	120974
3/8	1-1/8	3	3/8	0.015	121351
3/8	1-1/8	3	3/8	0.030	121352
3/8	1-1/8	3	3/8	0.060	121353
3/8	1-1/8	3	3/8	0.090	121354
3/8	1-1/8	3	3/8	0.120	121355
1/2	5/8	2-1/2	1/2	-	120984
1/2	5/8	2-1/2	1/2	0.015	120993
1/2	5/8	2-1/2	1/2	0.030	121389
1/2	5/8	2-1/2	1/2	0.060	121390
1/2	5/8	2-1/2	1/2	0.090	121391
1/2	5/8	2-1/2	1/2	0.120	121392
1/2	1	3	1/2	-	119762
1/2	1	3	1/2	0.015	120950
1/2	1	3	1/2	0.020	122033
1/2	1	3	1/2	0.030	120648
1/2	1	3	1/2	0.060	121317
1/2	1	3	1/2	0.090	121318
1/2	1	3	1/2	0.120	121319
1/2	1-1/4	3	1/2	0.015	121457
1/2	1-1/4	3	1/2	0.030	121458
1/2	1-1/4	3	1/2	0.060	121459
1/2	1-1/4	3	1/2	0.090	121460
1/2	1-1/4	3	1/2	0.120	121461
1/2	1-1/2	3	1/2	-	121600
1/2	1-1/2	3	1/2	0.015	121462
1/2	1-1/2	3	1/2	0.030	121463
1/2	1-1/2	3	1/2	0.060	121464
1/2	1-1/2	3	1/2	0.090	121465
1/2	1-1/2	3	1/2	0.120	121466
1/2	1-3/4	4	1/2	-	121520
1/2	1-3/4	4	1/2	0.015	121467
1/2	1-3/4	4	1/2	0.030	121468
1/2	1-3/4	4	1/2	0.060	121469
1/2	1-3/4	4	1/2	0.090	121470
1/2	1-3/4	4	1/2	0.120	121471
1/2	2	4	1/2	-	120967
1/2	2	4	1/2	0.015	120975
1/2	2	4	1/2	0.030	121356
1/2	2	4	1/2	0.060	121357
1/2	2	4	1/2	0.090	121358
1/2	2	4	1/2	0.120	121359
5/8	3/4	3	5/8	-	120985
5/8	3/4	3	5/8	0.015	121393
5/8	3/4	3	5/8	0.020	120994
5/8	3/4	3	5/8	0.030	121394
5/8	3/4	3	5/8	0.060	121395

*bold numbers are EDPs for ordering

ULTIMATE PERFORMANCE

Solid Carbide End Mills For Alloy Steels, HRSA, Hardened Steel



Series 1035 HGW5 | 5FL | Square and Radius | Hurrimill

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	EDP
5/8	3/4	3	5/8	0.090	121396
5/8	3/4	3	5/8	0.120	121398
5/8	1-1/4	3-1/2	5/8	-	119764
5/8	1-1/4	3-1/2	5/8	0.015	121320
5/8	1-1/4	3-1/2	5/8	0.020	119756
5/8	1-1/4	3-1/2	5/8	0.030	121321
5/8	1-1/4	3-1/2	5/8	0.060	121324
5/8	1-1/4	3-1/2	5/8	0.090	121325
5/8	1-1/4	3-1/2	5/8	0.120	121326
5/8	2-1/4	5	5/8	-	120968
5/8	2-1/4	5	5/8	0.015	121360
5/8	2-1/4	5	5/8	0.020	120976
5/8	2-1/4	5	5/8	0.030	121361
5/8	2-1/4	5	5/8	0.060	121362
5/8	2-1/4	5	5/8	0.090	121363
5/8	2-1/4	5	5/8	0.120	121364
3/4	7/8	3	3/4	-	120986
3/4	7/8	3	3/4	0.015	121399
3/4	7/8	3	3/4	0.030	120995
3/4	7/8	3	3/4	0.060	121400
3/4	7/8	3	3/4	0.090	121401
3/4	7/8	3	3/4	0.120	121402
3/4	1-1/2	4	3/4	-	119765
3/4	1-1/2	4	3/4	0.015	121327
3/4	1-1/2	4	3/4	0.030	119758
3/4	1-1/2	4	3/4	0.060	121328
3/4	1-1/2	4	3/4	0.090	121329
3/4	1-1/2	4	3/4	0.120	121330
3/4	2-1/4	5	3/4	-	120969
3/4	2-1/4	5	3/4	0.015	121365
3/4	2-1/4	5	3/4	0.030	120977
3/4	2-1/4	5	3/4	0.060	121366
3/4	2-1/4	5	3/4	0.090	121367
3/4	2-1/4	5	3/4	0.120	121368
1	1	4	1	-	120987
1	1	4	1	0.015	121403
1	1	4	1	0.030	120996
1	1	4	1	0.060	121404
1	1	4	1	0.090	121405
1	1	4	1	0.120	121406
1	1-1/2	4	1	-	119766
1	1-1/2	4	1	0.015	121336
1	1-1/2	4	1	0.030	119760
1	1-1/2	4	1	0.060	121338
1	1-1/2	4	1	0.090	121339
1	1-1/2	4	1	0.120	121340
1	2-1/4	5	1	-	120970
1	2-1/4	5	1	0.015	121369
1	2-1/4	5	1	0.030	120978
1	2-1/4	5	1	0.060	121370
1	2-1/4	5	1	0.090	121371
1	2-1/4	5	1	0.120	121372

*bold numbers are EDPs for ordering

Popular Custom Milling Options

Proprietary GWS tool coatings
 Longer lengths
 Enhanced geometry
 Special shank modifications like **SAFE-LOCK**

CUSTOM COMES STANDARD

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

ULTIMATE PERFORMANCE

Solid Carbide End Mills For Alloy Steels, HRSA, Hardened Steel



FEATURES/DESCRIPTION	APPLICATION	FEATURES								
<p>Variable Helix, Unequal Index</p> <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance Ideal for hardened steel, die steel and HRSA 7-flute variable helix design Ideal for High Efficiency Dynamic Milling SafeLock® shank available upon request 		<table border="1"> <tr> <td>CARBIDE</td> <td>VAR</td> </tr> <tr> <td>7FL</td> <td>RAD</td> </tr> <tr> <td>SQ</td> <td>P178</td> </tr> <tr> <td>h6</td> <td>FX1</td> </tr> </table>	CARBIDE	VAR	7FL	RAD	SQ	P178	h6	FX1
CARBIDE	VAR									
7FL	RAD									
SQ	P178									
h6	FX1									

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	●	●		○	●	●			●		●	○

● Best ○ Good

Series 1040 | HGW7 | 7FL | Square and Radius | Hurrimill

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	EDP
1/8	1/4	1-1/2	1/8	-	122664
1/8	1/4	1-1/2	1/8	0.005	122612
1/8	1/4	1-1/2	1/8	0.015	122613
1/8	1/4	1-1/2	1/8	0.030	122614
1/8	1/2	1-1/2	1/8	-	122876
1/8	1/2	1-1/2	1/8	0.005	122798
1/8	1/2	1-1/2	1/8	0.015	122799
1/8	1/2	1-1/2	1/8	0.030	122800
3/16	5/16	2	3/16	-	122665
3/16	5/16	2	3/16	0.005	122615
3/16	5/16	2	3/16	0.015	122616
3/16	5/16	2	3/16	0.030	122617
3/16	5/8	2	3/16	-	122877
3/16	5/8	2	3/16	0.005	122801
3/16	5/8	2	3/16	0.015	122802
3/16	5/8	2	3/16	0.030	122803
3/16	3/4	2	3/16	-	122930
3/16	3/4	2	3/16	0.005	122885
3/16	3/4	2	3/16	0.015	122886
3/16	3/4	2	3/16	0.030	122887
3/16	3/4	2	3/16	0.060	122888
1/4	5/16	2	1/4	-	122666
1/4	5/16	2	1/4	0.005	122618
1/4	5/16	2	1/4	0.010	122619
1/4	5/16	2	1/4	0.015	122620
1/4	5/16	2	1/4	0.030	122621
1/4	5/16	2	1/4	0.060	122622
1/4	1/2	2	1/4	-	122667
1/4	1/2	2	1/4	0.005	122623
1/4	1/2	2	1/4	0.010	122624
1/4	1/2	2	1/4	0.015	122625
1/4	1/2	2	1/4	0.030	122626
1/4	1/2	2	1/4	0.060	122627
1/4	3/4	2-1/2	1/4	-	122878
1/4	3/4	2-1/2	1/4	0.005	122804
1/4	3/4	2-1/2	1/4	0.010	122805
1/4	3/4	2-1/2	1/4	0.015	122806
1/4	3/4	2-1/2	1/4	0.030	122807
1/4	3/4	2-1/2	1/4	0.060	122808
1/4	1-1/8	3	1/4	-	122931
1/4	1-1/8	3	1/4	0.005	122889
1/4	1-1/8	3	1/4	0.010	122890
1/4	1-1/8	3	1/4	0.015	122891
1/4	1-1/8	3	1/4	0.030	122892
1/4	1-1/8	3	1/4	0.060	122893

*bold numbers are EDPs for ordering

ULTIMATE PERFORMANCE

Solid Carbide End Mills For Alloy Steels, HRSA, Hardened Steel



Series 1040 HGW7 | 7FL | Square and Radius | Hurrimill

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	EDP
5/16	1/2	2	5/16	-	122668
5/16	1/2	2	5/16	0.010	122628
5/16	1/2	2	5/16	0.015	122629
5/16	1/2	2	5/16	0.030	122630
5/16	1/2	2	5/16	0.060	122631
5/16	13/16	2-1/2	5/16	-	122879
5/16	13/16	2-1/2	5/16	0.010	122809
5/16	13/16	2-1/2	5/16	0.015	122810
5/16	13/16	2-1/2	5/16	0.030	122811
5/16	13/16	2-1/2	5/16	0.060	122812
5/16	1-1/8	3	5/16	-	122932
5/16	1-1/8	3	5/16	0.010	122894
5/16	1-1/8	3	5/16	0.015	122895
5/16	1-1/8	3	5/16	0.030	122896
5/16	1-1/8	3	5/16	0.060	122897
3/8	7/16	2	3/8	-	122670
3/8	7/16	2	3/8	0.015	122632
3/8	7/16	2	3/8	0.030	122633
3/8	7/16	2	3/8	0.060	122634
3/8	5/8	2	3/8	-	122669
3/8	5/8	2	3/8	0.015	122635
3/8	5/8	2	3/8	0.030	122636
3/8	5/8	2	3/8	0.060	122637
3/8	7/8	2-1/2	3/8	-	122880
3/8	7/8	2-1/2	3/8	0.010	122813
3/8	7/8	2-1/2	3/8	0.015	122814
3/8	7/8	2-1/2	3/8	0.030	122815
3/8	7/8	2-1/2	3/8	0.060	122816
3/8	1-1/8	3	3/8	-	122933
3/8	1-1/8	3	3/8	0.010	122898
3/8	1-1/8	3	3/8	0.015	122899
3/8	1-1/8	3	3/8	0.030	122900
3/8	1-1/8	3	3/8	0.060	122901
3/8	1-1/8	3	3/8	0.090	122902
3/8	1-1/8	3	3/8	0.120	122903
1/2	5/8	2-1/2	1/2	-	122671
1/2	5/8	2-1/2	1/2	0.015	122638
1/2	5/8	2-1/2	1/2	0.030	122639
1/2	5/8	2-1/2	1/2	0.060	122640
1/2	5/8	2-1/2	1/2	0.090	121901
1/2	5/8	2-1/2	1/2	0.120	122641
1/2	1	3	1/2	-	121242
1/2	1	3	1/2	0.015	124462
1/2	1	3	1/2	0.020	122823
1/2	1	3	1/2	0.030	122824
1/2	1	3	1/2	0.060	122825
1/2	1	3	1/2	0.090	122826
1/2	1	3	1/2	0.120	122827
1/2	1-1/4	3	1/2	-	122268
1/2	1-1/4	3	1/2	0.015	122828
1/2	1-1/4	3	1/2	0.030	122829
1/2	1-1/4	3	1/2	0.060	122830
1/2	1-1/4	3	1/2	0.090	122831
1/2	1-1/4	3	1/2	0.120	122832
1/2	1-1/2	3	1/2	-	122881
1/2	1-1/2	3	1/2	0.015	122833
1/2	1-1/2	3	1/2	0.030	122835
1/2	1-1/2	3	1/2	0.060	122836
1/2	1-1/2	3	1/2	0.090	122837
1/2	1-1/2	3	1/2	0.120	122838
1/2	1-3/4	4	1/2	-	122934
1/2	1-3/4	4	1/2	0.015	122904
1/2	1-3/4	4	1/2	0.030	122905
1/2	1-3/4	4	1/2	0.060	122906
1/2	1-3/4	4	1/2	0.090	122907
1/2	1-3/4	4	1/2	0.120	122908
1/2	2	4	1/2	-	122935
1/2	2	4	1/2	0.015	122909
1/2	2	4	1/2	0.030	122910
1/2	2	4	1/2	0.060	122911
1/2	2	4	1/2	0.090	122912
1/2	2	4	1/2	0.120	122913
5/8	3/4	3	5/8	-	122715
5/8	3/4	3	5/8	0.015	122642
5/8	3/4	3	5/8	0.020	122643
5/8	3/4	3	5/8	0.030	122644

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

ULTIMATE PERFORMANCE

Solid Carbide End Mills For Alloy Steels, HRSA, Hardened Steel



Series 1040 | HGW7 | 7FL | Square and Radius | Hurrimill

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	EDP
5/8	3/4	3	5/8	0.060	122645
5/8	3/4	3	5/8	0.090	122646
5/8	3/4	3	5/8	0.120	122647
5/8	1-1/4	3-1/2	5/8	-	122882
5/8	1-1/4	3-1/2	5/8	0.015	122839
5/8	1-1/4	3-1/2	5/8	0.020	122840
5/8	1-1/4	3-1/2	5/8	0.030	122841
5/8	1-1/4	3-1/2	5/8	0.060	122851
5/8	1-1/4	3-1/2	5/8	0.090	122852
5/8	1-1/4	3-1/2	5/8	0.120	122853
5/8	2-1/4	5	5/8	-	122936
5/8	2-1/4	5	5/8	0.015	122914
5/8	2-1/4	5	5/8	0.020	122915
5/8	2-1/4	5	5/8	0.030	122916
5/8	2-1/4	5	5/8	0.060	122917
5/8	2-1/4	5	5/8	0.090	122918
5/8	2-1/4	5	5/8	0.120	122919
3/4	7/8	3	3/4	-	122716
3/4	7/8	3	3/4	0.015	122648
3/4	7/8	3	3/4	0.030	122651
3/4	7/8	3	3/4	0.060	122654
3/4	7/8	3	3/4	0.090	122655
3/4	7/8	3	3/4	0.120	122656
3/4	1-1/2	4	3/4	-	122883
3/4	1-1/2	4	3/4	0.015	122854
3/4	1-1/2	4	3/4	0.030	122866
3/4	1-1/2	4	3/4	0.060	122867
3/4	1-1/2	4	3/4	0.090	122868
3/4	1-1/2	4	3/4	0.120	122761
3/4	2-1/4	5	3/4	-	122937
3/4	2-1/4	5	3/4	0.015	122920
3/4	2-1/4	5	3/4	0.030	122921
3/4	2-1/4	5	3/4	0.060	122922
3/4	2-1/4	5	3/4	0.090	122923
3/4	2-1/4	5	3/4	0.120	122924
1	1	4	1	-	122797
1	1	4	1	0.015	122659
1	1	4	1	0.030	122660
1	1	4	1	0.060	122661
1	1	4	1	0.090	122662
1	1	4	1	0.120	122663
1	1-1/2	4	1	-	122884
1	1-1/2	4	1	0.015	122869
1	1-1/2	4	1	0.030	122871
1	1-1/2	4	1	0.060	122872
1	1-1/2	4	1	0.090	122873
1	1-1/2	4	1	0.120	122875
1	2-1/4	5	1	-	122938
1	2-1/4	5	1	0.015	122925
1	2-1/4	5	1	0.030	122926
1	2-1/4	5	1	0.060	122927
1	2-1/4	5	1	0.090	122928
1	2-1/4	5	1	0.120	122929

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

ULTIMATE PERFORMANCE

Solid Carbide Roughing End Mills For Alloy Steels, HRSA, Hardened Steel



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES								
<p>Roughing</p> <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance Ideal for hardened steel, die steel and HRSA Roughing serrations break chips and reduce cutting forces SafeLock® shank available upon request 		<table border="1"> <tr> <td>CARBIDE</td> <td>VAR</td> </tr> <tr> <td>4FL</td> <td>SQ</td> </tr> <tr> <td>P179</td> <td>h6</td> </tr> <tr> <td>FX1</td> <td></td> </tr> </table>	CARBIDE	VAR	4FL	SQ	P179	h6	FX1	
CARBIDE	VAR									
4FL	SQ									
P179	h6									
FX1										

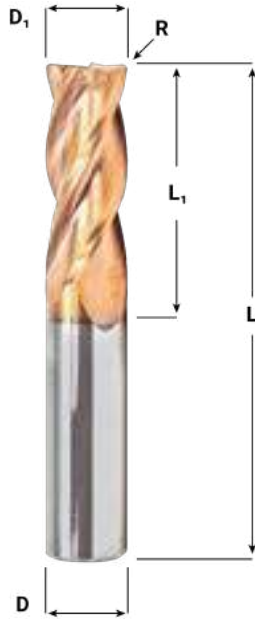
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	●	●		○	●	●			●		●	○

● Best ○ Good

Series 1031 SRF4 | 4FL | Square | Chamfer

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Chamfer(D)	EDP
1/8	1/4	1-1/2	1/8	0.007	107988
1/8	1/2	1-1/2	1/8	0.007	111235
3/16	5/16	2	3/16	0.007	111252
3/16	5/8	2	3/16	0.007	111236
1/4	1/2	2	1/4	0.010	107794
1/4	3/4	2-1/2	1/4	0.010	111237
1/4	1-1/8	3	1/4	0.010	111244
5/16	1/2	2	5/16	0.010	107990
5/16	13/16	2-1/2	5/16	0.010	111238
5/16	1-1/8	3	5/16	0.010	111245
3/8	5/8	2	3/8	0.010	111253
3/8	7/8	2-1/2	3/8	0.010	111239
3/8	1-1/8	3	3/8	0.010	111246
1/2	5/8	2-1/2	1/2	0.010	107904
1/2	1	3	1/2	0.015	107905
1/2	2	4	1/2	0.015	111247
5/8	3/4	3	5/8	0.015	107992
5/8	1-1/4	3-1/2	5/8	0.015	111277
5/8	2-1/4	5	5/8	0.015	111248
3/4	7/8	3	3/4	0.020	107919
3/4	1-1/2	4	3/4	0.020	111242
3/4	2-1/4	5	3/4	0.020	111249
1	1	4	1	0.020	107997
1	1-1/2	4	1	0.020	111243
1	2-1/4	5	1	0.020	111250

*bold numbers are EDPs for ordering



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Variable Helix, Unequal Index</p> <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance All-terrain 4-flute variable helix carbide end mill Capable of drilling and aggressive ramping Dynamic milling or conventional roughing SafeLock® shank available upon request 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	●	●	○	●	●	○	○	○	○	○	○

● Best ○ Good

Series 1034 AT4 | 4FL | Square and Radius | Plunge and Run

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	EDP	Weldon Flat
1/8	1/4	1-1/2	1/8	-	1034001	-
1/8	1/4	1-1/2	1/8	0.005	1034002	-
1/8	1/4	1-1/2	1/8	0.015	1034003	-
1/8	1/4	1-1/2	1/8	0.030	1034004	-
3/16	5/16	2	3/16	-	1034005	-
3/16	5/16	2	3/16	0.005	1034006	-
3/16	5/16	2	3/16	0.015	1034007	-
3/16	5/16	2	3/16	0.030	1034008	-
1/4	5/16	2	1/4	-	1034009	-
1/4	5/16	2	1/4	0.015	1034010	-
1/4	5/16	2	1/4	0.030	1034011	-
1/4	5/16	2	1/4	0.060	1034012	-
1/4	1/2	2	1/4	-	1034013	-
1/4	1/2	2	1/4	0.015	1034014	-
1/4	1/2	2	1/4	0.030	1034015	-
1/4	1/2	2	1/4	0.060	1034016	-
1/4	3/4	2-1/2	1/4	-	1034017	-
1/4	3/4	2-1/2	1/4	0.015	1034018	-
1/4	3/4	2-1/2	1/4	0.030	1034019	-
1/4	3/4	2-1/2	1/4	0.060	1034020	-
5/16	1/2	2	5/16	-	1034021	-
5/16	1/2	2	5/16	0.015	1034022	-
5/16	1/2	2	5/16	0.030	1034023	-
5/16	1/2	2	5/16	0.060	1034024	-
5/16	13/16	2-1/2	5/16	-	1034025	-
5/16	13/16	2-1/2	5/16	0.015	1034026	-
5/16	13/16	2-1/2	5/16	0.030	1034027	-
5/16	13/16	2-1/2	5/16	0.060	1034028	-
3/8	7/16	2	3/8	-	1034029	-
3/8	7/16	2	3/8	0.015	1034030	-
3/8	7/16	2	3/8	0.030	1034031	-
3/8	7/16	2	3/8	0.060	1034032	-
3/8	5/8	2	3/8	-	1034033	-
3/8	5/8	2	3/8	0.015	1034034	-
3/8	5/8	2	3/8	0.030	1034035	-
3/8	5/8	2	3/8	0.060	1034036	-
3/8	7/8	2-1/2	3/8	-	1034037	-
3/8	7/8	2-1/2	3/8	0.015	1034038	-
3/8	7/8	2-1/2	3/8	0.030	1034039	-
3/8	7/8	2-1/2	3/8	0.060	1034040	-
1/2	5/8	3	1/2	-	1034041	1034089
1/2	5/8	3	1/2	0.015	1034042	1034090
1/2	5/8	3	1/2	0.030	1034043	1034091
1/2	5/8	3	1/2	0.060	1034044	1034092
1/2	5/8	3	1/2	0.090	1034045	1034093

*bold numbers are EDPs for ordering

ULTIMATE PERFORMANCE

All-Terrain Carbide End Mills



Series 1034 AT4 | 4FL | Square and Radius | Plunge and Run

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	EDP	Weldon Flat
1/2	1	3	1/2	-	1034046	1034094
1/2	1	3	1/2	0.015	1034047	1034095
1/2	1	3	1/2	0.030	1034048	1034096
1/2	1	3	1/2	0.060	1034049	1034097
1/2	1	3	1/2	0.090	1034050	1034098
1/2	1-1/4	3-1/2	1/2	-	1034051	1034099
1/2	1-1/4	3-1/2	1/2	0.015	1034052	1034100
1/2	1-1/4	3-1/2	1/2	0.030	1034053	1034101
1/2	1-1/4	3-1/2	1/2	0.060	1034054	1034102
1/2	1-1/4	3-1/2	1/2	0.090	1034055	1034103
1/2	1-1/2	4	1/2	-	1034056	1034104
1/2	1-1/2	4	1/2	0.015	1034057	1034105
1/2	1-1/2	4	1/2	0.030	1034058	1034106
1/2	1-1/2	4	1/2	0.060	1034059	1034107
1/2	1-1/2	4	1/2	0.090	1034060	1034108
5/8	3/4	3	5/8	-	1034061	1034109
5/8	3/4	3	5/8	0.030	1034062	1034110
5/8	3/4	3	5/8	0.060	1034063	1034111
5/8	3/4	3	5/8	0.090	1034064	1034112
5/8	1-1/4	3-1/2	5/8	-	1034065	1034113
5/8	1-1/4	3-1/2	5/8	0.030	1034066	1034114
5/8	1-1/4	3-1/2	5/8	0.060	1034067	1034115
5/8	1-1/4	3-1/2	5/8	0.090	1034068	1034116
3/4	7/8	3-1/2	3/4	-	1034069	1034117
3/4	7/8	3-1/2	3/4	0.030	1034070	1034118
3/4	7/8	3-1/2	3/4	0.060	1034071	1034119
3/4	7/8	3-1/2	3/4	0.090	1034072	1034120
3/4	7/8	3-1/2	3/4	0.120	1034073	1034121
3/4	1-1/2	4	3/4	-	1034074	1034122
3/4	1-1/2	4	3/4	0.030	1034075	1034123
3/4	1-1/2	4	3/4	0.060	1034076	1034124
3/4	1-1/2	4	3/4	0.090	1034077	1034125
3/4	1-1/2	4	3/4	0.120	1034078	1034126
1	1	4	1	-	1034079	1034127
1	1	4	1	0.030	1034080	1034128
1	1	4	1	0.060	1034081	1034129
1	1	4	1	0.090	1034082	1034130
1	1	4	1	0.120	1034083	1034131
1	1-1/2	4	1	-	1034084	1034132
1	1-1/2	4	1	0.030	1034085	1034133
1	1-1/2	4	1	0.060	1034086	1034134
1	1-1/2	4	1	0.090	1034087	1034135
1	1-1/2	4	1	0.120	1034088	1034136

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

ULTIMATE PERFORMANCE

Solid Carbide End Mills For Alloyed Steels And Hardened Steels



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<h2>DM2</h2> <p>Contouring Mill For Die/Mold</p> <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance Ideal for hardened steels 40-65 Rc Robust core diameter and low rake for hard milling applications FX1 coating ensures long stable tool life 		<ul style="list-style-type: none"> CARBIDE 30° 2FL BALL h6 P 182 FX1

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
	●	●				○			○	○	●	●

● Best ○ Good

Series 1050 DM2 | 2FL | Ball Nose | Die/Mold

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(φ)	EDP
1/32	1/32	3	1/4	100333
1/16	1/16	3	1/4	100334
3/32	3/32	3	1/4	100335
1/8	1/8	3	1/4	100336
5/32	5/32	3	1/4	100338
3/16	3/16	3	1/4	100342
1/4	1/4	3	1/4	100346
5/16	5/16	3	5/16	100348
3/8	3/8	3-1/2	3/8	100349
1/2	1/2	4	1/2	100351

*bold numbers are EDPs for ordering

Popular Custom Milling Options

- Proprietary GWS tool coatings
- Longer lengths
- Enhanced geometry
- Special shank modifications like **SAFE-LOCK**

CUSTOM COMES STANDARD

ULTIMATE PERFORMANCE

Solid Carbide High Feed End Mills For Titanium



INTRO

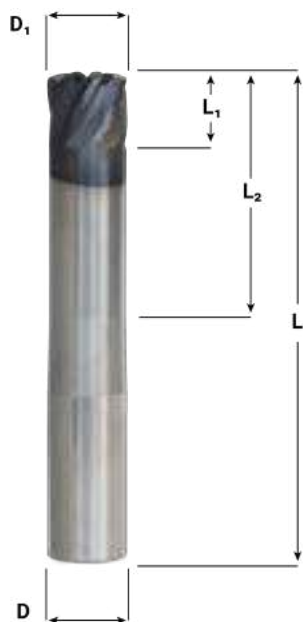
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES										
<h3>Ti FEED</h3> <p>High Feed Mill For Ti</p> <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance Ideal for stainless steels and Titanium Suited for Z-Level machining and 5-axis machines 		<table border="1"> <tr> <td>CARBIDE</td> <td>30°</td> </tr> <tr> <td>Multi</td> <td>RAD</td> </tr> <tr> <td>h6</td> <td>PC</td> </tr> <tr> <td>P202</td> <td>Necked</td> </tr> <tr> <td>AlTiN</td> <td></td> </tr> </table>	CARBIDE	30°	Multi	RAD	h6	PC	P202	Necked	AlTiN	
CARBIDE	30°											
Multi	RAD											
h6	PC											
P202	Necked											
AlTiN												

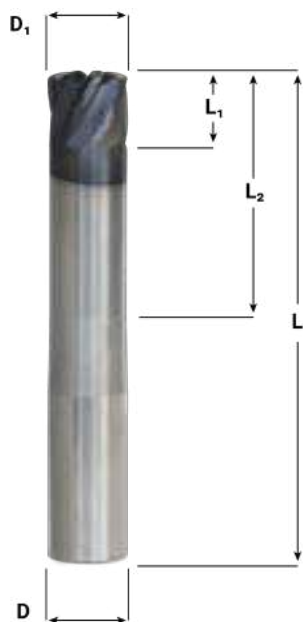
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
			●	●					○	●		

● Best ○ Good

Series 2052 | TF | 5-7FL | Corner Radius | High Feed

Diameter(D ₁)	LOC(L ₁)	LBS(L ₂)	OAL(L)	Shank(D)	EDP
1/4	1/8	0.21	3	1/4	205201
3/8	5/16	0.34	4	3/8	205202
1/2	3/8	0.46	5	1/2	205203
5/8	3/8	0.59	6	5/8	205204
3/4	7/16	0.71	6	3/4	205205
1	3/4	0.96	6	1	205206

*bold numbers are EDPs for ordering

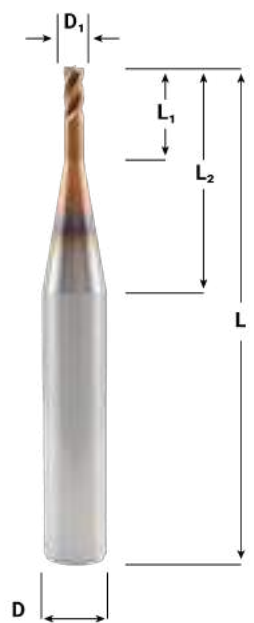


FEATURES/DESCRIPTION	APPLICATION	FEATURES																																							
<h3>Ti FEED</h3> <p>High Feed Mill For Ti</p> <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance Ideal for stainless steels and Titanium Suited for Z-Level machining and 5-axis machines Coolant-through 		<table border="1"> <tr> <td>CARBIDE</td> <td>30°</td> </tr> <tr> <td>Multi</td> <td>RAD</td> </tr> <tr> <td>THRU</td> <td>h6</td> </tr> <tr> <td>P202</td> <td>DC</td> </tr> <tr> <td>Heckel</td> <td>AlTiN</td> </tr> </table>	CARBIDE	30°	Multi	RAD	THRU	h6	P202	DC	Heckel	AlTiN																													
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STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL																														
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																													
			●	●					○	●																															

Series 2053 TF | 5-7FL | Corner Radius | Coolant-Through | High Feed

Diameter(D ₁)	LOC(L ₁)	LBS(L ₂)	OAL(L)	Shank(D)	EDP
1/4	0.13	0.21	3	1/4	205301
3/8	5/16	0.34	4	3/8	205302
1/2	3/8	0.46	5	1/2	205303
5/8	3/8	0.59	6	5/8	205304
3/4	7/16	0.71	6	3/4	205305
1	3/4	0.96	6	1	205306

*bold numbers are EDPs for ordering



FEATURES/DESCRIPTION	APPLICATION	FEATURES								
<p>HEXAMILL</p> <p>Torq Screw Milling</p> <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance Micro end mills designed for the milling of medical-grade bone screws and components Features FX7 micro coating for small diameter end mills Designed for use with HexaDrill, Series 4060 		<table border="1"> <tr> <td>CARBIDE</td> <td>Multi</td> </tr> <tr> <td>SQ</td> <td>30°</td> </tr> <tr> <td>h6</td> <td>P181</td> </tr> <tr> <td>FX7</td> <td></td> </tr> </table>	CARBIDE	Multi	SQ	30°	h6	P181	FX7	
CARBIDE	Multi									
SQ	30°									
h6	P181									
FX7										

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○	●	●	○	○			○	○	○	

● Best ○ Good

Series 2150 | HXM | Multi Flute | Square | Metric

Torx Type	Diameter(D ₁)	L ₁	LDR	D ₂	L ₂	Shank(D)	OAL(L)	Flutes	EDP
T4	0.20	0.70	3X	0.19	0.30	3	40mm	3	2150001
T4	0.20	1.00	5X	0.19	0.30	3	40mm	3	2150002
T5	0.25	0.88	3X	0.23	0.40	3	40mm	3	2150003
T5	0.25	1.25	5X	0.23	0.40	3	40mm	3	2150004
T6/T7	0.30	1.05	3X	0.28	0.45	3	40mm	3	2150005
T6/T7	0.30	1.50	5X	0.28	0.45	3	40mm	3	2150006
T8/T10	0.40	1.40	3X	0.38	0.60	3	40mm	3	2150007
T8/T10	0.40	2.00	5X	0.38	0.60	3	40mm	3	2150008
T10/T15	0.50	1.75	3X	0.47	0.75	3	40mm	4	2150009
T10/T15	0.50	2.50	5X	0.47	0.75	3	40mm	4	2150010
T20	0.60	2.10	3X	0.56	0.90	3	40mm	4	2150011
T20	0.60	3.00	5X	0.56	0.90	3	40mm	4	2150012
T25	0.80	2.80	3X	0.75	1.20	3	40mm	4	2150013
T25	0.80	4.00	5X	0.75	1.20	3	40mm	4	2150014
T30	1.00	3.50	3X	0.94	1.50	3	40mm	4	2150015
T30	1.00	5.00	5X	0.94	1.50	3	40mm	4	2150016

*bold numbers are EDPs for ordering

Popular Custom Milling Options

- Proprietary GWS tool coatings
- Longer lengths
- Enhanced geometry
- Special shank modifications like **SAFE-LOCK**

CUSTOM COMES STANDARD

ULTIMATE PERFORMANCE

Solid Carbide End Mill For Pocketing And Ramping In Aluminum



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION		APPLICATION	FEATURES																																							
<p>Alumigator Ramping Tool</p> <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance Ultra-high speed pocketing Aggressive ramping into pockets up to 45° Ultra-free cutting Staggered chip breakers to rough and finish 																																										
<table border="1"> <thead> <tr> <th colspan="3">STEEL</th> <th colspan="2">STAINLESS</th> <th colspan="2">CAST IRON</th> <th colspan="2">NON-FERROUS</th> <th colspan="2">HBSA</th> <th colspan="2">HARDENED STEEL</th> </tr> <tr> <th>P1</th><th>P2</th><th>P3</th> <th>M1</th><th>M2</th> <th>K1</th><th>K2</th> <th>N1</th><th>N2</th> <th>S1</th><th>S2</th> <th>H1</th><th>H2</th> </tr> </thead> <tbody> <tr> <td></td><td></td><td></td> <td></td><td></td> <td></td><td></td> <td>●</td><td>●</td> <td></td><td></td> <td></td><td></td> </tr> </tbody> </table>		STEEL			STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL		P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2								●	●						
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL																															
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																														
							●	●																																		

● Best ○ Good

Series 1010 | ART | 3FL | Chip Breaker | Radius | Alumigator

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	EDP
3/16	5/8	2	3/16	0.030	118300
3/16	5/8	2	3/16	0.015	125966
1/4	3/4	2-1/2	1/4	0.030	122493
1/4	3/4	2-1/2	1/4	0.015	125967
1/4	1-1/8	3	1/4	0.030	125969
1/4	1-1/8	3	1/4	0.015	125968
5/16	3/4	2-1/2	5/16	0.030	122494
5/16	3/4	2-1/2	5/16	0.015	125970
5/16	1-1/8	3	5/16	0.030	125973
5/16	1-1/8	3	5/16	0.015	125972
3/8	1	2-1/2	3/8	0.060	118084
3/8	1	2-1/2	3/8	0.030	120499
3/8	1	2-1/2	3/8	0.015	118083
3/8	1-1/2	4	3/8	0.060	125668
3/8	1-1/2	4	3/8	0.030	125974
3/8	1-1/2	4	3/8	0.015	125667
1/2	1-1/4	3	1/2	0.090	125975
1/2	1-1/4	3	1/2	0.060	117601
1/2	1-1/4	3	1/2	0.045	125965
1/2	1-1/4	3	1/2	0.030	118988
1/2	1-1/4	3	1/2	0.015	118043
1/2	2-1/4	4	1/2	0.090	125977
1/2	2-1/4	4	1/2	0.060	125671
1/2	2-1/4	4	1/2	0.045	125976
1/2	2-1/4	4	1/2	0.030	125670
1/2	2-1/4	4	1/2	0.015	125669
5/8	1-5/8	3-1/2	5/8	0.090	122562
5/8	1-5/8	3-1/2	5/8	0.060	118301
5/8	1-5/8	3-1/2	5/8	0.045	125957
5/8	1-5/8	3-1/2	5/8	0.030	125020
5/8	1-5/8	3-1/2	5/8	0.015	125978
5/8	2-1/2	5	5/8	0.090	125981
5/8	2-1/2	5	5/8	0.060	125674
5/8	2-1/2	5	5/8	0.030	125980
3/4	1-5/8	4	3/4	0.120	119621
3/4	1-5/8	4	3/4	0.090	125956
3/4	1-5/8	4	3/4	0.060	118489
3/4	1-5/8	4	3/4	0.030	118488
3/4	2-1/2	5	3/4	0.120	125677
3/4	2-1/2	5	3/4	0.090	125983
3/4	2-1/2	5	3/4	0.060	125982
3/4	2-1/2	5	3/4	0.030	125676

*bold numbers are EDPs for ordering

ULTIMATE PERFORMANCE

Solid Carbide End Mill For Roughing And Slotting In Aluminum



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION		APPLICATION	FEATURES																																							
<p>AlumiGator Slotting And Roughing Tool</p> <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance Ultra-high speed roughing in Aluminum Roughing and slotting at speeds in excess of 200 IPM Ultra-free cutting action Staggered chip breakers to rough and finish 																																										
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STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL																															
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																														
							●	●																																		

● Best ○ Good

Series 1015 **AST | 3FL | Chip Breaker | Square and Radius | Slotting Tool**

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	EDP
3/16	5/8	2	3/16	-	120650
3/16	5/8	2	3/16	0.015	125984
3/16	5/8	2	3/16	0.030	120652
1/4	3/4	2-1/2	1/4	-	120653
1/4	3/4	2-1/2	1/4	0.015	125985
1/4	3/4	2-1/2	1/4	0.030	124047
1/4	1-1/8	3	1/4	-	125625
1/4	1-1/8	3	1/4	0.015	125986
1/4	1-1/8	3	1/4	0.030	125987
5/16	3/4	2-1/2	5/16	-	120656
5/16	3/4	2-1/2	5/16	0.015	125988
5/16	3/4	2-1/2	5/16	0.030	125960
5/16	1-1/8	3	5/16	-	125626
5/16	1-1/8	3	5/16	0.015	125989
5/16	1-1/8	3	5/16	0.030	125990
3/8	1	2-1/2	3/8	-	120659
3/8	1	2-1/2	3/8	0.015	120660
3/8	1	2-1/2	3/8	0.030	121652
3/8	1	2-1/2	3/8	0.060	120661
3/8	1-1/2	4	3/8	-	125627
3/8	1-1/2	4	3/8	0.015	125635
3/8	1-1/2	4	3/8	0.030	125991
3/8	1-1/2	4	3/8	0.060	125636
1/2	1-1/4	3	1/2	-	120662
1/2	1-1/4	3	1/2	0.015	120663
1/2	1-1/4	3	1/2	0.030	124010
1/2	1-1/4	3	1/2	0.045	125958
1/2	1-1/4	3	1/2	0.060	124078
1/2	1-1/4	3	1/2	0.090	125959
1/2	2-1/4	4	1/2	-	125628
1/2	2-1/4	4	1/2	0.015	125637
1/2	2-1/4	4	1/2	0.030	125992
1/2	2-1/4	4	1/2	0.060	125993
1/2	2-1/4	4	1/2	0.090	125994
5/8	1-5/8	3-1/2	5/8	-	120665
5/8	1-5/8	3-1/2	5/8	0.015	125995
5/8	1-5/8	3-1/2	5/8	0.030	125961
5/8	1-5/8	3-1/2	5/8	0.045	125962
5/8	1-5/8	3-1/2	5/8	0.060	125963
5/8	1-5/8	3-1/2	5/8	0.090	125964
5/8	2-1/2	5	5/8	-	125629
5/8	2-1/2	5	5/8	0.015	125996
5/8	2-1/2	5	5/8	0.030	125997
5/8	2-1/2	5	5/8	0.060	125998
5/8	2-1/2	5	5/8	0.090	125999

*bold numbers are EDPs for ordering

ULTIMATE PERFORMANCE

Solid Carbide End Mill For Roughing And Slotting In Aluminum



Series 1015 **AST | 3FL | Chip Breaker | Square and Radius | Slotting Tool**

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	EDP
3/4	1-5/8	4	3/4	-	120668
3/4	1-5/8	4	3/4	0.030	120669
3/4	1-5/8	4	3/4	0.060	123610
3/4	1-5/8	4	3/4	0.090	123397
3/4	1-5/8	4	3/4	0.120	120670
3/4	2-1/2	5	3/4	-	125630
3/4	2-1/2	5	3/4	0.030	125641
3/4	2-1/2	5	3/4	0.060	125642
3/4	2-1/2	5	3/4	0.090	125643
3/4	2-1/2	5	3/4	0.120	125644

*bold numbers are EDPs for ordering

Popular Custom Milling Options

- Proprietary GWS tool coatings
- Longer lengths
- Enhanced geometry
- Special shank modifications like **SAFE-LOCK**

CUSTOM COMES STANDARD

ULTIMATE PERFORMANCE

Solid Carbide End Mill For Finishing In Aluminum



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION		APPLICATION	FEATURES																																							
<p>Alumigator Finisher Tool</p> <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance High speed finishing of Aluminum Polished flutes and wiper flats produce mirror-like finishes Ideal for floor finishing 																																										
<table border="1"> <thead> <tr> <th colspan="3">STEEL</th> <th colspan="2">STAINLESS</th> <th colspan="2">CAST IRON</th> <th colspan="2">NON-FERROUS</th> <th colspan="2">HSSA</th> <th colspan="2">HARDENED STEEL</th> </tr> <tr> <th>P1</th><th>P2</th><th>P3</th> <th>M1</th><th>M2</th> <th>K1</th><th>K2</th> <th>N1</th><th>N2</th> <th>S1</th><th>S2</th> <th>H1</th><th>H2</th> </tr> </thead> <tbody> <tr> <td></td><td></td><td></td> <td></td><td></td> <td></td><td></td> <td>●</td><td>●</td> <td></td><td></td> <td></td><td></td> </tr> </tbody> </table>		STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL		P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2								●	●						
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL																															
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																														
							●	●																																		

● Best ○ Good

Series 1020 **AFT | 3FL | Square and Radius | Finishing Tool**

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	EDP
3/16	5/8	2	3/16	-	120671
3/16	5/8	2	3/16	0.010	120672
3/16	5/8	2	3/16	0.030	120673
1/4	3/4	2-1/2	1/4	-	120674
1/4	3/4	2-1/2	1/4	0.010	120675
1/4	3/4	2-1/2	1/4	0.030	123922
1/4	3/4	2-1/2	1/4	0.040	120676
1/4	1-1/8	3	1/4	-	125645
1/4	1-1/8	3	1/4	0.010	125651
1/4	1-1/8	3	1/4	0.040	125652
5/16	3/4	2-1/2	5/16	-	120677
5/16	3/4	2-1/2	5/16	0.010	120678
5/16	3/4	2-1/2	5/16	0.030	125952
5/16	3/4	2-1/2	5/16	0.050	120679
5/16	1-1/8	3	5/16	-	125646
5/16	1-1/8	3	5/16	0.010	125653
5/16	1-1/8	3	5/16	0.050	125654
3/8	1	2-1/2	3/8	-	120680
3/8	1	2-1/2	3/8	0.015	120681
3/8	1	2-1/2	3/8	0.030	123921
3/8	1	2-1/2	3/8	0.060	120682
3/8	1-1/2	4	3/8	-	125647
3/8	1-1/2	4	3/8	0.015	125655
3/8	1-1/2	4	3/8	0.060	125656
1/2	1-1/4	3	1/2	-	120683
1/2	1-1/4	3	1/2	0.015	120684
1/2	1-1/4	3	1/2	0.030	123624
1/2	1-1/4	3	1/2	0.045	125950
1/2	1-1/4	3	1/2	0.060	124804
1/2	1-1/4	3	1/2	0.080	120685
1/2	1-1/4	3	1/2	0.090	125951
1/2	2-1/4	4	1/2	-	125648
1/2	2-1/4	4	1/2	0.015	125657
1/2	2-1/4	4	1/2	0.080	125658
5/8	1-5/8	3-1/2	5/8	-	120686
5/8	1-5/8	3-1/2	5/8	0.020	120687
5/8	1-5/8	3-1/2	5/8	0.030	125953
5/8	1-5/8	3-1/2	5/8	0.060	125954
5/8	1-5/8	3-1/2	5/8	0.090	125955
5/8	1-5/8	3-1/2	5/8	0.100	120688
5/8	2-1/2	5	5/8	-	125649
5/8	2-1/2	5	5/8	0.020	125659
5/8	2-1/2	5	5/8	0.100	125660
3/4	1-5/8	4	3/4	-	120689
3/4	1-5/8	4	3/4	0.030	120690

*bold numbers are EDPs for ordering

ULTIMATE PERFORMANCE

Solid Carbide End Mill For Finishing In Aluminum



Series 1020 AFT | 3FL | Square and Radius | Finishing Tool

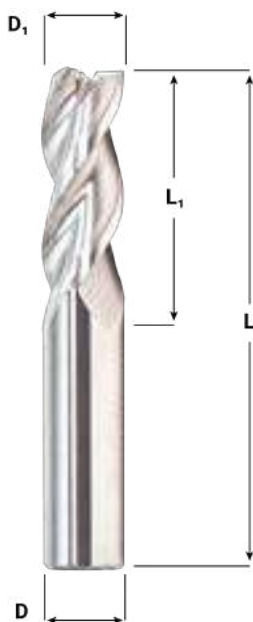
Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	EDP
3/4	1-5/8	4	3/4	0.060	123896
3/4	1-5/8	4	3/4	0.090	124422
3/4	1-5/8	4	3/4	0.120	120691
3/4	2-1/2	5	3/4	-	125650
3/4	2-1/2	5	3/4	0.030	125661
3/4	2-1/2	5	3/4	0.120	125662

*bold numbers are EDPs for ordering

Popular Custom Milling Options

- Proprietary GWS tool coatings
- Longer lengths
- Enhanced geometry
- Special shank modifications like **SAFE-LOCK**

CUSTOM COMES STANDARD



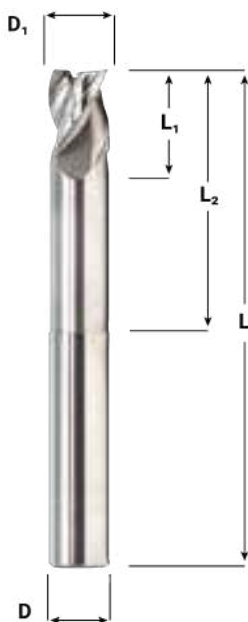
FEATURES/DESCRIPTION		APPLICATION	FEATURES																																							
<p>Roughing And Finishing</p> <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance Conventional or high speed machining of Aluminum Polished flutes resist built-up edge Built-in wiper flat for improved finish 																																										
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STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL																															
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																														
							●	●																																		

● Best ○ Good

Series 1025 **GWA3 | 3FL | Square**

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Bright	NF1
3/32	5/16	1-1/2	1/8	102537	103123
1/8	1/4	1-1/2	1/8	101035	101037
1/8	1/2	1-1/2	1/8	100942	105059
5/32	1/2	2	3/16	106407	108028
3/16	5/16	2	3/16	101039	101040
3/16	5/8	2	3/16	100947	100952
1/4	3/8	2-1/2	1/4	101044	101045
1/4	3/4	2-1/2	1/4	100955	103126
1/4	1-1/8	3	1/4	100994	100996
5/16	7/16	2-1/2	5/16	101046	101048
5/16	3/4	2-1/2	5/16	100960	100963
5/16	1-1/8	3	5/16	100997	100998
3/8	1/2	2-1/2	3/8	101049	101053
3/8	1	2-1/2	3/8	100964	100971
3/8	1-1/2	4	3/8	100999	101002
1/2	5/8	3	1/2	101054	101056
1/2	1-1/4	3	1/2	100972	104458
1/2	2-1/4	4	1/2	101003	101011
5/8	3/4	3-1/2	5/8	101057	101058
5/8	1-5/8	3-1/2	5/8	100986	100987
5/8	2-1/2	5	5/8	101012	101013
3/4	1	4	3/4	101061	101062
3/4	1-5/8	4	3/4	100988	105058
3/4	2-1/2	5	3/4	101014	101018
1	1-1/4	4	1	101063	101065
1	2	4	1	100992	100993
1	2-1/2	6	1	101020	101022

*bold numbers are EDPs for ordering



FEATURES/DESCRIPTION				APPLICATION		FEATURES																																				
<h3>Roughing And Finishing</h3> <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance Conventional or high speed machining of Aluminum Polished flutes resist built-up edge 																																										
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STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL																															
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																														
							●	●																																		

Series 1026 **GWA3 | 3FL | Reduced Neck | Square**

Diameter(D ₁)	LOC(L ₁)	LBS(L ₂)	OAL(L)	Shank(D)	Bright	NF1
1/8	1/4	3/4	1-1/2	1/8	101066	109102
1/8	1/4	1-1/4	2	1/8	101023	109101
3/16	5/16	1	2	3/16	101067	109103
3/16	5/16	1-1/2	3	3/16	101024	103152
1/4	3/8	1-1/8	2-1/2	1/4	101068	109104
1/4	3/8	2-1/8	4	1/4	101026	103153
1/4	3/8	2-7/8	4	1/4	101091	109110
5/16	7/16	1-1/8	2-1/2	5/16	101069	108136
5/16	7/16	2-1/8	4	5/16	101028	103154
5/16	7/16	2-7/8	4	5/16	101092	103161
3/8	1/2	1-1/8	2-1/2	3/8	101070	109105
3/8	1/2	2-1/8	4	3/8	101029	103155
3/8	1/2	3-3/8	6	3/8	101093	109111
1/2	5/8	1-3/8	3	1/2	101071	109106
1/2	5/8	2-1/8	4	1/2	101030	103156
1/2	5/8	3-3/8	6	1/2	101094	109112
5/8	3/4	1-5/8	3-1/2	5/8	101073	109107
5/8	3/4	2-3/8	6	5/8	101031	103157
5/8	3/4	3-3/8	6	5/8	101095	109113
3/4	1	1-5/8	4	3/4	101074	109108
3/4	1	2-1/2	6	3/4	101032	103158
3/4	1	3-3/8	6	3/4	101096	109114
1	1-1/4	2	4	1	101080	109109
1	1-1/4	3-3/8	6	1	101034	103159
1	1-1/4	4-1/2	7	1	101097	109115

*bold numbers are EDPs for ordering

ULTIMATE PERFORMANCE

Solid Carbide Coolant-Through End Mills For High Speed Roughing In Aluminum



INTRO

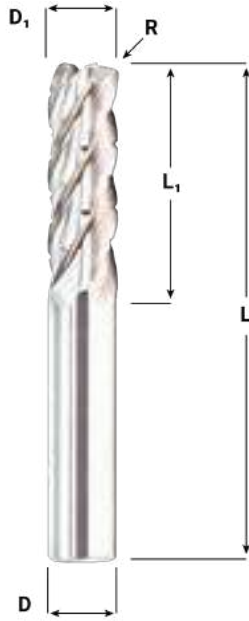
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES										
<p>Super Rougher</p> <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance Coolant-through design for high efficiency milling of Aluminum Chip breakers allow for reduced cutting torque Unequal indexing configuration SafeLock® shank available upon request 		<table border="1"> <tr> <td>CARBIDE</td> <td>37°</td> </tr> <tr> <td>5FL</td> <td>SQ</td> </tr> <tr> <td>RAD</td> <td>PC</td> </tr> <tr> <td>H6</td> <td>P184</td> </tr> <tr> <td>THRU</td> <td>Bright</td> </tr> </table>	CARBIDE	37°	5FL	SQ	RAD	PC	H6	P184	THRU	Bright
CARBIDE	37°											
5FL	SQ											
RAD	PC											
H6	P184											
THRU	Bright											

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
							●	●				

● Best ○ Good

Series 1500 ASR5 | 5FL | Chip Breaker | Square and Radius | Coolant-Through

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	EDP
3/8	1-1/8	3	3/8	-	150001
3/8	1-1/8	3	3/8	0.015	150002
3/8	1-1/8	3	3/8	0.030	150003
3/8	1-1/8	3	3/8	0.060	150004
1/2	1-1/2	3-1/2	1/2	-	150005
1/2	1-1/2	3-1/2	1/2	0.015	150006
1/2	1-1/2	3-1/2	1/2	0.030	150007
1/2	1-1/2	3-1/2	1/2	0.060	150008
5/8	1-7/8	4	5/8	-	150009
5/8	1-7/8	4	5/8	0.030	150010
5/8	1-7/8	4	5/8	0.060	150011
5/8	1-7/8	4	5/8	0.090	150012
3/4	2-1/4	5	3/4	-	150013
3/4	2-1/4	5	3/4	0.030	150014
3/4	2-1/4	5	3/4	0.060	150015
3/4	2-1/4	5	3/4	0.090	150016
1	3	5-1/2	1	-	150017
1	3	5-1/2	1	0.030	150018
1	3	5-1/2	1	0.060	150019
1	3	5-1/2	1	0.090	150020

*bold numbers are EDPs for ordering

ULTIMATE PERFORMANCE

Solid Carbide Coolant-Through End Mills For High Speed Roughing In Aluminum



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES								
<p>Super Rougher</p> <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance Chip breakers for reduced cutting torque Unequal indexing configuration SafeLock® shank available upon request 		<table border="1"> <tr> <td>CARBIDE</td> <td>37°</td> </tr> <tr> <td>5FL</td> <td>SQ</td> </tr> <tr> <td>RAD</td> <td>h6</td> </tr> <tr> <td>P184</td> <td>Bright</td> </tr> </table>	CARBIDE	37°	5FL	SQ	RAD	h6	P184	Bright
CARBIDE	37°									
5FL	SQ									
RAD	h6									
P184	Bright									

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
							●	●				

● Best ○ Good

Series 1502 | ASR5 | 5FL | Chip Breaker | Square and Radius | Solid

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	EDP
3/8	1-1/8	3	3/8	-	150201
3/8	1-1/8	3	3/8	0.015	150202
3/8	1-1/8	3	3/8	0.030	150203
3/8	1-1/8	3	3/8	0.060	150204
1/2	1-1/2	3-1/2	1/2	-	150205
1/2	1-1/2	3-1/2	1/2	0.015	150206
1/2	1-1/2	3-1/2	1/2	0.030	150207
1/2	1-1/2	3-1/2	1/2	0.060	150208
5/8	1-7/8	4	5/8	-	150209
5/8	1-7/8	4	5/8	0.030	150210
5/8	1-7/8	4	5/8	0.060	150211
5/8	1-7/8	4	5/8	0.090	150212
3/4	2-1/4	5	3/4	-	150213
3/4	2-1/4	5	3/4	0.030	150214
3/4	2-1/4	5	3/4	0.060	150215
3/4	2-1/4	5	3/4	0.090	150216
1	3	5-1/2	1	-	150217
1	3	5-1/2	1	0.030	150218
1	3	5-1/2	1	0.060	150219
1	3	5-1/2	1	0.090	150220

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Solid Carbide End Mills For Aluminum And Non-Ferrous Materials



INTRO

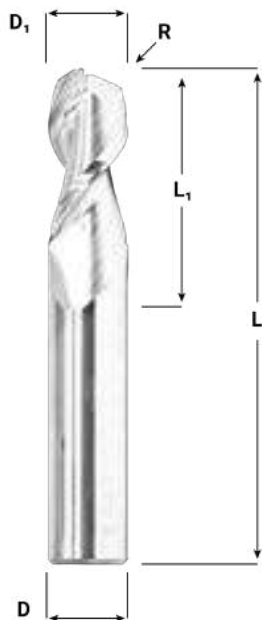
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION		APPLICATION	FEATURES																																							
<p>PERFORMANCE AL</p> <p>All-Terrain Aluminum Milling</p> <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance For conventional or high speed machining of Aluminum Productivity and cost-efficiency Highly polished cutting face and flutes Stocked Bright or NF1 coating for Aluminum machining 			<p>CARBIDE</p> <p>45°</p> <p>2FL</p> <p>SQ</p> <p>RAD</p> <p>h6</p> <p>P195</p> <p>NF1</p> <p>Bright</p>																																							
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STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL																															
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																														
							●	●																																		

● Best ○ Good

Series 2010 250 | 2FL | Square and Radius

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	Bright	NF1
1/8	1/4	1-1/2	1/8	-	312896	312900
1/8	1/4	1-1/2	1/8	0.010	-	312902
1/8	5/16	1-1/2	1/8	-	312904	312908
1/8	3/8	1-1/2	1/8	-	312911	312924
1/8	3/8	1-1/2	1/8	0.010	-	312915
1/8	3/8	1-1/2	1/8	0.020	-	312918
1/8	3/8	1-1/2	1/8	0.030	-	312922
1/8	1/2	2	1/8	-	312926	312928
1/8	5/8	2	1/8	-	312930	312934
1/8	3/4	2	1/8	-	312937	312939
1/8	1	2-1/2	1/8	-	312942	312944
5/32	5/16	2	3/16	-	312946	312948
5/32	9/16	2	3/16	-	312952	312955
3/16	5/16	2	3/16	-	312958	312960
3/16	5/16	2	3/16	0.020	-	312964
3/16	5/16	3	3/16	-	-	312966
3/16	3/8	2	3/16	-	312970	312973
3/16	5/8	2-1/2	3/16	-	312976	312979
3/16	5/8	2-1/2	3/16	0.010	-	312981
3/16	5/8	2-1/2	3/16	0.020	-	312984
3/16	5/8	2-1/2	3/16	0.030	-	312986
3/16	3/4	2-1/2	3/16	-	312988	312990
3/16	1	2-1/2	3/16	-	312993	312995
7/32	3/8	2-1/2	1/4	-	312997	313000
7/32	3/4	2-1/2	1/4	-	313002	313006
1/4	3/8	2-1/2	1/4	-	313010	313013
1/4	3/8	2-1/2	1/4	0.015	-	313015
1/4	3/8	2-1/2	1/4	0.020	-	313017
1/4	3/8	2-1/2	1/4	0.030	-	313021
1/4	3/8	2-1/2	1/4	0.060	-	313024
1/4	1/2	2-1/2	1/4	-	313028	313031
1/4	5/8	2-1/2	1/4	-	313033	313035
1/4	3/4	2-1/2	1/4	-	313037	313039
1/4	3/4	2-1/2	1/4	0.010	-	313042
1/4	3/4	2-1/2	1/4	0.015	-	313044
1/4	3/4	2-1/2	1/4	0.020	-	313047
1/4	3/4	2-1/2	1/4	0.030	-	313049
1/4	3/4	2-1/2	1/4	0.045	-	313052
1/4	3/4	2-1/2	1/4	0.060	-	313054
1/4	1	2-1/2	1/4	-	313056	313060
1/4	1-1/8	2-1/2	1/4	-	313063	313067
1/4	1-1/4	3	1/4	-	313070	313072
1/4	1-1/2	3	1/4	-	313074	313077
1/4	2	4	1/4	-	313079	313083
9/32	7/16	2-1/2	5/16	-	313087	313089

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Solid Carbide End Mills For Aluminum And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Series 2010		250 | 2FL | Square and Radius				
Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	Bright	NF1
9/32	13/16	2-1/2	5/16	-	313091	313094
5/16	7/16	2-1/2	5/16	-	313096	313098
5/16	7/16	2-1/2	5/16	0.020	-	313100
5/16	7/16	2-1/2	5/16	0.030	-	313102
5/16	1/2	2-1/2	5/16	-	313104	313108
5/16	13/16	2-1/2	5/16	-	313111	313114
5/16	13/16	2-1/2	5/16	0.020	-	313117
5/16	13/16	2-1/2	5/16	0.030	-	313120
5/16	13/16	2-1/2	5/16	0.060	-	313122
5/16	1-1/8	2-1/2	5/16	-	313124	313127
5/16	1-1/4	3-1/2	5/16	-	313129	313133
5/16	1-1/2	3-1/2	5/16	-	313136	313140
5/16	2-1/8	4	5/16	-	313144	313148
11/32	1/2	2-1/2	3/8	-	313150	313153
11/32	1	2-1/2	3/8	-	313157	313159
3/8	1/2	2-1/2	3/8	-	313162	313164
3/8	1/2	2-1/2	3/8	0.020	-	313166
3/8	1/2	2-1/2	3/8	0.030	-	313169
3/8	1/2	2-1/2	3/8	0.045	-	313172
3/8	5/8	2-1/2	3/8	-	313175	313177
3/8	3/4	2-1/2	3/8	-	313181	313183
3/8	1	2-1/2	3/8	-	313187	313189
3/8	1	2-1/2	3/8	0.020	-	313192
3/8	1	2-1/2	3/8	0.030	-	313194
3/8	1	2-1/2	3/8	0.045	-	313198
3/8	1	2-1/2	3/8	0.060	-	313201
3/8	1-1/4	3	3/8	-	313203	313207
3/8	1-1/2	4	3/8	-	313209	313212
3/8	2	4	3/8	-	313215	313218
3/8	2-1/2	6	3/8	-	313222	313225
13/32	9/16	2-3/4	7/16	-	313229	313231
13/32	1	2-3/4	7/16	-	313234	313238
7/16	9/16	2-3/4	7/16	-	313241	313244
7/16	1	2-3/4	7/16	-	313246	313249
7/16	2	4	7/16	-	313252	313254
15/32	5/8	3	1/2	-	313257	313260
15/32	1-1/4	3	1/2	-	313264	313266
1/2	5/8	3	1/2	-	313270	313274
1/2	5/8	3	1/2	0.015	-	313276
1/2	5/8	3	1/2	0.020	-	313278
1/2	5/8	3	1/2	0.030	-	313281
1/2	5/8	3	1/2	0.060	-	313284
1/2	5/8	3	1/2	0.090	-	313288
1/2	5/8	6	1/2	-	313978	313982
1/2	3/4	3	1/2	-	313291	313293
1/2	1	3	1/2	-	313297	313300
1/2	1-1/4	3	1/2	-	313302	313304
1/2	1-1/4	3	1/2	0.015	-	313307
1/2	1-1/4	3	1/2	0.020	-	313311
1/2	1-1/4	3	1/2	0.030	-	313315
1/2	1-1/4	3	1/2	0.060	-	313317
1/2	1-1/4	3	1/2	0.090	-	313321
1/2	1-1/4	3	1/2	0.120	-	313325
1/2	1-1/2	4	1/2	-	313329	313331
1/2	2	4	1/2	-	313333	313337
1/2	2-1/4	6	1/2	-	313339	313341
1/2	2-1/2	6	1/2	-	313344	313346
1/2	3-1/4	6	1/2	-	313348	313350
1/2	4	8	1/2	-	313353	313356
5/8	3/4	3-1/2	5/8	-	313358	313362
5/8	3/4	5	5/8	-	314027	314030
5/8	3/4	6	5/8	-	314037	314039
5/8	1-1/4	3-1/2	5/8	-	313366	313370
5/8	1-5/8	3-1/2	5/8	-	313372	313374
5/8	1-5/8	3-1/2	5/8	0.030	-	313378
5/8	1-5/8	3-1/2	5/8	0.060	-	313381
5/8	1-5/8	3-1/2	5/8	0.090	-	313383
5/8	1-5/8	3-1/2	5/8	0.120	-	313385
5/8	2	5	5/8	-	313389	313392
5/8	2-1/2	5	5/8	-	313395	313397
5/8	2-3/4	5	5/8	-	313399	313401
5/8	3-1/4	6	5/8	-	313403	313406
5/8	4	8	5/8	-	313410	313414
3/4	1	4	3/4	-	313418	313422
3/4	1	4	3/4	0.060	-	313424
3/4	1	4	3/4	0.090	-	313427

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Solid Carbide End Mills For Aluminum And Non-Ferrous Materials



Series 2010 250 | 2FL | Square and Radius

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	Bright	NF1
3/4	1	4	3/4	0.120	-	313429
3/4	1-1/2	4	3/4	-	313431	313435
3/4	1-5/8	4	3/4	-	313439	313443
3/4	1-5/8	4	3/4	0.060	-	313447
3/4	1-5/8	4	3/4	0.090	-	313450
3/4	1-5/8	4	3/4	0.120	-	313453
3/4	2	5	3/4	-	313456	313458
3/4	2-1/4	5	3/4	-	313461	313463
3/4	2-1/2	5	3/4	-	313465	313469
3/4	3	6	3/4	-	313473	313477
3/4	3-1/4	6	3/4	-	313479	313483
3/4	3-1/2	6	3/4	-	313487	313489
3/4	4	7	3/4	-	313492	313496
3/4	5	8	3/4	-	313499	313502
1	1-1/4	5	1	-	313506	313509
1	1-1/4	6	1	-	314146	314149
1	1-1/4	7	1	-	314172	314176
1	1-1/2	5	1	-	313511	313514
1	2	5	1	-	313517	313519
1	2	5	1	0.060	-	313523
1	2	5	1	0.090	-	313526
1	2	5	1	0.120	-	313528
1	2-1/2	5	1	-	313531	313533
1	3	6	1	-	313535	313537
1	3-1/2	6	1	-	313541	313543
1	4-1/8	7	1	-	313546	313548
1	5-1/2	8	1	-	313550	313553
1-1/4	1-1/4	4-1/2	1-1/4	-	-	313555
1-1/4	2	4-1/2	1-1/4	-	-	313557
1-1/4	5	7-1/2	1-1/4	-	-	313560

*bold numbers are EDPs for ordering

Popular Custom Milling Options

Proprietary GWS tool coatings
 Longer lengths
 Enhanced geometry
 Special shank modifications like **SAFE-LOCK**

CUSTOM COMES STANDARD

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

ADVANCED PERFORMANCE

Solid Carbide End Mills For Aluminum And Non-Ferrous Materials



INTRO

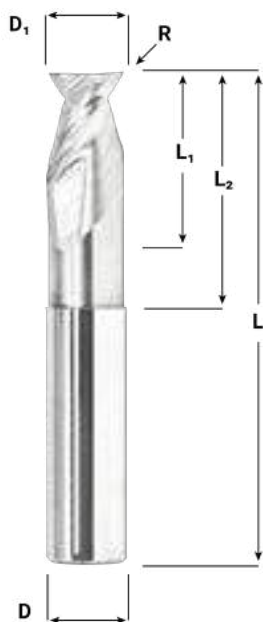
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES																																							
<p>PERFORMANCE AL</p> <p>All-Terrain Aluminum Milling</p> <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance For conventional or high speed machining of Aluminum Productivity and cost-efficiency Highly polished cutting face and flutes Stocked Bright or NF1 coating for Aluminum machining 																																									
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STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL																														
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																													
							●	●																																	

Series 2012 250 | 2FL | Reduced Neck | Square and Radius

Diameter(D ₁)	LOC(L ₁)	LBS(L ₂)	OAL(L)	Shank(D)	Radius(R)	Bright	NF1
1/8	1/4	-	1-1/2	1/8	-	313733	313736
1/8	1/4	-	3	1/8	-	313751	313755
1/8	1/4	1/2	1-1/2	1/8	-	313739	313743
1/8	1/4	1/2	1-1/2	1/8	0.020	-	313745
1/8	1/4	1/2	1-1/2	1/8	0.030	-	313749
1/8	1/4	1-3/8	3	1/8	-	313758	313761
1/8	1/4	1-3/8	3	1/8	0.020	-	313763
1/8	1/4	1-3/8	3	1/8	0.030	-	313766
3/16	5/16	-	2	3/16	-	313768	313771
3/16	5/16	-	3	3/16	-	313788	-
3/16	5/16	1/2	2	3/16	-	313773	313777
3/16	5/16	1/2	2	3/16	0.010	-	313781
3/16	5/16	1/2	2	3/16	0.030	-	313785
3/16	5/16	1-3/8	3	3/16	-	313792	313794
3/16	5/16	1-3/8	3	3/16	0.010	-	313797
3/16	5/16	1-3/8	3	3/16	0.030	-	313800
1/4	3/8	-	2-1/2	1/4	-	313802	313805
1/4	3/8	-	4	1/4	-	313822	313826
1/4	3/8	-	4	1/4	-	-	-
1/4	3/8	1-1/8	2-1/2	1/4	-	313808	-
1/4	3/8	1-1/8	2-1/2	1/4	0.015	-	313811
1/4	3/8	1-1/8	2-1/2	1/4	0.030	-	313813
1/4	3/8	1-1/8	2-1/2	1/4	0.060	-	313817
1/4	3/8	1-1/8	2-1/2	1/4	0.090	-	313819
1/4	3/8	2-1/8	4	1/4	-	313828	313831
1/4	3/8	2-1/8	4	1/4	-	-	-
1/4	3/8	2-1/8	4	1/4	0.015	-	313834
1/4	3/8	2-1/8	4	1/4	0.030	-	313836
1/4	3/8	2-1/8	4	1/4	0.060	-	313839
1/4	3/8	2-1/8	4	1/4	0.090	-	313843
1/4	3/4	2-1/8	4	1/4	0.015	-	313847
1/4	3/4	2-1/8	4	1/4	0.030	-	313851
1/4	3/4	2-1/8	4	1/4	0.060	-	313855
1/4	3/4	2-1/8	4	1/4	0.090	-	313858
5/16	7/16	-	2-1/2	5/16	-	313862	313864
5/16	7/16	-	4	5/16	-	313877	313879
5/16	7/16	1-1/8	2-1/2	5/16	-	313867	313869
5/16	7/16	1-1/8	2-1/2	5/16	0.015	-	313873
5/16	7/16	2-1/8	4	5/16	-	313882	313886
5/16	13/16	2-1/8	4	5/16	0.015	-	313888
3/8	1/2	-	2-1/2	3/8	-	313892	313894
3/8	1/2	-	4	3/8	-	313900	313904
3/8	1/2	1-1/8	2-1/2	3/8	-	313897	-
3/8	1/2	2-1/8	4	3/8	-	313907	313909
3/8	1/2	2-1/8	4	3/8	0.030	-	313913

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Solid Carbide End Mills For Aluminum And Non-Ferrous Materials



Series 2012 250 | 2FL | Reduced Neck | Square and Radius

Diameter(D ₁)	LOC(L ₁)	LBS(L ₂)	OAL(L)	Shank(D)	Radius(R)	Bright	NF1
1/2	5/8	-	3	1/2	-	313917	313920
1/2	5/8	-	4	1/2	-	313947	313949
1/2	5/8	1-3/8	3	1/2	-	313924	313927
1/2	5/8	1-3/8	3	1/2	0.015	-	313929
1/2	5/8	1-3/8	3	1/2	0.020	-	313932
1/2	5/8	1-3/8	3	1/2	0.030	-	313936
1/2	5/8	1-3/8	3	1/2	0.060	-	313938
1/2	5/8	1-3/8	3	1/2	0.090	-	313941
1/2	5/8	1-3/8	3	1/2	0.120	-	313943
1/2	5/8	2-3/8	4	1/2	-	313953	313957
1/2	5/8	2-3/8	4	1/2	0.015	-	313961
1/2	5/8	2-3/8	4	1/2	0.020	-	313963
1/2	5/8	2-3/8	4	1/2	0.030	-	313967
1/2	5/8	2-3/8	4	1/2	0.060	-	313969
1/2	5/8	2-3/8	4	1/2	0.090	-	313972
1/2	5/8	2-3/8	4	1/2	0.120	-	313974
1/2	5/8	3-3/8	6	1/2	0.015	-	313986
1/2	5/8	3-3/8	6	1/2	0.020	-	313989
1/2	5/8	3-3/8	6	1/2	0.030	-	313992
1/2	5/8	3-3/8	6	1/2	0.060	-	313994
1/2	5/8	3-3/8	6	1/2	0.090	-	313996
1/2	5/8	3-3/8	6	1/2	0.120	-	313999
1/2	1-1/4	3-3/8	6	1/2	0.015	-	314001
1/2	1-1/4	3-3/8	6	1/2	0.030	-	314004
1/2	1-1/4	3-3/8	6	1/2	0.060	-	314008
1/2	1-1/4	3-3/8	6	1/2	0.090	-	314010
1/2	1-1/4	3-3/8	6	1/2	0.120	-	314014
5/8	3/4	-	3-1/2	5/8	-	314017	314019
5/8	3/4	1-5/8	3-1/2	5/8	-	314022	314024
5/8	3/4	2-3/8	5	5/8	-	314032	314035
5/8	3/4	3-3/8	6	5/8	-	314043	314045
3/4	1	-	4	3/4	-	314049	314053
3/4	1	-	5	3/4	-	314077	314079
3/4	1	-	6	3/4	-	314101	314105
3/4	1	1-5/8	4	3/4	-	314057	314060
3/4	1	1-5/8	4	3/4	0.030	-	314064
3/4	1	1-5/8	4	3/4	0.060	-	314067
3/4	1	1-5/8	4	3/4	0.090	-	314071
3/4	1	1-5/8	4	3/4	0.120	-	314074
3/4	1	2-1/2	5	3/4	-	314082	314086
3/4	1	2-1/2	5	3/4	0.030	-	314088
3/4	1	2-1/2	5	3/4	0.060	-	314091
3/4	1	2-1/2	5	3/4	0.090	-	314095
3/4	1	2-1/2	5	3/4	0.120	-	314098
3/4	1	3-3/8	6	3/4	-	314109	314111
3/4	1	3-3/8	6	3/4	0.030	-	314114
3/4	1	3-3/8	6	3/4	0.060	-	314116
3/4	1	3-3/8	6	3/4	0.090	-	314119
3/4	1	3-3/8	6	3/4	0.120	-	314122
3/4	1-5/8	3-3/8	6	3/4	0.030	-	314126
3/4	1-5/8	3-3/8	6	3/4	0.060	-	314128
3/4	1-5/8	3-3/8	6	3/4	0.090	-	314130
3/4	1-5/8	3-3/8	6	3/4	0.120	-	314133
1	1-1/4	-	5	1	-	314136	314140
1	1-1/4	2-1/8	5	1	-	314142	314144
1	1-1/4	3-3/8	6	1	-	314153	314157
1	1-1/4	3-3/8	6	1	0.030	-	314161
1	1-1/4	3-3/8	6	1	0.060	-	314165
1	1-1/4	3-3/8	6	1	0.090	-	314167
1	1-1/4	3-3/8	6	1	0.120	-	314170
1	1-1/4	4-3/8	7	1	-	314179	314181
1	1-1/4	4-3/8	7	1	0.030	-	314184
1	1-1/4	4-3/8	7	1	0.060	-	314186
1	1-1/4	4-3/8	7	1	0.090	-	314190
1	1-1/4	4-3/8	7	1	0.120	-	314193
1	2	4-3/8	7	1	0.030	-	314197
1	2	4-3/8	7	1	0.060	-	314199
1	2	4-3/8	7	1	0.090	-	314202
1	2	4-3/8	7	1	0.120	-	314206

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

ADVANCED PERFORMANCE

Solid Carbide End Mills For Aluminum And Non-Ferrous Materials



INTRO

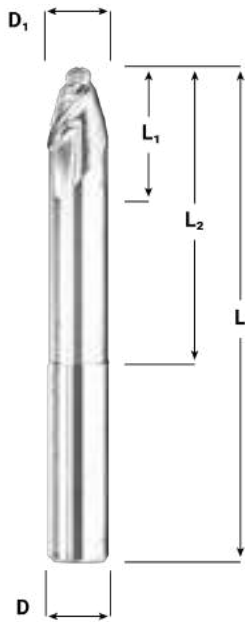
MILLING

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INSERTS



FEATURES/DESCRIPTION		APPLICATION	FEATURES																																							
PERFORMANCE AL All-Terrain Aluminum Milling <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance For conventional or high speed machining of Aluminum Productivity and cost-efficiency Highly polished cutting face and flutes Stocked Bright or NF1 coating for Aluminum machining 																																										
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STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL																															
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																														
							●	●																																		

● Best ○ Good

Series 2014 **250 | 2FL | Reduced Neck | Ball Nose**

Diameter(D ₁)	LOC(L ₁)	LBS(L ₂)	OAL(L)	Shank(D)	Bright	NF1
1/4	3/8	1-1/8	2-1/2	1/4	314223	314227
1/4	3/8	2-1/8	4	1/4	314231	314229
5/16	7/16	1-1/8	2-1/2	5/16	314245	314249
5/16	7/16	2-1/8	4	5/16	314253	314255
3/8	1/2	1-1/8	2-1/2	3/8	314273	314275
3/8	1/2	2-1/8	4	3/8	314278	314280
1/2	5/8	1-3/8	3	1/2	314303	314307
1/2	5/8	2-3/8	4	1/2	314309	314312
1/2	5/8	3-3/8	6	1/2	314316	314319
5/8	3/4	1-5/8	3-1/2	5/8	314343	314346
5/8	3/4	2-3/8	5	5/8	314350	314353
5/8	3/4	3-3/8	6	5/8	314357	314359
3/4	1	1-5/8	4	3/4	314378	314382
3/4	1	2-3/8	5	3/4	314386	314390
3/4	1	3-3/8	6	3/4	314392	314396
1	1-1/4	2-1/8	5	1	314415	314417
1	1-1/4	3-3/8	6	1	314421	314425
1	1-1/4	4-3/8	7	1	314428	314431

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Solid Carbide End Mills For Aluminum And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION		APPLICATION	FEATURES																																							
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P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																														
							●	●																																		

● Best ○ Good

Series 2015 **250BN | 2FL | Ball Nose**

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Bright	NF1
1/8	1/4	1-1/2	1/8	-	313567
1/8	1/2	2	1/8	-	313563
1/8	3/4	2	1/8	-	313571
3/16	5/16	2	3/16	-	313573
3/16	5/8	2-1/2	3/16	-	313576
3/16	1	2-1/2	3/16	-	313580
1/4	3/8	2-1/2	1/4	313584	313588
1/4	3/4	2-1/2	1/4	313592	313596
1/4	1-1/4	3	1/4	313598	313602
5/16	7/16	2-1/2	5/16	313604	313607
5/16	13/16	2-1/2	5/16	313609	313612
5/16	1-1/4	3	5/16	313615	313617
3/8	1/2	2-1/2	3/8	313621	313624
3/8	1	2-1/2	3/8	313628	313630
3/8	1-1/2	4	3/8	313632	313636
7/16	9/16	2-3/4	7/16	313640	313643
7/16	1	2-3/4	7/16	313645	313649
7/16	2	4	7/16	313652	313655
1/2	5/8	3	1/2	313659	313662
1/2	1-1/4	3	1/2	313666	313668
1/2	2	4	1/2	313671	313674
5/8	3/4	3-1/2	5/8	313678	313682
5/8	1-5/8	3-1/2	5/8	313685	313687
5/8	2-1/2	5	5/8	313691	313693
3/4	1	4	3/4	313697	313700
3/4	1-5/8	4	3/4	313704	313707
3/4	3-1/4	6	3/4	313709	313711
1	1-1/4	5	1	313714	313717
1	2	5	1	313721	313723

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Solid Carbide End Mills For Aluminum And Non-Ferrous Materials



INTRO

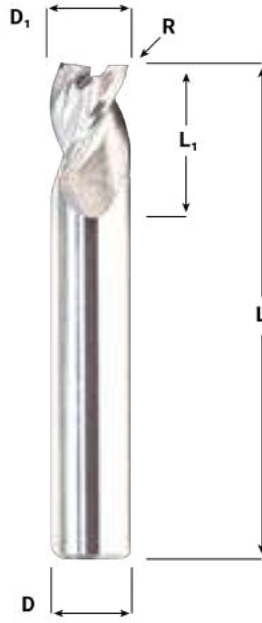
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES										
<p>PERFORMANCE AL</p> <p>All-Terrain Aluminum Milling</p> <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance For conventional or high speed machining of Aluminum Productivity and cost-efficiency Highly polished cutting face and flutes Stocked Bright or NF1 coating for Aluminum machining 		<table border="1"> <tr> <td>CARBIDE</td> <td>37°</td> </tr> <tr> <td>3FL</td> <td>SQ</td> </tr> <tr> <td>RAD</td> <td>h6</td> </tr> <tr> <td>P195</td> <td>NF1</td> </tr> <tr> <td>Bright</td> <td></td> </tr> </table>	CARBIDE	37°	3FL	SQ	RAD	h6	P195	NF1	Bright	
CARBIDE	37°											
3FL	SQ											
RAD	h6											
P195	NF1											
Bright												

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
							●	●				

● Best ○ Good

Series 2030 350 | 3FL | Square and Radius

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	Bright	NF1
1/8	1/4	1-1/2	1/8	-	314434	314436
1/8	5/16	1-1/2	1/8	-	314442	314445
1/8	3/8	1-1/2	1/8	-	314447	314450
1/8	3/8	1-1/2	1/8	0.020	314456	-
1/8	3/8	1-1/2	1/8	0.030	314458	-
1/8	1/2	2	1/8	-	314462	314466
1/8	5/8	2	1/8	-	314468	314472
1/8	3/4	2	1/8	-	314476	314479
1/8	1	2-1/2	1/8	-	314483	314487
5/32	5/16	2	3/16	-	314491	314493
5/32	9/16	2	3/16	-	314496	-
3/16	5/16	2	3/16	-	314498	314502
3/16	3/8	2	3/16	-	314508	314512
3/16	5/8	2-1/2	3/16	-	314516	314518
3/16	5/8	2-1/2	3/16	0.010	-	314520
3/16	5/8	2-1/2	3/16	0.030	-	314527
3/16	3/4	2-1/2	3/16	-	314531	314534
3/16	1	2-1/2	3/16	-	314536	314539
7/32	3/8	2-1/2	1/4	-	314542	314545
7/32	3/4	2-1/2	1/4	-	314547	314549
1/4	3/8	2-1/2	1/4	-	314551	314553
1/4	3/8	2-1/2	1/4	0.015	-	314556
1/4	3/8	2-1/2	1/4	0.020	-	314558
1/4	3/8	2-1/2	1/4	0.030	-	314560
1/4	3/8	2-1/2	1/4	0.060	-	314564
1/4	1/2	2-1/2	1/4	-	314568	314570
1/4	5/8	2-1/2	1/4	-	314572	314575
1/4	3/4	2-1/2	1/4	-	314577	314581
1/4	3/4	2-1/2	1/4	0.010	314584	-
1/4	3/4	2-1/2	1/4	0.015	314586	-
1/4	3/4	2-1/2	1/4	0.020	314590	-
1/4	3/4	2-1/2	1/4	0.030	314592	-
1/4	3/4	2-1/2	1/4	0.045	314596	-
1/4	3/4	2-1/2	1/4	0.060	314598	-
1/4	1	2-1/2	1/4	-	314600	314602
1/4	1-1/8	2-1/2	1/4	-	314605	314607
1/4	1-1/4	3	1/4	-	314610	314614
1/4	1-1/2	3	1/4	-	314616	314618
1/4	2	4	1/4	-	314622	314624
9/32	7/16	2-1/2	5/16	-	314626	314630
9/32	13/16	2-1/2	5/16	-	314633	314636
5/16	7/16	2-1/2	5/16	-	314639	-
5/16	7/16	2-1/2	5/16	-	-	314642
5/16	7/16	2-1/2	5/16	0.020	-	314645
5/16	7/16	2-1/2	5/16	0.030	-	314648

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Solid Carbide End Mills For Aluminum And Non-Ferrous Materials



Series 2030 350 | 3FL | Square and Radius

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	Bright	NF1
5/16	1/2	2-1/2	5/16	-	314651	314655
5/16	13/16	2-1/2	5/16	-	314657	314661
5/16	13/16	2-1/2	5/16	0.020	-	314663
5/16	13/16	2-1/2	5/16	0.030	-	314666
5/16	13/16	2-1/2	5/16	0.060	-	314670
5/16	1-1/8	2-1/2	5/16	-	314672	-
5/16	1-1/8	2-1/2	5/16	-	314674	-
5/16	1-1/4	3-1/2	5/16	-	314678	-
5/16	1-1/4	3	5/16	-	314681	-
5/16	1-1/2	3-1/2	5/16	-	314684	314687
5/16	2-1/8	4	5/16	-	314690	314692
11/32	1/2	2-1/2	3/8	-	314694	314696
11/32	1	2-1/2	3/8	-	314700	314703
3/8	1/2	2-1/2	3/8	-	314705	314709
3/8	1/2	2-1/2	3/8	0.020	-	314711
3/8	1/2	2-1/2	3/8	0.030	-	314714
3/8	1/2	2-1/2	3/8	0.045	-	314716
3/8	5/8	2-1/2	3/8	-	314719	314723
3/8	3/4	2-1/2	3/8	-	314726	314729
3/8	1	2-1/2	3/8	-	314732	314736
3/8	1	2-1/2	3/8	0.020	-	314738
3/8	1	2-1/2	3/8	0.030	-	314742
3/8	1	2-1/2	3/8	0.045	-	314744
3/8	1	2-1/2	3/8	0.060	-	314747
3/8	1-1/4	3	3/8	-	314749	314753
3/8	1-1/2	4	3/8	-	314755	314758
3/8	2	4	3/8	-	314762	314766
3/8	2	4	3/8	-	-	-
3/8	2-1/2	6	3/8	-	314768	314771
13/32	9/16	2-3/4	7/16	-	314773	314775
13/32	1	2-3/4	7/16	-	314779	314781
7/16	9/16	2-3/4	7/16	-	314783	314786
7/16	1	2-3/4	7/16	-	314790	314793
7/16	2	4	7/16	-	314797	314801
15/32	5/8	3	1/2	-	314803	314805
15/32	1-1/4	3	1/2	-	314808	314810
1/2	5/8	3	1/2	-	314814	314818
1/2	5/8	3	1/2	0.020	-	314821
1/2	5/8	3	1/2	0.030	-	314823
1/2	5/8	3	1/2	0.060	-	314827
1/2	5/8	3	1/2	0.090	-	314830
1/2	3/4	3	1/2	-	314834	314836
1/2	1	3	1/2	-	314838	314840
1/2	1-1/4	3	1/2	-	314843	314845
1/2	1-1/4	3	1/2	0.020	-	314847
1/2	1-1/4	3	1/2	0.030	-	314850
1/2	1-1/4	3	1/2	0.060	-	314854
1/2	1-1/4	3	1/2	0.090	-	314857
1/2	1-1/4	3	1/2	0.120	-	314860
1/2	1-1/2	4	1/2	-	314863	314865
1/2	2	4	1/2	-	314869	314872
1/2	2-1/4	6	1/2	-	314876	314878
1/2	2-1/2	6	1/2	-	314880	314884
1/2	3-1/4	6	1/2	-	314888	314892
1/2	4	8	1/2	-	314896	314900
5/8	3/4	3-1/2	5/8	-	314904	314908
5/8	1-1/4	3-1/2	5/8	-	314912	314914
5/8	1-5/8	3-1/2	5/8	-	314917	314920
5/8	1-5/8	3-1/2	5/8	0.030	-	314924
5/8	1-5/8	3-1/2	5/8	0.060	-	314928
5/8	1-5/8	3-1/2	5/8	0.090	-	314930
5/8	1-5/8	3-1/2	5/8	0.120	-	314934
5/8	2	5	5/8	-	314938	314941
5/8	2-1/2	5	5/8	-	314944	314948
5/8	2-3/4	5	5/8	-	314952	314954
5/8	3-1/4	6	5/8	-	314956	314960
5/8	4	8	5/8	-	314962	314965
3/4	1	4	3/4	-	314969	314972
3/4	1	4	3/4	0.060	-	314975
3/4	1	4	3/4	0.090	-	314978
3/4	1	4	3/4	0.120	-	314981
3/4	1-1/2	4	3/4	-	314983	314987
3/4	1-5/8	4	3/4	-	314991	314994
3/4	1-5/8	4	3/4	0.060	-	314996
3/4	1-5/8	4	3/4	0.090	-	314998
3/4	1-5/8	4	3/4	0.120	-	315002

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

ADVANCED PERFORMANCE

Solid Carbide End Mills For Aluminum And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Series 2030 **350 | 3FL | Square and Radius**

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	Bright	NF1
3/4	2	5	3/4	-	315005	315007
3/4	2-1/4	5	3/4	-	315011	315013
3/4	2-1/2	5	3/4	-	315017	315021
3/4	3	6	3/4	-	315023	315025
3/4	3-1/4	6	3/4	-	315027	315029
3/4	3-1/2	6	3/4	-	315031	315033
3/4	4	7	3/4	-	315036	315039
3/4	5	8	3/4	-	315043	315047
1	1-1/4	5	1	-	315051	315054
1	1-1/4	5	1	-	-	-
1	1-1/2	5	1	-	315057	315060
1	2	5	1	-	315062	315065
1	2	5	1	0.060	-	315067
1	2	5	1	0.090	-	315070
1	2	5	1	0.120	-	315074
1	2-1/2	5	1	-	315077	-
1	2-1/2	5	1	-	315081	-
1	3	6	1	-	315084	315086
1	3-1/2	6	1	-	315090	315093
1	4-1/8	7	1	-	315096	315099
1	5-1/2	8	1	-	315101	315105
1-1/4	1-1/4	5	1-1/4	-	-	315107
1-1/4	2	4-1/2	1-1/4	-	315109	315112
1-1/4	3-1/4	6	1-1/4	-	315115	315118
1-1/4	5-1/2	8	1-1/4	-	-	315121

*bold numbers are EDPs for ordering

Popular Custom Milling Options

Proprietary GWS tool coatings

Longer lengths

Enhanced geometry

Special shank modifications like **SAFE-LOCK**

CUSTOM COMES STANDARD

ADVANCED PERFORMANCE

Solid Carbide End Mills For Finishing In Aluminum



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES								
<p>PERFORMANCES AL</p> <p>All-Terrain Aluminum Milling</p> <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance For conventional or high speed machining of Aluminum Productivity and cost-efficiency Highly polished cutting face and flutes 		<table border="1"> <tr> <td>CARBIDE</td> <td>37°</td> </tr> <tr> <td>3FL</td> <td>SQ</td> </tr> <tr> <td>Wiper Flat</td> <td>h6</td> </tr> <tr> <td>P195</td> <td>NPT</td> </tr> </table>	CARBIDE	37°	3FL	SQ	Wiper Flat	h6	P195	NPT
CARBIDE	37°									
3FL	SQ									
Wiper Flat	h6									
P195	NPT									

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
							●	●				

● Best ○ Good

Series 2031 350WF | 3FL | Square | Wiper Flats

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	EDP
1/8	1/4	1-1/2	1/8	315123
1/8	1/2	2	1/8	315126
1/8	3/4	2	1/8	315130
3/16	5/16	2	3/16	315133
3/16	5/8	2-1/2	3/16	315137
3/16	3/4	2-1/2	3/16	315140
1/4	3/8	2-1/2	1/4	315143
1/4	3/4	2-1/2	1/4	315147
1/4	1-1/4	3	1/4	315149
5/16	7/16	2-1/2	5/16	315152
5/16	13/16	2-1/2	5/16	315155
5/16	1-1/4	3	5/16	315159
3/8	1/2	2-1/2	3/8	315162
3/8	1	2-1/2	3/8	315165
3/8	1-1/2	4	3/8	315167
1/2	5/8	3	1/2	315171
1/2	1-1/4	3	1/2	315173
1/2	2	4	1/2	315175
1/2	3-1/4	6	1/2	315178
5/8	3/4	3-1/2	5/8	315180
5/8	1-5/8	3-1/2	5/8	315184
5/8	2-1/2	5	5/8	315188
3/4	1	4	3/4	315190
3/4	1-5/8	4	3/4	315192
3/4	2-1/2	5	3/4	315196
3/4	3-1/4	6	3/4	315200
1	1-1/4	3	1	315203
1	2	5	1	315205
1	3	6	1	315209

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Solid Carbide End Mills For Aluminum And Non-Ferrous Materials



INTRO

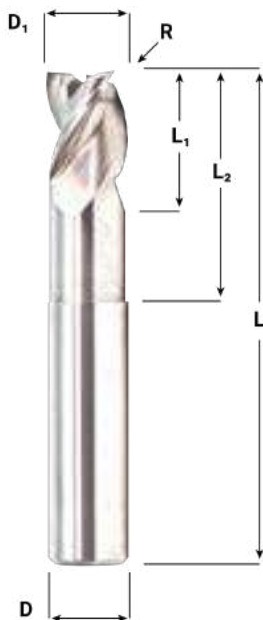
MILLING

SPECIALTY

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INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES																																							
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STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL																														
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																													
							●	●																																	

Series 2032 350 | 3FL | Reduced Neck | Square and Radius

Diameter(D ₁)	LOC(L ₁)	LBS(L ₂)	OAL(L)	Shank(D)	Radius(R)	Bright	NF1
1/8	1/4	1/2	1-1/2	1/8	0.020	-	315355
1/8	1/4	1/2	1-1/2	1/8	0.030	-	315359
1/8	1/4	1-3/8	3	1/8	0.020	-	315363
1/8	1/4	1-3/8	3	1/8	0.030	-	315367
3/16	5/16	1/2	2	3/16	0.010	-	315369
3/16	5/16	1/2	2	3/16	0.030	-	315371
3/16	5/16	1-3/8	3	3/16	0.010	-	315374
3/16	5/16	1-3/8	3	3/16	0.030	-	315377
1/4	3/8	-	2-1/2	1/4	-	315379	315381
1/4	3/8	-	2-1/2	1/4	-	315403	315405
1/4	3/8	1-1/8	2-1/2	1/4	-	315384	315388
1/4	3/8	1-1/8	2-1/2	1/4	0.015	-	315392
1/4	3/8	1-1/8	2-1/2	1/4	0.030	-	315394
1/4	3/8	1-1/8	2-1/2	1/4	0.060	-	315397
1/4	3/8	1-1/8	2-1/2	1/4	0.090	-	315399
1/4	3/8	2-1/8	4	1/4	-	315408	315411
1/4	3/8	2-1/8	4	1/4	0.015	-	315413
1/4	3/8	2-1/8	4	1/4	0.030	-	315415
1/4	3/8	2-1/8	4	1/4	0.060	-	315417
1/4	3/8	2-1/8	4	1/4	0.090	-	315419
1/4	3/4	2-1/8	4	1/4	0.015	-	315423
1/4	3/4	2-1/8	4	1/4	0.030	-	315427
1/4	3/4	2-1/8	4	1/4	0.060	-	315429
1/4	3/4	2-1/8	4	1/4	0.090	-	315433
5/16	7/16	-	2-1/2	5/16	-	315437	315441
5/16	7/16	1-1/8	2-1/2	5/16	-	315445	-
5/16	7/16	1-1/8	2-1/2	5/16	-	-	315447
5/16	7/16	1-1/8	2-1/2	5/16	0.015	-	315450
5/16	7/16	-	4	5/16	-	315453	315456
5/16	7/16	2-1/8	4	5/16	-	315458	315460
5/16	13/16	2-1/8	4	5/16	0.015	-	315464
3/8	1/2	-	2-1/2	3/8	-	315466	315469
3/8	1/2	-	2-1/2	3/8	-	315478	315481
3/8	1/2	1-1/8	2-1/2	3/8	-	315473	315476
3/8	1/2	2-1/8	4	3/8	-	315483	-
3/8	1/2	2-1/8	4	3/8	-	-	315486
3/8	1/2	2-1/8	4	3/8	0.030	-	315489
1/2	5/8	-	3	1/2	-	315491	315495
1/2	5/8	1-3/8	3	1/2	-	315498	-
1/2	5/8	1-3/8	3	1/2	-	-	315502
1/2	5/8	1-3/8	3	1/2	0.015	-	315505
1/2	5/8	1-3/8	3	1/2	0.020	-	315507
1/2	5/8	1-3/8	3	1/2	0.030	-	315511
1/2	5/8	1-3/8	3	1/2	0.060	-	315515
1/2	5/8	1-3/8	3	1/2	0.090	-	315518

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Solid Carbide End Mills For Aluminum And Non-Ferrous Materials



Series 2032 | 350 | 3FL | Reduced Neck | Square and Radius

Diameter(D ₁)	LOC(L ₁)	LBS(L ₂)	OAL(L)	Shank(D)	Radius(R)	Bright	NF1
1/2	5/8	1-3/8	3	1/2	0.120	-	315520
1/2	5/8	-	4	1/2	-	315523	315525
1/2	5/8	2-3/8	4	1/2	-	315527	-
1/2	5/8	2-3/8	4	1/2	-	-	315529
1/2	5/8	2-3/8	4	1/2	0.015	-	315532
1/2	5/8	2-3/8	4	1/2	0.020	-	315535
1/2	5/8	2-3/8	4	1/2	0.030	-	315537
1/2	5/8	2-3/8	4	1/2	0.060	-	315539
1/2	5/8	2-3/8	4	1/2	0.090	-	315542
1/2	5/8	2-3/8	4	1/2	0.120	-	315546
1/2	5/8	-	6	1/2	-	315548	315552
1/2	5/8	3-3/8	6	1/2	-	315554	-
1/2	5/8	3-3/8	6	1/2	0.015	-	315558
1/2	5/8	3-3/8	6	1/2	0.020	-	315562
1/2	5/8	3-3/8	6	1/2	0.030	-	315565
1/2	5/8	3-3/8	6	1/2	0.060	-	315569
1/2	5/8	3-3/8	6	1/2	0.090	-	315572
1/2	5/8	3-3/8	6	1/2	0.120	-	315574
1/2	1-1/4	3-3/8	6	1/2	0.015	-	315578
1/2	1-1/4	3-3/8	6	1/2	0.030	-	315581
1/2	1-1/4	3-3/8	6	1/2	0.060	-	315583
1/2	1-1/4	3-3/8	6	1/2	0.090	-	315586
1/2	1-1/4	3-3/8	6	1/2	0.120	-	315589
5/8	3/4	-	3-1/2	5/8	-	315591	315593
5/8	3/4	1-5/8	3-1/2	5/8	-	315597	315599
5/8	3/4	-	5	5/8	-	315601	315603
5/8	3/4	2-3/8	5	5/8	-	315605	315607
5/8	3/4	-	6	5/8	-	315609	315611
5/8	3/4	3-3/8	6	5/8	-	315615	315618
3/4	1	-	4	3/4	-	315621	315625
3/4	1	1-5/8	4	3/4	-	315627	-
3/4	1	1-5/8	4	3/4	-	-	315629
3/4	1	1-5/8	4	3/4	0.030	-	315632
3/4	1	1-5/8	4	3/4	0.060	-	315636
3/4	1	1-5/8	4	3/4	0.090	-	315640
3/4	1	1-5/8	4	3/4	0.120	-	315642
3/4	1	-	5	3/4	-	-	315644
3/4	1	2-1/2	5	3/4	-	315646	315650
3/4	1	2-1/2	5	3/4	0.030	-	315654
3/4	1	2-1/2	5	3/4	0.060	-	315656
3/4	1	2-1/2	5	3/4	0.090	-	315659
3/4	1	2-1/2	5	3/4	0.120	-	315662
3/4	1	-	6	3/4	-	-	315664
3/4	1	3-3/8	6	3/4	-	315667	315669
3/4	1	3-3/8	6	3/4	0.030	-	315671
3/4	1	3-3/8	6	3/4	0.060	-	315673
3/4	1	3-3/8	6	3/4	0.090	-	315675
3/4	1	3-3/8	6	3/4	0.120	-	315677
3/4	1-5/8	3-3/8	6	3/4	0.030	-	315679
3/4	1-5/8	3-3/8	6	3/4	0.060	-	315683
3/4	1-5/8	3-3/8	6	3/4	0.090	-	315686
3/4	1-5/8	3-3/8	6	3/4	0.120	-	315689
1	1-1/4	-	5	1	-	315693	315696
1	1-1/4	2-1/8	5	1	-	315699	315702
1	1-1/4	-	6	1	-	315706	315709
1	1-1/4	3-3/8	6	1	-	315713	-
1	1-1/4	3-3/8	6	1	-	-	315716
1	1-1/4	3-3/8	6	1	0.030	-	315720
1	1-1/4	3-3/8	6	1	0.060	-	315724
1	1-1/4	3-3/8	6	1	0.090	-	315728
1	1-1/4	3-3/8	6	1	0.120	-	315730
1	1-1/4	-	7	1	-	315734	315738
1	1-1/4	4-3/8	7	1	-	315742	-
1	1-1/4	4-3/8	7	1	-	-	315745
1	1-1/4	4-3/8	7	1	0.030	-	315749
1	1-1/4	4-3/8	7	1	0.060	-	315751
1	1-1/4	4-3/8	7	1	0.090	-	315755
1	1-1/4	4-3/8	7	1	0.120	-	315758
1	2	4-3/8	7	1	0.030	-	315761
1	2	4-3/8	7	1	0.060	-	315764
1	2	4-3/8	7	1	0.090	-	315767
1	2	4-3/8	7	1	0.120	-	315771

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

ADVANCED PERFORMANCE

Solid Carbide End Mills For Aluminum And Non-Ferrous Materials



INTRO

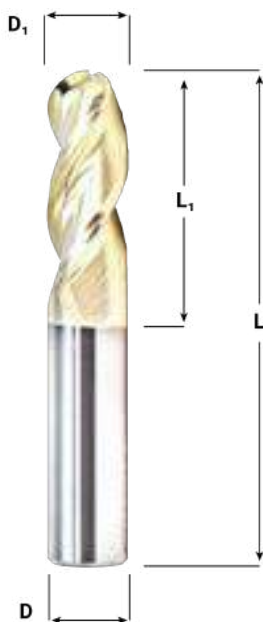
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>PERFORMANCE AL</p> <p>All-Terrain Aluminum Milling</p> <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance For conventional or high speed machining of Aluminum Productivity and cost-efficiency Highly polished cutting face and flutes Stocked Bright or NF1 coating for Aluminum machining 		<p>CARBIDE 37°</p> <p>3FL BALL</p> <p>h6 NF1</p> <p>Bright</p>

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
							●	●				

● Best ○ Good

Series 2045 350BN | 3FL | Ball Nose

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Bright	NF1
1/4	1-1/4	3	1/4	315212	315215
1/4	3/4	2-1/2	1/4	315219	315221
1/4	3/8	2-1/2	1/4	315223	315227
5/16	1-1/4	3	5/16	315229	315232
5/16	13/16	2-1/2	5/16	315236	315238
5/16	7/16	2-1/2	5/16	315240	315244
3/8	1	2-1/2	3/8	315248	315250
3/8	1/2	2-1/2	3/8	315253	315256
3/8	1-1/2	4	3/8	315259	315261
7/16	1	2-3/4	7/16	315265	315268
7/16	2	4	7/16	315271	315274
7/16	9/16	2-3/4	7/16	315277	315280
1/2	1-1/4	3	1/2	315282	315285
1/2	2	4	1/2	315288	315292
1/2	5/8	3	1/2	315296	315299
5/8	1-5/8	3-1/2	5/8	315303	315306
5/8	2-1/2	5	5/8	315308	315312
5/8	3/4	3-1/2	5/8	315316	315318
3/4	1	4	3/4	315320	315322
3/4	1-5/8	4	3/4	315324	315326
3/4	3-1/4	6	3/4	315330	315333
1	1-1/4	5	1	315336	315340
1	2	5	1	315343	315346
1	3-1/2	6	1	315348	315352

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Solid Carbide End Mills For Aluminum And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>PERFORMANCE AL</p> <p>All-Terrain Aluminum Milling</p> <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance For conventional or high speed machining of Aluminum Productivity and cost-efficiency Highly polished cutting face and flutes Stocked Bright or NF1 coating for Aluminum machining 		<p>CARBIDE 37°</p> <p>3FL BALL</p> <p>Necked h6</p> <p>P195 NF1</p> <p>Bright</p>

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
							●	●				

● Best ○ Good

Series 2047 350BN | 3FL | Reduced Neck | Ball Nose

Diameter(D ₁)	LOC(L ₁)	LBS(L ₂)	OAL(L)	Shank(D)	Bright	NF1
1/4	3/8	1-1/8	2-1/2	1/4	315779	315781
1/4	3/8	2-1/8	4	1/4	315790	-
5/16	7/16	1-1/8	2-1/2	5/16	315799	315802
5/16	7/16	2-1/8	4	5/16	315811	315814
3/8	1/2	1-1/8	2-1/2	3/8	315823	315825
3/8	1/2	2-1/8	4	3/8	315835	315838
1/2	5/8	1-3/8	3	1/2	315848	315852
1/2	5/8	2-3/8	4	1/2	315860	315864
1/2	5/8	3-3/8	6	1/2	315873	315877
5/8	3/4	1-5/8	3-1/2	5/8	315884	315886
5/8	3/4	2-3/8	5	5/8	315895	315899
5/8	3/4	3-3/8	6	5/8	315909	315912
3/4	1	1-5/8	4	3/4	315920	315924
3/4	1	2-3/8	5	3/4	315935	315938
3/4	1	3-3/8	6	3/4	315947	315951
1	1-1/4	2-1/8	5	1	315960	315963
1	1-1/4	3-3/8	6	1	315973	315977
1	1-1/4	4-3/8	7	1	315987	315991

*bold numbers are EDPs for ordering

Popular Custom Milling Options

- Proprietary GWS tool coatings
- Longer lengths
- Enhanced geometry
- Special shank modifications like **SAFE-LOCK**

CUSTOM COMES STANDARD

ADVANCED PERFORMANCE

Solid Carbide End Mills For Stainless, Titanium, Steel And Other Ferrous Alloys



INTRO

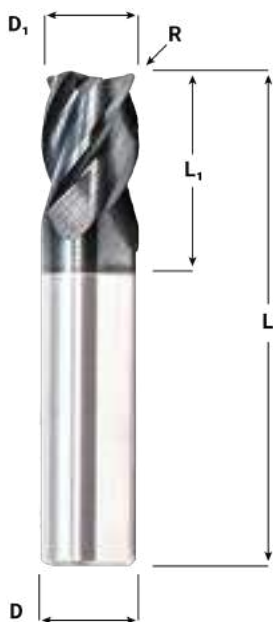
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES								
<h2>PYSTL</h2> <h3>Unequal Index End Mill</h3> <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance Unequal index tool for Titanium, stainless and other gummy materials Suited for slotting and profiling milling operations Specialized edge honing SafeLock® shank available upon request 		<table border="1"> <tr> <td>CARBIDE</td> <td>VAR</td> </tr> <tr> <td>4FL</td> <td>RAD</td> </tr> <tr> <td>SQ</td> <td>h6</td> </tr> <tr> <td>P185</td> <td>FX3</td> </tr> </table>	CARBIDE	VAR	4FL	RAD	SQ	h6	P185	FX3
CARBIDE	VAR									
4FL	RAD									
SQ	h6									
P185	FX3									

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	○	○	●	○	○				●		

● Best ○ Good

Series 2100 **438 | 4FL | Square and Radius | PYSTL**

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	EDP
1/8	1/4	2	1/8	-	310001
1/8	1/4	2	1/8	0.010	310005
1/8	1/4	2	1/8	0.020	310007
1/8	1/4	2	1/8	0.030	310009
1/8	1/2	2	1/8	-	310013
1/8	1/2	2	1/8	0.010	310017
1/8	1/2	2	1/8	0.020	310019
1/8	1/2	2	1/8	0.030	310023
1/8	3/4	2-1/2	1/8	-	310025
1/8	3/4	2-1/2	1/8	0.010	310029
1/8	3/4	2-1/2	1/8	0.020	310031
1/8	3/4	2-1/2	1/8	0.030	310034
3/16	5/16	2	3/16	-	310037
3/16	5/16	2	3/16	0.010	310040
3/16	5/16	2	3/16	0.020	310044
3/16	5/16	2	3/16	0.030	310048
3/16	9/16	2	3/16	-	310050
3/16	9/16	2	3/16	0.010	310054
3/16	9/16	2	3/16	0.020	310058
3/16	9/16	2	3/16	0.030	310060
3/16	3/4	2-1/2	3/16	-	310063
3/16	3/4	2-1/2	3/16	0.010	310066
3/16	3/4	2-1/2	3/16	0.020	310069
3/16	3/4	2-1/2	3/16	0.030	310071
1/4	3/8	2	1/4	-	310074
1/4	3/8	2	1/4	0.010	310078
1/4	3/8	2	1/4	0.020	310081
1/4	3/8	2	1/4	0.030	310085
1/4	3/8	2	1/4	0.060	310089
1/4	1/2	2-1/2	1/4	-	310093
1/4	1/2	2-1/2	1/4	0.010	310097
1/4	1/2	2-1/2	1/4	0.020	310100
1/4	1/2	2-1/2	1/4	0.030	310103
1/4	1/2	2-1/2	1/4	0.060	310105
1/4	3/4	2-1/2	1/4	-	310109
1/4	3/4	2-1/2	1/4	0.010	310113
1/4	3/4	2-1/2	1/4	0.020	310115
1/4	3/4	2-1/2	1/4	0.030	310117
1/4	3/4	2-1/2	1/4	0.060	310121
1/4	1	3	1/4	-	310125
1/4	1	3	1/4	0.010	310128
1/4	1	3	1/4	0.020	310130
1/4	1	3	1/4	0.030	310133
1/4	1	3	1/4	0.060	310136
1/4	1-1/4	3	1/4	-	310139

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Solid Carbide End Mills For Stainless, Titanium, Steel And Other Ferrous Alloys



Series 2100 438 | 4FL | Square and Radius | PYSTL

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	EDP
1/4	1-1/4	3	1/4	0.010	310141
1/4	1-1/4	3	1/4	0.020	310144
1/4	1-1/4	3	1/4	0.030	310147
1/4	1-1/4	3	1/4	0.060	310150
5/16	7/16	2	5/16	-	310154
5/16	7/16	2	5/16	0.010	310158
5/16	7/16	2	5/16	0.020	310160
5/16	7/16	2	5/16	0.030	310162
5/16	7/16	2	5/16	0.060	310166
5/16	13/16	2-1/2	5/16	-	310168
5/16	13/16	2-1/2	5/16	0.010	310172
5/16	13/16	2-1/2	5/16	0.020	310176
5/16	13/16	2-1/2	5/16	0.030	310180
5/16	13/16	2-1/2	5/16	0.060	310182
5/16	1	3	5/16	-	310186
5/16	1	3	5/16	0.010	310190
5/16	1	3	5/16	0.020	310194
5/16	1	3	5/16	0.030	310198
5/16	1	3	5/16	0.060	310201
3/8	1/2	2	3/8	-	310203
3/8	1/2	2	3/8	0.010	310205
3/8	1/2	2	3/8	0.020	310207
3/8	1/2	2	3/8	0.030	310210
3/8	1/2	2	3/8	0.060	310212
3/8	1/2	2	3/8	0.090	310214
3/8	1	2-1/2	3/8	-	310217
3/8	1	2-1/2	3/8	0.010	310220
3/8	1	2-1/2	3/8	0.020	310222
3/8	1	2-1/2	3/8	0.030	310224
3/8	1	2-1/2	3/8	0.060	310226
3/8	1	2-1/2	3/8	0.090	310229
3/8	1-1/4	3	3/8	-	310231
3/8	1-1/4	3	3/8	0.010	310233
3/8	1-1/4	3	3/8	0.020	310236
3/8	1-1/4	3	3/8	0.030	310238
3/8	1-1/4	3	3/8	0.060	310240
3/8	1-1/4	3	3/8	0.090	310243
3/8	1-1/2	3	3/8	-	310245
3/8	1-1/2	3	3/8	0.010	310247
3/8	1-1/2	3	3/8	0.020	310251
3/8	1-1/2	3	3/8	0.030	310255
3/8	1-1/2	3	3/8	0.060	310257
3/8	1-1/2	3	3/8	0.090	310259
1/2	5/8	2-1/2	1/2	-	310263
1/2	5/8	2-1/2	1/2	0.020	310267
1/2	5/8	2-1/2	1/2	0.030	310269
1/2	5/8	2-1/2	1/2	0.060	310273
1/2	5/8	2-1/2	1/2	0.090	310275
1/2	5/8	2-1/2	1/2	0.120	310279
1/2	1	3	1/2	-	310281
1/2	1	3	1/2	0.020	310284
1/2	1	3	1/2	0.030	310288
1/2	1	3	1/2	0.060	310290
1/2	1	3	1/2	0.090	310293
1/2	1	3	1/2	0.120	310295
1/2	1-1/4	3	1/2	-	310297
1/2	1-1/4	3	1/2	0.020	310301
1/2	1-1/4	3	1/2	0.030	310303
1/2	1-1/4	3	1/2	0.060	310307
1/2	1-1/4	3	1/2	0.090	310310
1/2	1-1/4	3	1/2	0.120	310312
1/2	1-5/8	4	1/2	-	310316
1/2	1-5/8	4	1/2	0.020	310318
1/2	1-5/8	4	1/2	0.030	310322
1/2	1-5/8	4	1/2	0.060	310325
1/2	1-5/8	4	1/2	0.090	310328
1/2	1-5/8	4	1/2	0.120	310332
1/2	2	4	1/2	-	310334
1/2	2	4	1/2	0.020	310338
1/2	2	4	1/2	0.030	310342
1/2	2	4	1/2	0.060	310346
1/2	2	4	1/2	0.090	310350
1/2	2	4	1/2	0.120	310354
5/8	3/4	3	5/8	-	310356
5/8	3/4	3	5/8	0.030	310360
5/8	3/4	3	5/8	0.060	310364

*bold numbers are EDPs for ordering

INTRO

MILLING

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HOLEMAKING

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ADVANCED PERFORMANCE

Solid Carbide End Mills For Stainless, Titanium, Steel And Other Ferrous Alloys



Series 2100 **438 | 4FL | Square and Radius | PYSTL**

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	EDP
5/8	3/4	3	5/8	0.090	310367
5/8	3/4	3	5/8	0.120	310370
5/8	1-1/4	3-1/2	5/8	-	310374
5/8	1-1/4	3-1/2	5/8	0.030	310376
5/8	1-1/4	3-1/2	5/8	0.060	310379
5/8	1-1/4	3-1/2	5/8	0.090	310383
5/8	1-1/4	3-1/2	5/8	0.120	310385
5/8	1-5/8	3-1/2	5/8	-	310388
5/8	1-5/8	3-1/2	5/8	0.030	310392
5/8	1-5/8	3-1/2	5/8	0.060	310395
5/8	1-5/8	3-1/2	5/8	0.090	310397
5/8	1-5/8	3-1/2	5/8	0.120	310400
5/8	2-1/8	4	5/8	-	310403
5/8	2-1/8	4	5/8	0.030	310407
5/8	2-1/8	4	5/8	0.060	310410
5/8	2-1/8	4	5/8	0.090	310412
5/8	2-1/8	4	5/8	0.120	310414
5/8	2-1/2	5	5/8	-	310416
5/8	2-1/2	5	5/8	0.030	310420
5/8	2-1/2	5	5/8	0.060	310422
5/8	2-1/2	5	5/8	0.090	310425
5/8	2-1/2	5	5/8	0.120	310429
3/4	1	3	3/4	-	310431
3/4	1	3	3/4	0.030	310434
3/4	1	3	3/4	0.060	310437
3/4	1	3	3/4	0.090	310441
3/4	1	3	3/4	0.120	310444
3/4	1	3	3/4	0.250	310447
3/4	1-5/8	4	3/4	-	310451
3/4	1-5/8	4	3/4	0.030	310455
3/4	1-5/8	4	3/4	0.060	310458
3/4	1-5/8	4	3/4	0.090	310461
3/4	1-5/8	4	3/4	0.120	310463
3/4	1-5/8	4	3/4	0.250	310467
3/4	2-1/4	5	3/4	-	310469
3/4	2-1/4	5	3/4	0.030	310473
3/4	2-1/4	5	3/4	0.060	310476
3/4	2-1/4	5	3/4	0.090	310479
3/4	2-1/4	5	3/4	0.120	310483
3/4	2-1/4	5	3/4	0.250	310485
3/4	2-3/4	5	3/4	-	310489
3/4	2-3/4	5	3/4	0.030	310491
3/4	2-3/4	5	3/4	0.060	310494
3/4	2-3/4	5	3/4	0.090	310496
3/4	2-3/4	5	3/4	0.120	310498
3/4	2-3/4	5	3/4	0.250	310502
3/4	3-1/4	6	3/4	-	310505
3/4	3-1/4	6	3/4	0.030	310509
3/4	3-1/4	6	3/4	0.060	310513
3/4	3-1/4	6	3/4	0.090	310515
3/4	3-1/4	6	3/4	0.120	310519
3/4	3-1/4	6	3/4	0.250	310521
1	1-1/4	4	1	-	310525
1	1-1/4	4	1	0.030	310529
1	1-1/4	4	1	0.060	310531
1	1-1/4	4	1	0.090	310534
1	1-1/4	4	1	0.120	310536
1	1-1/4	4	1	0.250	310538
1	2	4	1	-	310541
1	2	4	1	0.030	310545
1	2	4	1	0.060	310549
1	2	4	1	0.090	310553
1	2	4	1	0.120	310557
1	2	4	1	0.250	310559
1	2-5/8	5	1	-	310562
1	2-5/8	5	1	0.030	310565
1	2-5/8	5	1	0.060	310567
1	2-5/8	5	1	0.090	310569
1	2-5/8	5	1	0.120	310573
1	2-5/8	5	1	0.250	310576
1	3-1/4	6	1	-	310578
1	3-1/4	6	1	0.030	310582
1	3-1/4	6	1	0.060	310586
1	3-1/4	6	1	0.090	310590
1	3-1/4	6	1	0.120	310592
1	3-1/4	6	1	0.250	310596

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

ADVANCED PERFORMANCE

Solid Carbide End Mills For Stainless, Titanium, Steel And Other Ferrous Alloys



Series 2100 438 | 4FL | Square and Radius | PYSTL

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	EDP
1	4-1/4	7	1	-	310600
1	4-1/4	7	1	0.030	310602
1	4-1/4	7	1	0.060	310605
1	4-1/4	7	1	0.090	310609
1	4-1/4	7	1	0.120	310613
1	4-1/4	7	1	0.250	310617
1-1/4	1-1/2	4-1/2	1-1/4	-	310621
1-1/4	1-1/2	4-1/2	1-1/4	0.030	310624
1-1/4	1-1/2	4-1/2	1-1/4	0.060	310628
1-1/4	1-1/2	4-1/2	1-1/4	0.090	310630
1-1/4	1-1/2	4-1/2	1-1/4	0.120	310632
1-1/4	1-1/2	4-1/2	1-1/4	0.250	310636
1-1/4	2	4-1/2	1-1/4	-	310640
1-1/4	2	4-1/2	1-1/4	0.030	310642
1-1/4	2	4-1/2	1-1/4	0.060	310644
1-1/4	2	4-1/2	1-1/4	0.090	310648
1-1/4	2	4-1/2	1-1/4	0.120	310651
1-1/4	2	4-1/2	1-1/4	0.250	310654
1-1/4	2-5/8	6	1-1/4	-	310657
1-1/4	2-5/8	6	1-1/4	0.030	310661
1-1/4	2-5/8	6	1-1/4	0.060	310664
1-1/4	2-5/8	6	1-1/4	0.090	310667
1-1/4	2-5/8	6	1-1/4	0.120	310671
1-1/4	2-5/8	6	1-1/4	0.250	310673
1-1/4	4-1/2	7	1-1/4	-	310676
1-1/4	4-1/2	7	1-1/4	0.030	310680
1-1/4	4-1/2	7	1-1/4	0.060	310683
1-1/4	4-1/2	7	1-1/4	0.090	310687
1-1/4	4-1/2	7	1-1/4	0.120	310690
1-1/4	4-1/2	7	1-1/4	0.250	310693

*bold numbers are EDPs for ordering

Popular Custom Milling Options

Proprietary GWS tool coatings
 Longer lengths
 Enhanced geometry
 Special shank modifications like **SAFE-LOCK**

CUSTOM COMES STANDARD

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

ADVANCED PERFORMANCE

Solid Carbide End Mills For Stainless, Titanium, Steel And Other Ferrous Alloys



INTRO

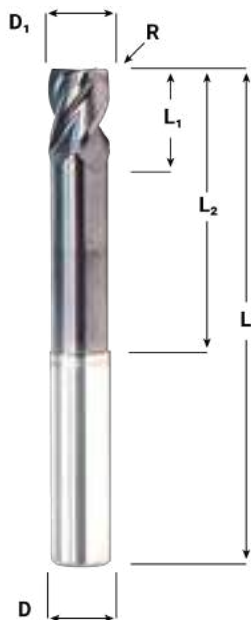
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES																																							
<h2>PYSTL</h2> <h3>Unequal Index End Mill</h3> <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance Unequal index tool for Titanium, stainless and other gummy materials Suited for slotting and profiling milling operations Specialized edge honing Reduced neck SafeLock® shank available upon request 		<table border="1"> <tr> <td>CARBIDE</td> <td>VAR</td> </tr> <tr> <td>4FL</td> <td>RAD</td> </tr> <tr> <td>SQ</td> <td>Reduced Neck</td> </tr> <tr> <td>h6</td> <td>P185</td> </tr> <tr> <td>FX3</td> <td></td> </tr> </table>	CARBIDE	VAR	4FL	RAD	SQ	Reduced Neck	h6	P185	FX3																														
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STEEL			STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL																														
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																													
●	●	○	○	●	○	○				●																															

Series 2105 **438RN | 4FL | Reduced Neck | Square and Radius | PYSTL**

Diameter(D ₁)	LOC(L ₁)	LBS(L ₂)	OAL(L)	Shank(D)	Radius(R)	EDP
1/8	3/16	3/8	2	1/8	-	310697
1/8	3/16	3/8	3	1/8	0.010	310701
1/8	3/16	3/8	3	1/8	0.020	310704
1/8	3/16	3/8	3	1/8	0.030	310706
1/8	3/16	1/2	3	1/8	-	310709
1/8	3/16	1/2	3	1/8	0.010	310711
1/8	3/16	1/2	3	1/8	0.020	310714
1/8	3/16	1/2	3	1/8	0.030	310717
1/8	3/16	3/4	3	1/8	-	310719
1/8	3/16	3/4	3	1/8	0.010	310722
1/8	3/16	3/4	3	1/8	0.020	310724
1/8	3/16	3/4	3	1/8	0.030	310727
3/16	1/4	1/2	3	3/16	-	310729
3/16	1/4	1/2	3	3/16	0.010	310732
3/16	1/4	1/2	3	3/16	0.020	310735
3/16	1/4	1/2	3	3/16	0.030	310738
3/16	1/4	3/4	3	3/16	-	310741
3/16	1/4	3/4	3	3/16	0.010	310745
3/16	1/4	3/4	3	3/16	0.020	310748
3/16	1/4	3/4	3	3/16	0.030	310750
3/16	1/4	1-1/8	3	3/16	-	310754
3/16	1/4	1-1/8	3	3/16	0.010	310758
3/16	1/4	1-1/8	3	3/16	0.020	310760
3/16	1/4	1-1/8	3	3/16	0.030	310762
1/4	3/8	3/4	4	1/4	-	310765
1/4	3/8	3/4	4	1/4	0.010	310767
1/4	3/8	3/4	4	1/4	0.020	310769
1/4	3/8	3/4	3	1/4	0.030	310772
1/4	3/8	3/4	4	1/4	0.060	310776
1/4	3/8	1-1/8	4	1/4	-	310780
1/4	3/8	1-1/8	4	1/4	0.010	310783
1/4	3/8	1-1/8	4	1/4	0.020	310787
1/4	3/8	1-1/8	4	1/4	0.030	310791
1/4	3/8	1-1/8	4	1/4	0.060	310794
1/4	3/8	2-1/8	4	1/4	-	310798
1/4	3/8	2-1/8	4	1/4	0.010	310802
1/4	3/8	2-1/8	4	1/4	0.020	310806
1/4	3/8	2-1/8	4	1/4	0.030	310810
1/4	3/8	2-1/8	4	1/4	0.060	310814
3/8	1/2	1-1/8	4	3/8	-	310817
3/8	1/2	1-1/8	4	3/8	0.020	310819
3/8	1/2	1-1/8	4	3/8	0.030	310821
3/8	1/2	1-1/8	4	3/8	0.060	310823
3/8	1/2	1-1/8	4	3/8	0.090	310825
3/8	1/2	2-1/8	4	3/8	-	310829

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Solid Carbide End Mills For Stainless, Titanium, Steel And Other Ferrous Alloys



Series 2105 | 438RN | 4FL | Reduced Neck | Square and Radius | PYSTL

Diameter(D ₁)	LOC(L ₁)	LBS(L ₂)	OAL(L)	Shank(D)	Radius(R)	EDP
3/8	1/2	2-1/8	4	3/8	0.020	310831
3/8	1/2	2-1/8	4	3/8	0.030	310835
3/8	1/2	2-1/8	4	3/8	0.060	310837
3/8	1/2	2-1/8	4	3/8	0.090	310839
3/8	1/2	3-1/8	6	3/8	-	310841
3/8	1/2	3-1/8	6	3/8	0.020	310843
3/8	1/2	3-1/8	6	3/8	0.030	310845
3/8	1/2	3-1/8	6	3/8	0.060	310848
3/8	1/2	3-1/8	6	3/8	0.090	310850
3/8	1/2	4-1/8	6	3/8	-	310853
3/8	1/2	4-1/8	6	3/8	0.020	310857
3/8	1/2	4-1/8	6	3/8	0.030	310860
3/8	1/2	4-1/8	6	3/8	0.060	310863
3/8	1/2	4-1/8	6	3/8	0.090	310866
1/2	5/8	1-1/2	4	1/2	-	310870
1/2	5/8	1-1/2	4	1/2	0.020	310874
1/2	5/8	1-1/2	4	1/2	0.060	310878
1/2	5/8	1-1/2	4	1/2	0.090	310881
1/2	5/8	1-1/2	4	1/2	0.120	310884
1/2	5/8	2-1/4	4	1/2	-	310888
1/2	5/8	2-1/4	4	1/2	0.020	310890
1/2	5/8	2-1/4	4	1/2	0.030	310893
1/2	5/8	2-1/4	4	1/2	0.060	310895
1/2	5/8	2-1/4	4	1/2	0.090	310897
1/2	5/8	2-1/4	4	1/2	0.120	310900
1/2	5/8	3-3/8	6	1/2	-	310903
1/2	5/8	3-3/8	6	1/2	0.020	310906
1/2	5/8	3-3/8	6	1/2	0.030	310910
1/2	5/8	3-3/8	6	1/2	0.060	310912
1/2	5/8	3-3/8	6	1/2	0.090	310915
1/2	5/8	3-3/8	6	1/2	0.120	310917
1/2	5/8	4-1/8	6	1/2	-	310921
1/2	5/8	4-1/8	6	1/2	0.020	310925
1/2	5/8	4-1/8	6	1/2	0.030	310927
1/2	5/8	4-1/8	6	1/2	0.060	310929
1/2	5/8	4-1/8	6	1/2	0.090	310933
1/2	5/8	4-1/8	6	1/2	0.120	310935
5/8	3/4	1-5/8	4	5/8	-	310937
5/8	3/4	1-5/8	4	5/8	0.030	310941
5/8	3/4	1-5/8	4	5/8	0.060	310943
5/8	3/4	1-5/8	4	5/8	0.090	310945
5/8	3/4	1-5/8	4	5/8	0.120	310949
5/8	3/4	2-3/8	6	5/8	-	310951
5/8	3/4	2-3/8	6	5/8	0.030	310955
5/8	3/4	2-3/8	6	5/8	0.060	310957
5/8	3/4	2-3/8	6	5/8	0.090	310961
5/8	3/4	2-3/8	6	5/8	0.120	310964
5/8	3/4	3-3/8	6	5/8	-	310968
5/8	3/4	3-3/8	6	5/8	0.030	310972
5/8	3/4	3-3/8	6	5/8	0.060	310975
5/8	3/4	3-3/8	6	5/8	0.090	310979
5/8	3/4	3-3/8	6	5/8	0.120	310982
5/8	3/4	4-1/8	6	5/8	-	310985
5/8	3/4	4-1/8	6	5/8	0.030	310987
5/8	3/4	4-1/8	6	5/8	0.060	310989
5/8	3/4	4-1/8	6	5/8	0.090	310992
5/8	3/4	4-1/8	6	5/8	0.120	310994
3/4	1	2	4	3/4	-	310997
3/4	1	2	4	3/4	0.030	310999
3/4	1	2	4	3/4	0.060	311002
3/4	1	2	4	3/4	0.090	311006
3/4	1	2	4	3/4	0.120	311010
3/4	1	2	4	3/4	0.190	311013
3/4	1	2	4	3/4	0.250	311016
3/4	1	2-1/2	6	3/4	-	311019
3/4	1	2-1/2	6	3/4	0.030	311023
3/4	1	2-1/2	6	3/4	0.060	311027
3/4	1	2-1/2	6	3/4	0.090	311031
3/4	1	2-1/2	6	3/4	0.120	311034
3/4	1	2-1/2	6	3/4	0.190	311037
3/4	1	2-1/2	6	3/4	0.250	311041
3/4	1	3-3/8	6	3/4	-	311043
3/4	1	3-3/8	6	3/4	0.030	311045
3/4	1	3-3/8	6	3/4	0.060	311049
3/4	1	3-3/8	6	3/4	0.090	311051
3/4	1	3-3/8	6	3/4	0.120	311053

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INTRO

MILLING

SPECIALTY

HOLEMAKING

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INSERTS

ADVANCED PERFORMANCE

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Series 2105 | 438RN | 4FL | Reduced Neck | Square and Radius | PYSTL

Diameter(D ₁)	LOC(L ₁)	LBS(L ₂)	OAL(L)	Shank(D)	Radius(R)	EDP
3/4	1	3-3/8	6	3/4	0.190	311056
3/4	1	3-3/8	6	3/4	0.250	311059
3/4	1	4-1/8	6	3/4	-	311063
3/4	1	4-1/8	6	3/4	0.030	311067
3/4	1	4-1/8	6	3/4	0.060	311071
3/4	1	4-1/8	6	3/4	0.090	311075
3/4	1	4-1/8	6	3/4	0.120	311077
3/4	1	4-1/8	6	3/4	0.190	311079
3/4	1	4-1/8	6	3/4	0.250	311082
1	1-1/4	2-1/4	4	1	-	311084
1	1-1/4	2-1/4	4	1	0.030	311088
1	1-1/4	2-1/4	4	1	0.060	311090
1	1-1/4	2-1/4	4	1	0.090	311092
1	1-1/4	2-1/4	4	1	0.120	311096
1	1-1/4	2-1/4	4	1	0.190	311099
1	1-1/4	2-1/4	4	1	0.250	311102
1	1-1/4	2-5/8	6	1	-	311104
1	1-1/4	2-5/8	6	1	0.030	311108
1	1-1/4	2-5/8	6	1	0.060	311110
1	1-1/4	2-5/8	6	1	0.090	311114
1	1-1/4	2-5/8	6	1	0.120	311118
1	1-1/4	2-5/8	6	1	0.190	311121
1	1-1/4	2-5/8	6	1	0.250	311124
1	1-1/4	3-3/8	6	1	-	311127
1	1-1/4	3-3/8	6	1	0.030	311131
1	1-1/4	3-3/8	6	1	0.060	311135
1	1-1/4	3-3/8	6	1	0.090	311138
1	1-1/4	3-3/8	6	1	0.120	311142
1	1-1/4	3-3/8	6	1	0.190	311144
1	1-1/4	3-3/8	6	1	0.250	311146
1	1-1/4	4-1/8	6	1	-	311149
1	1-1/4	4-1/8	6	1	0.030	311152
1	1-1/4	4-1/8	6	1	0.060	311156
1	1-1/4	4-1/8	6	1	0.090	311158
1	1-1/4	4-1/8	6	1	0.120	311160
1	1-1/4	4-1/8	6	1	0.190	311163
1	1-1/4	4-1/8	6	1	0.250	311167

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Solid Carbide End Mills For Stainless, Titanium, Steel And Other Ferrous Alloys



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

95



FEATURES/DESCRIPTION	APPLICATION	FEATURES								
<h2>PYSTL</h2> <h3>Unequal Index End Mill</h3> <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance Unequal index tool for Titanium, stainless and other gummy materials Suited for slotting and profiling milling operations Specialized edge honing SafeLock® shank available upon request 		<table border="1"> <tr> <td>CARBIDE</td> <td>VAR</td> </tr> <tr> <td>4FL</td> <td>BALL</td> </tr> <tr> <td>h6</td> <td>P185</td> </tr> <tr> <td>FX3</td> <td></td> </tr> </table>	CARBIDE	VAR	4FL	BALL	h6	P185	FX3	
CARBIDE	VAR									
4FL	BALL									
h6	P185									
FX3										

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	○	○	●	○	○				●		

● Best ○ Good

Series 2115 438 | 4FL | Ball Nose | PYSTL

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	EDP
1/8	1/4	2	1/8	311169
1/8	1/2	2	1/8	311171
3/16	5/16	2	3/16	311174
3/16	5/8	2	3/16	311176
1/4	3/8	2	1/4	311179
1/4	1/2	2-1/2	1/4	311183
1/4	3/4	2-1/2	1/4	311186
5/16	7/16	2	5/16	311190
5/16	13/16	2-1/2	5/16	311193
3/8	1/2	2	3/8	311197
3/8	1	2-1/2	3/8	311201
1/2	5/8	2-1/2	1/2	311204
1/2	1	3	1/2	311208
1/2	1-1/4	3	1/2	311210
5/8	1-1/4	3-1/2	5/8	311214
5/8	1-5/8	3-1/2	5/8	311216
3/4	1	3	3/4	311219
3/4	1-5/8	4	3/4	311222
1	1-1/4	4	1	311224
1	2	4	1	311226

*bold numbers are EDPs for ordering

Popular Custom Milling Options

- Proprietary GWS tool coatings
- Longer lengths
- Enhanced geometry
- Special shank modifications like **SAFE-LOCK®**

CUSTOM
COMES
STANDARD

ADVANCED PERFORMANCE

Solid Carbide End Mills For Stainless, Titanium, Steel And Other Ferrous Alloys



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES										
<h2>PYSTL</h2> <h3>Unequal Index End Mill</h3> <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance Unequal index tool for Titanium, stainless and other gummy materials Suited for slotting and profiling milling operations Specialized edge honing Staggered chip breakers SafeLock® shank available upon request 		<table border="1"> <tr> <td>CARBIDE</td> <td>VAR</td> </tr> <tr> <td>38°</td> <td>4FL</td> </tr> <tr> <td>RAD</td> <td>SQ</td> </tr> <tr> <td>h6</td> <td>P185</td> </tr> <tr> <td></td> <td>FW3</td> </tr> </table>	CARBIDE	VAR	38°	4FL	RAD	SQ	h6	P185		FW3
CARBIDE	VAR											
38°	4FL											
RAD	SQ											
h6	P185											
	FW3											

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	○	○	●	○	○				●		

● Best ○ Good

Series 2117 438CB | 4FL | Radius | Chip Breaker | PYSTL

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	EDP
1/8	1/4	2	1/8	0.010	311228
1/8	1/2	2	1/8	0.010	311231
1/8	3/4	2-1/2	1/8	0.010	311235
3/16	5/16	2	3/16	0.010	311237
3/16	9/16	2	3/16	0.010	311241
3/16	3/4	2-1/2	3/16	0.010	311245
1/4	3/8	2	1/4	0.020	311248
1/4	1/2	2-1/2	1/4	0.020	311250
1/4	3/4	2-1/2	1/4	0.020	311254
1/4	1	3	1/4	0.020	311258
5/16	7/16	2	5/16	0.020	311262
5/16	13/16	2-1/2	5/16	0.020	311265
5/16	1	3	5/16	0.020	311268
3/8	1/2	2	3/8	0.020	311271
3/8	7/8	2-1/2	3/8	0.020	311275
3/8	1	2-1/2	3/8	0.020	311278
3/8	1-1/4	3	3/8	0.020	311280
3/8	1-1/2	3	3/8	0.020	311282
1/2	5/8	2-1/2	1/2	0.030	311284
1/2	1	3	1/2	0.030	311287
1/2	1-1/4	3	1/2	0.030	311290
1/2	1-5/8	4	1/2	0.020	311292
1/2	1-5/8	4	1/2	0.030	311294
1/2	2	4	1/2	0.030	311297
5/8	3/4	3	5/8	0.030	311300
5/8	1-1/4	3-1/2	5/8	0.030	311302
5/8	1-5/8	3-1/2	5/8	0.030	311305
5/8	2-1/8	4	5/8	0.030	311307
5/8	2-1/2	5	5/8	0.030	311310
3/4	1	3	3/4	0.030	311314
3/4	1-5/8	4	3/4	0.030	311317
3/4	2-1/4	5	3/4	0.030	311320
3/4	2-3/4	5	3/4	0.030	311324
3/4	3-1/4	6	3/4	0.030	311327
1	1-1/4	4	1	0.030	311330
1	2	4	1	0.030	311333
1	2-5/8	5	1	0.030	311337
1	3-1/4	6	1	0.030	311340
1	4-1/4	7	1	0.030	311344

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Solid Carbide End Mills For Stainless, Titanium, Steel And Other Ferrous Alloys



INTRO

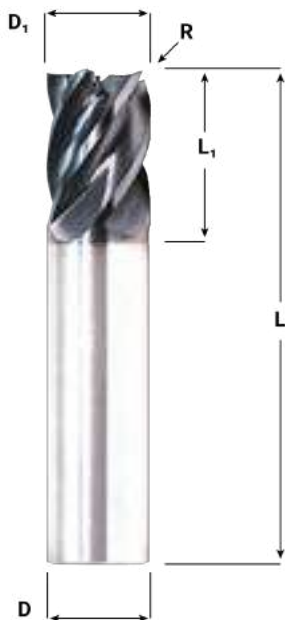
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES								
<h2>PYSTL</h2> <h3>Unequal Index End Mill</h3> <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance Unequal index tool for Titanium, stainless and other gummy materials Ideal for HEM profiling milling operations Specialized edge honing SafeLock® shank available upon request 		<table border="1"> <tr> <td>CARBIDE</td> <td>VAR</td> </tr> <tr> <td>5FL</td> <td>RAD</td> </tr> <tr> <td>SQ</td> <td>h6</td> </tr> <tr> <td>P186</td> <td>FX3</td> </tr> </table>	CARBIDE	VAR	5FL	RAD	SQ	h6	P186	FX3
CARBIDE	VAR									
5FL	RAD									
SQ	h6									
P186	FX3									

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	○	○	●	○	○				●		

● Best ○ Good

Series 2205 **538 | 5FL | Square and Radius | PYSTL**

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	EDP
1/8	1/4	1-1/2	1/8	-	311348
1/8	1/4	1-1/2	1/8	0.010	311351
1/8	1/4	1-1/2	1/8	0.020	311353
1/8	1/4	1-1/2	1/8	0.030	311356
1/8	1/2	2	1/8	-	311358
1/8	1/2	2	1/8	0.010	311360
1/8	1/2	2	1/8	0.020	311362
1/8	1/2	2	1/8	0.030	311364
1/8	3/4	2-1/2	1/8	-	311367
1/8	3/4	2-1/2	1/8	0.010	311369
1/8	3/4	2-1/2	1/8	0.020	311371
3/16	5/16	2	3/16	-	311373
3/16	5/16	2	3/16	0.010	311375
3/16	5/16	2	3/16	0.020	311378
3/16	9/16	2	3/16	-	311381
3/16	9/16	2	3/16	0.010	311384
3/16	9/16	2	3/16	0.020	311388
3/16	9/16	2	3/16	0.030	311392
3/16	3/4	2-1/2	3/16	-	311395
3/16	3/4	2-1/2	3/16	0.010	311398
3/16	3/4	2-1/2	3/16	0.020	311401
3/16	3/4	2-1/2	3/16	0.030	311403
1/4	3/8	2	1/4	-	311405
1/4	3/8	2	1/4	0.010	311408
1/4	3/8	2	1/4	0.020	311410
1/4	3/8	2	1/4	0.030	311413
1/4	3/8	2	1/4	0.060	311417
1/4	1/2	2-1/2	1/4	-	311421
1/4	1/2	2-1/2	1/4	0.010	311423
1/4	1/2	2-1/2	1/4	0.020	311425
1/4	1/2	2-1/2	1/4	0.030	311427
1/4	1/2	2-1/2	1/4	0.060	311430
1/4	3/4	2-1/2	1/4	-	311432
1/4	3/4	2-1/2	1/4	0.010	311434
1/4	3/4	2-1/2	1/4	0.020	311438
1/4	3/4	2-1/2	1/4	0.030	311440
1/4	3/4	2-1/2	1/4	0.060	311444
1/4	1	3	1/4	-	311446
1/4	1	3	1/4	0.010	311448
1/4	1	3	1/4	0.020	311452
1/4	1	3	1/4	0.030	311454
1/4	1	3	1/4	0.060	311458
1/4	1-1/4	3	1/4	-	311461
1/4	1-1/4	3	1/4	0.010	311464
1/4	1-1/4	3	1/4	0.020	311467

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ADVANCED PERFORMANCE

Solid Carbide End Mills For Stainless, Titanium, Steel And Other Ferrous Alloys



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Series 2205		538 | 5FL | Square and Radius | PYSTL			
Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	EDP
1/4	1-1/4	3	1/4	0.030	311469
1/4	1-1/4	3	1/4	0.060	311473
5/16	7/16	2	5/16	-	311477
5/16	7/16	2	5/16	0.010	311480
5/16	7/16	2	5/16	0.020	311484
5/16	7/16	2	5/16	0.030	311486
5/16	7/16	2	5/16	0.060	311489
5/16	13/16	2-1/2	5/16	-	311491
5/16	13/16	2-1/2	5/16	0.010	311495
5/16	13/16	2-1/2	5/16	0.020	311499
5/16	13/16	2-1/2	5/16	0.030	311501
5/16	13/16	2-1/2	5/16	0.060	311503
5/16	1	3	5/16	-	311505
5/16	1	3	5/16	0.010	311509
5/16	1	3	5/16	0.020	311512
5/16	1	3	5/16	0.030	311514
5/16	1	3	5/16	0.060	311518
3/8	1/2	2	3/8	-	311522
3/8	1/2	2	3/8	0.010	311524
3/8	1/2	2	3/8	0.020	311528
3/8	1/2	2	3/8	0.030	311531
3/8	1/2	2	3/8	0.060	311535
3/8	1/2	2	3/8	0.090	311537
3/8	1	2-1/2	3/8	-	311540
3/8	1	2-1/2	3/8	0.010	311543
3/8	1	2-1/2	3/8	0.020	311547
3/8	1	2-1/2	3/8	0.030	311550
3/8	1	2-1/2	3/8	0.060	311553
3/8	1	2-1/2	3/8	0.090	311556
3/8	1-1/4	3	3/8	-	311558
3/8	1-1/4	3	3/8	0.010	311562
3/8	1-1/4	3	3/8	0.020	311566
3/8	1-1/4	3	3/8	0.030	311568
3/8	1-1/4	3	3/8	0.060	311570
3/8	1-1/4	3	3/8	0.090	311574
3/8	1-1/2	4	3/8	-	311576
3/8	1-1/2	4	3/8	0.010	311578
3/8	1-1/2	4	3/8	0.020	311582
3/8	1-1/2	4	3/8	0.030	311586
3/8	1-1/2	4	3/8	0.060	311588
3/8	1-1/2	4	3/8	0.090	311590
1/2	5/8	2-1/2	1/2	-	311594
1/2	5/8	2-1/2	1/2	0.020	311597
1/2	5/8	2-1/2	1/2	0.030	311601
1/2	5/8	2-1/2	1/2	0.060	311604
1/2	5/8	2-1/2	1/2	0.090	311606
1/2	5/8	2-1/2	1/2	0.120	311610
1/2	1	3	1/2	-	311613
1/2	1	3	1/2	0.020	311615
1/2	1	3	1/2	0.030	311619
1/2	1	3	1/2	0.060	311622
1/2	1	3	1/2	0.090	311626
1/2	1	3	1/2	0.120	311630
1/2	1-1/4	3	1/2	-	311634
1/2	1-1/4	3	1/2	0.020	311637
1/2	1-1/4	3	1/2	0.030	311640
1/2	1-1/4	3	1/2	0.060	311642
1/2	1-1/4	3	1/2	0.090	311644
1/2	1-1/4	3	1/2	0.120	311648
1/2	1-5/8	4	1/2	-	311652
1/2	1-5/8	4	1/2	0.020	311654
1/2	1-5/8	4	1/2	0.030	311658
1/2	1-5/8	4	1/2	0.060	311660
1/2	1-5/8	4	1/2	0.090	311664
1/2	1-5/8	4	1/2	0.120	311666
1/2	2	4	1/2	-	311670
1/2	2	4	1/2	0.020	311674
1/2	2	4	1/2	0.030	311678
1/2	2	4	1/2	0.060	311681
1/2	2	4	1/2	0.090	311683
1/2	2	4	1/2	0.120	311687
5/8	3/4	3	5/8	-	311691
5/8	3/4	3	5/8	0.030	311695
5/8	3/4	3	5/8	0.060	311699
5/8	3/4	3	5/8	0.090	311703
5/8	3/4	3	5/8	0.120	311705

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ADVANCED PERFORMANCE

Solid Carbide End Mills For Stainless, Titanium, Steel And Other Ferrous Alloys



Series 2205 538 | 5FL | Square and Radius | PYSTL

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	EDP
5/8	1-1/4	3-1/2	5/8	-	311708
5/8	1-1/4	3-1/2	5/8	0.030	311712
5/8	1-1/4	3-1/2	5/8	0.060	311715
5/8	1-1/4	3-1/2	5/8	0.090	311719
5/8	1-1/4	3-1/2	5/8	0.120	311723
5/8	1-5/8	3-1/2	5/8	-	311725
5/8	1-5/8	3-1/2	5/8	0.030	311727
5/8	1-5/8	3-1/2	5/8	0.060	311730
5/8	1-5/8	3-1/2	5/8	0.090	311734
5/8	1-5/8	3-1/2	5/8	0.120	311737
5/8	2-1/8	4	5/8	-	311741
5/8	2-1/8	4	5/8	0.030	311743
5/8	2-1/8	4	5/8	0.060	311745
5/8	2-1/8	4	5/8	0.090	311748
5/8	2-1/8	4	5/8	0.120	311750
5/8	2-1/2	5	5/8	-	311754
5/8	2-1/2	5	5/8	0.030	311756
5/8	2-1/2	5	5/8	0.060	311759
5/8	2-1/2	5	5/8	0.090	311761
5/8	2-1/2	5	5/8	0.120	311764
3/4	1	3	3/4	-	311767
3/4	1	3	3/4	0.030	311771
3/4	1	3	3/4	0.060	311773
3/4	1	3	3/4	0.090	311776
3/4	1	3	3/4	0.120	311778
3/4	1	3	3/4	0.250	311780
3/4	1-5/8	4	3/4	-	311782
3/4	1-5/8	4	3/4	0.030	311785
3/4	1-5/8	4	3/4	0.060	311787
3/4	1-5/8	4	3/4	0.090	311789
3/4	1-5/8	4	3/4	0.120	311793
3/4	1-5/8	4	3/4	0.250	311796
3/4	2-1/4	5	3/4	-	311800
3/4	2-1/4	5	3/4	0.030	311804
3/4	2-1/4	5	3/4	0.060	311808
3/4	2-1/4	5	3/4	0.090	311810
3/4	2-1/4	5	3/4	0.120	311812
3/4	2-1/4	5	3/4	0.250	311814
3/4	2-3/4	5	3/4	-	311818
3/4	2-3/4	5	3/4	0.030	311820
3/4	2-3/4	5	3/4	0.060	311824
3/4	2-3/4	5	3/4	0.090	311826
3/4	2-3/4	5	3/4	0.120	311828
3/4	2-3/4	5	3/4	0.250	311831
3/4	3-1/4	6	3/4	-	311833
3/4	3-1/4	6	3/4	0.030	311837
3/4	3-1/4	6	3/4	0.060	311839
3/4	3-1/4	6	3/4	0.090	311842
3/4	3-1/4	6	3/4	0.120	311846
3/4	3-1/4	6	3/4	0.250	311848
1	1-1/4	4	1	-	311852
1	1-1/4	4	1	0.030	311855
1	1-1/4	4	1	0.060	311857
1	1-1/4	4	1	0.090	311860
1	1-1/4	4	1	0.120	311864
1	1-1/4	4	1	0.250	311868
1	2	4	1	-	311872
1	2	4	1	0.030	311876
1	2	4	1	0.060	311878
1	2	4	1	0.090	311881
1	2	4	1	0.120	311884
1	2	4	1	0.250	311888
1	2-5/8	5	1	-	311890
1	2-5/8	5	1	0.030	311893
1	2-5/8	5	1	0.060	311896
1	2-5/8	5	1	0.090	311900
1	2-5/8	5	1	0.120	311902
1	2-5/8	5	1	0.250	311905
1	3-1/4	6	1	-	311909
1	3-1/4	6	1	0.030	311913
1	3-1/4	6	1	0.060	311915
1	3-1/4	6	1	0.090	311918
1	3-1/4	6	1	0.120	311920
1	3-1/4	6	1	0.250	311924
1	4-1/4	7	1	-	311927
1	4-1/4	7	1	0.030	311931

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INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

ADVANCED PERFORMANCE

Solid Carbide End Mills For Stainless, Titanium, Steel And Other Ferrous Alloys



INTRO

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THREADING

INSERTS

Series 2205 **538 | 5FL | Square and Radius | PYSTL**

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	EDP
1	4-1/4	7	1	0.060	311933
1	4-1/4	7	1	0.090	311935
1	4-1/4	7	1	0.120	311937
1	4-1/4	7	1	0.250	311940
1-1/4	1-1/2	4-1/2	1-1/4	-	311943
1-1/4	1-1/2	4-1/2	1-1/4	0.030	311947
1-1/4	1-1/2	4-1/2	1-1/4	0.060	311949
1-1/4	1-1/2	4-1/2	1-1/4	0.090	311951
1-1/4	1-1/2	4-1/2	1-1/4	0.120	311955
1-1/4	1-1/2	4-1/2	1-1/4	0.250	311957
1-1/4	2	4-1/2	1-1/4	-	311961
1-1/4	2	4-1/2	1-1/4	0.030	311964
1-1/4	2	4-1/2	1-1/4	0.060	311966
1-1/4	2	4-1/2	1-1/4	0.090	311968
1-1/4	2	4-1/2	1-1/4	0.120	311971
1-1/4	2	4-1/2	1-1/4	0.250	311975
1-1/4	2-5/8	6	1-1/4	-	311977
1-1/4	2-5/8	6	1-1/4	0.030	311979
1-1/4	2-5/8	6	1-1/4	0.060	311983
1-1/4	2-5/8	6	1-1/4	0.090	311985
1-1/4	2-5/8	6	1-1/4	0.120	311987
1-1/4	2-5/8	6	1-1/4	0.250	311991
1-1/4	4-1/2	7	1-1/4	-	311993
1-1/4	4-1/2	7	1-1/4	0.030	311995
1-1/4	4-1/2	7	1-1/4	0.060	311998
1-1/4	4-1/2	7	1-1/4	0.090	312001
1-1/4	4-1/2	7	1-1/4	0.120	312003
1-1/4	4-1/2	7	1-1/4	0.250	312005

*bold numbers are EDPs for ordering

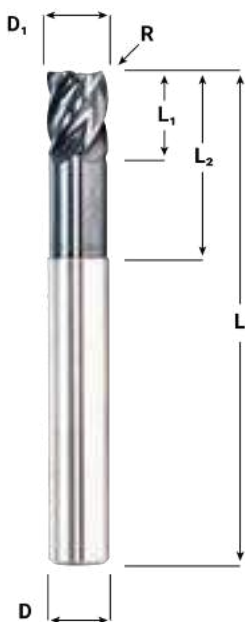
Popular Custom Milling Options

Proprietary GWS tool coatings
 Longer lengths
 Enhanced geometry
 Special shank modifications like **SAFE-LOCK**

CUSTOM COMES STANDARD

ADVANCED PERFORMANCE

Solid Carbide End Mills For Stainless, Titanium, Steel And Other Ferrous Alloys



FEATURES/DESCRIPTION	APPLICATION	FEATURES										
<h2>PYSTL</h2> <h3>Unequal Index End Mill</h3> <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance Unequal index tool for Titanium, stainless and other gummy materials Ideal for HEM profiling milling operations Specialized edge honing Reduced neck SafeLock® shank available upon request 		<table border="1"> <tr> <td>CARBIDE</td> <td>VAR</td> </tr> <tr> <td>5FSL</td> <td>RAD</td> </tr> <tr> <td>SQ</td> <td>Reduced Neck</td> </tr> <tr> <td>h6</td> <td>P186</td> </tr> <tr> <td>FX3</td> <td></td> </tr> </table>	CARBIDE	VAR	5FSL	RAD	SQ	Reduced Neck	h6	P186	FX3	
CARBIDE	VAR											
5FSL	RAD											
SQ	Reduced Neck											
h6	P186											
FX3												

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	○	○	●	○	○				●		

● Best ○ Good

Series 2213 **538RN | 5FL | Reduced Neck | Square and Radius | PYSTL**

Diameter(D ₁)	LOC(L ₁)	LBS(L ₂)	OAL(L)	Shank(D)	Radius(R)	EDP
1/8	3/16	3/8	2	1/8	0.020	312009
1/8	3/16	3/8	2	1/8	0.030	312011
1/8	3/16	1/2	2	1/8	-	312013
1/8	3/16	1/2	2	1/8	0.010	312015
1/8	3/16	1/2	2	1/8	0.020	312018
1/8	3/16	1/2	2	1/8	0.030	312022
1/8	3/16	3/4	2-1/2	1/8	-	312025
1/8	3/16	3/4	2-1/2	1/8	0.010	312029
1/8	3/16	3/4	2-1/2	1/8	0.020	312033
1/8	3/16	3/4	2-1/2	1/8	0.030	312036
3/16	1/4	1/2	2	3/16	-	312038
3/16	1/4	1/2	2	3/16	0.010	312041
3/16	1/4	1/2	2	3/16	0.020	312044
3/16	1/4	1/2	2	3/16	0.030	312046
3/16	1/4	3/4	2-1/2	3/16	-	312050
3/16	1/4	3/4	2-1/2	3/16	0.010	312053
3/16	1/4	3/4	2-1/2	3/16	0.020	312056
3/16	1/4	3/4	2-1/2	3/16	0.030	312060
3/16	1/4	1-1/8	2-1/2	3/16	-	312064
3/16	1/4	1-1/8	2-1/2	3/16	0.010	312066
3/16	1/4	1-1/8	2-1/2	3/16	0.020	312068
3/16	1/4	1-1/8	2-1/2	3/16	0.030	312071
1/4	3/8	3/4	4	1/4	-	312073
1/4	3/8	3/4	4	1/4	0.010	312075
1/4	3/8	3/4	4	1/4	0.020	312079
1/4	3/8	3/4	4	1/4	0.030	312082
1/4	3/8	3/4	4	1/4	0.060	312086
1/4	3/8	1-1/8	4	1/4	-	312090
1/4	3/8	1-1/8	4	1/4	0.010	312093
1/4	3/8	1-1/8	4	1/4	0.020	312096
1/4	3/8	1-1/8	4	1/4	0.030	312099
1/4	3/8	1-1/8	4	1/4	0.060	312103
1/4	3/8	2-1/8	4	1/4	-	312106
1/4	3/8	2-1/8	4	1/4	0.010	312109
1/4	3/8	2-1/8	4	1/4	0.020	312113
1/4	3/8	2-1/8	4	1/4	0.030	312116
1/4	3/8	2-1/8	4	1/4	0.060	312118
3/8	1/2	1-1/8	4	3/8	-	312122
3/8	1/2	1-1/8	4	3/8	0.020	312126
3/8	1/2	1-1/8	4	3/8	0.030	312130
3/8	1/2	1-1/8	4	3/8	0.060	312134
3/8	1/2	1-1/8	4	3/8	0.090	312137
3/8	1/2	2-1/8	4	3/8	-	312140
3/8	1/2	2-1/8	4	3/8	0.020	312143
3/8	1/2	2-1/8	4	3/8	0.030	312145

*bold numbers are EDPs for ordering

INTRO
 MILLING
 SPECIALTY
 HOLEMAKING
 THREADING
 INSERTS

ADVANCED PERFORMANCE

Solid Carbide End Mills For Stainless, Titanium, Steel And Other Ferrous Alloys



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Series 2213 538RN | 5FL | Reduced Neck | Square and Radius | PYSTL						
Diameter(D ₁)	LOC(L ₁)	LBS(L ₂)	OAL(L)	Shank(D)	Radius(R)	EDP
3/8	1/2	2-1/8	4	3/8	0.060	312149
3/8	1/2	2-1/8	4	3/8	0.090	312153
3/8	1/2	3-1/8	6	3/8	-	312155
3/8	1/2	3-1/8	6	3/8	0.020	312157
3/8	1/2	3-1/8	6	3/8	0.030	312159
3/8	1/2	3-1/8	6	3/8	0.060	312161
3/8	1/2	3-1/8	6	3/8	0.090	312164
3/8	1/2	4-1/8	6	3/8	-	312168
3/8	1/2	4-1/8	6	3/8	0.020	312171
3/8	1/2	4-1/8	6	3/8	0.030	312174
3/8	1/2	4-1/8	6	3/8	0.060	312176
3/8	1/2	4-1/8	6	3/8	0.090	312180
1/2	5/8	1-1/2	4	1/2	-	312182
1/2	5/8	1-1/2	4	1/2	0.020	312184
1/2	5/8	1-1/2	4	1/2	0.060	312187
1/2	5/8	1-1/2	4	1/2	0.090	312190
1/2	5/8	1-1/2	4	1/2	0.120	312193
1/2	5/8	2-1/4	4	1/2	-	312197
1/2	5/8	2-1/4	4	1/2	0.020	312199
1/2	5/8	2-1/4	4	1/2	0.030	312203
1/2	5/8	2-1/4	4	1/2	0.060	312207
1/2	5/8	2-1/4	4	1/2	0.090	312209
1/2	5/8	2-1/4	4	1/2	0.120	312212
1/2	5/8	3-3/8	6	1/2	-	312214
1/2	5/8	3-3/8	6	1/2	0.020	312217
1/2	5/8	3-3/8	6	1/2	0.030	312220
1/2	5/8	3-3/8	6	1/2	0.060	312222
1/2	5/8	3-3/8	6	1/2	0.090	312226
1/2	5/8	3-3/8	6	1/2	0.120	312228
1/2	5/8	4-1/8	6	1/2	-	312230
1/2	5/8	4-1/8	6	1/2	0.020	312233
1/2	5/8	4-1/8	6	1/2	0.030	312237
1/2	5/8	4-1/8	6	1/2	0.060	312241
1/2	5/8	4-1/8	6	1/2	0.090	312244
1/2	5/8	4-1/8	6	1/2	0.120	312248
5/8	3/4	1-5/8	4	5/8	-	312251
5/8	3/4	1-5/8	4	5/8	0.030	312253
5/8	3/4	1-5/8	4	5/8	0.060	312256
5/8	3/4	1-5/8	4	5/8	0.090	312259
5/8	3/4	1-5/8	4	5/8	0.120	312261
5/8	3/4	2-3/8	6	5/8	-	312263
5/8	3/4	2-3/8	6	5/8	0.030	312267
5/8	3/4	2-3/8	6	5/8	0.060	312270
5/8	3/4	2-3/8	6	5/8	0.090	312273
5/8	3/4	2-3/8	6	5/8	0.120	312275
5/8	3/4	3-3/8	6	5/8	-	312277
5/8	3/4	3-3/8	6	5/8	0.030	312279
5/8	3/4	3-3/8	6	5/8	0.060	312282
5/8	3/4	3-3/8	6	5/8	0.090	312286
5/8	3/4	3-3/8	6	5/8	0.120	312290
5/8	3/4	4-1/8	6	5/8	-	312293
5/8	3/4	4-1/8	6	5/8	0.030	312297
5/8	3/4	4-1/8	6	5/8	0.060	312300
5/8	3/4	4-1/8	6	5/8	0.090	312302
5/8	3/4	4-1/8	6	5/8	0.120	312306
3/4	1	2	4	3/4	-	312309
3/4	1	2	4	3/4	0.030	312312
3/4	1	2	4	3/4	0.060	312314
3/4	1	2	4	3/4	0.090	312318
3/4	1	2	4	3/4	0.120	312322
3/4	1	2	4	3/4	0.190	312325
3/4	1	2	4	3/4	0.250	312329
3/4	1	2-1/2	6	3/4	-	312333
3/4	1	2-1/2	6	3/4	0.030	312335
3/4	1	2-1/2	6	3/4	0.060	312338
3/4	1	2-1/2	6	3/4	0.090	312340
3/4	1	2-1/2	6	3/4	0.120	312342
3/4	1	2-1/2	6	3/4	0.190	312345
3/4	1	2-1/2	6	3/4	0.250	312349
3/4	1	3-3/8	6	3/4	-	312353
3/4	1	3-3/8	6	3/4	0.030	312357
3/4	1	3-3/8	6	3/4	0.060	312360
3/4	1	3-3/8	6	3/4	0.090	312364
3/4	1	3-3/8	6	3/4	0.120	312366
3/4	1	3-3/8	6	3/4	0.190	312370
3/4	1	3-3/8	6	3/4	0.250	312372

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Solid Carbide End Mills For Stainless, Titanium, Steel And Other Ferrous Alloys



Series 2213 538RN | 5FL | Reduced Neck | Square and Radius | PYSTL

Diameter(D ₁)	LOC(L ₁)	LBS(L ₂)	OAL(L)	Shank(D)	Radius(R)	EDP
3/4	1	4-1/8	6	3/4	-	312374
3/4	1	4-1/8	6	3/4	0.030	312378
3/4	1	4-1/8	6	3/4	0.060	312381
3/4	1	4-1/8	6	3/4	0.090	312385
3/4	1	4-1/8	6	3/4	0.120	312388
3/4	1	4-1/8	6	3/4	0.190	312391
3/4	1	4-1/8	6	3/4	0.250	312394
1	1-1/4	2-1/4	4	1	-	312398
1	1-1/4	2-1/4	4	1	0.030	312401
1	1-1/4	2-1/4	4	1	0.060	312404
1	1-1/4	2-1/4	4	1	0.090	312408
1	1-1/4	2-1/4	4	1	0.120	312411
1	1-1/4	2-1/4	4	1	0.190	312415
1	1-1/4	2-1/4	4	1	0.250	312417
1	1-1/4	2-5/8	6	1	-	312419
1	1-1/4	2-5/8	6	1	0.030	312423
1	1-1/4	2-5/8	6	1	0.060	312425
1	1-1/4	2-5/8	6	1	0.090	312428
1	1-1/4	2-5/8	6	1	0.120	312432
1	1-1/4	2-5/8	6	1	0.190	312436
1	1-1/4	2-5/8	6	1	0.250	312438
1	1-1/4	3-3/8	6	1	-	312441
1	1-1/4	3-3/8	6	1	0.030	312444
1	1-1/4	3-3/8	6	1	0.060	312448
1	1-1/4	3-3/8	6	1	0.090	312451
1	1-1/4	3-3/8	6	1	0.120	312455
1	1-1/4	3-3/8	6	1	0.190	312458
1	1-1/4	3-3/8	6	1	0.250	312461
1	1-1/4	4-1/8	6	1	-	312463
1	1-1/4	4-1/8	6	1	0.030	312467
1	1-1/4	4-1/8	6	1	0.060	312470
1	1-1/4	4-1/8	6	1	0.090	312474
1	1-1/4	4-1/8	6	1	0.120	312477
1	1-1/4	4-1/8	6	1	0.190	312480
1	1-1/4	4-1/8	6	1	0.250	312484
1-1/4	1-1/2	2-1/4	5	1-1/4	-	312487
1-1/4	1-1/2	2-1/4	5	1-1/4	0.030	312490
1-1/4	1-1/2	2-1/4	5	1-1/4	0.060	312493
1-1/4	1-1/2	2-1/4	5	1-1/4	0.090	312495
1-1/4	1-1/2	2-1/4	5	1-1/4	0.120	312499
1-1/4	1-1/2	2-1/4	5	1-1/4	0.190	312501
1-1/4	1-1/2	2-1/4	5	1-1/4	0.250	312505
1-1/4	1-1/2	2-5/8	6	1-1/4	-	312507
1-1/4	1-1/2	2-5/8	6	1-1/4	0.030	312510
1-1/4	1-1/2	2-5/8	6	1-1/4	0.060	312514
1-1/4	1-1/2	2-5/8	6	1-1/4	0.090	312517
1-1/4	1-1/2	2-5/8	6	1-1/4	0.120	312521
1-1/4	1-1/2	2-5/8	6	1-1/4	0.190	312525
1-1/4	1-1/2	2-5/8	6	1-1/4	0.250	312528
1-1/4	1-1/2	3-3/8	6	1-1/4	-	312532
1-1/4	1-1/2	3-3/8	6	1-1/4	0.030	312536
1-1/4	1-1/2	3-3/8	6	1-1/4	0.060	312540
1-1/4	1-1/2	3-3/8	6	1-1/4	0.090	312544
1-1/4	1-1/2	3-3/8	6	1-1/4	0.120	312547
1-1/4	1-1/2	3-3/8	6	1-1/4	0.190	312549
1-1/4	1-1/2	3-3/8	6	1-1/4	0.250	312551
1-1/4	1-1/2	4-1/8	6	1-1/4	-	312553
1-1/4	1-1/2	4-1/8	6	1-1/4	0.030	312556
1-1/4	1-1/2	4-1/8	6	1-1/4	0.060	312558
1-1/4	1-1/2	4-1/8	6	1-1/4	0.090	312560
1-1/4	1-1/2	4-1/8	6	1-1/4	0.120	312564
1-1/4	1-1/2	4-1/8	6	1-1/4	0.190	312568
1-1/4	1-1/2	4-1/8	6	1-1/4	0.250	312571

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

ADVANCED PERFORMANCE

Solid Carbide End Mills For Stainless, Titanium, Steel And Other Ferrous Alloys



INTRO

MILLING

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HOLEMAKING

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INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES								
<h2>PYSTL</h2> <h3>Equal Index End Mill</h3> <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance Ideal tool for Titanium, stainless and other gummy materials Well suited for slotting and profiling milling operations Specialized edge honing SafeLock® shank available upon request 		<table border="1"> <tr> <td>CARBIDE</td> <td>38°</td> </tr> <tr> <td>7FL</td> <td>RAD</td> </tr> <tr> <td>SQ</td> <td>h6</td> </tr> <tr> <td>P187</td> <td>FX3</td> </tr> </table>	CARBIDE	38°	7FL	RAD	SQ	h6	P187	FX3
CARBIDE	38°									
7FL	RAD									
SQ	h6									
P187	FX3									

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	○	○	●	○	○				●		

● Best ○ Good

Series 2215 | 738 | 7FL | Square and Radius | PYSTL

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	EDP
3/8	1/2	2	3/8	-	312575
3/8	1/2	2	3/8	0.030	312577
3/8	1/2	2	3/8	0.060	312581
3/8	1	2-1/2	3/8	-	312585
3/8	1	2-1/2	3/8	0.030	312589
3/8	1	2-1/2	3/8	0.060	312591
3/8	1-1/4	3	3/8	-	312595
3/8	1-1/4	3	3/8	0.030	312597
3/8	1-1/4	3	3/8	0.060	312599
3/8	1-1/2	4	3/8	-	312603
3/8	1-1/2	4	3/8	0.030	312606
3/8	1-1/2	4	3/8	0.060	312608
3/8	2-1/2	6	3/8	-	312610
3/8	2-1/2	6	3/8	0.030	312612
3/8	2-1/2	6	3/8	0.060	312614
1/2	3/4	2-1/2	1/2	-	312616
1/2	3/4	2-1/2	1/2	0.030	312620
1/2	3/4	2-1/2	1/2	0.060	312624
1/2	3/4	2-1/2	1/2	0.090	312628
1/2	1-1/4	3	1/2	-	312632
1/2	1-1/4	3	1/2	0.030	312636
1/2	1-1/4	3	1/2	0.060	312638
1/2	1-1/4	3	1/2	0.090	312642
1/2	2	4	1/2	-	312645
1/2	2	4	1/2	0.030	312649
1/2	2	4	1/2	0.060	312652
1/2	2	4	1/2	0.090	312654
1/2	3-1/4	6	1/2	-	312657
1/2	3-1/4	6	1/2	0.030	312659
1/2	3-1/4	6	1/2	0.060	312662
1/2	3-1/4	6	1/2	0.090	312664
5/8	3/4	3	5/8	-	312666
5/8	3/4	3	5/8	0.030	312669
5/8	3/4	3	5/8	0.060	312672
5/8	3/4	3	5/8	0.090	312674
5/8	3/4	3	5/8	0.120	312676
5/8	1-5/8	3-1/2	5/8	-	312679
5/8	1-5/8	3-1/2	5/8	0.030	312681
5/8	1-5/8	3-1/2	5/8	0.060	312684
5/8	1-5/8	3-1/2	5/8	0.090	312688
5/8	1-5/8	3-1/2	5/8	0.120	312692
5/8	2	5	5/8	-	312695
5/8	2	5	5/8	0.030	312697
5/8	2	5	5/8	0.060	312699
5/8	2	5	5/8	0.090	312701

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Solid Carbide End Mills For Stainless, Titanium, Steel And Other Ferrous Alloys



Series 2215 738 | 7FL | Square and Radius | PYSTL

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	EDP
5/8	2	5	5/8	0.120	312705
5/8	3-1/4	6	5/8	-	312708
5/8	3-1/4	6	5/8	0.030	312710
5/8	3-1/4	6	5/8	0.060	312714
5/8	3-1/4	6	5/8	0.090	312718
5/8	3-1/4	6	5/8	0.120	312720
3/4	1	3	3/4	-	312724
3/4	1	3	3/4	0.030	312726
3/4	1	3	3/4	0.060	312728
3/4	1	3	3/4	0.090	312730
3/4	1	3	3/4	0.120	312732
3/4	1-5/8	4	3/4	-	312736
3/4	1-5/8	4	3/4	0.030	312739
3/4	1-5/8	4	3/4	0.060	312742
3/4	1-5/8	4	3/4	0.090	312744
3/4	1-5/8	4	3/4	0.120	312746
3/4	2-1/4	5	3/4	-	312749
3/4	2-1/4	5	3/4	0.030	312753
3/4	2-1/4	5	3/4	0.060	312757
3/4	2-1/4	5	3/4	0.090	312759
3/4	2-1/4	5	3/4	0.120	312761
3/4	3-1/4	6	3/4	-	312764
3/4	3-1/4	6	3/4	0.030	312766
3/4	3-1/4	6	3/4	0.060	312770
3/4	3-1/4	6	3/4	0.090	312773
3/4	3-1/4	6	3/4	0.120	312777
1	1-1/4	4	1	-	312781
1	1-1/4	4	1	0.030	312783
1	1-1/4	4	1	0.060	312787
1	1-1/4	4	1	0.090	312791
1	1-1/4	4	1	0.120	312793
1	2	5	1	-	312795
1	2	5	1	0.030	312798
1	2	5	1	0.060	312800
1	2	5	1	0.090	312802
1	2	5	1	0.120	312804
1	3-1/4	6	1	-	312807
1	3-1/4	6	1	0.030	312809
1	3-1/4	6	1	0.060	312811
1	3-1/4	6	1	0.090	312815
1	3-1/4	6	1	0.120	312818
1	4-1/8	7	1	-	312821
1	4-1/8	7	1	0.030	312824
1	4-1/8	7	1	0.060	312828
1	4-1/8	7	1	0.090	312830
1	4-1/8	7	1	0.120	312834
1-1/4	2	4-1/2	1-1/4	-	312836
1-1/4	2	4-1/2	1-1/4	0.030	312839
1-1/4	2	4-1/2	1-1/4	0.060	312842
1-1/4	2	4-1/2	1-1/4	0.090	312846
1-1/4	2	4-1/2	1-1/4	0.120	312848
1-1/4	2-5/8	6	1-1/4	-	312851
1-1/4	2-5/8	6	1-1/4	0.030	312855
1-1/4	2-5/8	6	1-1/4	0.060	312858
1-1/4	2-5/8	6	1-1/4	0.090	312861
1-1/4	2-5/8	6	1-1/4	0.120	312863
1-1/4	3-1/4	6	1-1/4	-	312867
1-1/4	3-1/4	6	1-1/4	0.030	312869
1-1/4	3-1/4	6	1-1/4	0.060	312871
1-1/4	3-1/4	6	1-1/4	0.090	312874
1-1/4	3-1/4	6	1-1/4	0.120	312877
1-1/4	4-1/8	7-1/2	1-1/4	-	312880
1-1/4	4-1/8	7-1/2	1-1/4	0.030	312884
1-1/4	4-1/8	7-1/2	1-1/4	0.060	312887
1-1/4	4-1/8	7-1/2	1-1/4	0.090	312889
1-1/4	4-1/8	7-1/2	1-1/4	0.120	312893

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

ADVANCED PERFORMANCE

Variable Helix End Mill For Carbon And Alloy Steels



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>ALPHA⁴</p> <p>Variable Helix, Unequal Index End Mills</p> <ul style="list-style-type: none"> Sub-micron grade carbide substrate for wear resistance Raised land construction for rigidity Eccentric relief reduces cutting friction Variable helix, unequal index design for vibration mitigation 		<p>CARBIDE VAR</p> <p>4FL RAD</p> <p>h6 P188</p> <p>FX2</p>

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	●	○	○	●	●					○	

● Best ○ Good

Series 2004 Alpha4 | 4FL | Multi Length | Radius

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	EDP
1/8	1/4	1-1/2	1/8	0.015	294-001011
1/8	1/4	1-1/2	1/8	0.020	294-001012
1/8	1/4	1-1/2	1/8	0.030	294-001013
1/8	1/2	1-1/2	1/8	0.015	294-002011
1/8	1/2	1-1/2	1/8	0.020	294-002012
1/8	1/2	1-1/2	1/8	0.030	294-002013
3/16	3/8	2	3/16	0.015	294-001021
3/16	3/8	2	3/16	0.020	294-001022
3/16	3/8	2	3/16	0.030	294-001023
3/16	5/8	2	3/16	0.015	294-002021
3/16	5/8	2	3/16	0.020	294-002022
3/16	5/8	2	3/16	0.030	294-002023
1/4	1/2	2	1/4	0.015	294-001029
1/4	1/2	2	1/4	0.020	294-001031
1/4	1/2	2	1/4	0.030	294-001032
1/4	1/2	2	1/4	0.060	294-001033
1/4	3/4	2-1/2	1/4	0.015	294-002029
1/4	3/4	2-1/2	1/4	0.020	294-002031
1/4	3/4	2-1/2	1/4	0.030	294-002032
1/4	3/4	2-1/2	1/4	0.060	294-002033
1/4	1-1/8	4	1/4	0.020	294-003031
5/16	5/8	2	5/16	0.015	294-001039
5/16	5/8	2	5/16	0.030	294-001041
5/16	5/8	2	5/16	0.060	294-001042
5/16	3/4	2-1/2	5/16	0.015	294-002039
5/16	3/4	2-1/2	5/16	0.030	294-002041
5/16	3/4	2-1/2	5/16	0.060	294-002042
3/8	5/8	2	3/8	0.015	294-001049
3/8	5/8	2	3/8	0.030	294-001051
3/8	5/8	2	3/8	0.060	294-001052
3/8	1	2-1/2	3/8	0.015	294-002049
3/8	1	2-1/2	3/8	0.030	294-002051
3/8	1	2-1/2	3/8	0.060	294-002052
3/8	1-1/2	4	3/8	0.030	294-003051
7/16	1	2-3/4	7/16	0.030	294-002056
1/2	5/8	2-1/2	1/2	0.015	294-001059
1/2	5/8	2-1/2	1/2	0.030	294-001061
1/2	5/8	2-1/2	1/2	0.060	294-001062
1/2	5/8	2-1/2	1/2	0.090	294-001063
1/2	5/8	2-1/2	1/2	0.120	294-001064
1/2	1-1/4	3	1/2	0.015	294-002059
1/2	1-1/4	3	1/2	0.030	294-002061
1/2	1-1/4	3	1/2	0.045	294-002062
1/2	1-1/4	3	1/2	0.060	294-002063
1/2	1-1/4	3	1/2	0.090	294-002064

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Variable Helix End Mill For Carbon And Alloy Steels



Series 2004 | Alpha4 | 4FL | Multi Length | Radius

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	EDP
1/2	1-1/4	3	1/2	0.120	294-002065
1/2	2	4	1/2	0.030	294-003061
5/8	3/4	3	5/8	0.030	294-001069
5/8	3/4	3	5/8	0.045	294-001071
5/8	3/4	3	5/8	0.060	294-001072
5/8	3/4	3	5/8	0.090	294-001073
5/8	3/4	3	5/8	0.120	294-001074
5/8	1-1/4	3-1/2	5/8	0.030	294-002069
5/8	1-1/4	3-1/2	5/8	0.045	294-002071
5/8	1-1/4	3-1/2	5/8	0.060	294-002072
5/8	1-1/4	3-1/2	5/8	0.090	294-002073
5/8	1-1/4	3-1/2	5/8	0.120	294-002074
5/8	2-1/4	5	5/8	0.045	294-003071
3/4	1	3	3/4	0.030	294-001079
3/4	1	3	3/4	0.045	294-001081
3/4	1	3	3/4	0.060	294-001082
3/4	1	3	3/4	0.090	294-001083
3/4	1	3	3/4	0.120	294-001084
3/4	1-1/2	4	3/4	0.030	294-002079
3/4	1-1/2	4	3/4	0.045	294-002081
3/4	1-1/2	4	3/4	0.060	294-002082
3/4	1-1/2	4	3/4	0.090	294-002083
3/4	1-1/2	4	3/4	0.120	294-002084
3/4	2-1/4	5	3/4	0.045	294-003081
3/4	3-1/4	6	3/4	0.050	294-003083
1	1-1/2	4	1	0.030	294-002089
1	1-1/2	4	1	0.060	294-002091
1	1-1/2	4	1	0.090	294-002092
1	1-1/2	4	1	0.120	294-002093
1	2-1/4	5	1	0.060	294-003091
1	3	6	1	0.060	294-003093
1	4	7	1	0.060	294-003095

*bold numbers are EDPs for ordering

Popular Custom Milling Options

- Proprietary GWS tool coatings
- Longer lengths
- Enhanced geometry
- Special shank modifications like **SAFE-LOCK**

CUSTOM COMES STANDARD

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

ADVANCED PERFORMANCE

Variable Helix End Mill For Carbon And Alloy Steels



FEATURES/DESCRIPTION		APPLICATION	FEATURES																																							
<h2>ALPHA⁴</h2> <h3>Variable Helix, Unequal Index End Mills</h3> <ul style="list-style-type: none"> Sub-micron grade carbide substrate for wear resistance Raised land construction for rigidity Eccentric relief reduces cutting friction Variable helix, unequal index design for vibration mitigation Reduced neck 			<table border="1"> <tr> <td>CARBIDE</td> <td>VAR</td> </tr> <tr> <td>4FL</td> <td>RAD</td> </tr> <tr> <td>Necked</td> <td>h6</td> </tr> <tr> <td>P188</td> <td>FX2</td> </tr> </table>	CARBIDE	VAR	4FL	RAD	Necked	h6	P188	FX2																															
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STEEL			STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL																															
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																														
●	●	●	○	○	●	●																																				

● Best ○ Good

Series 2004R | Alpha4 | 4FL | Multi Length | Radius | Reduced Neck

Diameter(D ₁)	LOC(L ₁)	LBS(L ₂)	OAL(L)	Shank(D)	Radius(R)	EDP
1/8	1/4	1-3/8	3	1/8	0.010	294-004001
1/8	1/4	1-3/8	3	1/8	0.015	294-004002
1/8	1/4	1-3/8	3	1/8	0.030	294-004003
3/16	5/16	1-3/8	3	3/16	0.015	294-004011
3/16	5/16	1-3/8	3	3/16	0.030	294-004012
1/4	3/8	2-1/8	4	1/4	0.015	294-004021
1/4	3/8	2-1/8	4	1/4	0.030	294-004022
1/4	3/8	2-1/8	4	1/4	0.060	294-004023
3/8	1/2	1-1/2	3	3/8	0.015	294-004033
3/8	1/2	1-1/2	3	3/8	0.030	294-004034
3/8	1/2	1-1/2	3	3/8	0.060	294-004035
3/8	1/2	1-1/2	3	3/8	0.090	294-004036
3/8	1/2	1-1/2	3	3/8	0.120	294-004037
3/8	1/2	2-1/8	4	3/8	0.015	294-004038
3/8	1/2	2-1/8	4	3/8	0.030	294-004039
3/8	1/2	2-1/8	4	3/8	0.060	294-004040
3/8	1/2	2-1/8	4	3/8	0.090	294-004041
3/8	1/2	2-1/8	4	3/8	0.120	294-004042
1/2	5/8	2-3/8	4	1/2	0.030	294-004051
1/2	5/8	2-3/8	4	1/2	0.060	294-004052
1/2	5/8	2-3/8	4	1/2	0.090	294-004053
1/2	5/8	2-3/8	4	1/2	0.120	294-004054
1/2	5/8	3-3/8	6	1/2	0.030	294-004055
1/2	5/8	3-3/8	6	1/2	0.060	294-004056
1/2	5/8	3-3/8	6	1/2	0.090	294-004057
1/2	5/8	3-3/8	6	1/2	0.120	294-004058
5/8	3/4	2-3/8	5	5/8	0.030	294-004071
5/8	3/4	2-3/8	5	5/8	0.060	294-004072
5/8	3/4	2-3/8	5	5/8	0.090	294-004073
5/8	3/4	2-3/8	5	5/8	0.120	294-004074
5/8	3/4	2-3/8	6	5/8	0.030	294-004075
5/8	3/4	2-3/8	6	5/8	0.060	294-004076
5/8	3/4	2-3/8	6	5/8	0.090	294-004077
5/8	3/4	2-3/8	6	5/8	0.120	294-004078
3/4	1	3-1/2	6	3/4	0.030	294-004091
3/4	1	3-1/2	6	3/4	0.060	294-004092
3/4	1	3-1/2	6	3/4	0.090	294-004093
3/4	1	3-1/2	6	3/4	0.120	294-004094
3/4	1	4-1/2	7	3/4	0.030	294-004095
3/4	1	4-1/2	7	3/4	0.060	294-004096
3/4	1	4-1/2	7	3/4	0.090	294-004097
3/4	1	4-1/2	7	3/4	0.120	294-004098
1	1-1/4	3-1/2	6	1	0.030	294-004111
1	1-1/4	3-1/2	6	1	0.060	294-004112
1	1-1/4	3-1/2	6	1	0.090	294-004113

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Variable Helix End Mill For Carbon And Alloy Steels



Series 2004R

Alpha4 | 4FL | Multi Length | Radius | Reduced Neck

Diameter(D ₁)	LOC(L ₁)	LBS(L ₂)	OAL(L)	Shank(D)	Radius(R)	EDP
1	1-1/4	3-1/2	6	1	0.120	294-004114
1	1-1/4	4-1/2	7	1	0.030	294-004115
1	1-1/4	4-1/2	7	1	0.060	294-004116
1	1-1/4	4-1/2	7	1	0.090	294-004117
1	1-1/4	4-1/2	7	1	0.120	294-004118

*bold numbers are EDPs for ordering

Popular Custom Milling Options

- Proprietary GWS tool coatings
- Longer lengths
- Enhanced geometry
- Special shank modifications like **SAFE-LOCK**

CUSTOM COMES STANDARD

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Unequal Index End Mill</p> <ul style="list-style-type: none"> Sub-micron grade carbide substrate for wear resistance Raised land construction for rigidity Eccentric relief reduces cutting friction Unequal index design for vibration mitigation NEW square end sizes now available online 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	●	○	○	●	●					○	

● Best ○ Good

Series 2005 | Alpha5 | 5FL | Multi Length | Radius

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	EDP
1/8	1/4	2-1/2	1/8	0.010	295-010125B
1/8	1/4	2-1/2	1/8	0.020	295-010126B
1/8	1/4	2-1/2	1/8	0.030	295-010127B
1/8	1/2	2-1/2	1/8	0.010	295-020125B
1/8	1/2	2-1/2	1/8	0.020	295-020126B
1/8	1/2	2-1/2	1/8	0.030	295-020127B
3/16	3/8	2-1/2	3/16	0.010	295-010187B
3/16	3/8	2-1/2	3/16	0.020	295-010188B
3/16	3/8	2-1/2	3/16	0.030	295-010189B
3/16	5/8	2-1/2	3/16	0.010	295-020187B
3/16	5/8	2-1/2	3/16	0.020	295-020188B
3/16	5/8	2-1/2	3/16	0.030	295-020189B
1/4	3/8	2-1/2	1/4	0.015	295-010249B
1/4	3/8	2-1/2	1/4	0.020	295-010250B
1/4	3/8	2-1/2	1/4	0.030	295-010251B
1/4	3/8	2-1/2	1/4	0.060	295-010252B
1/4	3/4	2-1/2	1/4	0.015	295-020249B
1/4	3/4	2-1/2	1/4	0.020	295-020250B
1/4	3/4	2-1/2	1/4	0.030	295-020251B
1/4	3/4	2-1/2	1/4	0.060	295-020252B
1/4	1-1/4	4	1/4	0.015	295-030249B
1/4	1-1/4	4	1/4	0.020	295-030250B
1/4	1-1/4	4	1/4	0.030	295-030251B
1/4	1-1/4	4	1/4	0.060	295-030252B
5/16	1/2	2-1/2	5/16	0.020	295-010312B
5/16	13/16	2-1/2	5/16	0.020	295-020312B
5/16	1-1/4	4	5/16	0.020	295-030312B
3/8	1/2	2-1/2	3/8	0.015	295-010374B
3/8	1/2	2-1/2	3/8	0.020	295-010375B
3/8	1/2	2-1/2	3/8	0.030	295-010376B
3/8	1/2	2-1/2	3/8	0.060	295-010377B
3/8	1	2-1/2	3/8	0.015	295-020374B
3/8	1	2-1/2	3/8	0.020	295-020375B
3/8	1	2-1/2	3/8	0.030	295-020376B
3/8	1	2-1/2	3/8	0.060	295-020377B
3/8	1-1/2	4	3/8	0.015	295-030374B
3/8	1-1/2	4	3/8	0.020	295-030375B
3/8	1-1/2	4	3/8	0.030	295-030376B
3/8	1-1/2	4	3/8	0.060	295-030377B
1/2	5/8	3	1/2	0.020	295-010500B
1/2	5/8	3	1/2	0.030	295-010501B
1/2	5/8	3	1/2	0.060	295-010502B
1/2	5/8	3	1/2	0.090	295-010503B
1/2	5/8	3	1/2	0.120	295-010504B

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Variable Helix End Mill For Carbon And Alloy Steels



Series 2005 | Alpha5 | 5FL | Multi Length | Radius

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	EDP
1/2	1-1/4	3	1/2	0.020	295-020500B
1/2	1-1/4	3	1/2	0.030	295-020501B
1/2	1-1/4	3	1/2	0.060	295-020502B
1/2	1-1/4	3	1/2	0.090	295-020503B
1/2	1-1/4	3	1/2	0.120	295-020504B
1/2	1-5/8	4	1/2	0.020	295-030490B
1/2	1-5/8	4	1/2	0.030	295-030491B
1/2	1-5/8	4	1/2	0.060	295-030492B
1/2	1-5/8	4	1/2	0.090	295-030493B
1/2	1-5/8	4	1/2	0.120	295-030494B
1/2	2	4	1/2	0.020	295-030500B
1/2	2	4	1/2	0.030	295-030501B
1/2	2	4	1/2	0.060	295-030502B
1/2	2	4	1/2	0.090	295-030503B
1/2	2	4	1/2	0.120	295-030504B
5/8	3/4	3-1/2	5/8	0.020	295-010625B
5/8	3/4	3-1/2	5/8	0.030	295-010626B
5/8	3/4	3-1/2	5/8	0.060	295-010627B
5/8	3/4	3-1/2	5/8	0.090	295-010628B
5/8	3/4	3-1/2	5/8	0.120	295-010629B
5/8	1-1/4	3-1/2	5/8	0.020	295-020625B
5/8	1-1/4	3-1/2	5/8	0.030	295-020626B
5/8	1-1/4	3-1/2	5/8	0.060	295-020627B
5/8	1-1/4	3-1/2	5/8	0.090	295-020628B
5/8	1-1/4	3-1/2	5/8	0.120	295-020629B
5/8	2-1/2	5	5/8	0.020	295-030625B
5/8	2-1/2	5	5/8	0.030	295-030626B
5/8	2-1/2	5	5/8	0.060	295-030627B
5/8	2-1/2	5	5/8	0.090	295-030628B
5/8	2-1/2	5	5/8	0.120	295-030629B
3/4	1	4	3/4	0.020	295-010750B
3/4	1	4	3/4	0.030	295-010751B
3/4	1	4	3/4	0.060	295-010752B
3/4	1	4	3/4	0.090	295-010753B
3/4	1	4	3/4	0.120	295-010754B
3/4	1	4	3/4	0.156	295-010755B
3/4	1	4	3/4	0.190	295-010756B
3/4	1-5/8	4	3/4	0.020	295-020750B
3/4	1-5/8	4	3/4	0.030	295-020751B
3/4	1-5/8	4	3/4	0.060	295-020752B
3/4	1-5/8	4	3/4	0.090	295-020753B
3/4	1-5/8	4	3/4	0.120	295-020754B
3/4	1-5/8	4	3/4	0.156	295-020755B
3/4	1-5/8	4	3/4	0.190	295-020756B
3/4	2-1/2	5	3/4	0.020	295-030750B
3/4	2-1/2	5	3/4	0.030	295-030751B
3/4	2-1/2	5	3/4	0.060	295-030752B
3/4	2-1/2	5	3/4	0.090	295-030753B
3/4	2-1/2	5	3/4	0.120	295-030754B
3/4	2-1/2	5	3/4	0.156	295-030755B
3/4	2-1/2	5	3/4	0.190	295-030756B
1	1-3/4	4	1	0.020	295-021000B
1	1-3/4	4	1	0.030	295-021001B
1	1-3/4	4	1	0.060	295-021002B
1	1-3/4	4	1	0.090	295-021003B
1	1-3/4	4	1	0.120	295-021004B
1	1-3/4	4	1	0.156	295-021005B
1	1-3/4	4	1	0.190	295-021006B
1	1-3/4	4	1	0.250	295-021007B
1	2-5/8	6	1	0.020	295-031000B
1	2-5/8	6	1	0.030	295-031001B
1	2-5/8	6	1	0.060	295-031002B
1	2-5/8	6	1	0.090	295-031003B
1	2-5/8	6	1	0.120	295-031004B
1	2-5/8	6	1	0.156	295-031005B
1	2-5/8	6	1	0.190	295-031006B
1	2-5/8	6	1	0.250	295-031007B

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

ADVANCED PERFORMANCE

Variable Helix End Mill For Carbon And Alloy Steels



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES								
<p>ALPHA⁵</p> <p>Unequal Index End Mill</p> <ul style="list-style-type: none"> Sub-micron grade carbide substrate for wear resistance Raised land construction for rigidity Eccentric relief reduces cutting friction Unequal index design for vibration mitigation Reduced neck 		<table border="1"> <tr> <td>CARBIDE</td> <td>40°</td> </tr> <tr> <td>5FL</td> <td>RAD</td> </tr> <tr> <td>h6</td> <td>P189</td> </tr> <tr> <td>Necked</td> <td>FX2</td> </tr> </table>	CARBIDE	40°	5FL	RAD	h6	P189	Necked	FX2
CARBIDE	40°									
5FL	RAD									
h6	P189									
Necked	FX2									

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	●	○	○	●	●					○	

● Best ○ Good

Series 2005R | Alpha 5 | 5FL | Multi Length | Radius | Reduced Neck

Diameter(D ₁)	LOC(L ₁)	LBS(L ₂)	OAL(L)	Shank(D)	Radius(R)	EDP
1/8	1/4	1-3/8	3	1/8	0.010	295-054001
1/8	1/4	1-3/8	3	1/8	0.015	295-054002
1/8	1/4	1-3/8	3	1/8	0.030	295-054003
3/16	5/16	1-3/8	3	3/16	0.015	295-054011
3/16	5/16	1-3/8	3	3/16	0.030	295-054012
1/4	3/8	2-1/8	4	1/4	0.015	295-054021
1/4	3/8	2-1/8	4	1/4	0.030	295-054022
1/4	3/8	2-1/8	4	1/4	0.060	295-054023
3/8	1/2	1-1/2	3	3/8	0.015	295-054033
3/8	1/2	1-1/2	3	3/8	0.030	295-054034
3/8	1/2	1-1/2	3	3/8	0.060	295-054035
3/8	1/2	1-1/2	3	3/8	0.090	295-054036
3/8	1/2	1-1/2	3	3/8	0.120	295-054037
3/8	1/2	2-1/8	4	3/8	0.015	295-054038
3/8	1/2	2-1/8	4	3/8	0.030	295-054039
3/8	1/2	2-1/8	4	3/8	0.060	295-054040
3/8	1/2	2-1/8	4	3/8	0.090	295-054041
3/8	1/2	2-1/8	4	3/8	0.120	295-054042
1/2	5/8	2-3/8	4	1/2	0.030	295-054051
1/2	5/8	2-3/8	4	1/2	0.060	295-054052
1/2	5/8	2-3/8	4	1/2	0.090	295-054053
1/2	5/8	2-3/8	4	1/2	0.120	295-054054
1/2	5/8	3-3/8	6	1/2	0.030	295-054055
1/2	5/8	3-3/8	6	1/2	0.060	295-054056
1/2	5/8	3-3/8	6	1/2	0.090	295-054057
1/2	5/8	3-3/8	6	1/2	0.120	295-054058
5/8	3/4	2-3/8	5	5/8	0.030	295-054071
5/8	3/4	2-3/8	5	5/8	0.060	295-054072
5/8	3/4	2-3/8	5	5/8	0.090	295-054073
5/8	3/4	2-3/8	5	5/8	0.120	295-054074
5/8	3/4	3-3/8	6	5/8	0.030	295-054075
5/8	3/4	3-3/8	6	5/8	0.060	295-054076
5/8	3/4	3-3/8	6	5/8	0.090	295-054077
5/8	3/4	3-3/8	6	5/8	0.120	295-054078
3/4	1	3-1/2	6	3/4	0.030	295-054091
3/4	1	3-1/2	6	3/4	0.060	295-054092
3/4	1	3-1/2	6	3/4	0.090	295-054093
3/4	1	3-1/2	6	3/4	0.120	295-054094
3/4	1	4-1/2	7	3/4	0.030	295-054095
3/4	1	4-1/2	7	3/4	0.060	295-054096
3/4	1	4-1/2	7	3/4	0.090	295-054097
3/4	1	4-1/2	7	3/4	0.120	295-054098
3/4	1	4-1/2	7	3/4	0.156	295-054099
3/4	1	4-1/2	7	3/4	0.190	295-054100
1	1-1/4	3-1/2	6	1	0.030	295-054111

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Variable Helix End Mill For Carbon And Alloy Steels



Series 2005R | Alpha5 | 5FL | Multi Length | Radius | Reduced Neck

Diameter(D ₁)	LOC(L ₁)	LBS(L ₂)	OAL(L)	Shank(D)	Radius(R)	EDP
1	1-1/4	3-1/2	6	1	0.060	295-054112
1	1-1/4	3-1/2	6	1	0.090	295-054113
1	1-1/4	3-1/2	6	1	0.120	295-054114
1	1-1/4	4-1/2	7	1	0.030	295-054115
1	1-1/4	4-1/2	7	1	0.060	295-054116
1	1-1/4	4-1/2	7	1	0.090	295-054117
1	1-1/4	4-1/2	7	1	0.120	295-054118
1	1-1/4	4-1/2	7	1	0.156	295-054119
1	1-1/4	4-1/2	7	1	0.190	295-054120
1	1-1/4	4-1/2	7	1	0.250	295-054121

*bold numbers are EDPs for ordering

Popular Custom Milling Options

- Proprietary GWS tool coatings
- Longer lengths
- Enhanced geometry
- Special shank modifications like **SAFE-LOCK**

CUSTOM COMES STANDARD

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES								
<p>ALPHA⁶</p> <p>Equal Index End Mill</p> <ul style="list-style-type: none"> Sub-micron grade carbide substrate for wear resistance Raised land construction for rigidity Eccentric relief reduces cutting friction Equal index Progressive 40° helix for maximum MRR NEW square end sizes now available online 		<table border="1"> <tr> <td>CARBIDE</td> <td>40°</td> </tr> <tr> <td>6FL</td> <td>RAD</td> </tr> <tr> <td>h6</td> <td>P190</td> </tr> <tr> <td>FX2</td> <td></td> </tr> </table>	CARBIDE	40°	6FL	RAD	h6	P190	FX2	
CARBIDE	40°									
6FL	RAD									
h6	P190									
FX2										

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	●	○	○	●	●					○	

● Best ○ Good

Series 2006 **Alpha6 | 6FL | Multi Length | Radius**

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	EDP
1/4	1/2	2	1/4	0.020	292-201133
1/4	3/4	2-1/2	1/4	0.020	292-301133
1/4	1-1/8	3	1/4	0.020	292-401133
1/4	1-1/2	4	1/4	0.020	292-501133
1/4	1-1/2	6	1/4	0.020	292-601133
5/16	13/16	2-1/2	5/16	0.020	292-301153
5/16	1-1/8	3	5/16	0.020	292-401153
5/16	1-1/2	6	5/16	0.020	292-601153
5/16	1-5/8	4	5/16	0.020	292-501153
3/8	5/8	2	3/8	0.020	292-201173
3/8	1	2-1/2	3/8	0.020	292-301173
3/8	1-3/8	3	3/8	0.020	292-401173
3/8	1-1/2	6	3/8	0.020	292-601173
3/8	1-3/4	4	3/8	0.020	292-501173
3/8	3	6	3/8	0.020	292-601193
1/2	5/8	2-1/2	1/2	0.020	292-201203
1/2	1	3	1/2	0.020	292-301203
1/2	1-1/2	6	1/2	0.020	292-601203
1/2	1-5/8	4	1/2	0.020	292-401193
1/2	2	4	1/2	0.020	292-401203
1/2	3	6	1/2	0.020	292-501203
5/8	1	3	5/8	0.020	292-201223
5/8	1-1/4	3-1/2	5/8	0.020	292-301223
5/8	1-1/2	6	5/8	0.020	292-601223
5/8	2-1/2	5	5/8	0.020	292-401223
5/8	3-1/4	6	5/8	0.020	292-501223
3/4	1	3	3/4	0.020	292-201243
3/4	1-1/2	4	3/4	0.020	292-301243
3/4	1-1/2	6	3/4	0.020	292-601233
3/4	2-5/8	5	3/4	0.020	292-401243
3/4	3-1/4	6	3/4	0.020	292-501243
3/4	4	7	3/4	0.020	292-601243
1	1-1/2	6	1	0.020	292-601253
1	1-3/4	4	1	0.020	292-301263
1	2-5/8	5	1	0.020	292-401263
1	3-1/4	6	1	0.020	292-501270
1	4	7	1	0.020	292-601263
1	4-1/2	7	1	0.020	292-601293

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Variable Helix End Mill For Carbon And Alloy Steels



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>FUSION</p> <p>Variable Helix HP-Hybrid End Mills</p> <ul style="list-style-type: none"> Sub-micron grade carbide substrate for wear resistance Variable helix, unequal index design for vibration mitigation Dual edge-prep technology Excellent cost-to-performance value Diameter Tol.: +0/-0.002" Shank Tol.: +0/-0.0004" 		<p>CARBIDE</p> <p>VAR</p> <p>4FL</p> <p>RAD</p> <p>SQ</p> <p>P191</p> <p>Bright</p> <p>FX3</p>

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	●	○	○	●	●			○	●		

● Best ○ Good

Series 1130 Fusion | 4FL | Multi Length | Square and Radius

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	Bright	FX2
1/8	1/4	1-1/2	1/8	-	284-000058	284-000059
1/8	1/4	1-1/2	1/8	0.010	284-000375	284-000376
1/8	1/4	1-1/2	1/8	0.015	284-000377	284-000378
1/8	1/4	1-1/2	1/8	0.020	284-000379	284-000380
1/8	1/4	1-1/2	1/8	0.030	284-000381	284-000382
1/8	1/2	1-1/2	1/8	-	284-000060	284-000061
1/8	1/2	1-1/2	1/8	0.010	284-000383	284-000384
1/8	1/2	1-1/2	1/8	0.015	284-000385	284-000386
1/8	1/2	1-1/2	1/8	0.020	284-000387	284-000388
1/8	1/2	1-1/2	1/8	0.030	284-000389	284-000390
1/8	3/4	2-1/4	1/8	-	284-000062	284-000063
1/8	3/4	2-1/4	1/8	0.015	284-000391	284-000392
1/8	3/4	2-1/4	1/8	0.020	284-000393	284-000394
1/8	3/4	2-1/4	1/8	0.030	284-000395	284-000396
1/8	1	3	1/8	-	284-000064	284-000065
1/8	1	3	1/8	0.015	284-000397	284-000398
1/8	1	3	1/8	0.020	284-000399	284-000400
1/8	1	3	1/8	0.030	284-000401	284-000402
3/16	3/8	2	3/16	-	284-000088	284-000089
3/16	3/8	2	3/16	0.010	284-000403	284-000404
3/16	3/8	2	3/16	0.015	284-000405	284-000406
3/16	3/8	2	3/16	0.020	284-000407	284-000408
3/16	3/8	2	3/16	0.030	284-000409	284-000410
3/16	3/8	2	3/16	0.045	284-000411	284-000412
3/16	5/8	2	3/16	-	284-000090	284-000091
3/16	5/8	2	3/16	0.010	284-000413	284-000414
3/16	5/8	2	3/16	0.015	284-000415	284-000416
3/16	5/8	2	3/16	0.020	284-000417	284-000418
3/16	5/8	2	3/16	0.030	284-000419	284-000420
3/16	5/8	2	3/16	0.045	284-000421	284-000422
3/16	3/4	2-1/2	3/16	-	284-000092	284-000093
3/16	3/4	2-1/2	3/16	0.015	284-000423	284-000424
3/16	3/4	2-1/2	3/16	0.020	284-000425	284-000426
3/16	3/4	2-1/2	3/16	0.030	284-000427	284-000428
3/16	1	4	3/16	0.015	284-000435	284-000436
3/16	1	4	3/16	0.020	284-000437	284-000438
3/16	1	4	3/16	0.030	284-000439	284-000440
3/16	1-1/8	3	3/16	-	284-000094	284-000095
3/16	1-1/8	3	3/16	0.015	284-000429	284-000430
3/16	1-1/8	3	3/16	0.020	284-000431	284-000432
3/16	1-1/8	3	3/16	0.030	284-000433	284-000434
1/4	1/2	2-1/2	1/4	-	284-000118	284-000119
1/4	1/2	2-1/2	1/4	0.015	284-000441	284-000442
1/4	1/2	2-1/2	1/4	0.020	284-000443	284-000444
1/4	1/2	2-1/2	1/4	0.030	284-000445	284-000446

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Variable Helix End Mill For Carbon And Alloy Steels



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Series 1130		Fusion | 4FL | Multi Length | Square and Radius					
Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	Bright	FX2	
1/4	1/2	2-1/2	1/4	0.045	284-000447	284-000448	
1/4	1/2	2-1/2	1/4	0.060	284-000449	284-000450	
1/4	3/4	2-1/2	1/4	-	284-000120	284-000121	
1/4	3/4	2-1/2	1/4	0.015	284-000451	284-000452	
1/4	3/4	2-1/2	1/4	0.020	284-000453	284-000454	
1/4	3/4	2-1/2	1/4	0.030	284-000455	284-000456	
1/4	3/4	2-1/2	1/4	0.045	284-000457	284-000458	
1/4	3/4	2-1/2	1/4	0.060	284-000459	284-000460	
1/4	1	4	1/4	0.015	284-000471	284-000472	
1/4	1	4	1/4	0.020	284-000473	284-000474	
1/4	1	4	1/4	0.030	284-000475	284-000476	
1/4	1	4	1/4	0.045	284-000477	284-000478	
1/4	1	4	1/4	0.060	284-000479	284-000480	
1/4	1-1/8	3	1/4	-	284-000122	284-000123	
1/4	1-1/8	3	1/4	0.015	284-000461	284-000462	
1/4	1-1/8	3	1/4	0.020	284-000463	284-000464	
1/4	1-1/8	3	1/4	0.030	284-000465	284-000466	
1/4	1-1/8	3	1/4	0.045	284-000467	284-000468	
1/4	1-1/8	3	1/4	0.060	284-000469	284-000470	
1/4	1-1/2	4	1/4	-	284-000124	284-000125	
1/4	1-1/2	4	1/4	0.015	284-000481	284-000482	
1/4	1-1/2	4	1/4	0.020	284-000483	284-000484	
1/4	1-1/2	4	1/4	0.030	284-000485	284-000486	
1/4	1-1/2	4	1/4	0.045	284-000487	284-000488	
1/4	1-1/2	4	1/4	0.060	284-000489	284-000490	
1/4	1-1/2	6	1/4	0.015	284-000491	284-000492	
1/4	1-1/2	6	1/4	0.020	284-000493	284-000494	
1/4	1-1/2	6	1/4	0.030	284-000495	284-000496	
1/4	1-1/2	6	1/4	0.045	284-000497	284-000498	
1/4	1-1/2	6	1/4	0.060	284-000499	284-000500	
5/16	1/2	2-1/2	5/16	-	284-000148	284-000149	
5/16	1/2	2-1/2	5/16	0.015	284-000501	284-000502	
5/16	1/2	2-1/2	5/16	0.020	284-000503	284-000504	
5/16	1/2	2-1/2	5/16	0.030	284-000505	284-000506	
5/16	1/2	2-1/2	5/16	0.045	284-000507	284-000508	
5/16	1/2	2-1/2	5/16	0.060	284-000509	284-000510	
5/16	1/2	2-1/2	5/16	0.090	284-000511	284-000512	
5/16	13/16	2-1/2	5/16	-	284-000150	284-000151	
5/16	13/16	2-1/2	5/16	0.015	284-000513	284-000514	
5/16	13/16	2-1/2	5/16	0.020	284-000515	284-000516	
5/16	13/16	2-1/2	5/16	0.030	284-000517	284-000518	
5/16	13/16	2-1/2	5/16	0.045	284-000519	284-000520	
5/16	13/16	2-1/2	5/16	0.060	284-000521	284-000522	
5/16	13/16	2-1/2	5/16	0.090	284-000523	284-000524	
5/16	1-1/8	3	5/16	-	284-000152	284-000153	
5/16	1-1/8	3	5/16	0.015	284-000525	284-000526	
5/16	1-1/8	3	5/16	0.020	284-000527	284-000528	
5/16	1-1/8	3	5/16	0.030	284-000529	284-000530	
5/16	1-1/8	3	5/16	0.045	284-000531	284-000532	
5/16	1-1/8	3	5/16	0.060	284-000533	284-000534	
5/16	1-1/2	6	5/16	0.015	284-000545	284-000546	
5/16	1-1/2	6	5/16	0.020	284-000547	284-000548	
5/16	1-1/2	6	5/16	0.030	284-000549	284-000550	
5/16	1-1/2	6	5/16	0.045	284-000551	284-000552	
5/16	1-1/2	6	5/16	0.060	284-000553	284-000554	
5/16	1-5/8	4	5/16	-	284-000154	284-000155	
5/16	1-5/8	4	5/16	0.015	284-000535	284-000536	
5/16	1-5/8	4	5/16	0.020	284-000537	284-000538	
5/16	1-5/8	4	5/16	0.030	284-000539	284-000540	
5/16	1-5/8	4	5/16	0.045	284-000541	284-000542	
5/16	1-5/8	4	5/16	0.060	284-000543	284-000544	
3/8	5/8	2-1/2	3/8	-	284-000178	284-000179	
3/8	5/8	2-1/2	3/8	0.015	284-000555	284-000556	
3/8	5/8	2-1/2	3/8	0.020	284-000557	284-000558	
3/8	5/8	2-1/2	3/8	0.030	284-000559	284-000560	
3/8	5/8	2-1/2	3/8	0.045	284-000561	284-000562	
3/8	5/8	2-1/2	3/8	0.060	284-000563	284-000564	
3/8	5/8	2-1/2	3/8	0.090	284-000565	284-000566	
3/8	1	2-1/2	3/8	-	284-000180	284-000181	
3/8	1	2-1/2	3/8	0.015	284-000567	284-000568	
3/8	1	2-1/2	3/8	0.020	284-000569	284-000570	
3/8	1	2-1/2	3/8	0.030	284-000571	284-000572	
3/8	1	2-1/2	3/8	0.045	284-000573	284-000574	
3/8	1	2-1/2	3/8	0.060	284-000575	284-000576	
3/8	1	2-1/2	3/8	0.090	284-000577	284-000578	
3/8	1	4	3/8	0.015	284-000589	284-000590	

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Variable Helix End Mill For Carbon And Alloy Steels



Series 1130 Fusion | 4FL | Multi Length | Square and Radius

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	Bright	FX2
3/8	1	4	3/8	0.020	284-000591	284-000592
3/8	1	4	3/8	0.030	284-000593	284-000594
3/8	1	4	3/8	0.045	284-000595	284-000596
3/8	1	4	3/8	0.060	284-000597	284-000598
3/8	1-1/8	3	3/8	-	284-000182	284-000183
3/8	1-1/8	3	3/8	0.015	284-000579	284-000580
3/8	1-1/8	3	3/8	0.020	284-000581	284-000582
3/8	1-1/8	3	3/8	0.030	284-000583	284-000584
3/8	1-1/8	3	3/8	0.045	284-000585	284-000586
3/8	1-1/8	3	3/8	0.060	284-000587	284-000588
3/8	1-1/2	6	3/8	0.015	284-000609	284-000610
3/8	1-1/2	6	3/8	0.020	284-000611	284-000612
3/8	1-1/2	6	3/8	0.030	284-000613	284-000614
3/8	1-1/2	6	3/8	0.045	284-000615	284-000616
3/8	1-1/2	6	3/8	0.060	284-000617	284-000618
3/8	1-3/4	4	3/8	-	284-000184	284-000185
3/8	1-3/4	4	3/8	0.015	284-000599	284-000600
3/8	1-3/4	4	3/8	0.020	284-000601	284-000602
3/8	1-3/4	4	3/8	0.030	284-000603	284-000604
3/8	1-3/4	4	3/8	0.045	284-000605	284-000606
3/8	1-3/4	4	3/8	0.060	284-000607	284-000608
7/16	1	2-3/4	7/16	-	284-000210	284-000211
7/16	1	2-3/4	7/16	0.030	284-000619	284-000620
7/16	1	2-3/4	7/16	0.045	284-000621	284-000622
7/16	1	2-3/4	7/16	0.060	284-000623	284-000624
7/16	1	2-3/4	7/16	0.090	284-000625	284-000626
7/16	1	2-3/4	7/16	0.125	284-000627	284-000628
7/16	2	4	7/16	-	284-000212	284-000213
7/16	3	6	7/16	-	284-000214	284-000215
1/2	5/8	3	1/2	-	284-000238	284-000239
1/2	5/8	3	1/2	0.015	284-000629	284-000630
1/2	5/8	3	1/2	0.020	284-000631	284-000632
1/2	5/8	3	1/2	0.030	284-000633	284-000634
1/2	5/8	3	1/2	0.045	284-000635	284-000636
1/2	5/8	3	1/2	0.060	284-000637	284-000638
1/2	5/8	3	1/2	0.090	284-000639	284-000640
1/2	5/8	3	1/2	0.125	284-000641	284-000642
1/2	1	3	1/2	-	284-000240	284-000241
1/2	1	4	1/2	0.015	284-000657	284-000658
1/2	1	4	1/2	0.020	284-000659	284-000660
1/2	1	4	1/2	0.030	284-000661	284-000662
1/2	1	4	1/2	0.045	284-000663	284-000664
1/2	1	4	1/2	0.060	284-000665	284-000666
1/2	1	4	1/2	0.090	284-000667	284-000668
1/2	1	4	1/2	0.125	284-000669	284-000670
1/2	1-1/4	3	1/2	-	284-000242	284-000243
1/2	1-1/4	3	1/2	0.015	284-000643	284-000644
1/2	1-1/4	3	1/2	0.020	284-000645	284-000646
1/2	1-1/4	3	1/2	0.030	284-000647	284-000648
1/2	1-1/4	3	1/2	0.045	284-000649	284-000650
1/2	1-1/4	3	1/2	0.060	284-000651	284-000652
1/2	1-1/4	3	1/2	0.090	284-000653	284-000654
1/2	1-1/4	3	1/2	0.125	284-000655	284-000656
1/2	1-1/2	4	1/2	-	284-000244	284-000245
1/2	1-1/2	4	1/2	0.015	284-000671	284-000672
1/2	1-1/2	4	1/2	0.020	284-000673	284-000674
1/2	1-1/2	4	1/2	0.030	284-000675	284-000676
1/2	1-1/2	4	1/2	0.045	284-000677	284-000678
1/2	1-1/2	4	1/2	0.060	284-000679	284-000680
1/2	1-1/2	4	1/2	0.090	284-000681	284-000682
1/2	1-1/2	4	1/2	0.125	284-000683	284-000684
1/2	1-1/2	6	1/2	0.015	284-000699	284-000700
1/2	1-1/2	6	1/2	0.020	284-000701	284-000702
1/2	1-1/2	6	1/2	0.030	284-000703	284-000704
1/2	1-1/2	6	1/2	0.045	284-000705	284-000706
1/2	1-1/2	6	1/2	0.060	284-000707	284-000708
1/2	1-1/2	6	1/2	0.090	284-000709	284-000710
1/2	1-1/2	6	1/2	0.125	284-000711	284-000712
1/2	2	4	1/2	-	284-000246	284-000247
1/2	2	4	1/2	0.015	284-000685	284-000686
1/2	2	4	1/2	0.020	284-000687	284-000688
1/2	2	4	1/2	0.030	284-000689	284-000690
1/2	2	4	1/2	0.045	284-000691	284-000692
1/2	2	4	1/2	0.060	284-000693	284-000694
1/2	2	4	1/2	0.090	284-000695	284-000696
1/2	2	4	1/2	0.125	284-000697	284-000698

*bold numbers are EDPs for ordering

INTRO
 MILLING
 SPECIALTY
 HOLEMAKING
 THREADING
 INSERTS

ADVANCED PERFORMANCE

Variable Helix End Mill For Carbon And Alloy Steels



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Series 1130		Fusion | 4FL | Multi Length | Square and Radius				
Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	Bright	FX2
1/2	3	6	1/2	-	284-000248	284-000249
1/2	3	6	1/2	0.015	284-000713	284-000714
1/2	3	6	1/2	0.020	284-000715	284-000716
1/2	3	6	1/2	0.030	284-000717	284-000718
1/2	3	6	1/2	0.045	284-000719	284-000720
1/2	3	6	1/2	0.060	284-000721	284-000722
1/2	3	6	1/2	0.090	284-000723	284-000724
1/2	3	6	1/2	0.125	284-000725	284-000726
5/8	3/4	3-1/2	5/8	-	284-000268	284-000269
5/8	3/4	3-1/2	5/8	0.015	284-000727	284-000728
5/8	3/4	3-1/2	5/8	0.020	284-000729	284-000730
5/8	3/4	3-1/2	5/8	0.030	284-000731	284-000732
5/8	3/4	3-1/2	5/8	0.045	284-000733	284-000734
5/8	3/4	3-1/2	5/8	0.060	284-000735	284-000736
5/8	3/4	3-1/2	5/8	0.090	284-000737	284-000738
5/8	3/4	3-1/2	5/8	0.125	284-000739	284-000740
5/8	1-1/4	3-1/2	5/8	-	284-000270	284-000271
5/8	1-1/4	3-1/2	5/8	0.015	284-000741	284-000742
5/8	1-1/4	3-1/2	5/8	0.020	284-000743	284-000744
5/8	1-1/4	3-1/2	5/8	0.030	284-000745	284-000746
5/8	1-1/4	3-1/2	5/8	0.045	284-000747	284-000748
5/8	1-1/4	3-1/2	5/8	0.060	284-000749	284-000750
5/8	1-1/4	3-1/2	5/8	0.090	284-000751	284-000752
5/8	1-1/4	3-1/2	5/8	0.125	284-000753	284-000754
5/8	1-1/2	6	5/8	0.030	284-000765	284-000766
5/8	1-1/2	6	5/8	0.045	284-000767	284-000768
5/8	1-1/2	6	5/8	0.060	284-000769	284-000770
5/8	1-1/2	6	5/8	0.090	284-000771	284-000772
5/8	1-1/2	6	5/8	0.125	284-000773	284-000774
5/8	2-1/4	5	5/8	-	284-000272	284-000273
5/8	2-1/4	5	5/8	0.030	284-000755	284-000756
5/8	2-1/4	5	5/8	0.045	284-000757	284-000758
5/8	2-1/4	5	5/8	0.060	284-000759	284-000760
5/8	2-1/4	5	5/8	0.090	284-000761	284-000762
5/8	2-1/4	5	5/8	0.125	284-000763	284-000764
5/8	3	6	5/8	-	284-000274	284-000275
5/8	3	6	5/8	0.030	284-000775	284-000776
5/8	3	6	5/8	0.045	284-000777	284-000778
5/8	3	6	5/8	0.060	284-000779	284-000780
5/8	3	6	5/8	0.090	284-000781	284-000782
5/8	3	6	5/8	0.125	284-000783	284-000784
3/4	1	4	3/4	-	284-000298	284-000299
3/4	1	4	3/4	0.030	284-000785	284-000786
3/4	1	4	3/4	0.045	284-000787	284-000788
3/4	1	4	3/4	0.060	284-000789	284-000790
3/4	1	4	3/4	0.090	284-000791	284-000792
3/4	1	4	3/4	0.125	284-000793	284-000794
3/4	1	4	3/4	0.190	284-000795	284-000796
3/4	1	4	3/4	0.250	284-000797	284-000798
3/4	1-1/2	4	3/4	-	284-000300	284-000301
3/4	1-1/2	4	3/4	0.030	284-000799	284-000800
3/4	1-1/2	4	3/4	0.045	284-000801	284-000802
3/4	1-1/2	4	3/4	0.060	284-000803	284-000804
3/4	1-1/2	4	3/4	0.090	284-000805	284-000806
3/4	1-1/2	4	3/4	0.125	284-000807	284-000808
3/4	1-1/2	4	3/4	0.190	284-000809	284-000810
3/4	1-1/2	4	3/4	0.250	284-000811	284-000812
3/4	1-1/2	6	3/4	0.030	284-000825	284-000826
3/4	1-1/2	6	3/4	0.045	284-000827	284-000828
3/4	1-1/2	6	3/4	0.060	284-000829	284-000830
3/4	1-1/2	6	3/4	0.090	284-000831	284-000832
3/4	1-1/2	6	3/4	0.125	284-000833	284-000834
3/4	1-1/2	6	3/4	0.250	284-000835	284-000836
3/4	2-1/4	5	3/4	-	284-000302	284-000303
3/4	2-1/4	5	3/4	0.030	284-000813	284-000814
3/4	2-1/4	5	3/4	0.045	284-000815	284-000816
3/4	2-1/4	5	3/4	0.060	284-000817	284-000818
3/4	2-1/4	5	3/4	0.090	284-000819	284-000820
3/4	2-1/4	5	3/4	0.125	284-000821	284-000822
3/4	2-1/4	5	3/4	0.250	284-000823	284-000824
3/4	3	6	3/4	-	284-000304	284-000305
3/4	3	6	3/4	0.030	284-000837	284-000838
3/4	3	6	3/4	0.045	284-000839	284-000840
3/4	3	6	3/4	0.060	284-000841	284-000842
3/4	3	6	3/4	0.090	284-000843	284-000844
3/4	3	6	3/4	0.125	284-000845	284-000846

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ADVANCED PERFORMANCE

Variable Helix End Mill For Carbon And Alloy Steels



Series 1130 Fusion | 4FL | Multi Length | Square and Radius

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	Bright	FX2
3/4	3	6	3/4	0.250	284-000847	284-000848
3/4	4	7	3/4	-	284-000306	284-000307
3/4	4	7	3/4	0.030	284-000849	284-000850
3/4	4	7	3/4	0.045	284-000851	284-000852
3/4	4	7	3/4	0.060	284-000853	284-000854
3/4	4	7	3/4	0.090	284-000855	284-000856
3/4	4	7	3/4	0.125	284-000857	284-000858
3/4	4	7	3/4	0.250	284-000859	284-000860
1	1-1/2	4	1	-	284-000330	284-000331
1	1-1/2	4	1	0.030	284-000861	284-000862
1	1-1/2	4	1	0.045	284-000863	284-000864
1	1-1/2	4	1	0.060	284-000865	284-000866
1	1-1/2	4	1	0.090	284-000867	284-000868
1	1-1/2	4	1	0.125	284-000869	284-000870
1	1-1/2	4	1	0.190	284-000871	284-000872
1	1-1/2	4	1	0.250	284-000873	284-000874
1	1-1/2	6	1	0.030	284-000887	284-000888
1	1-1/2	6	1	0.045	284-000889	284-000890
1	1-1/2	6	1	0.060	284-000891	284-000892
1	1-1/2	6	1	0.090	284-000893	284-000894
1	1-1/2	6	1	0.125	284-000895	284-000896
1	1-1/2	6	1	0.250	284-000897	284-000898
1	2-1/4	5	1	-	284-000332	284-000333
1	2-1/4	5	1	0.030	284-000875	284-000876
1	2-1/4	5	1	0.045	284-000877	284-000878
1	2-1/4	5	1	0.060	284-000879	284-000880
1	2-1/4	5	1	0.090	284-000881	284-000882
1	2-1/4	5	1	0.125	284-000883	284-000884
1	2-1/4	5	1	0.250	284-000885	284-000886
1	3	6	1	-	284-000334	284-000335
1	3	6	1	0.030	284-000899	284-000900
1	3	6	1	0.045	284-000901	284-000902
1	3	6	1	0.060	284-000903	284-000904
1	3	6	1	0.090	284-000905	284-000906
1	3	6	1	0.125	284-000907	284-000908
1	3	6	1	0.250	284-000909	284-000910
1	4	7	1	-	284-000336	284-000337
1	4	7	1	0.030	284-000911	284-000912
1	4	7	1	0.045	284-000913	284-000914
1	4	7	1	0.060	284-000915	284-000916
1	4	7	1	0.090	284-000917	284-000918
1	4	7	1	0.125	284-000919	284-000920
1	4	7	1	0.250	284-000921	284-000922

*bold numbers are EDPs for ordering

INTRO

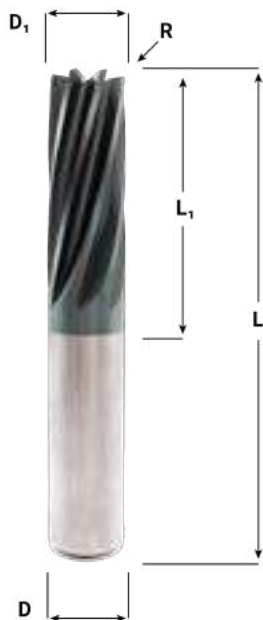
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>PERFORMANCES Ni</p> <p>Slow Helix For Nickel Alloys</p> <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance 6-12 flute mills ideal for HRSA Ideal for Nickel Alloys Tapered core with low helix for rigidity Slow helix increases core diameter for maximum rigidity SafeLock® shank available upon request 		<p>CARBIDE 15°</p> <p>SQ RAD</p> <p>h6 P192</p> <p>FX3</p>

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
					○	○			●		●	●

● Best ○ Good

Series 270 | 815 | Multi Flute | Square and Radius | Ni Alloys

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	Flutes	EDP
3/8	1/2	2-1/2	3/8	-	6	317080
3/8	1/2	2-1/2	3/8	0.020	6	317083
3/8	1/2	2-1/2	3/8	0.030	6	317086
3/8	1	2-1/2	3/8	-	6	317088
3/8	1	2-1/2	3/8	0.020	6	317092
3/8	1	2-1/2	3/8	0.030	6	317096
3/8	1	3	3/8	-	6	317099
3/8	1	3	3/8	0.020	6	317102
3/8	1	3	3/8	0.030	6	317106
1/2	5/8	3	1/2	-	8	317110
1/2	5/8	3	1/2	0.030	8	317113
1/2	5/8	3	1/2	0.060	8	317117
1/2	1-1/4	3	1/2	-	8	317119
1/2	1-1/4	3	1/2	0.030	8	317123
1/2	1-1/4	3	1/2	0.060	8	317125
1/2	1-1/4	4	1/2	-	8	317127
5/8	3/4	3	5/8	-	8	317130
5/8	3/4	3	5/8	0.030	8	317132
5/8	3/4	3	5/8	0.060	8	317135
5/8	1-5/8	3-1/2	5/8	-	8	317138
5/8	1-5/8	3-1/2	5/8	0.030	8	317142
5/8	1-5/8	3-1/2	5/8	0.060	8	317146
3/4	1	4	3/4	-	10	317148
3/4	1	4	3/4	0.030	10	317150
3/4	1	4	3/4	0.060	10	317152
3/4	1-5/8	4	3/4	-	10	317155
3/4	1-5/8	4	3/4	0.030	10	317158
3/4	1-5/8	4	3/4	0.060	10	317162
3/4	1-5/8	4	3/4	0.090	10	317164
1	1-1/4	4	1	-	12	317168
1	1-1/4	4	1	0.030	12	317172
1	1-1/4	4	1	0.060	12	317174
1	1-1/4	4	1	0.090	12	317176
1	2	4	1	-	12	317180
1	2	4	1	0.030	12	317182
1	2	4	1	0.060	12	317186
1	2	4	1	0.090	12	317190
1	3-1/4	6	1	-	12	317193
1	3-1/4	6	1	0.030	12	317195
1	3-1/4	6	1	0.060	12	317199
1	3-1/4	6	1	0.090	12	317201

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

End Mills For Titanium Alloys



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION		APPLICATION	FEATURES																																							
<p>PERFORMANCE Ti</p> <p>High Helix For Titanium Alloys</p> <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance 8-10 flute design distributes heat to reduce wear FX3 coating adds heat resistance and lubricity High helix with increased flute counts for improved heat control Ideal for 6Al4V Available with & without neck for extended reach SafeLock® shank available upon request 			<p>CARBIDE</p> <p>40°</p> <p>SQ</p> <p>RAD</p> <p>h6</p> <p>P193</p> <p>FX3</p>																																							
<table border="1"> <thead> <tr> <th colspan="3">STEEL</th> <th colspan="2">STAINLESS</th> <th colspan="2">CAST IRON</th> <th colspan="2">NON-FERROUS</th> <th colspan="2">HSSA</th> <th colspan="2">HARDENED STEEL</th> </tr> <tr> <th>P1</th> <th>P2</th> <th>P3</th> <th>M1</th> <th>M2</th> <th>K1</th> <th>K2</th> <th>N1</th> <th>N2</th> <th>S1</th> <th>S2</th> <th>H1</th> <th>H2</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td>○</td> <td>○</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>●</td> <td></td> <td></td> </tr> </tbody> </table>		STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL		P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2				○	○						●				
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL																															
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																														
			○	○						●																																

● Best ○ Good

Series 280 840 | Multi Flute | Square and Radius | Titanium

Diameter(D ₁)	LOC(L ₁)	LBS(L ₂)	OAL(L)	Shank(D)	Radius(R)	Flutes	EDP
1/2	5/8	-	3	1/2	-	8	317204
1/2	5/8	1-1/8	3	1/2	-	8	317321
1/2	5/8	-	3	1/2	0.030	8	317208
1/2	5/8	1-1/8	3	1/2	0.030	8	317324
1/2	5/8	-	3	1/2	0.060	8	317212
1/2	5/8	1-1/8	3	1/2	0.060	8	317326
1/2	5/8	2 1/8	4	1/2	-	8	317329
1/2	5/8	2 1/8	4	1/2	0.030	8	317331
1/2	5/8	2 1/8	4	1/2	0.060	8	317335
1/2	5/8	3 1/8	6	1/2	-	8	317339
1/2	5/8	3 1/8	6	1/2	0.030	8	317343
1/2	5/8	3 1/8	6	1/2	0.060	8	317345
1/2	1-1/4	-	3	1/2	-	8	317216
1/2	1-1/4	-	3	1/2	0.030	8	317218
1/2	1-1/4	-	3	1/2	0.060	8	317221
5/8	3/4	-	3	5/8	-	8	317225
5/8	3/4	-	3	5/8	0.030	8	317228
5/8	3/4	-	3	5/8	0.060	8	317232
5/8	3/4	-	3	5/8	0.090	8	317236
5/8	3/4	1 5/8	4	5/8	-	8	317349
5/8	3/4	1 5/8	4	5/8	0.030	8	317352
5/8	3/4	1 5/8	4	5/8	0.060	8	317354
5/8	3/4	1 5/8	4	5/8	0.090	8	317358
5/8	3/4	2 5/8	5	5/8	-	8	317362
5/8	3/4	2 5/8	5	5/8	0.030	8	317364
5/8	3/4	2 5/8	5	5/8	0.060	8	317368
5/8	3/4	2 5/8	5	5/8	0.090	8	317370
5/8	3/4	3 5/8	6	5/8	-	8	317374
5/8	3/4	3 5/8	6	5/8	0.030	8	317376
5/8	3/4	3 5/8	6	5/8	0.060	8	317378
5/8	3/4	3 5/8	6	5/8	0.090	8	317381
5/8	1-5/8	-	3-1/2	5/8	-	8	317238
5/8	1-5/8	-	3-1/2	5/8	0.030	8	317240
5/8	1-5/8	-	3-1/2	5/8	0.060	8	317243
5/8	1-5/8	-	3-1/2	5/8	0.090	8	317245
3/4	1	-	4	3/4	-	10	317247
3/4	1	1 7/8	4	3/4	-	10	317385
3/4	1	-	4	3/4	0.030	10	317249
3/4	1	1 7/8	4	3/4	0.030	10	317388
3/4	1	-	4	3/4	0.060	10	317253
3/4	1	1 7/8	4	3/4	0.060	10	317391
3/4	1	-	4	3/4	0.090	10	317257
3/4	1	1 7/8	4	3/4	0.090	10	317395
3/4	1	-	4	3/4	0.120	10	317260
3/4	1	1 7/8	4	3/4	0.120	10	317398

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

End Mills For Titanium Alloys



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Series 280		840 | Multi Flute | Square and Radius | Titanium					
Diameter(D ₁)	LOC(L ₁)	LBS(L ₂)	OAL(L)	Shank(D)	Radius(R)	Flutes	EDP
3/4	1	2 7/8	5	3/4	-	10	317402
3/4	1	2 7/8	5	3/4	0.030	10	317406
3/4	1	2 7/8	5	3/4	0.060	10	317409
3/4	1	2 7/8	5	3/4	0.090	10	317412
3/4	1	2 7/8	5	3/4	0.120	10	317414
3/4	1	3 7/8	6	3/4	-	10	317416
3/4	1	3 7/8	6	3/4	0.030	10	317420
3/4	1	3 7/8	6	3/4	0.060	10	317423
3/4	1	3 7/8	6	3/4	0.090	10	317427
3/4	1	3 7/8	6	3/4	0.120	10	317430
3/4	1-5/8	-	4	3/4	-	10	317262
3/4	1-5/8	-	4	3/4	0.030	10	317264
3/4	1-5/8	-	4	3/4	0.060	10	317267
3/4	1-5/8	-	4	3/4	0.090	10	317269
3/4	1-5/8	-	4	3/4	0.120	10	317272
1	1-1/4	-	4	1	-	10	317275
1	1-1/4	-	4	1	-	10	317433
1	1-1/4	-	4	1	0.030	10	317277
1	1-1/4	-	4	1	0.030	10	317435
1	1-1/4	-	4	1	0.060	10	317279
1	1-1/4	1 5/8	4	1	0.060	10	317439
1	1-1/4	-	4	1	0.090	10	317282
1	1-1/4	1 5/8	4	1	0.090	10	317441
1	1-1/4	-	4	1	0.120	10	317286
1	1-1/4	1 5/8	4	1	0.120	10	317444
1	1-1/4	2 5/8	5	1	-	10	317447
1	1-1/4	2 5/8	5	1	0.030	10	317449
1	1-1/4	2 5/8	5	1	0.060	10	317452
1	1-1/4	2 5/8	5	1	0.090	10	317454
1	1-1/4	2 5/8	5	1	0.120	10	317458
1	1-1/4	3 5/8	6	1	-	10	317461
1	1-1/4	3 5/8	6	1	0.030	10	317464
1	1-1/4	3 5/8	6	1	0.060	10	317467
1	1-1/4	3 5/8	6	1	0.090	10	317470
1	1-1/4	3 5/8	6	1	0.120	10	317474
1	2	-	4	1	-	10	317288
1	2	-	4	1	0.030	10	317291
1	2	-	4	1	0.060	10	317295
1	2	-	4	1	0.090	10	317299
1	2	-	4	1	0.120	10	317302
1	3-1/4	-	6	1	-	10	317305
1	3-1/4	-	6	1	0.030	10	317309
1	3-1/4	-	6	1	0.060	10	317311
1	3-1/4	-	6	1	0.090	10	317314
1	3-1/4	-	6	1	0.120	10	317317

*bold numbers are EDPs for ordering



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<h3>ATOMIC</h3> <h4>Variable Helix Micro Mills</h4> <ul style="list-style-type: none"> Hydrostatically CNC ground for accuracy and precision Features 45° X 0.003" corner chamfer Square end design aids in surface finish quality Optional multilayer AlTiN coating for extra edge retention in ferrous materials 3FL design for ultimate versatility in ferrous and non-ferrous materials Variable helix for vibration dampening Diameter Tol.: +/- 0.0005" LOC Tol.: +0.0120"/-0 Shank Tol.: +0/-0.0003" 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	●	○	○	●	●	●	●	○	○	○	○

● Best ○ Good

Series 1103 Atomic | 3FL | Chamfer | Variable Helix

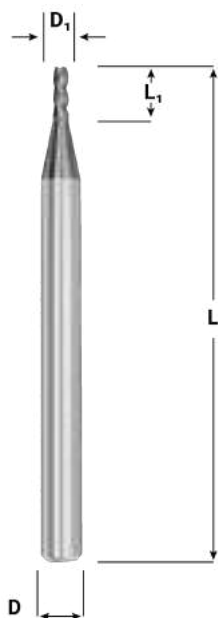
Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Bright	AlTiN
1/32	0.047	1.500	1/8	251-003005	251-003005B
1/32	0.093	1.500	1/8	251-003010	251-003010B
1/32	0.063	2.500	1/8	251-003015	251-003015B
1/32	0.063	2.500	1/8	251-003020	251-003020B
3/64	0.071	1.500	1/8	251-003025	251-003025B
3/64	0.141	1.500	1/8	251-003030	251-003030B
3/64	0.094	2.500	1/8	251-003035	251-003035B
3/64	0.094	2.500	1/8	251-003040	251-003040B
1/16	0.093	1.500	1/8	251-003045	251-003045B
1/16	0.186	1.500	1/8	251-003050	251-003050B
1/16	0.094	2.500	1/8	251-003055	251-003055B
1/16	0.094	2.500	1/8	251-003060	251-003060B
5/64	0.117	1.500	1/8	251-003065	251-003065B
5/64	0.234	1.500	1/8	251-003070	251-003070B
5/64	0.156	2.500	1/8	251-003075	251-003075B
5/64	0.156	2.500	1/8	251-003080	251-003080B
3/32	0.140	1.500	1/8	251-003085	251-003085B
3/32	0.279	1.500	1/8	251-003090	251-003090B
3/32	0.188	2.500	1/8	251-003095	251-003095B
3/32	0.188	2.500	1/8	251-003100	251-003100B
1/8	0.188	1.500	1/8	251-003105	251-003105B
1/8	0.375	1.500	1/8	251-003110	251-003110B
1/8	0.250	2.500	1/8	251-003115	251-003115B
1/8	0.250	2.500	1/8	251-003120	251-003120B

*bold numbers are EDPs for ordering

Popular Custom Milling Options

- Proprietary GWS tool coatings
- Longer lengths
- Enhanced geometry
- Special shank modifications like **SAFE-LOCK**

CUSTOM
COMES
STANDARD



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<h3>ATOMIC</h3> <h4>Variable Helix Micro Mills</h4> <ul style="list-style-type: none"> Hydrostatically CNC ground for accuracy and precision Features 45° X 0.003" corner chamfer Optional multilayer AlTiN coating for extra edge retention in ferrous materials Variable helix for vibration dampening Diameter Tol.: +/- 0.0005" LOC Tol.: +0.0120"/-0 Shank Tol.: +0/-0.0003" 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	●	○	○	●	●	●	●	○	○	○	○

● Best ○ Good

Series 1104 Atomic | 4FL | Chamfer | Variable Helix

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Bright	AlTiN
1/32	0.047	1.500	1/8	251-004005	251-004005B
1/32	0.093	1.500	1/8	251-004010	251-004010B
1/32	0.063	2.500	1/8	251-004015	251-004015B
1/32	0.063	2.500	1/8	251-004015	251-004015B
3/64	0.071	1.500	1/8	251-004025	251-004025B
3/64	0.141	1.500	1/8	251-004030	251-004030B
3/64	0.094	2.500	1/8	251-004035	251-004035B
3/64	0.094	2.500	1/8	251-004035	251-004035B
1/16	0.093	1.500	1/8	251-004045	251-004045B
1/16	0.186	1.500	1/8	251-004050	251-004050B
1/16	0.094	2.500	1/8	251-004055	251-004055B
1/16	0.094	2.500	1/8	251-004055	251-004055B
5/64	0.117	1.500	1/8	251-004065	251-004065B
5/64	0.234	1.500	1/8	251-004070	251-004070B
5/64	0.156	2.500	1/8	251-004075	251-004075B
5/64	0.156	2.500	1/8	251-004075	251-004075B
3/32	0.140	1.500	1/8	251-004085	251-004085B
3/32	0.279	1.500	1/8	251-004090	251-004090B
3/32	0.188	2.500	1/8	251-004095	251-004095B
3/32	0.188	2.500	1/8	251-004095	251-004095B
1/8	0.188	1.500	1/8	251-004105	251-004105B
1/8	0.375	1.500	1/8	251-004110	251-004110B
1/8	0.250	2.500	1/8	251-004115	251-004115B
1/8	0.250	2.500	1/8	251-004115	251-004115B

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Solid Carbide End Mills For Ferrous And Non-Ferrous Materials



FEATURES/DESCRIPTION	APPLICATION	FEATURES
ATTACKER Chip Breaker End Mills <ul style="list-style-type: none"> Sub-micron grade carbide substrate for wear resistance Designed for heavy material removal applications where cycle times are critical Chip breaker profile creates smaller chips for less edge build up and lower power usage Stocked Bright and AlTiN Diameter Tol.: +0/-0.002" Shank Tol.: +0/-0.0004" 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	●	○	○	●	●	●	●	○	○	○	○

● Best ○ Good

Series 2142 | 3FL | Chip Breaker | Radius

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	Bright	AlTiN
1/8	1/2	1-1/2	1/8	0.010	267-125500	267-125503
3/16	5/8	2	3/16	0.010	267-187625	267-187628
1/4	3/4	2-1/2	1/4	0.010	267-250750	267-250753
5/16	13/16	2-1/2	5/16	0.010	267-312812	267-312815
3/8	1	2-1/2	3/8	0.015	267-375875	267-375878
7/16	1	2-3/4	7/16	0.015	267-437100	267-437103
1/2	1	3	1/2	0.015	267-500100	267-500103
5/8	1-1/4	3-1/2	5/8	0.020	267-625114	267-625117
3/4	1-1/2	4	3/4	0.020	267-750112	267-750115
1	1-1/2	4	1	0.020	267-100112	267-100115

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

ADVANCED PERFORMANCE

Solid Carbide End Mills For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>ATTACKER</p> <p>Chip Breaker End Mills</p> <ul style="list-style-type: none"> Sub-micron grade carbide substrate for wear resistance Designed for heavy material removal applications where cycle times are critical Chip breaker profile creates smaller chips for less edge build up and lower power usage Stocked Bright and AlTiN Diameter Tol.: +0/-0.002" Shank Tol.: +0/-0.0004" 		<p>CARBIDE 30°</p> <p>3FL BALL</p> <p>P196</p> <p>Bright AlTiN</p>

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	●	○	○	●	●	●	●	○	○	○	○

● Best ○ Good

Series 2143 3FL | Chip Breaker | Ball Nose

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Bright	AlTiN
1/8	1/2	1-1/2	1/8	268-125500	268-125503
3/16	5/8	2	3/16	268-187625	268-187628
1/4	3/4	2-1/2	1/4	268-250750	268-250753
5/16	13/16	2-1/2	5/16	268-312812	268-312815
3/8	1	2-1/2	3/8	268-375875	268-375878
7/16	1	2-3/4	7/16	268-437100	268-437103
1/2	1	3	1/2	268-500100	268-500103
5/8	1-1/4	3-1/2	5/8	268-625114	268-625117
3/4	1-1/2	4	3/4	268-750112	268-750115
1	1-1/2	4	1	268-100112	268-100115

*bold numbers are EDPs for ordering

Popular Custom Milling Options

- Proprietary GWS tool coatings
- Longer lengths
- Enhanced geometry
- Special shank modifications like **SAFE-LOCK**

CUSTOM
COMES
STANDARD

ADVANCED PERFORMANCE

Solid Carbide End Mills For Ferrous And Non-Ferrous Materials



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>ATTACKER</p> <p>Chip Breaker End Mills</p> <ul style="list-style-type: none"> Sub-micron grade carbide substrate for wear resistance Designed for heavy material removal applications where cycle times are critical Chip breaker profile creates smaller chips for less edge build up and lower power usage Stocked Bright and AlTiN Diameter Tol.: +0/-0.002" Shank Tol.: +0/-0.0004" 		<p>CARBIDE 30°</p> <p>4FL RAD</p> <p>P196</p> <p>Bright AlTiN</p>

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	●	○	○	●	●	●	●	○	○	○	○

● Best ○ Good

Series 2140 4FL | Chip Breaker | Radius

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	Bright	AlTiN
1/8	1/2	1-1/2	1/8	0.010	257-125500	257-125503
3/16	5/8	2	3/16	0.010	257-187625	257-187628
1/4	3/4	2-1/2	1/4	0.010	257-250750	257-250753
5/16	13/16	2-1/2	5/16	0.010	257-312812	257-312815
3/8	1	2-1/2	3/8	0.015	257-375875	257-375878
7/16	1	2-3/4	7/16	0.015	257-437100	257-437103
1/2	1	3	1/2	0.015	257-500100	257-500103
5/8	1-1/4	3-1/2	5/8	0.020	257-625114	257-625117
3/4	1-1/2	4	3/4	0.020	257-750112	257-750115
1	1-1/2	4	1	0.020	257-100112	257-100115

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

ADVANCED PERFORMANCE

Solid Carbide End Mills For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>ATTACKER</p> <p>Chip Breaker End Mills</p> <ul style="list-style-type: none"> Sub-micron grade carbide substrate for wear resistance Designed for heavy material removal applications where cycle times are critical Chip breaker profile creates smaller chips for less edge build up and lower power usage Stocked Bright and AlTiN Diameter Tol.: +0/-0.002" Shank Tol.: +0/-0.0004" 		<p>CARBIDE 30°</p> <p>4FL BALL</p> <p>P196</p> <p>Bright AlTiN</p>

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	●	○	○	●	●	●	●	○	○	○	○

● Best ○ Good

Series 2141 4FL | Chip Breaker | Ball Nose

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Bright	AlTiN
1/8	1/2	1-1/2	1/8	258-125500	258-125503
3/16	5/8	2	3/16	258-187625	258-187628
1/4	3/4	2-1/2	1/4	258-250750	258-250753
5/16	13/16	2-1/2	5/16	258-312812	258-312815
3/8	1	2-1/2	3/8	258-375875	258-375878
7/16	1	2-3/4	7/16	258-437100	258-437103
1/2	1	3	1/2	258-500100	258-500103
5/8	1-1/4	3-1/2	5/8	258-625114	258-625117
3/4	1-1/2	4	3/4	258-750112	258-750115
1	1-1/2	4	1	258-100112	258-100115

*bold numbers are EDPs for ordering

Popular Custom Milling Options

- Proprietary GWS tool coatings
- Longer lengths
- Enhanced geometry
- Special shank modifications like **SAFE-LOCK**

CUSTOM
COMES
STANDARD

ADVANCED PERFORMANCE

Roughing End Mill For Aluminum



INTRO

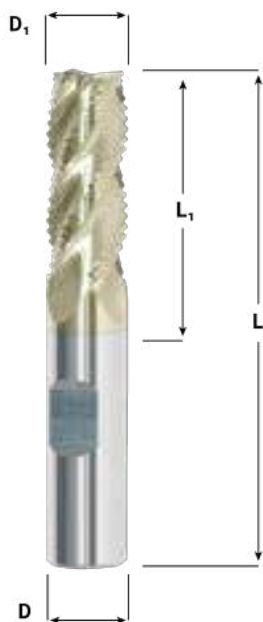
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>AGGRESSOR^F</p> <p>Roughing Mills - Coarse Pitch</p> <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance Corner chamfer for edge strength and wear protection Designed for heavy material removal applications where cycle times are critical Coarse tooth serrations promote smooth chip clearance by creating small chips Diameter Tol.: +0/-0.002" Shank Tol.: +0/-0.0004" 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
							●	●				

● Best ○ Good

Series 2133 AGG-C | 3FL | Corner Chamfer | Coarse Pitch Rougher | Weldon

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Bright	NF1
3/16	3/4	2	3/16	255-050187	255-050187D
1/4	3/4	2-1/2	1/4	255-050250	255-050250D
5/16	7/8	2-1/2	5/16	255-050312	255-050312D
3/8	1	2-1/2	3/8	255-050375	255-050375D
1/2	1-1/4	3	1/2	255-050500	255-050500D
5/8	1-1/4	3-1/2	5/8	255-050625	255-050625D
3/4	1-5/8	4	3/4	255-050750	255-050750D
1	1-3/4	4	1	255-051000	255-051000D

*bold numbers are EDPs for ordering



FEATURES/DESCRIPTION				APPLICATION		FEATURES						
AGGRESSOR^F Roughing Mills - Fine Pitch <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance Unequal index for vibration mitigation Relaxed 20° helix enhances stability in hard materials Fine tooth serrations promote smooth chip clearance Diameter < 1" = 4FL, Diameter > 3/4" = 5FL Diameter Tol.: +0/-0.002" Shank Tol.: +0/-0.0004" 												
STEEL		STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL		
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	●	○	○	●	●			○	○	○	
● Best ○ Good												

Series 2134 | AGG-F | 4-5FL | Corner Chamfer | Fine Pitch Rougher | Weldon

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Flutes	Bright	FX3
1/4	1/2	2	1/4	4	255-100240	255-100240B
1/4	3/4	2-1/2	1/4	4	255-100250	255-100250B
5/16	1/2	2	5/16	4	255-100302	255-100302B
5/16	13/16	2-1/2	5/16	4	255-100312	255-100312B
3/8	5/8	2	3/8	4	255-100365	255-100365B
3/8	1	2-1/2	3/8	4	255-100375	255-100375B
7/16	1	2-3/4	7/16	4	255-100437	255-100437B
1/2	5/8	2-1/2	1/2	4	255-100490	255-100490B
1/2	1-1/4	3	1/2	4	255-100500	255-100500B
1/2	2	4	1/2	4	255-200500	255-200500B
5/8	3/4	3	5/8	4	255-100615	255-100615B
5/8	1-5/8	4	5/8	4	255-100625	255-100625B
3/4	1	3-1/2	3/4	4	255-100740	255-100740B
3/4	1-3/4	4	3/4	4	255-100750	255-100750B
3/4	2-1/4	5	3/4	4	255-200750	255-200750B
3/4	3	6	3/4	4	255-300750	255-300750B
1	2	5	1	5	255-101000	255-101000B
1	2-5/8	5	1	5	255-201000	255-201000B
1	3-1/4	6	1	5	255-301000	255-301000B
1	4-1/8	7	1	5	255-301100	255-301100B

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Roughing End Mill For Steel, Stainless And Cast Iron



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>AGGRESSOR^M</p> <p>Roughing Mills - Medium Pitch</p> <ul style="list-style-type: none"> Premium sub-micron grade carbide substrate for wear resistance Corner chamfer for edge strength and wear protection Designed for heavy material removal applications where cycle times are critical Medium tooth serrations promote smooth chip clearance by creating small chips in hard materials Diameter Tol.: +0/-0.002" Shank Tol.: +0/-0.0004" 		<p>CARBIDE</p> <p>30°</p> <p>Multi</p> <p>CHF</p> <p>P198</p> <p>Bright</p> <p>FX3</p>

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	●			●	●			○			

● Best ○ Good

Series 2135 AGG-M | 3-5FL | Corner Chamfer | Med Pitch Rougher | Weldon

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Flutes	Bright	FX3
3/16	5/8	2	3/16	3	256-187625	256-187625
1/4	3/4	2-1/2	1/4	4	256-250750	256-250750
1/4	1-1/8	3	1/4	4	256-250850	256-250850
5/16	3/4	2-1/2	5/16	4	256-312812	256-312812
3/8	7/8	2-1/2	3/8	4	256-375875	256-375875
7/16	1	2-3/4	7/16	4	256-437100	256-437100
1/2	1-1/4	3	1/2	4	256-500100	256-500100
5/8	1-1/4	3-1/2	5/8	4	256-625114	256-625114
3/4	1-5/8	4	3/4	4	256-750112	256-750112
1	1-3/4	4	1	5	256-100112	256-100112

*bold numbers are EDPs for ordering

Popular Custom Milling Options

- Proprietary GWS tool coatings
- Longer lengths
- Enhanced geometry
- Special shank modifications like **SAFE-LOCK[®]**

CUSTOM
COMES
STANDARD

GENERAL PURPOSE

Solid Carbide End Mills For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES										
2-Flute Square End Mills <ul style="list-style-type: none"> • Universal application • Sub-micron grade carbide substrate for wear resistance • Multiple coating options • Diameter Tol.: +0/-0.002" • Shank Tol.: +0/-0.0005" 		<table border="1"> <tr> <td>CARBIDE</td> <td>30°</td> </tr> <tr> <td>Multi</td> <td>CHF</td> </tr> <tr> <td>P199</td> <td>Bright</td> </tr> <tr> <td>TiN</td> <td>TiCN</td> </tr> <tr> <td>AlTiN</td> <td></td> </tr> </table>	CARBIDE	30°	Multi	CHF	P199	Bright	TiN	TiCN	AlTiN	
CARBIDE	30°											
Multi	CHF											
P199	Bright											
TiN	TiCN											
AlTiN												

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 202 | 2FL | Multi Length | Square

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Bright	TiN	TiCN	AlTiN
1/64	3/64	1-1/2	1/8	204-001000	204-000995	-	204-000997
1/32	1/16	1-1/2	1/8	202-001001	202-001002	202-001003	202-001004
1/32	1/8	1-1/2	1/8	204-001001	204-001002	204-001003	204-001005
3/64	3/32	1-1/2	1/8	202-001010	202-001011	202-001012	202-001013
3/64	1/8	1-1/2	1/8	204-001010	204-001011	204-021010	204-001013
1/16	1/8	1-1/2	1/8	202-001020	202-001021	202-001022	202-001023
1/16	1/4	1-1/2	1/8	204-001020	204-001021	204-001022	204-001023
5/64	5/32	1-1/2	1/8	202-001030	202-001031	202-001032	202-001033
5/64	1/4	1-1/2	1/8	204-001030	204-001032	204-001033	204-001036
3/32	3/16	1-1/2	1/8	202-001040	202-001041	202-001042	202-001043
3/32	3/8	1-1/2	1/8	204-001040	204-001041	204-001042	204-001043
7/64	7/32	1-1/2	1/8	202-001050	202-001051	202-001052	202-001053
7/64	3/8	1-1/2	1/8	204-001050	204-001052	204-021050	204-001055
1/8	1/4	1-1/2	1/8	202-001060	202-001061	202-001062	202-001063
1/8	1/2	1-1/2	1/8	204-001060	204-001061	204-001062	204-001063
1/8	3/4	2-1/4	1/8	213-001001	213-001002	213-001003	213-001004
1/8	1	3	1/8	216-001001	216-001002	216-001003	216-001004
9/64	9/32	2	3/16	202-001070	202-001071	202-001072	202-001073
9/64	9/16	2	3/16	204-001070	204-001072	204-021070	204-001074
5/32	5/16	2	3/16	202-001080	202-001081	202-001082	202-001083
5/32	9/16	2	3/16	204-001080	204-001081	204-001083	204-001084
5/32	3/4	2-1/2	3/16	213-001005	213-001006	213-001007	213-001008
5/32	1-1/8	3	3/16	216-001005	216-001006	216-001007	216-001008
11/64	5/16	2	3/16	202-001090	202-001091	202-001092	202-001093
11/64	9/16	2	3/16	204-001090	204-001092	204-021090	204-001094
3/16	3/8	2	3/16	202-001100	202-001101	202-001102	202-001103
3/16	5/8	2	3/16	204-001100	204-001101	204-001103	204-001104
3/16	3/4	2-1/2	3/16	213-001012	213-001013	213-001016	213-001014
3/16	1-1/8	3	3/16	216-001010	216-001011	216-001012	216-001013
13/64	3/8	2	1/4	202-001110	202-001111	202-001112	202-001113
13/64	5/8	2-1/2	1/4	204-001110	204-001112	204-021110	204-001114
7/32	7/16	2	1/4	202-001120	202-001121	202-001122	202-001123
7/32	5/8	2-1/2	1/4	204-001120	204-001121	204-001123	204-001124
15/64	7/16	2	1/4	202-001125	202-001126	202-001127	202-001128
15/64	3/4	2-1/2	1/4	204-001125	204-001127	204-021125	204-001129
1/4	1/2	2	1/4	202-001130	202-001131	202-001132	202-001133
1/4	3/4	2-1/2	1/4	204-001130	204-001131	204-001133	204-001134
1/4	1-1/8	3	1/4	213-001020	213-001021	213-001022	213-001023
1/4	1-1/2	4	1/4	216-001020	216-001021	216-001022	216-001023
1/4	1-1/2	6	1/4	216-001025	216-001027	216-001028	216-001029
17/64	3/4	2-1/2	5/16	204-001135	204-001137	204-021181	204-001139
9/32	1/2	2	5/16	202-001140	202-001141	202-001142	202-001143
9/32	3/4	2-1/2	5/16	204-001140	204-001141	204-001143	204-001144
19/64	13/16	2-1/2	5/16	204-001145	204-001148	204-021145	204-031145
5/16	1/2	2	5/16	202-001150	202-001151	202-001152	202-001153

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide End Mills For Ferrous And Non-Ferrous Materials



Series 202

2FL | Multi Length | Square

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Bright	TiN	TiCN	AlTiN
5/16	13/16	2-1/2	5/16	204-001150	204-001151	204-001155	204-001153
5/16	1-1/8	3	5/16	213-001030	213-001031	213-001032	213-001033
5/16	1-1/2	6	5/16	216-001034	216-001035	216-001036	216-001034A
5/16	1-5/8	4	5/16	216-001030	216-001031	216-001032	216-001033
21/64	1	2-1/2	3/8	204-001154	204-001157	204-021154	204-031154
11/32	1	2-1/2	3/8	204-001160	204-001162	204-001163	204-001164
23/64	1	2-1/2	3/8	204-001165	204-001166	204-021165	204-031165
3/8	5/8	2	3/8	202-001170	202-001171	202-001172	202-001173
3/8	1	2-1/2	3/8	204-001170	204-001171	204-001179	204-001173
3/8	1-1/8	3	3/8	213-001040	213-001009	213-001015	213-001010
3/8	1-1/2	6	3/8	216-001045	216-001046	216-001047	216-001048
3/8	1-3/4	4	3/8	216-001040	216-001041	216-001042	216-001043
25/64	1	2-3/4	7/16	204-001175	204-001178	204-021175	204-031175
13/32	1	2-3/4	7/16	204-001180	204-001182	204-021180	204-001184
27/64	1	2-3/4	7/16	204-001185	204-001187	204-021185	204-031185
7/16	5/8	2-1/2	7/16	202-001190	202-001191	202-001192	202-001193
7/16	1	2-3/4	7/16	204-001190	204-001191	204-001189	204-001198
7/16	2	4	7/16	213-001050	213-001051	213-001053	213-001052
7/16	3	6	7/16	216-001050	216-001051	216-001052	216-001053
29/64	1	3	1/2	204-001192	204-001194	204-021192	204-031192
15/32	1	3	1/2	204-001193	204-001197	204-021193	204-001196
31/64	1	3	1/2	204-001195	204-001199	204-021195	204-031195
1/2	5/8	2-1/2	1/2	202-001200	202-001201	202-001202	202-001203
1/2	1	3	1/2	204-001200	204-001201	204-001202	204-001205
1/2	1-1/4	3	1/2	204-001200A	204-001200AA	204-001200C	204-001205A
1/2	1-1/2	4	1/2	213-001059	213-001056	213-001062	213-001063
1/2	1-1/2	6	1/2	216-001053A	216-001057	216-001058	216-001059
1/2	2	4	1/2	213-001060	213-001061	213-001065	213-001064
1/2	3	6	1/2	216-001054	216-001061	216-001062	216-001063
33/64	1-1/4	3-1/2	9/16	204-001206	204-001206A	204-001206C	204-001206B
17/32	1-1/4	3-1/2	9/16	204-001207	204-001207A	204-001207C	204-001207B
9/16	1-1/4	3-1/2	9/16	204-001210	204-001209	204-001211	204-001212
5/8	3/4	3	5/8	202-001220	202-001221	202-001222	202-001223
5/8	1-1/4	3-1/2	5/8	204-001220	204-001222	204-001225	204-001224
5/8	1-1/2	6	5/8	216-001074	216-001076	216-001075	216-001074A
5/8	2-1/4	5	5/8	213-001070	213-001071	213-001072	213-001073
5/8	3	6	5/8	216-001070	216-001071	216-001072	216-001073
11/16	1-1/2	4	3/4	204-001230	204-001231	204-001233	204-001232
3/4	1	3	3/4	202-001240	202-001241	202-001242	202-001243
3/4	1-1/2	4	3/4	204-001240	204-001241	204-001243	204-001242
3/4	1-1/2	6	3/4	216-001084	216-001085	216-001086	216-001084A
3/4	2-1/4	5	3/4	213-001080	213-001081	213-001082	213-001083
3/4	3	6	3/4	216-001080	216-001081	216-001082	216-001083
3/4	4	7	3/4	216-001087	216-001087A	216-001087C	216-001087B
7/8	1-1/2	4	7/8	204-001250	204-001251	204-001252	204-001253
1	1-1/2	4	1	204-001260	204-001261	204-001262	204-001263
1	1-1/2	6	1	216-001095	216-001097	216-001098	216-001096
1	2-1/4	5	1	213-001090	213-001091	213-001092	213-001093
1	3	6	1	216-001090	216-001091	216-001092	216-001093
1	4	7	1	216-001099	216-001099A	216-001099C	216-001099B

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Solid Carbide End Mills For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>2-Flute Metric Square End Mills</p> <ul style="list-style-type: none"> • Universal application • Sub-micron grade carbide substrate for wear resistance • Multiple coating options • Diameter Tol.: +0/-0.002" • Shank Tol.: +0/-0.0005" • All listed dimensions in millimeters 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

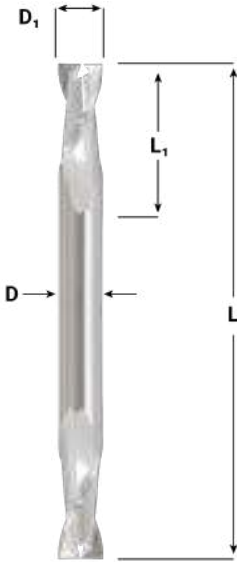
Series 202M 2FL | Square | Metric

Dia.(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Bright	TiN	TiCN	AlTiN
1	4	39	3	204-001275	204-001270A	204-001270C	204-001270B
1.5	5	39	3	204-001285	204-001285A	204-001285C	204-001285B
2	8	39	3	204-001295	204-001295A	204-001295C	204-001295B
2.5	9.5	39	3	204-001301	204-001297A	204-001297C	204-001297B
3	12	39	3	204-001313	204-001311A	204-001311C	204-001311B
3.5	12	51	4	204-001321	204-001321A	204-001321C	204-001321B
4	14	51	4	204-001330	204-001330A	204-001330C	204-001330B
4.5	16	51	5	204-001341	204-001341A	204-001341C	204-001341B
5	16	51	5	204-001351	204-001351A	204-001351C	204-001351B
6	19	63	6	204-001361	204-001361A	204-001361C	204-001361B
7	19	63	8	204-001371	204-001371A	204-001371C	204-001371B
8	20	63	8	204-001381	204-001381A	204-001381C	204-001381B
9	22	63	10	204-001391	204-001391A	204-001391C	204-001391B
10	22	76	10	204-001400	204-001400A	204-001400C	204-001400B
11	25	76	12	204-001410	204-001410A	204-001410C	204-001410B
12	25	76	12	204-001420	204-001420A	204-001420C	204-001420B
14	32	90	14	204-001430	204-001430A	204-001430C	204-001430B
16	38	102	16	204-001440	204-001440A	204-001440C	204-001440B
18	38	102	18	204-001450	204-001450A	204-001450C	204-001450B
20	38	102	20	204-001460	204-001460A	204-001460C	204-001460B
22	38	102	22	204-001470	-	-	204-001470B
25	38	102	25	204-001480	-	-	204-001480B

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide End Mills For Ferrous And Non-Ferrous Materials



FEATURES/DESCRIPTION				APPLICATION	FEATURES							
2-Flute Double-Ended Square End Mills <ul style="list-style-type: none"> • Universal application • Sub-micron grade carbide substrate for wear resistance • Multiple coating options • Weldon flat standard for regular length sizes • Diameter Tol.: +0/-0.002" • Shank Tol.: +0/-0.0005" 												
STEEL		STAINLESS		CAST IRON	NON-FERROUS		HRSA	HARDENED STEEL				
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 202D | 2FL | Multi Length | Square | Double End

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Bright	TiN	TiCN	AlTiN
1/32	1/16	1-1/2	1/8	234-001001	234-001002	234-001003	234-001004
3/64	3/32	1-1/2	1/8	234-001010	234-001011	234-021010	234-031010
1/16	1/8	1-1/2	1/8	234-001011A	234-001021	234-001022	234-001015
5/64	1/8	1-1/2	1/8	234-001012	234-001013	234-001014	234-001024
3/32	3/16	1-1/2	1/8	234-001030	234-001031	234-001033	234-001034
7/64	3/16	1-1/2	1/8	234-001035	234-001036	234-001037	234-001038
1/8	1/4	1-1/2	1/8	234-001040	234-001041	234-021040	234-001044
1/8	3/8	3	3/8	237-001001	-	-	237-001004
9/64	5/16	2	3/16	234-001042	234-001043	234-001048	234-001049
5/32	5/16	2	3/16	234-001050	234-001051	234-001052	234-001054
5/32	7/16	3	3/8	237-001010	-	-	237-001013
11/64	5/16	2	3/16	234-001055	234-001056	234-001057	234-001058
3/16	3/8	2	3/16	234-001060	234-001061	234-021061	234-001059
3/16	1/2	3	3/8	237-001020	-	-	237-001023
13/64	1/2	2-1/2	1/4	234-001063	234-001064	234-001065	234-001066
7/32	1/2	2-1/2	1/4	234-001070	234-001071	234-001072	234-001074
7/32	9/16	3-1/2	3/8	237-001030	-	-	237-001033
15/64	1/2	2-1/2	1/4	234-001075	234-001076	234-001077	234-001078
1/4	1/2	2-1/2	1/4	234-001080	234-001081	234-021081	234-001084
1/4	5/8	3-1/2	3/8	237-001040	-	237-001042	237-001043
9/32	1/2	2-1/2	5/16	234-001082	234-001086	234-001087	234-001088
9/32	11/16	3-1/2	3/8	237-001050	-	-	237-001053
5/16	1/2	2-1/2	5/16	234-001090	234-001091	234-001092	234-001093
5/16	3/4	3-1/2	3/8	237-001060	-	-	237-001063
11/32	9/16	2-1/2	3/8	234-001094	234-001095	234-001096	234-001098
11/32	3/4	3-1/2	3/8	237-001070	-	-	237-001073
3/8	9/16	2-1/2	3/8	234-001100	234-001101	234-001102	234-001104
3/8	3/4	3-1/2	3/8	237-001080	237-001081	-	237-001083
7/16	9/16	2-3/4	7/16	234-001110	234-001111	234-021111	234-001114
7/16	7/8	4	1/2	237-001090	-	-	237-001093
1/2	5/8	3	1/2	234-001120	234-001121	234-021121	234-001124
1/2	1	4	1/2	237-001100	-	-	237-001103

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Solid Carbide End Mills For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES																																							
2-Flute Corner Radius End Mills <ul style="list-style-type: none"> Universal application Sub-micron grade carbide substrate for wear resistance Multiple coating options Diameter Tol.: +0/-0.002" Shank Tol.: +0/-0.0005" 																																									
<table border="1"> <thead> <tr> <th colspan="3">STEEL</th> <th colspan="2">STAINLESS</th> <th colspan="2">CAST IRON</th> <th colspan="2">NON-FERROUS</th> <th colspan="2">HBSA</th> <th colspan="2">HARDENED STEEL</th> </tr> <tr> <th>P1</th><th>P2</th><th>P3</th> <th>M1</th><th>M2</th> <th>K1</th><th>K2</th> <th>N1</th><th>N2</th> <th>S1</th><th>S2</th> <th>H1</th><th>H2</th> </tr> </thead> <tbody> <tr> <td>○</td><td>○</td><td>○</td> <td></td><td></td> <td>○</td><td>○</td> <td>○</td><td>○</td> <td></td><td></td> <td>○</td><td></td> </tr> </tbody> </table>			STEEL			STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL		P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2	○	○	○			○	○	○	○			○	
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL																														
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																													
○	○	○			○	○	○	○			○																														

● Best ○ Good

Series 204 | 2FL | Multi Length | Corner Radius

Dia. (D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	Bright	TiN	TiCN	AlTiN
1/8	1/2	1-1/2	1/8	0.010	204-602300	204-602301	204-602302	204-602303
1/8	1/2	1-1/2	1/8	0.015	204-602306	204-602307	204-602308	204-602309
1/8	1/2	1-1/2	1/8	0.020	204-602312	204-602313	204-602314	204-602315
1/8	1/2	1-1/2	1/8	0.030	204-602318	204-602319	204-602320	204-602321
3/16	5/8	2	3/16	0.010	204-602424	204-602425	204-602426	204-602427
3/16	5/8	2	3/16	0.015	204-602430	204-602431	204-602432	204-602433
3/16	5/8	2	3/16	0.020	204-602436	204-602437	204-602438	204-602439
3/16	5/8	2	3/16	0.030	204-602442	204-602443	204-602444	204-602445
3/16	5/8	2	3/16	0.045	204-602448	204-602449	204-602450	204-602451
3/16	5/8	2	3/16	0.060	204-602452	-	-	-
1/4	3/4	2-1/2	1/4	0.015	204-602551	204-602552	204-602553	204-602554
1/4	3/4	2-1/2	1/4	0.020	204-602557	204-602558	204-602559	204-602560
1/4	3/4	2-1/2	1/4	0.025	204-602563	204-602564	204-602565	204-602566
1/4	3/4	2-1/2	1/4	0.030	204-602569	204-602570	204-602571	204-602572
1/4	3/4	2-1/2	1/4	0.045	204-602575	204-602576	204-602577	204-602578
1/4	3/4	2-1/2	1/4	0.060	204-602581	204-602582	204-602583	204-602584
5/16	13/16	2-1/2	5/16	0.015	204-602684	204-602685	204-602686	204-602687
5/16	13/16	2-1/2	5/16	0.020	204-602690	204-602691	204-602692	204-602693
5/16	13/16	2-1/2	5/16	0.025	204-602696	204-602697	204-602698	204-602699
5/16	13/16	2-1/2	5/16	0.030	204-602702	204-602703	204-602704	204-602705
5/16	13/16	2-1/2	5/16	0.045	204-602708	204-602709	204-602710	204-602711
5/16	13/16	2-1/2	5/16	0.060	204-602714	204-602715	204-602716	204-602717
3/8	1	2-1/2	3/8	0.015	204-602820	204-602821	204-602822	204-602823
3/8	1	2-1/2	3/8	0.020	204-602826	204-602827	204-602828	204-602829
3/8	1	2-1/2	3/8	0.025	204-602832	204-602833	204-602834	204-602835
3/8	1	2-1/2	3/8	0.030	204-602838	204-602839	204-602840	204-602841
3/8	1	2-1/2	3/8	0.045	204-602844	204-602845	204-602846	204-602847
3/8	1	2-1/2	3/8	0.060	204-602850	204-602851	204-602852	204-602853
3/8	1	2-1/2	3/8	0.090	204-602856	204-602857	204-602858	204-602859
3/8	1	2-1/2	3/8	0.125	204-999375	-	-	-
7/16	1	2-3/4	7/16	0.015	204-602961	204-602962	204-602963	204-602964
7/16	1	2-3/4	7/16	0.020	204-602967	204-602968	204-602969	204-602970
7/16	1	2-3/4	7/16	0.025	204-602974	204-602975	204-602976	204-602977
7/16	1	2-3/4	7/16	0.030	204-602980	204-602981	204-602982	204-602983
7/16	1	2-3/4	7/16	0.045	204-602986	204-602987	204-602988	204-602989
7/16	1	2-3/4	7/16	0.060	204-602992	204-602993	204-602994	204-602995
7/16	1	2-3/4	7/16	0.090	204-602998	204-602999	204-603000	204-603001
1/2	1	3	1/2	0.015	204-603003	204-603004	204-603005	204-603006
1/2	1	3	1/2	0.020	204-603009	204-603010	204-603011	204-603012
1/2	1	3	1/2	0.025	204-603015	204-603016	204-603017	204-603018
1/2	1	3	1/2	0.030	204-603021	204-603022	204-603023	204-603024
1/2	1	3	1/2	0.045	204-603027	204-603028	204-603029	204-603030
1/2	1	3	1/2	0.060	204-603033	204-603034	204-603035	204-603036
1/2	1	3	1/2	0.090	204-603039	204-603040	204-603041	204-603042
1/2	1	3	1/2	0.125	204-603045	204-603046	204-603047	204-603048

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide End Mills For Ferrous And Non-Ferrous Materials



Series 204 2FL | Multi Length | Corner Radius

Dia. (D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	Bright	TiN	TiCN	AlTiN
5/8	1-1/4	3-1/2	5/8	0.015	204-603150	204-603151	204-603152	204-603153
5/8	1-1/4	3-1/2	5/8	0.020	204-603156	204-603157	204-603158	204-603159
5/8	1-1/4	3-1/2	5/8	0.025	204-603162	204-603163	204-603164	204-603165
5/8	1-1/4	3-1/2	5/8	0.030	204-603168	204-603169	204-603170	204-603171
5/8	1-1/4	3-1/2	5/8	0.045	204-603174	204-603175	204-603176	204-603177
5/8	1-1/4	3-1/2	5/8	0.060	204-603180	204-603181	204-603182	204-603183
5/8	1-1/4	3-1/2	5/8	0.090	204-603186	204-603187	204-603188	204-603189
5/8	1-1/4	3-1/2	5/8	0.125	204-603192	204-603193	204-603194	204-603195
5/8	1-1/4	3-1/2	5/8	0.250	204-603196	-	-	-
3/4	1-1/2	4	3/4	0.015	204-603297	204-603298	204-603299	204-603300
3/4	1-1/2	4	3/4	0.020	204-603303	204-603304	204-603305	204-603306
3/4	1-1/2	4	3/4	0.025	204-603309	204-603310	204-603311	204-603312
3/4	1-1/2	4	3/4	0.030	204-603315	204-603316	204-603317	204-603318
3/4	1-1/2	4	3/4	0.045	204-603321	204-603322	204-603323	204-603324
3/4	1-1/2	4	3/4	0.060	204-603327	204-603328	204-603329	204-603330
3/4	1-1/2	4	3/4	0.090	204-603333	204-603334	204-603335	204-603336
3/4	1-1/2	4	3/4	0.125	204-603339	204-603340	204-603341	204-603342
3/4	1-1/2	4	3/4	0.190	204-603345	204-603346	204-603347	204-603348
3/4	1-1/2	4	3/4	0.250	204-603349	-	-	-
1	1-1/2	4	1	0.015	204-603450	204-603451	204-603452	204-603453
1	1-1/2	4	1	0.020	204-603456	204-603457	204-603458	204-603459
1	1-1/2	4	1	0.025	204-603462	204-603463	204-603464	204-603465
1	1-1/2	4	1	0.030	204-603468	204-603469	204-603470	204-603471
1	1-1/2	4	1	0.045	204-603474	204-603475	204-603476	204-603477
1	1-1/2	4	1	0.060	204-603480	204-603481	204-603482	204-603483
1	1-1/2	4	1	0.090	204-603486	204-603487	204-603488	204-603489
1	1-1/2	4	1	0.125	204-603492	204-603493	204-603494	204-603495
1	1-1/2	4	1	0.190	204-603498	204-603499	204-603500	204-603501
1	1-1/2	4	1	0.250	204-603504	204-603505	204-603506	204-603507

*bold numbers are EDPs for ordering

Popular Custom Milling Options

- Proprietary GWS tool coatings
- Longer lengths
- Enhanced geometry
- Special shank modifications like **SAFE-LOCK**

CUSTOM COMES STANDARD

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Solid Carbide End Mills For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
2-Flute Ball Nose End Mills <ul style="list-style-type: none"> • Universal application • Sub-micron grade carbide substrate for wear resistance • Multiple coating options • Diameter Tol.: +0/-0.002" • Shank Tol.: +0/-0.0005" 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 219 | 2FL | Multi Length | Ball Nose

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Bright	TiN	TiCN	AlTiN
1/64	3/64	1-1/2	1/8	221-001000	221-000995	221-000996	221-000997
1/32	1/16	1-1/2	1/8	219-001001	219-001002	219-001003	219-001004
1/32	1/8	1-1/2	1/8	221-001005	221-001006	221-021005	221-001016
3/64	3/32	1-1/2	1/8	219-001010	219-001011	219-001012	219-001013
3/64	1/8	1-1/2	1/8	221-001007	221-001004	221-021007	221-001013
1/16	1/8	1-1/2	1/8	219-001020	219-001021	219-001022	219-001023
1/16	1/4	1-1/2	1/8	221-001008AA	221-001002	221-000999	221-001003
5/64	5/32	1-1/2	1/8	219-001025	219-011025	219-021025	219-031025
5/64	1/4	1-1/2	1/8	221-001009	221-001008	221-021009	221-001018
3/32	3/16	1-1/2	1/8	219-001030	219-001031	219-001032	219-001033
3/32	3/8	1-1/2	1/8	221-001010	221-001011	221-001012	221-001019
7/64	7/32	1-1/2	1/8	219-001035	219-011035	219-021035	219-031035
7/64	3/8	1-1/2	1/8	221-001014	221-001015	221-021014	221-001017
1/8	1/4	1-1/2	1/8	219-001040	219-001041	219-001042	219-001043
1/8	1/2	1-1/2	1/8	221-001020	221-001021	221-001026	221-001023
1/8	1/2	1-1/2	1/8	282-125510	-	-	-
1/8	3/4	2-1/4	1/8	224-001001	224-001002	224-001003	224-001004
1/8	1	3	1/8	227-001001	227-001002	227-001003	227-001004
9/64	9/32	2	3/16	219-001045	219-011045	219-021045	219-031045
9/64	9/16	2	3/16	221-001024	221-001025	221-021024	221-001027
5/32	5/16	2	3/16	219-001050	219-001051	219-001052	219-001053
5/32	9/16	2	3/16	221-001030	221-001031	221-001032	221-001033
5/32	3/4	2-1/2	3/16	224-001005	224-001006	224-001007	224-001008
5/32	1-1/8	3	3/16	227-001005	227-001006	227-001007	227-001008
11/64	5/16	2	3/16	219-001055	219-011055	219-021055	219-031055
11/64	9/16	2	3/16	221-001034	221-001035	221-021034	221-001037
3/16	3/8	2	3/16	219-001060	219-001061	219-001062	219-001063
3/16	5/8	2	3/16	221-001040	221-001041	221-001042	221-001043
3/16	3/4	2-1/2	3/16	224-001012	224-001013	224-001014	224-001015
3/16	1-1/8	3	3/16	227-001010	227-001011	227-001012	227-001013
13/64	3/8	2	1/4	219-001065	219-011065	219-021065	219-031065
13/64	5/8	2-1/2	1/4	221-001044	221-001045	221-021044	221-001047
7/32	7/16	2	1/4	219-001070	219-001071	219-001072	219-001073
7/32	5/8	2-1/2	1/4	221-001050	221-001051	221-001052	221-001053
15/64	7/16	2	1/4	219-001075	219-011075	219-021075	219-031075
15/64	3/4	2-1/2	1/4	221-001054	221-001055	221-021054	221-001057
1/4	1/2	2	1/4	219-001080	219-001081	219-001082	219-001083
1/4	3/4	2-1/2	1/4	221-001060	221-001061	221-001059	221-001062
1/4	1-1/8	3	1/4	224-001020	224-001021	224-001022	224-001023
1/4	1-1/2	4	1/4	227-001020	227-001021	227-001022	227-001023
1/4	1-1/2	6	1/4	227-001025	227-001027	227-001028	227-001029
17/64	3/4	2-1/2	5/16	221-001063	221-001064	221-001065	221-001066
9/32	1/2	2	5/16	219-001085	-	-	-
9/32	3/4	2-1/2	5/16	221-001070	221-001071	221-001072	221-001073
19/64	13/16	2-1/2	5/16	221-001075	221-001076	221-001077	221-001078

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide End Mills For Ferrous And Non-Ferrous Materials



Series 219 2FL | Multi Length | Ball Nose

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Bright	TiN	TiCN	AlTiN
5/16	1/2	2	5/16	219-001090	219-001091	219-001092	219-001093
5/16	13/16	2-1/2	5/16	221-001080	221-001081	221-001082	221-001079
5/16	1-1/8	3	5/16	224-001030	224-001031	224-001032	224-001033
5/16	1-1/2	6	5/16	227-001033A	227-001033C	227-001033D	227-001033B
5/16	1-5/8	4	5/16	227-001030	227-001031	227-001032	227-001033
21/64	1	2-1/2	3/8	221-001083	221-001084	221-021083	221-031083
11/32	1	2-1/2	3/8	221-001085	221-001086	221-001165	221-001087
23/64	1	2-1/2	3/8	221-001088	221-001089	221-021088	221-031088
3/8	5/8	2	3/8	219-001100	219-001101	219-001102	219-001103
3/8	1	2-1/2	3/8	221-001090	221-001095	221-001167	221-001091
3/8	1-1/8	3	3/8	224-001040	224-001041	224-001042	224-001044
3/8	1-1/2	6	3/8	227-001035	227-001049	227-001037	227-001035A
3/8	1-3/4	4	3/8	227-001040	227-001041	227-001042	227-001043
25/64	1	2-3/4	7/16	221-001093	221-001094	221-021093	221-031093
13/32	1	2-3/4	7/16	221-001096	221-001097	221-021096	221-001118
27/64	1	2-3/4	7/16	221-001098	221-001099	221-021099	221-031099
7/16	5/8	2-1/2	7/16	219-001110	219-001111	219-001112	219-001113
7/16	1	2-3/4	7/16	221-001100	221-001101	221-001104	221-001119
7/16	2	4	7/16	224-001050	224-001051	224-001052	224-001053
7/16	3	6	7/16	227-001050	227-001051	227-001052	227-001053
29/64	1	3	1/2	221-001102	221-001103	221-021102	221-031102
15/32	1	3	1/2	221-001105	221-001106	221-021105	221-001123
31/64	1	3	1/2	221-001108	221-001109	221-021108	221-031108
1/2	5/8	2-1/2	1/2	219-001120	219-001121	219-001122	219-001123
1/2	1	3	1/2	221-001110	221-001115	221-001116	221-001117
1/2	1-1/2	4	1/2	224-001059	224-001059A	224-001059C	224-001059B
1/2	1-1/2	6	1/2	227-001053A	227-001057	227-001058	227-001059
1/2	2	4	1/2	224-001060	224-001061	224-001062	224-001063
1/2	3	6	1/2	227-001054	227-001061	227-001062	227-001064
9/16	1-1/4	3-1/2	9/16	221-001120	221-001121	221-001125	221-001124
5/8	3/4	3	5/8	219-001130	219-001131	219-001132	219-001133
5/8	1-1/4	3-1/2	5/8	221-001130	221-001131	221-001133	221-001134
5/8	1-1/2	6	5/8	227-001073A	227-001073C	227-001073D	227-001073B
5/8	2-1/4	5	5/8	224-001070	224-001071	224-001072	224-001073
5/8	3	6	5/8	227-001070	227-001071	227-001072	227-001074
11/16	1-1/2	4	3/4	221-001140	221-001141	221-021140	221-031140
3/4	1	3	3/4	219-001140	219-001141	219-001142	219-001143
3/4	1-1/2	4	3/4	221-001150	221-001151	221-001153	221-001154
3/4	1-1/2	6	3/4	227-001085	227-001085A	227-001085B	227-001086
3/4	2-1/4	5	3/4	224-001080	224-001081	224-001082	224-001083
3/4	3	6	3/4	227-001080	227-001081	227-001082	227-001084
3/4	4	7	3/4	227-001080A	-	-	-
7/8	1-1/2	4	7/8	221-001155	221-001156	221-021155	221-001158
1	1-1/2	4	1	221-001160	221-001161	221-001163	221-001164
1	1-1/2	6	1	227-001088	227-001088A	227-001088C	227-001089
1	2-1/4	5	1	224-001090	224-001091	224-001092	224-001093
1	3	6	1	227-001090	227-001091	227-001092	227-001094

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Solid Carbide End Mills For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>2-Flute Metric Ball Nose End Mills</p> <ul style="list-style-type: none"> • Universal application • Sub-micron grade carbide substrate for wear resistance • Multiple coating options • Diameter Tol.: +0/-0.002" • Shank Tol.: +0/-0.0005" • All listed dimensions in millimeters 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 219M | 2FL | Multi Length | Ball Nose | Metric

Dia. (D ₁)	LOC (L ₁)	OAL (L)	Shank (D)	Bright	TiN	TiCN	AlTiN
1	5.5	39	3	-	221-001400A	221-001400C	221-001400B
1.5	5	39	3	221-001410	221-001410A	221-001410C	221-001410B
2	8	39	3	221-001420	221-001420A	221-001420C	221-001420B
2.5	9.5	39	3	221-001425	221-001425A	221-001425C	221-001425B
3	12	39	3	221-001430	221-001430A	221-001430C	221-001430B
3.5	12	51	4	221-001435	221-001435A	221-001435C	221-001435B
4	14	51	4	221-001440	221-001440A	221-001440C	221-001440B
4.5	16	51	5	221-001445	221-001445A	221-001445C	221-001445B
5	16	51	5	221-001450	221-001450A	221-001450C	221-001450B
6	19	63	6	221-001460	221-001460A	221-001460C	221-001460B
7	19	63	8	221-001470	221-001470A	221-001470C	221-001470B
8	20	63	8	221-001480	221-001480A	221-001480C	221-001480B
9	22	63	10	221-001490	221-001490A	221-001490C	221-001490B
10	22	76	10	221-001500	221-001500A	221-001500C	221-001500B
11	25	76	12	221-001510	-	221-001510C	221-001510B
12	25	76	12	221-001520	221-001520A	221-001520C	221-001520B
14	32	90	14	221-001540	221-001540A	221-001540C	221-001540B
16	32	102	16	221-001560	221-001560A	221-001560C	221-001560B
18	38	102	18	221-001580	221-001580A	221-001580C	221-001580B
20	38	102	20	221-001600	221-001600A	221-001600C	221-001600B
22	38	102	22	221-001620	-	-	221-001620B
25	38	102	25	221-001650	-	-	221-001650B

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide End Mills For Ferrous And Non-Ferrous Materials



INTRO

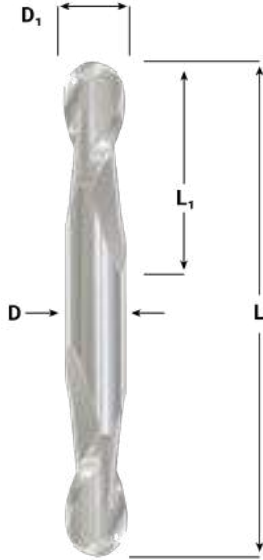
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION				APPLICATION		FEATURES						
2-Flute Double-Ended Ball Mills <ul style="list-style-type: none"> • Universal application • Sub-micron grade carbide substrate for wear resistance • Multiple coating options • Weldon for regular length sizes • Diameter Tol.: +0/-0.002" • Shank Tol.: +0/-0.0005" 												
STEEL		STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL		
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 219D | 2FL | Multi Length | Ball Nose | Double End

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Bright	TiN	TiCN	AlTiN
1/32	1/16	1-1/2	1/8	240-001001	240-001005	240-021001	240-031001
3/64	3/32	1-1/2	1/8	240-001001A	240-001011	240-021010	240-031010
1/16	1/8	1-1/2	1/8	240-001002	240-001021	240-021002	240-031003
5/64	1/8	1-1/2	1/8	240-001003	240-001013	240-021003	240-031002
3/32	3/16	1-1/2	1/8	240-001003A	240-001031	240-021030	240-031030
7/64	3/16	1-1/2	1/8	240-001004	240-001036	240-021004	240-031004
1/8	1/4	1-1/2	1/8	240-001040	240-001041	240-021040	240-031040
1/8	3/8	3	3/8	243-001001	-	-	243-001004
9/64	5/16	2	3/16	240-001044	240-001043	240-021044	240-031044
5/32	5/16	2	3/16	240-001050	240-001051	240-021050	240-031050
5/32	7/16	3	3/8	243-001010	-	-	243-001013
11/64	5/16	2	3/16	240-001055	240-001056	240-001057	240-031055
3/16	3/8	2	3/16	240-001060	240-001061	240-021060	240-031060
3/16	1/2	3	3/8	243-001020	-	-	243-001023
13/64	1/2	2-1/2	1/4	240-001065	240-001066	240-021065	240-031065
7/32	1/2	2-1/2	1/4	240-001070	240-001071	240-021070	240-031070
7/32	9/16	3-1/2	3/8	243-001030	-	-	243-001033
15/64	1/2	2-1/2	1/4	240-001075	240-001076	240-021075	240-031075
1/4	1/2	2-1/2	1/4	240-001080	240-001081	240-021080	240-031080
1/4	5/8	3-1/2	3/8	243-001040	-	-	243-001043
9/32	1/2	2-1/2	5/16	240-001085	240-001086	240-021085	240-031085
9/32	11/16	3-1/2	3/8	243-001050	-	-	243-001053
5/16	1/2	2-1/2	5/16	240-001090	240-001091	240-021090	240-031090
5/16	3/4	3-1/2	3/8	243-001060	-	-	243-001063
11/32	9/16	2-1/2	3/8	240-001094	240-001095	240-021094	240-031094
11/32	3/4	3-1/2	3/8	243-001070	-	-	243-001073
3/8	9/16	2-1/2	3/8	240-001100	240-001101	240-021100	240-031100
3/8	3/4	3-1/2	3/8	243-001080	-	-	243-001083
7/16	9/16	2-3/4	7/16	240-001110	240-001111	240-021110	240-031110
7/16	7/8	4	1/2	243-001090	-	-	243-001093
1/2	5/8	3	1/2	240-001120	240-001121	240-021120	240-031120
1/2	1	4	1/2	243-001100	-	-	243-001103

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide End Mills For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
3-Flute Square End Mills <ul style="list-style-type: none"> • Universal application • Sub-micron grade carbide substrate for wear resistance • Multiple coating options • Diameter Tol.: +0/-0.002" • Shank Tol.: +0/-0.0005" 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 205 | 3FL | Regular Length | Square

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Bright	TiN	TiCN	AlTiN
1/32	1/8	1-1/2	1/8	205-001001	205-001002	205-001003	205-001004
3/64	1/8	1-1/2	1/8	205-001020	205-001021	205-001022	205-001023
1/16	1/4	1-1/2	1/8	205-001030	205-001031	205-001032	205-001033
5/64	1/4	1-1/2	1/8	205-001040	205-001041	205-001042	205-001043
3/32	3/8	1-1/2	1/8	205-001050	205-001051	205-001052	205-001053
7/64	3/8	1-1/2	1/8	205-001060	205-001061	205-001062	205-001063
1/8	1/2	1-1/2	1/8	205-001070	205-001071	205-001072	205-001073
5/32	9/16	2	3/16	205-001090	205-001091	205-001092	205-001093
11/64	5/16	2	3/16	205-001100	205-001101	205-001102	205-001103
3/16	5/8	2	3/16	205-001110	205-001111	205-001112	205-001113
13/64	3/8	2-1/2	1/4	-	-	205-001122	205-001123
7/32	5/8	2-1/2	1/4	205-001130	205-001131	205-001132	205-001133
15/64	3/4	2-1/2	1/4	205-001135	205-001136	205-001137	205-001138
1/4	3/4	2-1/2	1/4	205-001140	205-001143	205-021140	205-031140
17/64	3/4	2-1/2	5/16	205-001145	205-001146	205-001147	205-001148
9/32	3/4	2-1/2	5/16	205-001150	205-001151	205-001152	205-001153
19/64	13/16	2-1/2	5/16	205-001155	205-001156	205-001157	205-001158
5/16	13/16	2-1/2	5/16	205-001160	205-001161	205-001162	205-001163
21/64	1	2-1/2	3/8	205-001165	205-001166	205-001167	205-001168
11/32	1	2-1/2	3/8	205-001170	205-001171	205-001172	205-001173
23/64	1	2-1/2	3/8	205-001175	205-001176	205-001177	205-001178
3/8	1	2-1/2	3/8	205-001180	205-001184	205-001185	205-001186
7/16	1	2-3/4	7/16	205-001200	205-001201	205-001202	205-001203
1/2	1	3	1/2	205-001210	205-001214	205-001215	205-001216
9/16	1-1/4	3-1/2	9/16	205-001220	-	-	205-001223
5/8	1-1/4	3-1/2	5/8	205-001230	205-001231	205-001232	205-001233
11/16	1-1/2	4	3/4	205-001240	205-001241	205-001242	205-001243
3/4	1-1/2	4	3/4	205-001250	205-001251	205-001252	205-001253
7/8	1-1/2	4	7/8	205-001260	205-001261	205-001262	205-001263
1	1-1/2	4	1	205-001270	205-001271	205-001272	205-001273

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide End Mills For Ferrous And Non-Ferrous Materials



INTRO

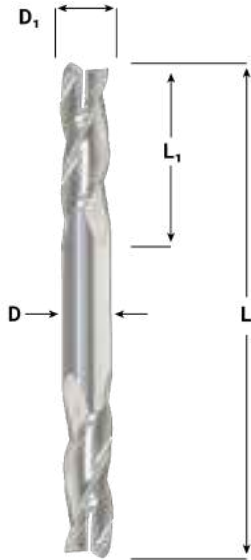
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>3-Flute Double-Ended End Mills</p> <ul style="list-style-type: none"> • Universal application • Sub-micron grade carbide substrate for wear resistance • Multiple coating options • Diameter Tol.: +0/-0.002" • Shank Tol.: +0/-0.0005" 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 205D 3FL | Stub Length | Square | Double End

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Bright
1/32	1/16	1-1/2	1/8	235-001001
3/64	3/32	1-1/2	1/8	235-001010
1/16	1/8	1-1/2	1/8	235-001020
3/32	3/16	1-1/2	1/8	235-001030
1/8	1/4	1-1/2	1/8	235-001040
3/16	3/8	2	3/16	235-001060
7/32	1/2	2-1/2	1/4	235-001070
1/4	1/2	2-1/2	1/4	235-001080
5/16	1/2	2-1/2	5/16	235-001090
3/8	9/16	2-1/2	3/8	235-001100
7/16	9/16	2-3/4	7/16	235-001110
1/2	5/8	3	1/2	235-001120

*bold numbers are EDPs for ordering

Popular Custom Milling Options

- Proprietary GWS tool coatings
- Longer lengths
- Enhanced geometry
- Special shank modifications like **SAFE-LOCK**

CUSTOM
COMES
STANDARD

GENERAL PURPOSE

Solid Carbide End Mills For Ferrous And Non-Ferrous Materials



INTRO

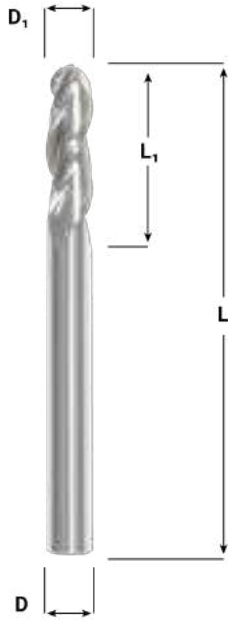
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
3-Flute Ball Nose End Mills <ul style="list-style-type: none"> • Universal application • Sub-micron grade carbide substrate for wear resistance • Multiple coating options • Diameter Tol.: +0/-0.002" • Shank Tol.: +0/-0.0005" 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 222 | 3FL | Regular Length | Ball Nose

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Bright	TiN	TiCN	AlTiN
1/32	1/8	1-1/2	1/8	222-001001	222-001002	222-001003	222-001004
3/64	1/8	1-1/2	1/8	222-001020	222-001021	222-001022	222-001023
1/16	1/4	1-1/2	1/8	222-001030	222-001031	222-001032	222-001033
5/64	1/4	1-1/2	1/8	222-001040	222-001041	222-001042	222-001043
3/32	3/8	1-1/2	1/8	222-001050	222-001051	222-001052	222-001053
7/64	3/8	1-1/2	1/8	222-001060	222-001061	222-001062	222-001063
1/8	1/2	1-1/2	1/8	222-001070	222-001071	222-001072	222-001073
5/32	9/16	2	3/16	222-001090	222-001091	222-001092	222-001093
3/16	5/8	2	3/16	222-001110	222-001111	222-001112	222-001113
13/64	5/8	2-1/2	1/4	222-001120	222-001121	222-001122	222-001123
7/32	5/8	2-1/2	1/4	222-001130	222-001131	222-001132	222-001133
15/64	3/4	2-1/2	1/4	222-001135	222-001136	222-001137	222-001138
1/4	3/4	2-1/2	1/4	222-001140	222-001141	222-001142	222-001143
17/64	3/4	2-1/2	5/16	222-001145	222-001146	222-001147	222-001148
9/32	3/4	2-1/2	5/16	222-001150	222-001151	222-001152	222-001153
19/64	13/16	2-1/2	5/16	222-001155	222-001156	222-001157	222-001158
5/16	13/16	2-1/2	5/16	222-001160	222-001161	222-001162	222-001163
21/64	1	2-1/2	3/8	222-001165	222-001166	222-001167	222-001168
11/32	1	2-1/2	3/8	222-001170	222-001171	222-001172	222-001173
23/64	1	2-1/2	3/8	222-001175	222-001176	222-001177	222-001178
3/8	1	2-1/2	3/8	222-001180	222-001181	222-001182	222-001183
13/32	1	2-3/4	7/16	222-001190	222-001191	222-001192	222-001193
7/16	1	2-3/4	7/16	222-001200	222-001201	222-001202	222-001203
1/2	1	3	1/2	222-001210	222-001211	222-001212	222-001213
9/16	1-1/4	3-1/2	9/16	222-001220	222-001221	222-001222	222-001223
5/8	1-1/4	3-1/2	5/8	222-001230	222-001231	222-001232	222-001233
11/16	1-1/2	4	3/4	222-001240	222-001241	222-001242	222-001243
3/4	1-1/2	4	3/4	222-001250	222-001251	222-001252	222-001253
7/8	1-1/2	4	7/8	222-001260	222-001261	222-001262	222-001263
1	1-1/2	4	1	222-001270	222-001271	222-001272	222-001273

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide End Mills For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION				APPLICATION		FEATURES						
4-Flute Square End Mills <ul style="list-style-type: none"> • Universal application • Sub-micron grade carbide substrate for wear resistance • Multiple coating options • Diameter Tol.: +0/-0.002" • Shank Tol.: +0/-0.0005" 												
STEEL		STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL		
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 203 | 4FL | Multi Length | Square

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Bright	TiN	TiCN	AlTiN
1/32	1/16	1-1/2	1/8	203-001001	203-001002	203-001003	203-001004
1/32	1/8	1-1/2	1/8	206-001001	206-001002	206-001003	206-001005
3/64	3/32	1-1/2	1/8	203-001010	203-001011	203-001012	203-001013
3/64	1/8	1-1/2	1/8	206-001010	206-001011	206-001013	206-001015
1/16	1/8	1-1/2	1/8	203-001020	203-001021	203-001022	203-001023
1/16	1/4	1-1/2	1/8	206-001020	206-001021	206-001022	206-001027
5/64	5/32	1-1/2	1/8	203-001030	203-001031	203-001032	203-001033
5/64	1/4	1-1/2	1/8	206-001030	206-001031	206-001032	206-001036
3/32	3/16	1-1/2	1/8	203-001040	203-001041	203-001042	203-001043
3/32	3/8	1-1/2	1/8	206-001040	206-001041	206-001042	206-001044
1/8	1/2	1-1/2	1/8	206-001060	206-001061	206-001063	206-001067
3/4	1	4	3/4	206-001238	-	-	206-001238B
3/4	1-1/2	4	3/4	206-001239	206-001241	206-001243	206-001244
7/64	7/32	1-1/2	1/8	203-001050	203-001051	203-001052	203-001053
7/64	3/8	1-1/2	1/8	206-001050	206-001051	206-001052	206-001053
1/8	1/4	1-1/2	1/8	203-001060	203-001061	203-001062	203-001063
1/8	3/4	2-1/4	1/8	215-001001	215-001002	215-001003	215-001004
1/8	3/4	2-1/4	1/8	215-001001	215-001002	215-001003	215-001004
1/8	3/4	2-1/4	1/8	215-001001	215-001002	215-001003	215-001004
1/8	1	3	1/8	218-001001	218-001002	218-001003	218-001004
1/8	1	3	1/8	218-001001	218-001002	218-001003	218-001004
1/8	1	3	1/8	218-001001	218-001002	218-001003	218-001004
9/64	9/32	2	3/16	203-001070	203-001071	203-001072	203-001073
9/64	9/16	2	3/16	206-001070	206-001071	206-001072	206-001073
5/32	5/16	2	3/16	203-001080	203-001081	203-001082	203-001083
5/32	9/16	2	3/16	206-001080	206-001081	206-001082	206-001083
5/32	3/4	2-1/2	3/16	215-001005	215-001006	215-001007	215-001008
5/32	3/4	2-1/2	3/16	215-001005	215-001006	215-001007	215-001008
5/32	3/4	2-1/2	3/16	215-001005	215-001006	215-001007	215-001008
5/32	1-1/8	3	3/16	218-001005	218-001006	218-001007	218-001008
5/32	1-1/8	3	3/16	218-001005	218-001006	218-001007	218-001008
5/32	1-1/8	3	3/16	218-001005	218-001006	218-001007	218-001008
11/64	5/16	2	3/16	203-001090	203-001091	203-001092	203-001093
11/64	9/16	2	3/16	206-001090	206-001091	206-021090	206-001093
3/16	3/8	2	3/16	203-001100	203-001101	203-001105	203-001103
3/16	5/8	2	3/16	206-001100	206-001101	206-001102	206-001107
3/16	3/4	2-1/2	3/16	215-001012	215-001013	215-001014	215-001015
3/16	3/4	2-1/2	3/16	215-001012	215-001013	215-001014	215-001015
3/16	3/4	2-1/2	3/16	215-001012	215-001013	215-001014	215-001015
3/16	1	4	3/16	218-001015	218-001015A	218-001015B	218-001015C
3/16	1	4	3/16	218-001015	218-001015A	218-001015B	218-001015C
3/16	1	4	3/16	218-001015	218-001015A	218-001015B	218-001015C
3/16	1-1/8	3	3/16	218-001010	218-001011	218-001012	218-001013
3/16	1-1/8	3	3/16	218-001010	218-001011	218-001012	218-001013
3/16	1-1/8	3	3/16	218-001010	218-001011	218-001012	218-001013

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide End Mills For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Series 203		4FL | Multi Length | Square					
Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Bright	TiN	TiCN	AITiN
13/64	3/8	2	1/4	203-001110	203-001111	203-001112	203-001113
13/64	5/8	2-1/2	1/4	206-001110	206-021110	-	206-001113
7/32	7/16	2	1/4	203-001120	203-001121	203-001122	203-001123
7/32	5/8	2-1/2	1/4	206-001120	206-001122	-	206-001123
15/64	7/16	2	1/4	203-001125	203-001126	203-001127	203-001128
15/64	3/4	2-1/2	1/4	206-001125	206-021125	-	206-001128
1/4	1/2	2	1/4	203-001130	203-001131	203-001132	203-001133
1/4	3/4	2-1/2	1/4	206-001130	206-001132	-	206-001137
1/4	1	4	1/4	218-001019	218-001019A	218-001019C	218-001019B
1/4	1	4	1/4	218-001019	218-001019A	218-001019C	218-001019B
1/4	1	4	1/4	218-001019	218-001019A	218-001019C	218-001019B
1/4	1-1/8	3	1/4	215-001020	215-001021	215-001022	215-001023
1/4	1-1/8	3	1/4	215-001020	215-001021	215-001022	215-001023
1/4	1-1/8	3	1/4	215-001020	215-001021	215-001022	215-001023
1/4	1-1/2	4	1/4	218-001020	218-001021	218-001024	218-001023
1/4	1-1/2	4	1/4	218-001020	218-001021	218-001024	218-001023
1/4	1-1/2	4	1/4	218-001020	218-001021	218-001024	218-001023
1/4	1-1/2	6	1/4	218-001025	218-001026	218-001027	218-001028
1/4	1-1/2	6	1/4	218-001025	218-001026	218-001027	218-001028
1/4	1-1/2	6	1/4	218-001025	218-001026	218-001027	218-001028
17/64	3/4	2-1/2	5/16	206-001133	206-021133	-	206-001136
9/32	1/2	2	5/16	203-001140	203-001141	203-001142	203-001143
9/32	3/4	2-1/2	5/16	206-001140	206-001143	-	206-001144
19/64	13/16	2-1/2	5/16	206-001147	206-021147	-	206-031147
5/16	1/2	2	5/16	203-001150	203-001151	203-001152	203-001153
5/16	13/16	2-1/2	5/16	206-001150	206-001152	-	206-001153
5/16	1-1/8	3	5/16	215-001030	215-001033	215-001029	215-001028
5/16	1-1/8	3	5/16	215-001030	215-001033	215-001029	215-001028
5/16	1-1/8	3	5/16	215-001030	215-001033	215-001029	215-001028
5/16	1-1/2	6	5/16	218-001029	218-001029AA	218-001029B	218-001029A
5/16	1-1/2	6	5/16	218-001029	218-001029AA	218-001029B	218-001029A
5/16	1-1/2	6	5/16	218-001029	218-001029AA	218-001029B	218-001029A
5/16	1-5/8	4	5/16	218-001030	218-001031	218-001032	218-001033
5/16	1-5/8	4	5/16	218-001030	218-001031	218-001032	218-001033
5/16	1-5/8	4	5/16	218-001030	218-001031	218-001032	218-001033
21/64	1	2-1/2	3/8	206-001154	206-021154	-	206-031154
11/32	1	2-1/2	3/8	206-001160	-	206-001162	206-001163
23/64	1	2-1/2	3/8	206-001169	-	206-021169	206-031169
3/8	5/8	2	3/8	203-001170	203-001171	203-001172	203-001173
3/8	1	4	3/8	218-001035	218-001035A	218-001037C	218-001037
3/8	1	4	3/8	218-001035	218-001035A	218-001037C	218-001037
3/8	1	4	3/8	218-001035	218-001035A	218-001037C	218-001037
3/8	1	2-1/2	3/8	206-001170	-	206-001176	206-001177
3/8	1	2-1/2	3/8	-	-	-	-
3/8	1-1/8	3	3/8	215-001040	215-001041	215-001044	215-001043
3/8	1-1/8	3	3/8	215-001040	215-001041	215-001044	215-001043
3/8	1-1/8	3	3/8	215-001040	215-001041	215-001044	215-001043
3/8	1-1/2	6	3/8	218-001045	218-001046	218-001048	218-001047
3/8	1-1/2	6	3/8	218-001045	218-001046	218-001048	218-001047
3/8	1-1/2	6	3/8	218-001045	218-001046	218-001048	218-001047
3/8	1-3/4	4	3/8	218-001040	218-001039	218-001036	218-001038
3/8	1-3/4	4	3/8	218-001040	218-001039	218-001036	218-001038
3/8	1-3/4	4	3/8	218-001040	218-001039	218-001036	218-001038
25/64	1	2-3/4	7/16	206-001175	-	206-021175	206-031175
13/32	1	2-3/4	7/16	206-001180	-	206-001182	206-001183
27/64	1	2-3/4	7/16	206-001185	-	206-021185	206-031185
7/16	5/8	2-1/2	7/16	203-001190	203-001191	203-001192	203-001193
7/16	1	2-3/4	7/16	206-001190	-	206-001192	206-001193
7/16	2	4	7/16	215-001050	215-001051	215-001052	215-001053
7/16	2	4	7/16	215-001050	215-001051	215-001052	215-001053
7/16	2	4	7/16	215-001050	215-001051	215-001052	215-001053
7/16	3	6	7/16	218-001050	218-001051	218-001052	218-001053
7/16	3	6	7/16	218-001050	218-001051	218-001052	218-001053
7/16	3	6	7/16	218-001050	218-001051	218-001052	218-001053
29/64	1	3	1/2	206-001195	206-001194	206-021195	206-031195
15/32	1	3	1/2	206-001198	206-001196	206-021198	206-001206
31/64	1	3	1/2	206-001199	206-001197	206-021199	206-031199
1/2	5/8	2-1/2	1/2	203-001200	203-001201	203-001202	203-001203
1/2	1	4	1/2	215-001054	215-001054A	215-001054C	215-001054B
1/2	1	4	1/2	215-001054	215-001054A	215-001054C	215-001054B
1/2	1	4	1/2	215-001054	215-001054A	215-001054C	215-001054B
1/2	1-1/2	4	1/2	215-001059	215-001058	215-001057	215-001056
1/2	1-1/2	4	1/2	215-001059	215-001058	215-001057	215-001056
1/2	1-1/2	4	1/2	215-001059	215-001058	215-001057	215-001056
1/2	1-1/2	6	1/2	218-001053A	218-001061	218-001062	218-001059
1/2	1-1/2	6	1/2	218-001053A	218-001061	218-001062	218-001059

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide End Mills For Ferrous And Non-Ferrous Materials



Series 203		4FL | Multi Length | Square					
Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Bright	TiN	TiCN	AITiN
1/2	1-1/2	6	1/2	218-001053A	218-001061	218-001062	218-001059
1/2	2	4	1/2	215-001060	215-001063	215-001065	215-001067
1/2	2	4	1/2	215-001060	215-001063	215-001065	215-001067
1/2	2	4	1/2	215-001060	215-001063	215-001065	215-001067
1/2	3	6	1/2	218-001053AA	218-001056	218-001057	218-001058
1/2	3	6	1/2	218-001053AA	218-001056	218-001057	218-001058
1/2	3	6	1/2	218-001053AA	218-001056	218-001057	218-001058
1/2	4	7	1/2	218-001150	-	-	218-001150B
1/2	5	8	1/2	218-001151	-	-	218-001151B
1/2	1	3	1/2	206-001200	206-001201	206-001204	206-001207
1/2	1-1/4	3	1/2	206-001203	206-001203B	206-001203C	206-001203A
33/64	1-1/4	3-1/2	9/16	206-001208	206-001208A	206-001208B	206-001218
17/32	1-1/4	3-1/2	9/16	206-001209	206-001209A	206-001209C	206-001219
9/16	1-1/4	3-1/2	9/16	206-001210	206-001211	206-001212	206-001213
19/32	1-1/4	3-1/2	5/8	206-001217	206-001217A	206-001217C	206-001217B
5/8	3/4	3	5/8	203-001220	203-001221	203-001222	203-001223
5/8	1-1/4	3-1/2	5/8	206-001220	206-001221	206-001225	206-001226
5/8	1-1/2	6	5/8	218-001074	218-001075	218-001076	218-001074A
5/8	1-1/2	6	5/8	218-001074	218-001075	218-001076	218-001074A
5/8	1-1/2	6	5/8	218-001074	218-001075	218-001076	218-001074A
5/8	2-1/4	5	5/8	215-001070	215-001071	215-001072	215-001073
5/8	2-1/4	5	5/8	215-001070	215-001071	215-001072	215-001073
5/8	2-1/4	5	5/8	215-001070	215-001071	215-001072	215-001073
5/8	3	6	5/8	218-001070	218-001071	218-001072	218-001073
5/8	3	6	5/8	218-001070	218-001071	218-001072	218-001073
5/8	3	6	5/8	218-001070	218-001071	218-001072	218-001073
5/8	4	7	5/8	218-001152	-	-	218-001152B
5/8	5	8	5/8	218-001153	-	-	218-001153B
5/8	6	9	5/8	218-001154	-	-	218-001154B
41/64	1-1/2	4	3/4	206-001236	206-001236A	206-001236C	206-001237
21/32	1-1/2	4	3/4	206-001228	206-001228A	206-001228C	206-001228B
11/16	1-1/2	4	3/4	206-001230	206-001231	206-001232	206-001233
47/64	1-1/2	4	3/4	206-001237F	206-001237FA	206-001237FC	206-001237FB
3/4	1	3	3/4	203-001240	203-001241	203-001242	203-001243
3/4	1-1/2	6	3/4	218-001101	218-001101A	218-001101B	218-001102
3/4	1-1/2	6	3/4	218-001101	218-001101A	218-001101B	218-001102
3/4	1-1/2	6	3/4	218-001101	218-001101A	218-001101B	218-001102
3/4	2-1/4	5	3/4	215-001080	215-001081	215-001082	215-001083
3/4	2-1/4	5	3/4	215-001080	215-001081	215-001082	215-001083
3/4	2-1/4	5	3/4	215-001080	215-001081	215-001082	215-001083
3/4	3	6	3/4	218-001080	218-001082	218-001086	218-001079
3/4	3	6	3/4	218-001080	218-001082	218-001086	218-001079
3/4	3	6	3/4	218-001080	218-001082	218-001086	218-001079
3/4	4	7	3/4	218-001081	218-001083	218-001087	218-001084
3/4	4	7	3/4	218-001081	218-001083	218-001087	218-001084
3/4	4	7	3/4	218-001081	218-001083	218-001087	218-001084
3/4	5	8	3/4	218-001155	-	-	218-001155B
3/4	6	9	3/4	218-001156	-	-	218-001156B
3/4	8	12	3/4	218-001157	-	-	218-001157B
13/16	1-1/2	4	7/8	206-001245	206-001245A	206-001245C	206-001246
7/8	1-1/2	4	7/8	206-001250	206-001251	206-001252	206-001254
15/16	1-1/2	4	1	206-001255	206-001255A	206-001255C	206-001256
1	1	4	1	206-001259	-	-	206-001259B
1	1-1/2	4	1	206-001260	206-001261	206-001263	206-001264
1	1	3	1	203-001260	203-001261	203-001262	203-001263
1	1-1/2	6	1	218-001103	218-001105	218-001106	218-001104
1	1-1/2	6	1	218-001103	218-001105	218-001106	218-001104
1	1-1/2	6	1	218-001103	218-001105	218-001106	218-001104
1	2-1/4	5	1	215-001090	215-001091	215-001092	215-001093
1	2-1/4	5	1	215-001090	215-001091	215-001092	215-001093
1	3	6	1	218-001090	218-001088	218-001097	218-001094
1	3	6	1	218-001090	218-001088	218-001097	218-001094
1	3	6	1	218-001090	218-001088	218-001097	218-001094
1	4	7	1	218-001091	218-001089	218-001098	218-001095
1	4	7	1	218-001091	218-001089	218-001098	218-001095
1	4	7	1	218-001091	218-001089	218-001098	218-001095
1	5	8	1	218-001158	-	-	218-001158B
1	6	9	1	218-001159	-	-	218-001159B
1	7	10	1	218-001160	-	-	218-001160B
1	8	12	1	218-001161	-	-	218-001161B
1-1/4	2	4-1/2	1-1/4	206-001266	206-001266A	206-001266C	206-001266B

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Solid Carbide End Mills For Ferrous And Non-Ferrous Materials



INTRO

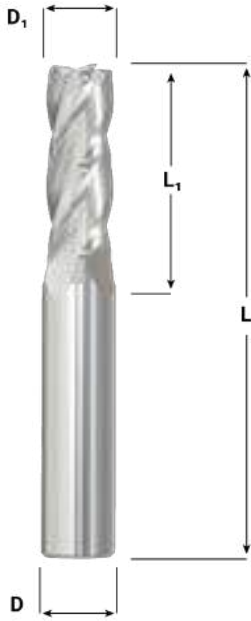
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>4-Flute Metric Square End Mills</p> <ul style="list-style-type: none"> • Universal application • Sub-micron grade carbide substrate for wear resistance • Multiple coating options • Diameter Tol.: +0/-0.002" • Shank Tol.: +0/-0.0005" • All listed dimensions in millimeters 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 203M | 4FL | Multi Length | Square | Metric

Dia. (D ₁)	LOC (L ₁)	OAL (L)	Shank (D)	Bright	TiN	TiCN	AlTiN
1	4	39	3	206-001275	206-001275A	206-001270AA	206-001272
1.5	5	39	3	206-001285	206-001285A	206-001285C	206-001287
2	8	39	3	206-001295	206-001295A	206-001295C	206-001292
2.5	9.5	39	3	206-001300	206-001300A	206-001300C	206-001302
3	12	39	3	206-001313	206-001311	206-001313C	206-001314
3.5	12	51	4	206-001320	206-001320A	206-001320C	206-001322
4	14	51	4	206-001330	206-001330A	206-001330C	206-001330B
4.5	16	51	5	206-001340	206-001340A	206-001340C	206-001340B
5	16	51	5	206-001350	206-001350A	206-001350C	206-001350B
6	19	63	6	206-001360	206-001360A	206-001360C	206-001360B
7	19	63	8	206-001370	206-001370A	206-001370C	206-001372
8	20	63	8	206-001380	206-001380A	206-001380C	206-001380B
9	22	63	10	206-001390	206-001390A	206-001390C	206-001390B
10	22	76	10	206-001400	206-001400A	206-001400C	206-001402
11	25	76	12	206-001410	206-001410A	206-001410C	206-001412
12	25	76	12	206-001420	206-001420A	206-001420C	206-001420B
14	32	90	14	206-001430	206-001430A	206-001430C	206-001430B
16	32	102	16	206-001440	206-001440A	206-001440C	206-001442
18	38	102	18	206-001450	206-001450A	206-001450C	206-001452
20	38	102	20	206-001460	206-001460A	206-001460C	206-001460B
22	38	102	22	206-001470	206-001470A	206-001470C	206-001470B
25	38	102	25	206-001480	206-001480A	206-001480C	206-001480B

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide End Mills For Ferrous And Non-Ferrous Materials



INTRO

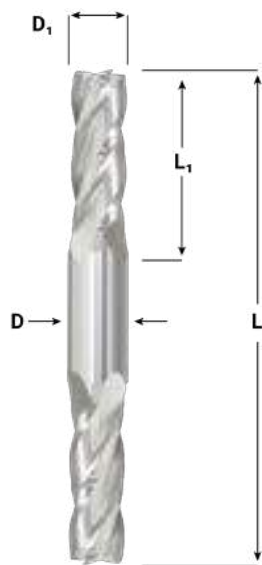
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION				APPLICATION		FEATURES						
4-Flute Double-Ended Square End Mills <ul style="list-style-type: none"> • Universal application • Sub-micron grade carbide substrate for wear resistance • Multiple coating options • Weldon flat for regular length sizes • Diameter Tol.: +0/-0.002" • Shank Tol.: +0/-0.0005" 												
STEEL		STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL		
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 203D 4FL | Multi Length | Square | Double End

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Weldon	Bright	TiN	TiCN	AlTiN
1/32	1/16	1-1/2	1/8	No	236-001001	236-001011	236-001003	236-001004
3/64	3/32	1-1/2	1/8	No	236-001010	236-001012	236-001013	236-001014
1/16	1/8	1-1/2	1/8	No	236-001020	236-001021	236-001028	236-031025
5/64	1/8	1-1/2	1/8	No	236-001025	236-001026	236-021025	236-001027
3/32	3/16	1-1/2	1/8	No	236-001030	236-001031	236-001037	236-001034
7/64	3/16	1-1/2	1/8	No	236-001035	236-001036	236-021036	236-031035
1/8	1/4	1-1/2	1/8	No	236-001040	236-001041	236-001045	236-001047
1/8	3/8	3	3/8	Yes	239-001001	239-001002	-	239-001003
9/64	5/16	2	3/16	No	236-001042	236-001044	236-021044	236-031042
5/32	5/16	2	3/16	No	236-001050	236-001051	236-001053	236-001054
5/32	7/16	3	3/8	Yes	239-001010	239-001011	-	239-001013
11/64	5/16	2	3/16	No	236-001055	236-001056	236-021055	236-001057
3/16	3/8	2	3/16	No	236-001060	236-001061	236-001062	236-001064
3/16	1/2	3	3/8	Yes	239-001020	239-001021	-	239-001023
13/64	1/2	2-1/2	1/4	No	236-001065	236-001066	236-021065	236-031065
7/32	1/2	2-1/2	1/4	No	236-001070	236-001071	236-001073	236-001074
7/32	9/16	3-1/2	3/8	Yes	239-001030	-	-	239-001033
15/64	1/2	2-1/2	1/4	No	236-001075	236-001076	236-021075	236-031075
1/4	1/2	2-1/2	1/4	No	236-001080	236-001081	236-001083	236-001085
1/4	5/8	3-1/2	3/8	Yes	239-001040	239-001041	-	239-001043
9/32	1/2	2-1/2	5/16	No	236-001082	236-001087	236-001088	236-001089
9/32	11/16	3-1/2	3/8	Yes	239-001050	-	-	239-001053
5/16	1/2	2-1/2	5/16	No	236-001090	236-001091	236-001093	236-001094
5/16	3/4	3-1/2	3/8	Yes	239-001060	239-001061	-	239-001063
11/32	9/16	2-1/2	3/8	No	236-001092	236-001095	236-001096	236-031092
11/32	3/4	3-1/2	3/8	Yes	239-001070	-	-	239-001073
3/8	9/16	2-1/2	3/8	No	236-001100	236-001101	236-001102	236-001103
3/8	3/4	3-1/2	3/8	Yes	239-001080	-	-	239-001083
7/16	9/16	2-3/4	7/16	No	236-001110	236-021111	236-001111	236-031110
7/16	7/8	4	1/2	Yes	239-001090	-	-	239-001093
1/2	5/8	3	1/2	No	236-001120	236-001121	236-001122	236-001124
1/2	1	4	1/2	Yes	239-001100	239-001101	239-001102	239-001103

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide End Mills For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES																																							
4-Flute Corner Radius End Mills <ul style="list-style-type: none"> • Universal application • Sub-micron grade carbide substrate for wear resistance • Multiple coating options • Diameter Tol.: +0/-0.002" • Shank Tol.: +0/-0.0005" 																																									
<table border="1"> <thead> <tr> <th colspan="3">STEEL</th> <th colspan="2">STAINLESS</th> <th colspan="2">CAST IRON</th> <th colspan="2">NON-FERROUS</th> <th colspan="2">HSSA</th> <th colspan="2">HARDENED STEEL</th> </tr> <tr> <th>P1</th> <th>P2</th> <th>P3</th> <th>M1</th> <th>M2</th> <th>K1</th> <th>K2</th> <th>N1</th> <th>N2</th> <th>S1</th> <th>S2</th> <th>H1</th> <th>H2</th> </tr> </thead> <tbody> <tr> <td>○</td> <td>○</td> <td>○</td> <td></td> <td></td> <td>○</td> <td>○</td> <td>○</td> <td>○</td> <td></td> <td></td> <td>○</td> <td></td> </tr> </tbody> </table>			STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL		P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2	○	○	○			○	○	○	○			○	
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL																														
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																													
○	○	○			○	○	○	○			○																														

● Best ○ Good

Series 206 | 4FL | Multi Length | Corner Radius

Dia. (D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	Bright	TiN	TiCN	AlTiN
1/8	1/2	1-1/2	1/8	0.005	206-602297	-	-	206-602298
1/8	1/2	1-1/2	1/8	0.010	206-602300	206-602301	206-602302	206-602303
1/8	1/2	1-1/2	1/8	0.015	206-602306	206-602307	206-602308	206-602309
1/8	1/2	1-1/2	1/8	0.020	206-602312	206-602313	206-602314	206-602315
1/8	1/2	1-1/2	1/8	0.030	206-602318	206-602319	206-602320	206-602321
3/16	5/8	2	3/16	0.010	206-602424	206-602425	206-602426	206-602427
3/16	5/8	2	3/16	0.015	206-602430	206-602431	206-602432	206-602433
3/16	5/8	2	3/16	0.020	206-602436	206-602437	206-602438	206-602439
3/16	5/8	2	3/16	0.030	206-602442	206-602443	206-602444	206-602445
3/16	5/8	2	3/16	0.045	206-602448	206-602449	206-602450	206-602451
3/16	5/8	2	3/16	0.050	206-602452	-	-	206-602455
3/16	5/8	2	3/16	0.060	206-602453	-	-	206-602456
1/4	3/4	2-1/2	1/4	0.005	206-602545	-	-	-
1/4	3/4	2-1/2	1/4	0.010	206-602548	-	-	206-602549
1/4	3/4	2-1/2	1/4	0.015	206-602551	206-602552	206-602553	206-602554
1/4	3/4	2-1/2	1/4	0.020	206-602557	206-602558	206-602559	206-602560
1/4	3/4	2-1/2	1/4	0.025	206-602563	206-602564	206-602565	206-602566
1/4	3/4	2-1/2	1/4	0.030	206-602569	206-602570	206-602571	206-602572
1/4	3/4	2-1/2	1/4	0.045	206-602575	206-602576	206-602577	206-602578
1/4	3/4	2-1/2	1/4	0.060	206-602581	206-602582	206-602583	206-602584
1/4	3/4	2-1/2	1/4	0.090	206-602595	-	-	206-602598
5/16	13/16	2-1/2	5/16	0.015	206-602684	206-602685	206-602686	206-602687
5/16	13/16	2-1/2	5/16	0.020	206-602690	206-602691	206-602692	206-602693
5/16	13/16	2-1/2	5/16	0.025	206-602696	206-602697	206-602698	206-602699
5/16	13/16	2-1/2	5/16	0.030	206-602702	206-602703	206-602704	206-602705
5/16	13/16	2-1/2	5/16	0.045	206-602708	206-602709	206-602710	206-602711
5/16	13/16	2-1/2	5/16	0.060	206-602714	206-602715	206-602716	206-602717
5/16	13/16	2-1/2	5/16	0.090	206-602719	-	-	206-602722
5/16	13/16	2-1/2	5/16	0.125	206-602723	-	-	206-602726
3/8	1	2-1/2	3/8	0.015	206-602820	206-602821	206-602822	206-602823
3/8	1	2-1/2	3/8	0.020	206-602826	206-602827	206-602828	206-602829
3/8	1	2-1/2	3/8	0.025	206-602832	206-602833	206-602834	206-602835
3/8	1	2-1/2	3/8	0.030	206-602838	206-602839	206-602840	206-602841
3/8	1	2-1/2	3/8	0.045	206-602844	206-602845	206-602846	206-602847
3/8	1	2-1/2	3/8	0.060	206-602850	206-602851	206-602852	206-602853
3/8	1	2-1/2	3/8	0.090	206-602856	206-602857	206-602858	206-602859
3/8	1	2-1/2	3/8	0.125	206-602860	-	-	206-602863
7/16	1	2-3/4	7/16	0.015	206-602961	206-602962	206-602963	206-602964
7/16	1	2-3/4	7/16	0.020	206-602967	206-602968	206-602969	206-602970
7/16	1	2-3/4	7/16	0.025	206-602974	206-602975	206-602976	206-602977
7/16	1	2-3/4	7/16	0.030	206-602980	206-602981	206-602982	206-602983
7/16	1	2-3/4	7/16	0.045	206-602986	206-602987	206-602988	206-602989
7/16	1	2-3/4	7/16	0.060	206-602992	206-602993	206-602994	206-602995
7/16	1	2-3/4	7/16	0.090	206-602998	206-602999	206-603000	206-603001
7/16	1	2-3/4	7/16	0.125	206-603002	-	-	206-603002B

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide End Mills For Ferrous And Non-Ferrous Materials



Series 206 | 4FL | Multi Length | Corner Radius

Dia. (D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	Bright	TiN	TiCN	AlTiN
1/2	1	3	1/2	0.015	206-603003	206-603004	206-603005	206-603006
1/2	1	3	1/2	0.020	206-603009	206-603010	206-603011	206-603012
1/2	1	3	1/2	0.025	206-603015	206-603016	206-603017	206-603018
1/2	1	3	1/2	0.030	206-603021	206-603022	206-603023	206-603024
1/2	1	3	1/2	0.045	206-603027	206-603028	206-603029	206-603030
1/2	1	3	1/2	0.060	206-603033	206-603034	206-603035	206-603036
1/2	1	3	1/2	0.090	206-603039	206-603040	206-603041	206-603042
1/2	1	3	1/2	0.125	206-603045	206-603046	206-603047	206-603048
5/8	1-1/4	3-1/2	5/8	0.015	206-603150	206-603151	206-603152	206-603153
5/8	1-1/4	3-1/2	5/8	0.020	206-603156	206-603157	206-603158	206-603159
5/8	1-1/4	3-1/2	5/8	0.025	206-603162	206-603163	206-603164	206-603165
5/8	1-1/4	3-1/2	5/8	0.030	206-603168	206-603169	206-603170	206-603171
5/8	1-1/4	3-1/2	5/8	0.045	206-603174	206-603175	206-603176	206-603177
5/8	1-1/4	3-1/2	5/8	0.060	206-603180	206-603181	206-603182	206-603183
5/8	1-1/4	3-1/2	5/8	0.090	206-603186	206-603187	206-603188	206-603189
5/8	1-1/4	3-1/2	5/8	0.125	206-603192	206-603193	206-603194	206-603195
3/4	1-1/2	4	3/4	0.015	206-603297	206-603298	206-603299	206-603300
3/4	1-1/2	4	3/4	0.020	206-603303	206-603304	206-603305	206-603306
3/4	1-1/2	4	3/4	0.025	206-603309	206-603310	206-603311	206-603312
3/4	1-1/2	4	3/4	0.030	206-603315	206-603316	206-603317	206-603318
3/4	1-1/2	4	3/4	0.045	206-603321	206-603322	206-603323	206-603324
3/4	1-1/2	4	3/4	0.060	206-603327	206-603328	206-603329	206-603330
3/4	1-1/2	4	3/4	0.090	206-603333	206-603334	206-603335	206-603336
3/4	1-1/2	4	3/4	0.125	206-603339	206-603340	206-603341	206-603342
3/4	1-1/2	4	3/4	0.190	206-603345	206-603346	206-603347	206-603348
3/4	1-1/2	4	3/4	0.250	206-603350	-	-	206-603353
1	1-1/2	4	1	0.015	206-603450	206-603451	206-603452	206-603453
1	1-1/2	4	1	0.020	206-603456	206-603457	206-603458	206-603459
1	1-1/2	4	1	0.025	206-603462	206-603463	206-603464	206-603465
1	1-1/2	4	1	0.030	206-603468	206-603469	206-603470	206-603471
1	1-1/2	4	1	0.045	206-603474	206-603475	206-603476	206-603477
1	1-1/2	4	1	0.060	206-603480	206-603481	206-603482	206-603483
1	1-1/2	4	1	0.090	206-603486	206-603487	206-603488	206-603489
1	1-1/2	4	1	0.125	206-603492	206-603493	206-603494	206-603495
1	1-1/2	4	1	0.190	206-603498	206-603499	206-603500	206-603501
1	1-1/2	4	1	0.250	206-603504	206-603505	206-603506	206-603507

*bold numbers are EDPs for ordering

Popular Custom Milling Options

- Proprietary GWS tool coatings
- Longer lengths
- Enhanced geometry
- Special shank modifications like **SAFE-LOCK**

CUSTOM COMES STANDARD

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Solid Carbide End Mills For Ferrous And Non-Ferrous Materials



INTRO

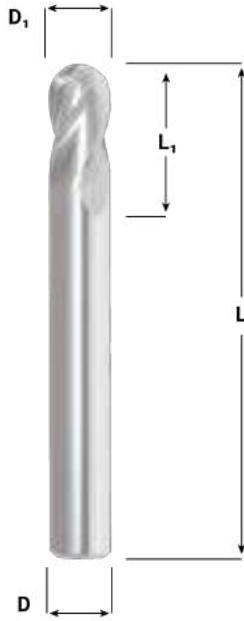
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
4-Flute Ball Nose End Mills <ul style="list-style-type: none"> • Universal application • Sub-micron grade carbide substrate for wear resistance • Multiple coating options • Diameter Tol.: +0/-0.002" • Shank Tol.: +0/-0.0005" 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 220 | 4FL | Multi Length | Ball Nose

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Bright	TiN	TiCN	AlTiN
1/64	3/64	1-1/2	1/8	223-000998	223-000995	223-020998	223-001007
1/32	1/8	1-1/2	1/8	223-000999	223-001003	223-000996	223-001009
3/64	1/8	1-1/2	1/8	223-001000	223-001004	223-021000	223-001014
1/16	1/4	1-1/2	1/8	223-001001	223-001002	223-001015	223-001016
5/64	1/4	1-1/2	1/8	223-001005	223-001006	223-001008	223-001019
3/32	3/8	1-1/2	1/8	223-001010	223-001011	223-001012	223-001013
7/64	3/8	1-1/2	1/8	223-001017	223-001052	223-021051	223-001039
1/8	1/2	1-1/2	1/8	223-001020	223-001021	223-001023	223-001028
1/8	3/4	2-1/4	1/8	226-001001	226-001002	226-001003	226-001004
1/8	1	3	1/8	229-001001	229-001002	229-001003	229-001004
9/64	9/16	2	3/16	223-001025	223-001026	223-001027	223-001029
5/32	9/16	2	3/16	223-001030	223-001031	223-001033	223-001032
5/32	3/4	2-1/2	3/16	226-001005	226-001006	226-001008	226-001007
5/32	1-1/8	3	3/16	229-001005	229-001006	229-001008	229-001009
11/64	9/16	2	3/16	223-001035	223-001055	223-021054	223-001043
3/16	5/8	2	3/16	223-001040	223-001041	223-001042	223-001034
3/16	3/4	2-1/2	3/16	226-001012	226-001013	226-001014	226-001016
3/16	1	4	3/16	229-001015	-	-	-
3/16	1-1/8	3	3/16	229-001010	229-001011	229-001012	229-001014
13/64	5/8	2-1/2	1/4	223-001046	223-001059	223-021058	223-001047
7/32	5/8	2-1/2	1/4	223-001050	223-001056	223-001037	223-001036
15/64	3/4	2-1/2	1/4	223-001053	223-001057	223-021053	223-001045
1/4	3/4	2-1/2	1/4	223-001060	223-001062	223-001063	223-001066
1/4	1-1/8	3	1/4	226-001020	226-001021	226-001022	226-001024
1/4	1-1/2	4	1/4	229-001020	229-001021	229-001022	229-001024
1/4	1-1/2	6	1/4	229-001026	229-001026A	229-001026C	229-001027
17/64	3/4	2-1/2	5/16	223-001061	223-001064	223-021061	223-031061
9/32	3/4	2-1/2	5/16	223-001070	223-001065	223-001067	223-001068
19/64	13/16	2-1/2	5/16	223-001071	223-001072	223-021071	223-031071
5/16	13/16	2-1/2	5/16	223-001080	223-001082	223-001083	223-001073
5/16	1-1/8	3	5/16	226-001030	226-001031	226-001032	226-001034
5/16	1-1/2	6	5/16	229-001035	229-001035A	229-001035C	229-001036
5/16	1-5/8	4	5/16	229-001030	229-001031	229-001032	229-001034
21/64	1	2-1/2	3/8	223-001084	223-001085	223-021084	223-031084
11/32	1	2-1/2	3/8	223-001086	223-001087	223-001169	223-001115
23/64	1	2-1/2	3/8	223-001088	223-001089	223-021088	223-031088
3/8	1	2-1/2	3/8	223-001090	223-001092	223-001093	223-001116
3/8	1-1/8	3	3/8	226-001040	226-001041	226-001042	226-001044
3/8	1-1/2	6	3/8	229-001046	229-001048	229-001049	229-001047
3/8	1-3/4	4	3/8	229-001040	229-001041	229-001042	229-001044
25/64	1	2-3/4	7/16	223-001094	223-001096	223-021094	223-031094
13/32	1	2-3/4	7/16	223-001095	223-001097	223-021095	223-001117
27/64	1	2-3/4	7/16	223-001098	223-001099	223-021098	223-031098
7/16	1	2-3/4	7/16	223-001100	223-001101	223-001102	223-001118
7/16	2	4	7/16	226-001050	226-001051	226-001052	226-001054

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide End Mills For Ferrous And Non-Ferrous Materials



Series 220 | 4FL | Multi Length | Ball Nose

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Bright	TiN	TiCN	AlTiN
7/16	3	6	7/16	229-001050	229-001051	229-001052	229-001053
29/64	1	3	1/2	223-001103	223-001104	223-021103	223-031103
15/32	1	3	1/2	223-001105	223-001107	223-001121	223-001119
31/64	1	3	1/2	223-001109	223-001108	223-021108	223-031108
1/2	1	3	1/2	223-001110	223-001111	223-001112	223-001114
1/2	1-1/2	4	1/2	226-001059	226-001057	226-001058	226-001059A
1/2	1-1/2	6	1/2	229-001053A	229-001055	229-001056	229-001057
1/2	2	4	1/2	226-001060	226-001061	226-001062	226-001064
1/2	3	6	1/2	229-001053AA	229-001066	229-001067	229-001068
9/16	1-1/4	3-1/2	9/16	223-001120	223-001125	223-001126	223-001127
5/8	1-1/4	3-1/2	5/8	223-001130	223-001131	223-001132	223-001135
5/8	1-1/2	6	5/8	229-001076	229-001076A	229-001076C	229-001077
5/8	2-1/4	5	5/8	226-001070	226-001071	226-001072	226-001074
5/8	3	6	5/8	229-001070	229-001071	229-001072	229-001074
11/16	1-1/2	4	3/4	223-001140	223-001155	223-021156	223-001167
3/4	1-1/2	4	3/4	223-001150	223-001151	223-001152	223-001154
3/4	1-1/2	6	3/4	229-001085	229-001085A	229-001085C	229-001086
3/4	2-1/4	5	3/4	226-001080	226-001081	226-001082	226-001084
3/4	3	6	3/4	229-001080	229-001081	229-001082	229-001084
3/4	4	7	3/4	229-001080A	-	229-001080C	229-001080B
7/8	1-1/2	4	7/8	223-001157	223-001159	223-021157	223-001165
1	1-1/2	4	1	223-001160	223-001162	-	223-001163
1	1-1/2	6	1	229-001095	229-001095C	-	229-001096
1	2-1/4	5	1	226-001090	226-001092	-	226-001097
1	3	6	1	229-001090	229-001092	-	229-001094

*bold numbers are EDPs for ordering

Popular Custom Milling Options

Proprietary GWS tool coatings
 Longer lengths
 Enhanced geometry
 Special shank modifications like **SAFE-LOCK**[®]

CUSTOM COMES STANDARD

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Solid Carbide End Mills For Ferrous And Non-Ferrous Materials



INTRO

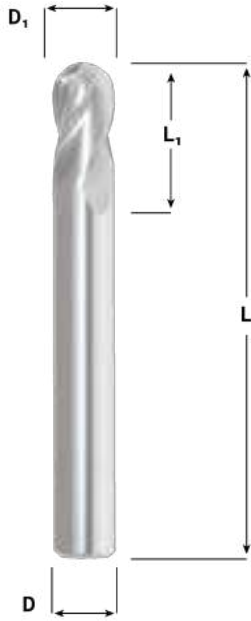
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>4-Flute Metric Ball Nose End Mills</p> <ul style="list-style-type: none"> • Universal application • Sub-micron grade carbide substrate for wear resistance • Multiple coating options • Diameter Tol.: +0/-0.002" • Shank Tol.: +0/-0.0005" • All listed dimensions in millimeters 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 220M | 4FL | Multi Length | Ball Nose | Metric

Dia. (D ₁)	LOC (L ₁)	OAL (L)	Shank (D)	Bright	TiN	TiCN	AlTiN
1	4	39	3	223-001400	-	223-001400C	223-001400B
1.5	4.5	39	3	223-001405	223-001410C	-	223-001410B
2	8	39	3	223-001421	-	-	223-001420B
2.5	9.5	39	3	223-001425	-	223-001425C	223-001425B
3	12	39	3	223-001430	-	223-001430C	223-001430B
3.5	12	51	4	223-001435	-	223-001435C	223-001435B
4	14	51	4	223-001440	-	223-001440C	223-001440B
4.5	16	51	5	223-001445	-	223-001445C	223-001445B
5	16	51	5	223-001450	-	223-001450C	223-001450B
6	19	63	6	223-001460	-	223-001460C	223-001460B
7	19	63	8	223-001470	-	223-001470C	223-001470B
8	20	63	8	223-001480	-	223-001480C	223-001480B
9	22	63	10	223-001490	223-001490C	-	223-001490B
10	22	76	10	223-001500	-	223-001500C	223-001500B
11	25	76	12	223-001510	-	223-001510C	223-001510B
12	25	76	12	223-001520	-	223-001520C	223-001520B
14	32	90	14	223-001540	-	223-001540C	223-001540B
16	32	102	16	223-001560	-	223-001560C	223-001560B
18	38	102	18	223-001580	-	223-001580C	223-001580B
20	38	102	20	223-001600	-	223-001600C	223-001600B
22	38	102	22	223-001620	-	-	223-001620B
25	38	102	25	223-001650	-	-	223-001650B

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide End Mills For Ferrous And Non-Ferrous Materials



INTRO

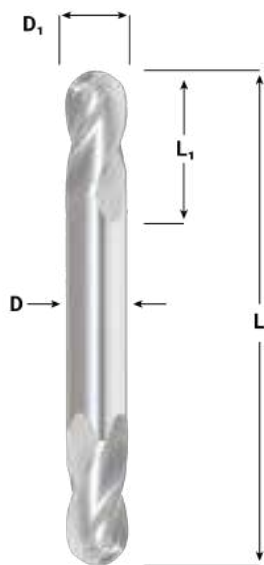
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION				APPLICATION		FEATURES						
4-Flute Double-Ended Ball Nose End Mills <ul style="list-style-type: none"> • Universal application • Sub-micron grade carbide substrate for wear resistance • Multiple coating options • Weldon flat for regular length sizes • Diameter Tol.: +0/-0.002" • Shank Tol.: +0/-0.0005" 												
STEEL		STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL		
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 220D 4FL | Multi Length | Ball Nose | Double End

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Weldon	Bright	TiN	TiCN	AlTiN
1/32	1/16	1-1/2	1/8	No	242-001001	242-001011	242-021001	242-031011
3/64	3/32	1-1/2	1/8	No	242-001010	242-001012	242-021010	242-031012
1/16	1/8	1-1/2	1/8	No	242-001010A	242-001021	242-001022	242-031026
5/64	1/8	1-1/2	1/8	No	242-001019	242-001026	242-001027	242-031021
3/32	3/16	1-1/2	1/8	No	242-001030	242-001031	242-001032	242-031031
7/64	3/16	1-1/2	1/8	No	242-001035	242-001036	242-001037	242-031036
1/8	1/4	1-1/2	1/8	No	242-001040	242-001041	242-001042	242-001043
9/64	5/16	2	3/16	No	242-001044	242-001045	242-001046	242-031044
5/32	5/16	2	3/16	No	242-001050	242-001051	242-001052	242-001053
11/64	5/16	2	3/16	No	242-001055	242-001056	242-001057	242-031055
3/16	3/8	2	3/16	No	242-001060	242-001061	242-001062	242-001063
13/64	1/2	2-1/2	1/4	No	242-001065	242-001066	242-001067	242-031065
7/32	1/2	2-1/2	1/4	No	242-001070	242-001071	242-001072	242-031070
15/64	1/2	2-1/2	1/4	No	242-001075	242-001076	242-001077	242-031075
1/4	1/2	2-1/2	1/4	No	242-001080	242-001081	242-001082	242-001083
17/64	1/2	2-1/2	5/16	No	242-001084	-	-	-
9/32	1/2	2-1/2	5/16	No	242-001085	242-001087	242-001088	242-031085
19/64	1/2	2-1/2	5/16	No	242-001147	-	-	-
5/16	1/2	2-1/2	5/16	No	242-001090	242-001091	242-001093	242-001094
11/32	9/16	2-1/2	3/8	No	242-001092	242-001095	242-001096	242-031092
3/8	9/16	2-1/2	3/8	No	242-001100	242-001101	242-001102	242-001104
7/16	9/16	2-3/4	7/16	No	242-001110	242-001111	242-001112	242-001114
1/2	5/8	3	1/2	No	242-001120	242-001121	242-001122	242-001124
1/2	1	4	1/2	Yes	245-001100	-	-	245-001103
1/4	5/8	3-1/2	3/8	Yes	245-001040	245-001041	-	245-001043
1/8	3/8	3	3/8	Yes	245-001001	245-001002	-	245-001003
11/32	3/4	3-1/2	3/8	Yes	245-001070	-	-	245-001073
3/16	1/2	3	3/8	Yes	245-001020	-	-	245-001023
3/8	3/4	3-1/2	3/8	Yes	245-001080	-	-	245-001083
5/16	3/4	3-1/2	3/8	Yes	245-001060	-	-	245-001063
5/32	7/16	3	3/8	Yes	245-001010	-	-	245-001013
7/16	7/8	4	1/2	Yes	245-001090	-	-	245-001093
7/32	9/16	3-1/2	3/8	Yes	245-001030	-	-	245-001033
9/32	11/16	3-1/2	3/8	Yes	245-001050	-	-	245-001053

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide Micro End Mills For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Micro 2-Flute Square Mills</p> <ul style="list-style-type: none"> • Universal application • Sub-micron grade carbide substrate for wear resistance • Multiple coating options • Diameter Tol.: +/- 0.0005" • Shank Tol.: +0/-0.0003" • LOC Tol.: +0/-0.0120" 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 250 2FL | Square | Micro

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Bright	AITiN
0.016	0.125	2.50	1/8	251-001000	251-001000B
0.031	0.250	2.50	1/8	251-001001	251-001001B
0.031	0.375	2.50	1/8	251-001002	251-001002B
0.047	0.250	2.50	1/8	251-001010	251-001010B
0.047	0.375	2.50	1/8	251-001011	251-001011B
0.047	0.500	2.50	1/8	251-001013	251-001013B
0.063	0.500	2.50	1/8	251-001020	251-001020B
0.063	0.750	2.50	1/8	251-001021	251-001021B
0.063	1.000	2.50	1/8	251-001022	251-001022B
0.078	0.500	2.50	1/8	251-001030	251-001030B
0.094	0.500	2.50	1/8	251-001040	251-001040B
0.094	0.750	2.50	1/8	251-001041	251-001041B

*bold numbers are EDPs for ordering

Popular Custom Milling Options

- Proprietary GWS tool coatings
- Longer lengths
- Enhanced geometry
- Special shank modifications like **SAFE-LOCK**

CUSTOM
COMES
STANDARD

GENERAL PURPOSE

Solid Carbide Micro End Mills For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Micro 2-Flute Radius Mills</p> <ul style="list-style-type: none"> • Micro mills • Universal application with 30° helix • Sub-micron grade carbide substrate for wear resistance • Multiple coating options • Diameter Tol.: +/- 0.0005" • Shank Tol.: +0/-0.0003" • LOC Tol.: +0/-0.0120" 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 251 | 2FL | Corner Radius | Micro

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	Bright	AlTiN
0.010	0.015	1.50	1/8	0.002	250-6201002	250-6201002B
0.010	0.030	1.50	1/8	0.002	250-5201002	250-5201002B
0.015	0.023	1.50	1/8	0.002	250-6201502	250-6201502B
0.015	0.045	1.50	1/8	0.002	250-5201502	250-5201502B
0.020	0.030	1.50	1/8	0.005	250-6202005	250-6202005B
0.020	0.060	1.50	1/8	0.005	250-5202005	250-5202005B
0.025	0.038	1.50	1/8	0.005	250-6202505	250-6202505B
0.025	0.075	1.50	1/8	0.005	250-5202505	250-5202505B
0.030	0.045	1.50	1/8	0.005	250-6203005	250-6203005B
0.030	0.045	1.50	1/8	0.010	250-6203010	250-6203010B
0.030	0.090	1.50	1/8	0.005	250-5203005	250-5203005B
0.030	0.090	1.50	1/8	0.010	250-5203010	250-5203010B
0.031	0.047	1.50	1/8	0.005	250-6203105	250-6203105B
0.031	0.047	1.50	1/8	0.010	250-6203110	250-6203110B
0.031	0.093	1.50	1/8	0.005	250-5203105	250-5203105B
0.031	0.093	1.50	1/8	0.010	250-5203110	250-5203110B
0.035	0.053	1.50	1/8	0.005	250-6203505	250-6203505B
0.035	0.053	1.50	1/8	0.010	250-6203510	250-6203510B
0.035	0.105	1.50	1/8	0.005	250-5203505	250-5203505B
0.035	0.105	1.50	1/8	0.010	250-5203510	250-5203510B
0.040	0.060	1.50	1/8	0.005	250-6204005	250-6204005B
0.040	0.060	1.50	1/8	0.010	250-6204010	250-6204010B
0.040	0.120	1.50	1/8	0.005	250-5204005	250-5204005B
0.040	0.120	1.50	1/8	0.010	250-5204010	250-5204010B
0.045	0.068	1.50	1/8	0.005	250-6204505	250-6204505B
0.045	0.068	1.50	1/8	0.010	250-6204510	250-6204510B
0.045	0.068	1.50	1/8	0.015	250-6204515	250-6204515B
0.045	0.135	1.50	1/8	0.005	250-5204505	250-5204505B
0.045	0.135	1.50	1/8	0.010	250-5204510	250-5204510B
0.045	0.135	1.50	1/8	0.015	250-5204515	250-5204515B
0.047	0.071	1.50	1/8	0.005	250-6204705	250-6204705B
0.047	0.071	1.50	1/8	0.010	250-6204710	250-6204710B
0.047	0.071	1.50	1/8	0.015	250-6204715	250-6204715B
0.047	0.141	1.50	1/8	0.005	250-5204705	250-5204705B
0.047	0.141	1.50	1/8	0.010	250-5204710	250-5204710B
0.047	0.141	1.50	1/8	0.015	250-5204715	250-5204715B
0.050	0.075	1.50	1/8	0.005	250-6205005	250-6205005B
0.050	0.075	1.50	1/8	0.010	250-6205010	250-6205010B
0.050	0.075	1.50	1/8	0.015	250-6205015	250-6205015B
0.050	0.150	1.50	1/8	0.005	250-5205005	250-5205005B
0.050	0.150	1.50	1/8	0.010	250-5205010	250-5205010B
0.050	0.150	1.50	1/8	0.015	250-5205015	250-5205015B
0.055	0.083	1.50	1/8	0.005	250-6205505	250-6205505B
0.055	0.083	1.50	1/8	0.010	250-6205510	250-6205510B
0.055	0.083	1.50	1/8	0.015	250-6205515	250-6205515B

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide Micro End Mills For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Series 251		2FL | Corner Radius | Micro						
Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	Bright	AITIN		
0.055	0.165	1.50	1/8	0.005	250-5205505	250-5205505B		
0.055	0.165	1.50	1/8	0.010	250-5205510	250-5205510B		
0.055	0.165	1.50	1/8	0.015	250-5205515	250-5205515B		
0.060	0.090	1.50	1/8	0.005	250-6206005	250-6206005B		
0.060	0.090	1.50	1/8	0.010	250-6206010	250-6206010B		
0.060	0.090	1.50	1/8	0.015	250-6206015	250-6206015B		
0.060	0.180	1.50	1/8	0.005	250-5206005	250-5206005B		
0.060	0.180	1.50	1/8	0.010	250-5206010	250-5206010B		
0.060	0.180	1.50	1/8	0.015	250-5206015	250-5206015B		
0.062	0.093	1.50	1/8	0.005	250-6206205	250-6206205B		
0.062	0.093	1.50	1/8	0.010	250-6206210	250-6206210B		
0.062	0.093	1.50	1/8	0.015	250-6206215	250-6206215B		
0.062	0.186	1.50	1/8	0.005	250-5206205	250-5206205B		
0.062	0.186	1.50	1/8	0.010	250-5206210	250-5206210B		
0.062	0.186	1.50	1/8	0.015	250-5206215	250-5206215B		
0.065	0.098	1.50	1/8	0.005	250-6206505	250-6206505B		
0.065	0.098	1.50	1/8	0.010	250-6206510	250-6206510B		
0.065	0.098	1.50	1/8	0.015	250-6206515	250-6206515B		
0.065	0.195	1.50	1/8	0.005	250-5206505	250-5206505B		
0.065	0.195	1.50	1/8	0.010	250-5206510	250-5206510B		
0.065	0.195	1.50	1/8	0.015	250-5206515	250-5206515B		
0.070	0.105	1.50	1/8	0.005	250-6207005	250-6207005B		
0.070	0.105	1.50	1/8	0.010	250-6207010	250-6207010B		
0.070	0.105	1.50	1/8	0.015	250-6207015	250-6207015B		
0.070	0.210	1.50	1/8	0.005	250-5207005	250-5207005B		
0.070	0.210	1.50	1/8	0.010	250-5207010	250-5207010B		
0.070	0.210	1.50	1/8	0.015	250-5207015	250-5207015B		
0.075	0.113	1.50	1/8	0.005	250-6207505	250-6207505B		
0.075	0.113	1.50	1/8	0.010	250-6207510	250-6207510B		
0.075	0.113	1.50	1/8	0.015	250-6207515	250-6207515B		
0.075	0.225	1.50	1/8	0.005	250-5207505	250-5207505B		
0.075	0.225	1.50	1/8	0.010	250-5207510	250-5207510B		
0.075	0.225	1.50	1/8	0.015	250-5207515	250-5207515B		
0.078	0.117	1.50	1/8	0.005	250-6207805	250-6207805B		
0.078	0.117	1.50	1/8	0.010	250-6207810	250-6207810B		
0.078	0.117	1.50	1/8	0.015	250-6207815	250-6207815B		
0.078	0.234	1.50	1/8	0.005	250-5207805	250-5207805B		
0.078	0.234	1.50	1/8	0.010	250-5207810	250-5207810B		
0.078	0.234	1.50	1/8	0.015	250-5207815	250-5207815B		
0.080	0.120	1.50	1/8	0.005	250-6208005	250-6208005B		
0.080	0.120	1.50	1/8	0.010	250-6208010	250-6208010B		
0.080	0.120	1.50	1/8	0.015	250-6208015	250-6208015B		
0.080	0.240	1.50	1/8	0.005	250-5208005	250-5208005B		
0.080	0.240	1.50	1/8	0.010	250-5208010	250-5208010B		
0.080	0.240	1.50	1/8	0.015	250-5208015	250-5208015B		
0.085	0.128	1.50	1/8	0.005	250-6208505	250-6208505B		
0.085	0.128	1.50	1/8	0.010	250-6208510	250-6208510B		
0.085	0.128	1.50	1/8	0.015	250-6208515	250-6208515B		
0.085	0.255	1.50	1/8	0.005	250-5208505	250-5208505B		
0.085	0.255	1.50	1/8	0.010	250-5208510	250-5208510B		
0.085	0.255	1.50	1/8	0.015	250-5208515	250-5208515B		
0.090	0.135	1.50	1/8	0.005	250-6209005	250-6209005B		
0.090	0.135	1.50	1/8	0.010	250-6209010	250-6209010B		
0.090	0.135	1.50	1/8	0.015	250-6209015	250-6209015B		
0.090	0.270	1.50	1/8	0.005	250-5209005	250-5209005B		
0.090	0.270	1.50	1/8	0.010	250-5209010	250-5209010B		
0.090	0.270	1.50	1/8	0.015	250-5209015	250-5209015B		
0.093	0.140	1.50	1/8	0.005	250-6209305	250-6209305B		
0.093	0.140	1.50	1/8	0.010	250-6209310	250-6209310B		
0.093	0.140	1.50	1/8	0.015	250-6209315	250-6209315B		
0.093	0.279	1.50	1/8	0.005	250-5209305	250-5209305B		
0.093	0.279	1.50	1/8	0.010	250-5209310	250-5209310B		
0.093	0.279	1.50	1/8	0.015	250-5209315	250-5209315B		
0.095	0.143	1.50	1/8	0.005	250-6209505	250-6209505B		
0.095	0.143	1.50	1/8	0.010	250-6209510	250-6209510B		
0.095	0.143	1.50	1/8	0.015	250-6209515	250-6209515B		
0.095	0.285	1.50	1/8	0.005	250-5209505	250-5209505B		
0.095	0.285	1.50	1/8	0.010	250-5209510	250-5209510B		
0.095	0.285	1.50	1/8	0.015	250-5209515	250-5209515B		
0.100	0.150	1.50	1/8	0.005	250-6210005	250-6210005B		
0.100	0.150	1.50	1/8	0.010	250-6210010	250-6210010B		
0.100	0.150	1.50	1/8	0.015	250-6210015	250-6210015B		
0.100	0.300	1.50	1/8	0.005	250-5210005	250-5210005B		
0.100	0.300	1.50	1/8	0.010	250-5210010	250-5210010B		
0.100	0.300	1.50	1/8	0.015	250-5210015	250-5210015B		
0.105	0.158	1.50	1/8	0.010	250-6210510	250-6210510B		

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide Micro End Mills For Ferrous And Non-Ferrous Materials



Series 251		2FL | Corner Radius | Micro					
Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	Bright	AITN	
0.105	0.158	1.50	1/8	0.015	250-6210515	250-6210515B	
0.105	0.158	1.50	1/8	0.020	250-6210520	250-6210520B	
0.105	0.315	1.50	1/8	0.010	250-5210510	250-5210510B	
0.105	0.315	1.50	1/8	0.015	250-5210515	250-5210515B	
0.105	0.315	1.50	1/8	0.020	250-5210520	250-5210520B	
0.110	0.165	1.50	1/8	0.010	250-6211010	250-6211010B	
0.110	0.165	1.50	1/8	0.015	250-6211015	250-6211015B	
0.110	0.165	1.50	1/8	0.020	250-6211020	250-6211020B	
0.110	0.330	1.50	1/8	0.010	250-5211010	250-5211010B	
0.110	0.330	1.50	1/8	0.015	250-5211015	250-5211015B	
0.110	0.330	1.50	1/8	0.020	250-5211020	250-5211020B	
0.115	0.173	1.50	1/8	0.010	250-6211510	250-6211510B	
0.115	0.173	1.50	1/8	0.015	250-6211515	250-6211515B	
0.115	0.173	1.50	1/8	0.020	250-6211520	250-6211520B	
0.115	0.345	1.50	1/8	0.010	250-5211510	250-5211510B	
0.115	0.345	1.50	1/8	0.015	250-5211515	250-5211515B	
0.115	0.345	1.50	1/8	0.020	250-5211520	250-5211520B	
0.120	0.180	1.50	1/8	0.010	250-6212010	250-6212010B	
0.120	0.180	1.50	1/8	0.015	250-6212015	250-6212015B	
0.120	0.180	1.50	1/8	0.020	250-6212020	250-6212020B	
0.120	0.360	1.50	1/8	0.010	250-5212010	250-5212010B	
0.120	0.360	1.50	1/8	0.015	250-5212015	250-5212015B	
0.120	0.360	1.50	1/8	0.020	250-5212020	250-5212020B	

*bold numbers are EDPs for ordering

Popular Custom Milling Options

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Solid Carbide Micro End Mills For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Micro 2-Flute Ball Mills</p> <ul style="list-style-type: none"> • Micro mills • Universal application with 30° helix • Sub-micron grade carbide substrate for wear resistance • Multiple coating options • Diameter Tol.: +/- 0.0005" • Shank Tol.: +0/-0.0003" • LOC Tol.: +0/-0.0120" 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 252 | 2FL | Ball Nose | Micro

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Bright	AlTiN
0.010	0.015	1.50	1/8	250-360100	250-360100B
0.010	0.030	1.50	1/8	250-320010	250-320010B
0.011	0.033	1.50	1/8	250-320011	250-320011B
0.012	0.036	1.50	1/8	250-320012	250-320012B
0.013	0.039	1.50	1/8	250-320013	250-320013B
0.014	0.042	1.50	1/8	250-320014	250-320014B
0.015	0.023	1.50	1/8	250-360200	250-360200B
0.015	0.045	1.50	1/8	250-320015	250-320015B
0.016	0.048	1.50	1/8	250-320016	250-320016B
0.016	0.125	1.50	1/8	251-001100	251-001100B
0.017	0.051	1.50	1/8	250-320017	250-320017B
0.018	0.054	1.50	1/8	250-320018	250-320018B
0.019	0.057	1.50	1/8	250-320019	250-320019B
0.020	0.030	1.50	1/8	250-360250	250-360250B
0.020	0.060	1.50	1/8	250-320020	250-320020B
0.021	0.063	1.50	1/8	250-320021	250-320021B
0.022	0.066	1.50	1/8	250-320022	250-320022B
0.023	0.069	1.50	1/8	250-320023	250-320023B
0.024	0.072	1.50	1/8	250-320024	250-320024B
0.025	0.038	1.50	1/8	250-360300	250-360300B
0.025	0.075	1.50	1/8	250-320025	250-320025B
0.026	0.078	1.50	1/8	250-320026	250-320026B
0.027	0.081	1.50	1/8	250-320027	250-320027B
0.028	0.084	1.50	1/8	250-320028	250-320028B
0.029	0.087	1.50	1/8	250-320029	250-320029B
0.030	0.045	1.50	1/8	250-360350	250-360350B
0.030	0.090	1.50	1/8	250-320030	250-320030B
0.031	0.093	1.50	1/8	250-320031	250-320031B
0.031	0.250	1.50	1/8	251-001101	251-001101B
0.031	0.375	1.50	1/8	251-001102	251-001102B
0.032	0.096	1.50	1/8	250-320032	250-320032B
0.033	0.099	1.50	1/8	250-320033	250-320033B
0.034	0.102	1.50	1/8	250-320034	250-320034B
0.035	0.053	1.50	1/8	250-360400	250-360400B
0.035	0.105	1.50	1/8	250-320035	250-320035B
0.036	0.108	1.50	1/8	250-320036	250-320036B
0.037	0.111	1.50	1/8	250-320037	250-320037B
0.038	0.114	1.50	1/8	250-320038	250-320038B
0.039	0.117	1.50	1/8	250-320039	250-320039B
0.040	0.060	1.50	1/8	250-360450	250-360450B
0.040	0.120	1.50	1/8	250-320040	250-320040B
0.041	0.123	1.50	1/8	250-320041	250-320041B
0.042	0.126	1.50	1/8	250-320042	250-320042B
0.043	0.129	1.50	1/8	250-320043	250-320043B
0.044	0.132	1.50	1/8	250-320044	250-320044B

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide Micro End Mills For Ferrous And Non-Ferrous Materials



Series 252

2FL | Ball Nose | Micro

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Bright	AITN
0.045	0.068	1.50	1/8	250-360500	250-360500B
0.045	0.135	1.50	1/8	250-320045	250-320045B
0.046	0.138	1.50	1/8	250-320046	250-320046B
0.047	0.141	1.50	1/8	250-320047	250-320047B
0.047	0.250	1.50	1/8	251-001110	251-001110B
0.047	0.375	1.50	1/8	251-001111	251-001111B
0.047	0.500	1.50	1/8	251-001112	251-001112B
0.048	0.144	1.50	1/8	250-320048	250-320048B
0.049	0.147	1.50	1/8	250-320049	250-320049B
0.050	0.075	1.50	1/8	250-360550	250-360550B
0.050	0.150	1.50	1/8	250-320050	250-320050B
0.051	0.153	1.50	1/8	250-320051	250-320051B
0.052	0.156	1.50	1/8	250-320052	250-320052B
0.053	0.159	1.50	1/8	250-320053	250-320053B
0.054	0.162	1.50	1/8	250-320054	250-320054B
0.055	0.083	1.50	1/8	250-360600	250-360600B
0.055	0.165	1.50	1/8	250-320055	250-320055B
0.056	0.168	1.50	1/8	250-320056	250-320056B
0.057	0.171	1.50	1/8	250-320057	250-320057B
0.058	0.174	1.50	1/8	250-320058	250-320058B
0.059	0.177	1.50	1/8	250-320059	250-320059B
0.060	0.090	1.50	1/8	250-360620	250-360620B
0.060	0.180	1.50	1/8	250-320060	250-320060B
0.061	0.183	1.50	1/8	250-320061	250-320061B
0.062	0.186	1.50	1/8	250-320062	250-320062B
0.063	0.189	1.50	1/8	250-320063	250-320063B
0.063	0.500	1.50	1/8	251-001120	251-001120B
0.063	0.750	1.50	1/8	251-001121	251-001121B
0.063	1.000	1.50	1/8	251-001122	251-001122B
0.064	0.192	1.50	1/8	250-320064	250-320064B
0.065	0.098	1.50	1/8	250-360640	250-360640B
0.065	0.195	1.50	1/8	250-320065	250-320065B
0.070	0.105	1.50	1/8	250-360660	250-360660B
0.070	0.210	1.50	1/8	250-320070	250-320070B
0.075	0.113	1.50	1/8	250-360680	250-360680B
0.075	0.225	1.50	1/8	250-320075	250-320075B
0.078	0.500	1.50	1/8	251-001130	251-001130B
0.080	0.120	1.50	1/8	250-360700	250-360700B
0.080	0.240	1.50	1/8	250-320080	250-320080B
0.085	0.128	1.50	1/8	250-360720	250-360720B
0.085	0.255	1.50	1/8	250-320085	250-320085B
0.090	0.135	1.50	1/8	250-360740	250-360740B
0.090	0.270	1.50	1/8	250-320090	250-320090B
0.094	0.500	1.50	1/8	251-001140	251-001140B
0.094	0.750	1.50	1/8	251-001141	251-001141B
0.095	0.143	1.50	1/8	250-360760	250-360760B
0.095	0.285	1.50	1/8	250-320095	250-320095B
0.100	0.150	1.50	1/8	250-360780	250-360780B
0.100	0.300	1.50	1/8	250-320100	250-320100B
0.105	0.158	1.50	1/8	250-360800	250-360800B
0.105	0.315	1.50	1/8	250-320105	250-320105B
0.110	0.165	1.50	1/8	250-360820	250-360820B
0.110	0.330	1.50	1/8	250-320110	250-320110B
0.115	0.173	1.50	1/8	250-360840	250-360840B
0.115	0.345	1.50	1/8	250-320115	250-320115B
0.120	0.180	1.50	1/8	250-360860	250-360860B
0.120	0.360	1.50	1/8	250-320120	250-320120B

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Solid Carbide Micro End Mills For Ferrous And Non-Ferrous Materials



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Micro 4-Flute Square Mills</p> <ul style="list-style-type: none"> • Micro mills • Universal application with 30° helix • Sub-micron grade carbide substrate for wear resistance • Multiple coating options • Diameter Tol.: +/- 0.0005" • Shank Tol.: +0/-0.0003" • LOC Tol.: +.0120"/-0 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 254 | 4FL | Square | Micro

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Bright	AlTiN
0.005	0.008	1.50	1/8	250-305100	-
0.005	0.015	1.50	1/8	250-100410	-
0.006	0.009	1.50	1/8	250-305110	-
0.006	0.018	1.50	1/8	250-205110	-
0.007	0.011	1.50	1/8	250-305120	-
0.007	0.021	1.50	1/8	250-205120	-
0.008	0.012	1.50	1/8	250-305130	-
0.008	0.024	1.50	1/8	250-205130	-
0.009	0.014	1.50	1/8	250-305140	-
0.009	0.027	1.50	1/8	250-205140	-
0.010	0.015	1.50	1/8	250-305150	250-305150B
0.010	0.030	1.50	1/8	250-100430	250-100430B
0.011	0.017	1.50	1/8	250-305160	250-305160B
0.011	0.033	1.50	1/8	250-205160	250-205160B
0.012	0.018	1.50	1/8	250-305170	250-305170B
0.012	0.036	1.50	1/8	250-205170	250-205170B
0.013	0.020	1.50	1/8	250-305180	250-305180B
0.013	0.039	1.50	1/8	250-205180	250-205180B
0.014	0.021	1.50	1/8	250-305190	250-305190B
0.014	0.042	1.50	1/8	250-205190	250-205190B
0.015	0.023	1.50	1/8	250-305200	250-305200B
0.015	0.045	1.50	1/8	250-100450	250-100450B
0.016	0.024	1.50	1/8	250-305210	250-305210B
0.016	0.048	1.50	1/8	250-205210	250-205210B
0.016	0.125	2.50	1/8	251-002000	-
0.017	0.026	1.50	1/8	250-305220	250-305220B
0.017	0.051	1.50	1/8	250-205220	250-205220B
0.018	0.027	1.50	1/8	250-305230	250-305230B
0.018	0.054	1.50	1/8	250-205230	250-205230B
0.019	0.029	1.50	1/8	250-305240	250-305240B
0.019	0.057	1.50	1/8	250-205240	250-205240B
0.020	0.030	1.50	1/8	250-305250	250-305250B
0.020	0.060	1.50	1/8	250-100470	250-100470B
0.021	0.032	1.50	1/8	250-305260	250-305260B
0.021	0.063	1.50	1/8	250-205260	250-205260B
0.022	0.033	1.50	1/8	250-305270	250-305270B
0.022	0.066	1.50	1/8	250-205270	250-205270B
0.023	0.035	1.50	1/8	250-305280	250-305280B
0.023	0.069	1.50	1/8	250-205280	250-205280B
0.024	0.036	1.50	1/8	250-305290	250-305290B
0.024	0.072	1.50	1/8	250-205290	250-205290B
0.025	0.038	1.50	1/8	250-305300	250-305300B
0.025	0.075	1.50	1/8	250-100490	250-100490B
0.026	0.039	1.50	1/8	250-305310	250-305310B
0.026	0.078	1.50	1/8	250-205310	250-205310B

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide Micro End Mills For Ferrous And Non-Ferrous Materials



Series 254		4FL | Square | Micro			
Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Bright	AITN
0.027	0.041	1.50	1/8	250-305320	250-305320B
0.027	0.081	1.50	1/8	250-205320	250-205320B
0.028	0.042	1.50	1/8	250-305330	250-305330B
0.028	0.084	1.50	1/8	250-205330	250-205330B
0.029	0.044	1.50	1/8	250-305340	250-305340B
0.029	0.087	1.50	1/8	250-205340	250-205340B
0.030	0.045	1.50	1/8	250-305350	250-305350B
0.030	0.090	1.50	1/8	250-100510	250-100510B
0.031	0.047	1.50	1/8	250-305360	250-305360B
0.031	0.093	1.50	1/8	250-205360	250-205360B
0.031	0.250	2.50	1/8	251-002001	-
0.031	0.375	2.50	1/8	251-002002	-
0.032	0.048	1.50	1/8	250-305370	250-305370B
0.032	0.096	1.50	1/8	250-205370	250-205370B
0.033	0.050	1.50	1/8	250-305380	250-305380B
0.033	0.099	1.50	1/8	250-205380	250-205380B
0.034	0.051	1.50	1/8	250-305390	250-305390B
0.034	0.102	1.50	1/8	250-205390	250-205390B
0.035	0.053	1.50	1/8	250-305400	250-305400B
0.035	0.105	1.50	1/8	250-100530	250-100530B
0.036	0.054	1.50	1/8	250-305410	250-305410B
0.036	0.108	1.50	1/8	250-205410	250-205410B
0.037	0.056	1.50	1/8	250-305420	250-305420B
0.037	0.111	1.50	1/8	250-205420	250-205420B
0.038	0.057	1.50	1/8	250-305430	250-305430B
0.038	0.114	1.50	1/8	250-205430	250-205430B
0.039	0.059	1.50	1/8	250-305440	250-305440B
0.039	0.117	1.50	1/8	250-205440	250-205440B
0.040	0.060	1.50	1/8	250-305450	250-305450B
0.040	0.120	1.50	1/8	250-100550	250-100550B
0.041	0.062	1.50	1/8	250-305460	250-305460B
0.041	0.123	1.50	1/8	250-205460	250-205460B
0.042	0.063	1.50	1/8	250-305470	250-305470B
0.042	0.126	1.50	1/8	250-205470	250-205470B
0.043	0.065	1.50	1/8	250-305480	250-305480B
0.043	0.129	1.50	1/8	250-205480	250-205480B
0.044	0.066	1.50	1/8	250-305490	250-305490B
0.044	0.132	1.50	1/8	250-205490	250-205490B
0.045	0.068	1.50	1/8	250-305500	250-305500B
0.045	0.135	1.50	1/8	250-100570	250-100570B
0.046	0.069	1.50	1/8	250-305510	250-305510B
0.046	0.138	1.50	1/8	250-205510	250-205510B
0.047	0.071	1.50	1/8	250-305520	250-305520B
0.047	0.141	1.50	1/8	250-205520	250-205520B
0.047	0.250	2.50	1/8	251-002010	-
0.047	0.375	2.50	1/8	251-002011	-
0.047	0.500	2.50	1/8	251-002013	-
0.048	0.072	1.50	1/8	250-305530	250-305530B
0.048	0.144	1.50	1/8	250-205530	250-205530B
0.049	0.074	1.50	1/8	250-305540	250-305540B
0.049	0.147	1.50	1/8	250-205540	250-205540B
0.050	0.075	1.50	1/8	250-305550	250-305550B
0.050	0.150	1.50	1/8	250-100590	250-100590B
0.051	0.077	1.50	1/8	250-305560	250-305560B
0.051	0.153	1.50	1/8	250-205560	250-205560B
0.052	0.078	1.50	1/8	250-305570	250-305570B
0.052	0.156	1.50	1/8	250-205570	250-205570B
0.053	0.080	1.50	1/8	250-305580	250-305580B
0.053	0.159	1.50	1/8	250-205580	250-205580B
0.054	0.081	1.50	1/8	250-305590	250-305590B
0.054	0.162	1.50	1/8	250-205590	250-205590B
0.055	0.083	1.50	1/8	250-305600	250-305600B
0.055	0.165	1.50	1/8	250-100610	250-100610B
0.056	0.084	1.50	1/8	250-305610	250-305610B
0.056	0.168	1.50	1/8	250-205610	250-205610B
0.057	0.086	1.50	1/8	250-305620	250-305620B
0.057	0.171	1.50	1/8	250-205620	250-205620B
0.058	0.087	1.50	1/8	250-305630	250-305630B
0.058	0.174	1.50	1/8	250-205630	250-205630B
0.059	0.089	1.50	1/8	250-305640	250-305640B
0.059	0.177	1.50	1/8	250-205640	250-205640B
0.060	0.090	1.50	1/8	250-305650	250-305650B
0.060	0.180	1.50	1/8	250-100630	250-100630B
0.061	0.092	1.50	1/8	250-305660	250-305660B
0.061	0.183	1.50	1/8	250-205660	250-205660B
0.062	0.093	1.50	1/8	250-305670	250-305670B

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Solid Carbide Micro End Mills For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Series 254		4FL | Square | Micro			
Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Bright	AITN
0.062	0.186	1.50	1/8	250-205670	250-205670B
0.063	0.095	1.50	1/8	250-305680	250-305680B
0.063	0.189	1.50	1/8	250-205680	250-205680B
0.063	0.500	2.50	1/8	251-002020	-
0.063	0.750	2.50	1/8	251-002021	-
0.063	1.000	2.50	1/8	251-002022	-
0.064	0.096	1.50	1/8	250-305690	250-305690B
0.064	0.192	1.50	1/8	250-205690	250-205690B
0.065	0.098	1.50	1/8	250-305700	250-305700B
0.065	0.195	1.50	1/8	250-100650	250-100650B
0.070	0.105	1.50	1/8	250-305750	250-305750B
0.070	0.210	1.50	1/8	250-100670	250-100670B
0.075	0.113	1.50	1/8	250-305800	250-305800B
0.075	0.225	1.50	1/8	250-100690	250-100690B
0.078	0.500	2.50	1/8	251-002030	-
0.080	0.120	1.50	1/8	250-305850	250-305850B
0.080	0.240	1.50	1/8	250-100710	250-100710B
0.085	0.128	1.50	1/8	250-305900	250-305900B
0.085	0.255	1.50	1/8	250-100730	250-100730B
0.090	0.135	1.50	1/8	250-305950	250-305950B
0.090	0.270	1.50	1/8	250-100750	250-100750B
0.094	0.500	2.50	1/8	251-002040	-
0.094	0.750	2.50	1/8	251-002041	-
0.095	0.143	1.50	1/8	250-306000	250-306000B
0.095	0.285	1.50	1/8	250-100770	250-100770B
0.100	0.150	1.50	1/8	250-306050	250-306050B
0.100	0.300	1.50	1/8	250-100790	250-100790B
0.105	0.158	1.50	1/8	250-306100	250-306100B
0.105	0.315	1.50	1/8	250-100801	250-100801B
0.110	0.165	1.50	1/8	250-306150	250-306150B
0.110	0.330	1.50	1/8	250-100803	250-100803B
0.115	0.173	1.50	1/8	250-306200	250-306200B
0.115	0.345	1.50	1/8	250-100805	250-100805B
0.120	0.180	1.50	1/8	250-306250	250-306250B
0.120	0.360	1.50	1/8	250-100807	250-100807B

*bold numbers are EDPs for ordering

Popular Custom Milling Options

Proprietary GWS tool coatings
 Longer lengths
 Enhanced geometry
 Special shank modifications like **SAFE-LOCK**

CUSTOM COMES STANDARD

GENERAL PURPOSE

Solid Carbide Micro End Mills For Ferrous And Non-Ferrous Materials



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Micro 4-Flute Radius Mills</p> <ul style="list-style-type: none"> • Micro mills • Universal application with 30° helix • Sub-micron grade carbide substrate for wear resistance • Multiple coating options • Diameter Tol.: +/- 0.0005" • Shank Tol.: +0/-0.0003" • LOC Tol.: +.0120"/-0 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 255 | 4FL | Corner Radius | Micro

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	Bright	AlTiN
0.010	0.015	1.50	1/8	0.002	250-6401002	250-6401002B
0.010	0.030	1.50	1/8	0.002	250-5401002	250-5401002B
0.015	0.023	1.50	1/8	0.002	250-6401502	250-6401502B
0.015	0.045	1.50	1/8	0.002	250-5401502	250-5401502B
0.020	0.030	1.50	1/8	0.005	250-6402005	250-6402005B
0.020	0.060	1.50	1/8	0.005	250-5402005	250-5402005B
0.025	0.038	1.50	1/8	0.005	250-6402505	250-6402505B
0.025	0.075	1.50	1/8	0.005	250-5402505	250-5402505B
0.030	0.045	1.50	1/8	0.005	250-6403005	250-6403005B
0.030	0.045	1.50	1/8	0.010	250-6403010	250-6403010B
0.030	0.090	1.50	1/8	0.005	250-5403005	250-5403005B
0.030	0.090	1.50	1/8	0.010	250-5403010	250-5403010B
0.031	0.047	1.50	1/8	0.005	250-6403105	250-6403105B
0.031	0.047	1.50	1/8	0.010	250-6403110	250-6403110B
0.031	0.093	1.50	1/8	0.005	250-5403105	250-5403105B
0.031	0.093	1.50	1/8	0.010	250-5403110	250-5403110B
0.035	0.053	1.50	1/8	0.005	250-6403505	250-6403505B
0.035	0.053	1.50	1/8	0.010	250-6403510	250-6403510B
0.035	0.105	1.50	1/8	0.005	250-5403505	250-5403505B
0.035	0.105	1.50	1/8	0.010	250-5403510	250-5403510B
0.040	0.060	1.50	1/8	0.005	250-6404005	250-6404005B
0.040	0.060	1.50	1/8	0.010	250-6404010	250-6404010B
0.040	0.120	1.50	1/8	0.005	250-5404005	250-5404005B
0.040	0.120	1.50	1/8	0.010	250-5404010	250-5404010B
0.045	0.068	1.50	1/8	0.005	250-6404505	250-6404505B
0.045	0.068	1.50	1/8	0.010	250-6404510	250-6404510B
0.045	0.068	1.50	1/8	0.015	250-6404515	250-6404515B
0.045	0.135	1.50	1/8	0.005	250-5404505	250-5404505B
0.045	0.135	1.50	1/8	0.010	250-5404510	250-5404510B
0.045	0.135	1.50	1/8	0.015	250-5404515	250-5404515B
0.047	0.071	1.50	1/8	0.005	250-6404705	250-6404705B
0.047	0.071	1.50	1/8	0.010	250-6404710	250-6404710B
0.047	0.071	1.50	1/8	0.015	250-6404715	250-6404715B
0.047	0.141	1.50	1/8	0.005	250-5404705	250-5404705B
0.047	0.141	1.50	1/8	0.010	250-5404710	250-5404710B
0.047	0.141	1.50	1/8	0.015	250-5404715	250-5404715B
0.050	0.075	1.50	1/8	0.005	250-6405005	250-6405005B
0.050	0.075	1.50	1/8	0.010	250-6405010	250-6405010B
0.050	0.075	1.50	1/8	0.015	250-6405015	250-6405015B
0.050	0.150	1.50	1/8	0.005	250-5405005	250-5405005B
0.050	0.150	1.50	1/8	0.010	250-5405010	250-5405010B
0.050	0.150	1.50	1/8	0.015	250-5405015	250-5405015B
0.055	0.083	1.50	1/8	0.005	250-6405505	250-6405505B
0.055	0.083	1.50	1/8	0.010	250-6405510	250-6405510B
0.055	0.083	1.50	1/8	0.015	250-6405515	250-6405515B

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Solid Carbide Micro End Mills For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Series 255		4FL | Corner Radius | Micro						
Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	Bright	AITIN		
0.055	0.165	1.50	1/8	0.005	250-5405505	250-5405505B		
0.055	0.165	1.50	1/8	0.010	250-5405510	250-5405510B		
0.055	0.165	1.50	1/8	0.015	250-5405515	250-5405515B		
0.060	0.090	1.50	1/8	0.005	250-6406005	250-6406005B		
0.060	0.090	1.50	1/8	0.010	250-6406010	250-6406010B		
0.060	0.090	1.50	1/8	0.015	250-6406015	250-6406015B		
0.060	0.180	1.50	1/8	0.005	250-5406005	250-5406005B		
0.060	0.180	1.50	1/8	0.010	250-5406010	250-5406010B		
0.060	0.180	1.50	1/8	0.015	250-5406015	250-5406015B		
0.062	0.093	1.50	1/8	0.005	250-6406205	250-6406205B		
0.062	0.093	1.50	1/8	0.010	250-6406210	250-6406210B		
0.062	0.093	1.50	1/8	0.015	250-6406215	250-6406215B		
0.062	0.186	1.50	1/8	0.005	250-5406205	250-5406205B		
0.062	0.186	1.50	1/8	0.010	250-5406210	250-5406210B		
0.062	0.186	1.50	1/8	0.015	250-5406215	250-5406215B		
0.065	0.098	1.50	1/8	0.005	250-6406505	250-6406505B		
0.065	0.098	1.50	1/8	0.010	250-6406510	250-6406510B		
0.065	0.098	1.50	1/8	0.015	250-6406515	250-6406515B		
0.065	0.195	1.50	1/8	0.005	250-5406505	250-5406505B		
0.065	0.195	1.50	1/8	0.010	250-5406510	250-5406510B		
0.065	0.195	1.50	1/8	0.015	250-5406515	250-5406515B		
0.070	0.105	1.50	1/8	0.005	250-6407005	250-6407005B		
0.070	0.105	1.50	1/8	0.010	250-6407010	250-6407010B		
0.070	0.105	1.50	1/8	0.015	250-6407015	250-6407015B		
0.070	0.210	1.50	1/8	0.005	250-5407005	250-5407005B		
0.070	0.210	1.50	1/8	0.010	250-5407010	250-5407010B		
0.070	0.210	1.50	1/8	0.015	250-5407015	250-5407015B		
0.075	0.113	1.50	1/8	0.005	250-6407505	250-6407505B		
0.075	0.113	1.50	1/8	0.010	250-6407510	250-6407510B		
0.075	0.113	1.50	1/8	0.015	250-6407515	250-6407515B		
0.075	0.225	1.50	1/8	0.005	250-5407505	250-5407505B		
0.075	0.225	1.50	1/8	0.010	250-5407510	250-5407510B		
0.075	0.225	1.50	1/8	0.015	250-5407515	250-5407515B		
0.078	0.117	1.50	1/8	0.005	250-6407805	250-6407805B		
0.078	0.117	1.50	1/8	0.010	250-6407810	250-6407810B		
0.078	0.117	1.50	1/8	0.015	250-6407815	250-6407815B		
0.078	0.234	1.50	1/8	0.005	250-5407805	250-5407805B		
0.078	0.234	1.50	1/8	0.010	250-5407810	250-5407810B		
0.078	0.234	1.50	1/8	0.015	250-5407815	250-5407815B		
0.080	0.120	1.50	1/8	0.005	250-6408005	250-6408005B		
0.080	0.120	1.50	1/8	0.010	250-6408010	250-6408010B		
0.080	0.120	1.50	1/8	0.015	250-6408015	250-6408015B		
0.080	0.240	1.50	1/8	0.005	250-5408005	250-5408005B		
0.080	0.240	1.50	1/8	0.010	250-5408010	250-5408010B		
0.080	0.240	1.50	1/8	0.015	250-5408015	250-5408015B		
0.085	0.128	1.50	1/8	0.005	250-6408505	250-6408505B		
0.085	0.128	1.50	1/8	0.010	250-6408510	250-6408510B		
0.085	0.128	1.50	1/8	0.015	250-6408515	250-6408515B		
0.085	0.255	1.50	1/8	0.005	250-5408505	250-5408505B		
0.085	0.255	1.50	1/8	0.010	250-5408510	250-5408510B		
0.085	0.255	1.50	1/8	0.015	250-5408515	250-5408515B		
0.090	0.135	1.50	1/8	0.005	250-6409005	250-6409005B		
0.090	0.135	1.50	1/8	0.010	250-6409010	250-6409010B		
0.090	0.135	1.50	1/8	0.015	250-6409015	250-6409015B		
0.090	0.270	1.50	1/8	0.005	250-5409005	250-5409005B		
0.090	0.270	1.50	1/8	0.010	250-5409010	250-5409010B		
0.090	0.270	1.50	1/8	0.015	250-5409015	250-5409015B		
0.093	0.140	1.50	1/8	0.005	250-6409305	250-6409305B		
0.093	0.140	1.50	1/8	0.010	250-6409310	250-6409310B		
0.093	0.140	1.50	1/8	0.015	250-6409315	250-6409315B		
0.093	0.279	1.50	1/8	0.005	250-5409305	250-5409305B		
0.093	0.279	1.50	1/8	0.010	250-5409310	250-5409310B		
0.093	0.279	1.50	1/8	0.015	250-5409315	250-5409315B		
0.095	0.143	1.50	1/8	0.005	250-6409505	250-6409505B		
0.095	0.143	1.50	1/8	0.010	250-6409510	250-6409510B		
0.095	0.143	1.50	1/8	0.015	250-6409515	250-6409515B		
0.095	0.285	1.50	1/8	0.005	250-5409505	250-5409505B		
0.095	0.285	1.50	1/8	0.010	250-5409510	250-5409510B		
0.095	0.285	1.50	1/8	0.015	250-5409515	250-5409515B		
0.100	0.150	1.50	1/8	0.005	250-6410005	250-6410005B		
0.100	0.150	1.50	1/8	0.010	250-6410010	250-6410010B		
0.100	0.150	1.50	1/8	0.015	250-6410015	250-6410015B		
0.100	0.300	1.50	1/8	0.005	250-5410005	250-5410005B		
0.100	0.300	1.50	1/8	0.010	250-5410010	250-5410010B		
0.100	0.300	1.50	1/8	0.015	250-5410015	250-5410015B		
0.105	0.158	1.50	1/8	0.010	250-6410510	250-6410510B		

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide Micro End Mills For Ferrous And Non-Ferrous Materials



Series 255 | 4FL | Corner Radius | Micro

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Radius(R)	Bright	AITN
0.105	0.158	1.50	1/8	0.015	250-6410515	250-6410515B
0.105	0.158	1.50	1/8	0.020	250-6410520	250-6410520B
0.105	0.315	1.50	1/8	0.010	250-5410510	250-5410510B
0.105	0.315	1.50	1/8	0.015	250-5410515	250-5410515B
0.105	0.315	1.50	1/8	0.020	250-5410520	250-5410520B
0.110	0.165	1.50	1/8	0.010	250-6411010	250-6411010B
0.110	0.165	1.50	1/8	0.015	250-6411015	250-6411015B
0.110	0.165	1.50	1/8	0.020	250-6411020	250-6411020B
0.110	0.330	1.50	1/8	0.010	250-5411010	250-5411010B
0.110	0.330	1.50	1/8	0.015	250-5411015	250-5411015B
0.110	0.330	1.50	1/8	0.020	250-5411020	250-5411020B
0.115	0.173	1.50	1/8	0.010	250-6411510	250-6411510B
0.115	0.173	1.50	1/8	0.015	250-6411515	250-6411515B
0.115	0.173	1.50	1/8	0.020	250-6411520	250-6411520B
0.115	0.345	1.50	1/8	0.010	250-5411510	250-5411510B
0.115	0.345	1.50	1/8	0.015	250-5411515	250-5411515B
0.115	0.345	1.50	1/8	0.020	250-5411520	250-5411520B
0.120	0.180	1.50	1/8	0.010	250-6412010	250-6412010B
0.120	0.180	1.50	1/8	0.015	250-6412015	250-6412015B
0.120	0.180	1.50	1/8	0.020	250-6412020	250-6412020B
0.120	0.360	1.50	1/8	0.010	250-5412010	250-5412010B
0.120	0.360	1.50	1/8	0.015	250-5412015	250-5412015B
0.120	0.360	1.50	1/8	0.020	250-5412020	250-5412020B

*bold numbers are EDPs for ordering

Popular Custom Milling Options

Proprietary GWS tool coatings
 Longer lengths
 Enhanced geometry
 Special shank modifications like **SAFE-LOCK**

CUSTOM COMES STANDARD

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Micro 4-Flute Ball Mills</p> <ul style="list-style-type: none"> • Micro mills • Universal application with 30° helix • Sub-micron grade carbide substrate for wear resistance • Multiple coating options • Diameter Tol.: +/- 0.0005" • Shank Tol.: +0/-0.0003" • LOC Tol.: +.0120"/-0 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 256 | 4FL | Ball Nose | Micro

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Bright	AlTiN
0.010	0.015	1.50	1/8	250-370150	250-370150B
0.010	0.030	1.50	1/8	250-340010	250-340010B
0.011	0.033	1.50	1/8	250-340011	250-340011B
0.012	0.036	1.50	1/8	250-340012	250-340012B
0.013	0.039	1.50	1/8	250-340013	250-340013B
0.014	0.042	1.50	1/8	250-340014	250-340014B
0.015	0.023	1.50	1/8	250-370200	250-370200B
0.015	0.045	1.50	1/8	250-340015	250-340015B
0.016	0.048	1.50	1/8	250-340016	250-340016B
0.016	0.125	2.50	1/8	251-002100	251-002100B
0.017	0.051	1.50	1/8	250-340017	250-340017B
0.018	0.054	1.50	1/8	250-340018	250-340018B
0.019	0.057	1.50	1/8	250-340019	250-340019B
0.020	0.030	1.50	1/8	250-370250	250-370250B
0.020	0.060	1.50	1/8	250-340020	250-340020B
0.021	0.063	1.50	1/8	250-340021	250-340021B
0.022	0.066	1.50	1/8	250-340022	250-340022B
0.023	0.069	1.50	1/8	250-340023	250-340023B
0.024	0.072	1.50	1/8	250-340024	250-340024B
0.025	0.038	1.50	1/8	250-370300	250-370300B
0.025	0.075	1.50	1/8	250-340025	250-340025B
0.026	0.078	1.50	1/8	250-340026	250-340026B
0.027	0.081	1.50	1/8	250-340027	250-340027B
0.028	0.084	1.50	1/8	250-340028	250-340028B
0.029	0.087	1.50	1/8	250-340029	250-340029B
0.030	0.045	1.50	1/8	250-370350	250-370350B
0.030	0.090	1.50	1/8	250-340030	250-340030B
0.031	0.093	1.50	1/8	250-340031	250-340031B
0.031	0.250	2.50	1/8	251-002101	251-002101B
0.031	0.375	2.50	1/8	251-002102	251-002102B
0.032	0.096	1.50	1/8	250-340032	250-340032B
0.033	0.099	1.50	1/8	250-340033	250-340033B
0.034	0.102	1.50	1/8	250-340034	250-340034B
0.035	0.053	1.50	1/8	250-370400	250-370400B
0.035	0.105	1.50	1/8	250-340035	250-340035B
0.036	0.108	1.50	1/8	250-340036	250-340036B
0.037	0.111	1.50	1/8	250-340037	250-340037B
0.038	0.114	1.50	1/8	250-340038	250-340038B
0.039	0.117	1.50	1/8	250-340039	250-340039B
0.040	0.060	1.50	1/8	250-370450	250-370450B
0.040	0.120	1.50	1/8	250-340040	250-340040B
0.041	0.123	1.50	1/8	250-340041	250-340041B
0.042	0.126	1.50	1/8	250-340042	250-340042B
0.043	0.129	1.50	1/8	250-340043	250-340043B
0.044	0.132	1.50	1/8	250-340044	250-340044B

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide Micro End Mills For Ferrous And Non-Ferrous Materials



Series 256

4FL | Ball Nose | Micro

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Bright	AITN
0.045	0.068	1.50	1/8	250-370500	250-370500B
0.045	0.135	1.50	1/8	250-340045	250-340045B
0.046	0.138	1.50	1/8	250-340046	250-340046B
0.047	0.141	1.50	1/8	250-340047	250-340047B
0.047	0.250	2.50	1/8	251-002110	251-002110B
0.047	0.375	2.50	1/8	251-002111	251-002111B
0.047	0.500	2.50	1/8	251-002112	251-002112B
0.048	0.144	1.50	1/8	250-340048	250-340048B
0.049	0.147	1.50	1/8	250-340049	250-340049B
0.050	0.075	1.50	1/8	250-370550	250-370550B
0.050	0.150	1.50	1/8	250-340050	250-340050B
0.051	0.153	1.50	1/8	250-340051	250-340051B
0.052	0.156	1.50	1/8	250-340052	250-340052B
0.053	0.159	1.50	1/8	250-340053	250-340053B
0.054	0.162	1.50	1/8	250-340054	250-340054B
0.055	0.083	1.50	1/8	250-370600	250-370600B
0.055	0.165	1.50	1/8	250-340055	250-340055B
0.056	0.168	1.50	1/8	250-340056	250-340056B
0.057	0.171	1.50	1/8	250-340057	250-340057B
0.058	0.174	1.50	1/8	250-340058	250-340058B
0.059	0.177	1.50	1/8	250-340059	250-340059B
0.060	0.090	1.50	1/8	250-370620	250-370620B
0.060	0.180	1.50	1/8	250-340060	250-340060B
0.061	0.183	1.50	1/8	250-340061	250-340061B
0.062	0.186	1.50	1/8	250-340062	250-340062B
0.063	0.189	1.50	1/8	250-340063	250-340063B
0.063	0.500	2.50	1/8	251-002120	251-002120B
0.063	0.750	2.50	1/8	251-002121	251-002121B
0.063	1.000	2.50	1/8	251-002122	251-002122B
0.064	0.192	1.50	1/8	250-340064	250-340064B
0.065	0.098	1.50	1/8	250-370640	250-370640B
0.065	0.195	1.50	1/8	250-340065	250-340065B
0.070	0.105	1.50	1/8	250-370660	250-370660B
0.070	0.210	1.50	1/8	250-340070	250-340070B
0.075	0.113	1.50	1/8	250-370680	250-370680B
0.075	0.225	1.50	1/8	250-340075	250-340075B
0.078	0.500	2.50	1/8	251-002130	251-002130B
0.080	0.120	1.50	1/8	250-370700	250-370700B
0.080	0.240	1.50	1/8	250-340080	250-340080B
0.085	0.128	1.50	1/8	250-370720	250-370720B
0.085	0.255	1.50	1/8	250-340085	250-340085B
0.090	0.135	1.50	1/8	250-370740	250-370740B
0.090	0.270	1.50	1/8	250-340090	250-340090B
0.094	0.500	2.50	1/8	251-002140	251-002140B
0.094	0.750	2.50	1/8	251-002141	251-002141B
0.095	0.143	1.50	1/8	250-370760	250-370760B
0.095	0.285	1.50	1/8	250-340095	250-340095B
0.100	0.150	1.50	1/8	250-370780	250-370780B
0.100	0.300	1.50	1/8	250-340100	250-340100B
0.105	0.158	1.50	1/8	250-370800	250-370800B
0.105	0.315	1.50	1/8	250-340105	250-340105B
0.110	0.165	1.50	1/8	250-370820	250-370820B
0.110	0.330	1.50	1/8	250-340110	250-340110B
0.115	0.173	1.50	1/8	250-370840	250-370840B
0.115	0.345	1.50	1/8	250-340115	250-340115B
0.120	0.180	1.50	1/8	250-370860	250-370860B
0.120	0.360	1.50	1/8	250-340120	250-340120B

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Solid Carbide Drill/Mill For Ferrous And Non-Ferrous Materials



INTRO

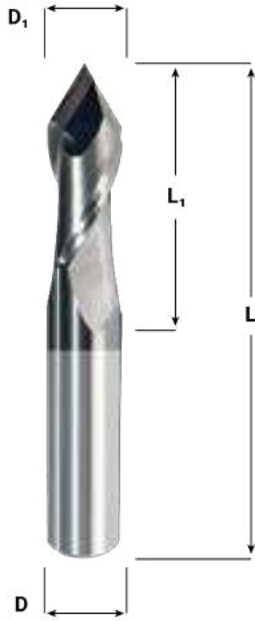
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
Drill Mill <ul style="list-style-type: none"> One tool - five applications: drill, mill, chamfer, spot and countersink Two flute design optimizes drilling, spotting, and countersinking processes Multiple included angles Diameter Tol.: +0/-0.002" Shank Tol.: +0/-0.0005" Angle: +/- 1.0° 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 207 2FL | 60°, 82°, 90°

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Incl. Angle	Bright	AlTiN
1/8	1/2	1-1/2	1/8	60°	208-621250	208-621253
1/8	1/2	1-1/2	1/8	82°	208-822125	208-822125B
1/8	1/2	1-1/2	1/8	90°	208-000125	208-010125
3/16	5/8	2	3/16	60°	208-621870	208-621873
3/16	5/8	2	3/16	82°	208-822187	208-822187B
3/16	5/8	2	3/16	90°	208-000187	208-010187
1/4	3/4	2-1/2	1/4	60°	208-622500	208-622503
1/4	3/4	2-1/2	1/4	82°	208-822250	208-822250B
1/4	3/4	2-1/2	1/4	90°	208-000250	208-010250
5/16	13/16	2-1/2	5/16	60°	208-623120	208-623123
5/16	13/16	2-1/2	5/16	90°	208-000312	208-010312
3/8	1	2-1/2	3/8	60°	208-623750	208-623753
3/8	1	2-1/2	3/8	82°	208-822375	208-822375B
3/8	1	2-1/2	3/8	90°	208-000375	208-010375
7/16	1	2-3/4	7/16	60°	208-624370	208-624373
7/16	1	2-3/4	7/16	90°	208-000437	208-010437
1/2	1	3	1/2	60°	208-625000	208-625003
1/2	1	3	1/2	82°	208-822500	208-822500B
1/2	1	3	1/2	90°	208-000500	208-010500
5/8	1-1/4	3-1/2	5/8	60°	208-626250	208-626253
5/8	1-1/4	3-1/2	5/8	90°	208-000625	208-010625
3/4	1-1/2	4	3/4	60°	208-627500	208-627503
3/4	1-1/2	4	3/4	90°	208-000750	208-010750

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide Drill/Mill For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
Drill Mill <ul style="list-style-type: none"> One tool - five applications: drill, mill, chamfer, spot and countersink Two flute design optimizes drilling, spotting, and countersinking processes Multiple included angles Diameter Tol.: +0/-0.002" Shank Tol.: +0/-0.0005" Angle: +/- 1.0° 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 208 4FL | 60°, 82°, 90°, 120°

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Incl. Angle	Bright	AlTiN
1/8	1/2	1-1/2	1/8	60°	208-641250	208-641253
1/8	1/2	1-1/2	1/8	82°	208-824125	208-824125B
1/8	1/2	1-1/2	1/8	90°	208-400125	208-420125
3/16	5/8	2	3/16	60°	208-641870	208-641873
3/16	5/8	2	3/16	82°	208-824187	208-824188
3/16	5/8	2	3/16	90°	208-400187	208-420187
1/4	3/4	2-1/2	1/4	60°	208-642500	208-642503
1/4	3/4	2-1/2	1/4	82°	208-824250	208-824253
1/4	3/4	2-1/2	1/4	90°	208-400250	208-420250
1/4	3/4	2-1/2	1/4	120°	208-662500	208-662503
5/16	13/16	2-1/2	5/16	60°	208-643120	208-643123
5/16	13/16	2-1/2	5/16	90°	208-400312	208-420312
3/8	1	2-1/2	3/8	60°	208-643750	208-643753
3/8	1	2-1/2	3/8	82°	208-824375	208-824378
3/8	1	2-1/2	3/8	90°	208-400375	208-420375
3/8	1	2-1/2	3/8	120°	208-663750	208-663753
7/16	1	2-3/4	7/16	60°	208-644370	208-644373
7/16	1	2-3/4	7/16	90°	208-400437	208-420437
1/2	1	3	1/2	60°	208-645000	208-645003
1/2	1	3	1/2	82°	208-824500	208-824503
1/2	1	3	1/2	90°	208-400500	208-420500
1/2	1	3	1/2	120°	208-665000	208-665003
5/8	1-1/4	3-1/2	5/8	60°	208-646250	208-646253
5/8	1-1/4	3-1/2	5/8	90°	208-400625	208-420625
3/4	1-1/2	4	3/4	60°	208-647500	208-647503
3/4	1-1/2	4	3/4	90°	208-400750	208-420750

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide Chamfer Mills For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
Chamfer Mills <ul style="list-style-type: none"> • 2FL & 4FL chamfer mills • Sub-micron grade carbide substrate for wear resistance • Optimizes drilling, spotting, and countersinking processes • Multiple included angles • Diameter Tol.: +0/-0.0005" • Shank Tol.: +0/-0.0005" • Angle: +/- 1.0° 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 209 2 and 4 FL | 60°, 82°, 90°

Diameter(D ₁)	OAL(L)	Shank(D)	Flutes	Incl. Angle	Bright	AlTiN
1/8	1-1/2	1/8	2	60°	209-062125	209-062125B
1/8	1-1/2	1/8	2	82°	209-082125	209-082125B
1/8	1-1/2	1/8	2	90°	209-092125	209-092125B
3/16	2	3/16	2	60°	209-062187	209-062187B
3/16	2	3/16	2	82°	209-082187	209-082187B
3/16	2	3/16	2	90°	209-092187	209-092187B
1/4	2-1/2	1/4	2	60°	209-062250	209-062250B
1/4	2-1/2	1/4	2	82°	209-082250	209-082250B
1/4	2-1/2	1/4	2	90°	209-092250	209-092250B
3/8	2-1/2	3/8	2	60°	209-062375	209-062375B
3/8	2-1/2	3/8	2	82°	209-082375	209-082375B
3/8	2-1/2	3/8	2	90°	209-092375	209-092375B
1/2	3	1/2	2	60°	209-062500	209-062500B
1/2	3	1/2	2	82°	209-082500	209-082500B
1/2	3	1/2	2	90°	209-092500	209-092500B
3/4	3	3/4	2	60°	209-062750	209-062750B
3/4	3	3/4	2	82°	209-082750	209-082750B
3/4	3	3/4	2	90°	209-092750	209-092750B
1/8	1-1/2	1/8	4	60°	209-064125	209-064125B
1/8	1-1/2	1/8	4	82°	209-084125	209-084125B
1/8	1-1/2	1/8	4	90°	209-094125	209-094125B
3/16	2	3/16	4	60°	209-064187	209-064187B
3/16	2	3/16	4	82°	209-084187	209-084187B
3/16	2	3/16	4	90°	209-094187	209-094187B
1/4	2-1/2	1/4	4	60°	209-064250	209-064250B
1/4	2-1/2	1/4	4	82°	209-084250	209-084250B
1/4	2-1/2	1/4	4	90°	209-094250	209-094250B
3/8	2-1/2	3/8	4	60°	209-064375	209-064375B
3/8	2-1/2	3/8	4	82°	209-084375	209-084375B
3/8	2-1/2	3/8	4	90°	209-094375	209-094375B
1/2	3	1/2	4	60°	209-064500	209-064500B
1/2	3	1/2	4	82°	209-084500	209-084500B
1/2	3	1/2	4	90°	209-094500	209-094500B
3/4	3	3/4	4	60°	209-064750	209-064750B
3/4	3	3/4	4	82°	209-084750	209-084750B
3/4	3	3/4	4	90°	209-094750	209-094750B

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide Chamfer Mills For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION		APPLICATION	FEATURES																																							
Chamfer Mills - Double Ended <ul style="list-style-type: none"> • 2FL & 4FL chamfer mills • Sub-micron grade carbide substrate for wear resistance • Optimizes drilling, spotting, and countersinking processes • Multiple included angles • Diameter Tol.: +0/-0.0005" • Shank Tol.: +0/-0.0005" • Angle: +/- 1.0° 																																										
<table border="1"> <thead> <tr> <th colspan="3">STEEL</th> <th colspan="2">STAINLESS</th> <th colspan="2">CAST IRON</th> <th colspan="2">NON-FERROUS</th> <th colspan="2">HRSA</th> <th colspan="2">HARDENED STEEL</th> </tr> <tr> <th>P1</th> <th>P2</th> <th>P3</th> <th>M1</th> <th>M2</th> <th>K1</th> <th>K2</th> <th>N1</th> <th>N2</th> <th>S1</th> <th>S2</th> <th>H1</th> <th>H2</th> </tr> </thead> <tbody> <tr> <td>○</td> <td>○</td> <td>○</td> <td></td> <td></td> <td>○</td> <td>○</td> <td>○</td> <td>○</td> <td></td> <td></td> <td>○</td> <td></td> </tr> </tbody> </table>		STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL		P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2	○	○	○			○	○	○	○			○			
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL																															
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																														
○	○	○			○	○	○	○			○																															

● Best ○ Good

Series 209D 2 and 4 FL | 60°, 82°, 90° | Double End

Diameter(D ₁)	OAL(L)	Shank(D)	Flutes	Incl. Angle	Bright	AlTiN
1/8	1-1/2	1/8	2	60°	209-262125	209-262125B
1/8	1-1/2	1/8	2	90°	209-292125	209-292125B
3/16	2	3/16	2	60°	209-262187	209-262187B
3/16	2	3/16	2	90°	209-292187	209-292187B
1/4	2-1/2	1/4	2	60°	209-262250	209-262250B
1/4	2-1/2	1/4	2	90°	209-292250	209-292250B
3/8	2-1/2	3/8	2	60°	209-262375	209-262375B
3/8	2-1/2	3/8	2	90°	209-292375	209-292375B
1/2	3	1/2	2	60°	209-262500	209-262500B
1/2	3	1/2	2	90°	209-292500	209-292500B
1/8	1-1/2	1/8	4	90°	209-694125	209-694125B
3/16	2	3/16	4	90°	209-694187	209-694187B
1/4	2-1/2	1/4	4	90°	209-694250	209-694250B
3/8	2-1/2	3/8	4	90°	209-694375	209-694375B
1/2	3	1/2	4	90°	209-694500	209-694500B

*bold numbers are EDPs for ordering

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TECHNICAL DATA

MILLING



Series 1030, 1032

HGW4 | 4 FL | SQ, CR, BN | Hurrimill

Material	Axial ↓	Radial →	SFM	1/8		1/4		3/8		1/2		5/8		3/4		
				RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	
P	Carbon Steel 10XX, 11XX, 12XX, 13XX	1 x D	1 x D	220	6723	13	3362	13	2241	16	1681	17	1345	16	1121	15
		1.25 x D	.3 x D	264	8068	19	4034	19	2689	23	2017	24	1614	23	1345	21
		1.5 X D	.1 x D	343	10488	42	5244	42	3496	50	2622	53	2098	51	1748	47
	Alloy Steel 4140, 8620	1 x D	1 x D	180	5501	21	2750	16	1834	13	1375	13	1100	13	917	12
		1.25 x D	.3 x D	225	6876	31	3438	24	2292	19	1719	20	1375	19	1146	17
		1.5 X D	.1 x D	270	8251	63	4126	47	2750	38	2063	40	1650	38	1375	35
	Tool Steel A2 ,A3, D2, H11, H13	1 x D	.5 x D	180	5501	10	2750	10	1834	13	1375	13	1100	13	917	12
		1.25 x D	.3 x D	225	6876	16	3438	16	2292	19	1719	20	1375	19	1146	17
		1.5 X D	.1 x D	270	8251	31	4126	31	2750	38	2063	40	1650	38	1375	35
M	SS 300 & 400 Series 303, 304, 316, 420, 417	.75 x D	1 x D	140	4278	7	2139	7	1426	8	1070	9	856	8	713	8
		1.25 x D	.3 x D	185	5654	11	2827	11	1885	13	1413	14	1131	13	942	12
		1.5 x D	.1 x D	230	7039	23	3519	23	2346	28	1760	29	1408	28	1173	25
	Precipitation SS 15-5, 16-6, 17-4, 17-6	2 X D	0.07 X D	393 - 800	12000	50	10696	107	7131	107	5348	107	4270	107	4075	107
		1.5 X D	0.15 X D	393 - 800	12000	55	10696	118	7131	118	5348	118	4270	118	4075	118
		1.0 X D	0.25 X D	393 - 800	12000	62	10696	132	7131	132	5348	132	4270	132	4075	132
S	High Temp Alloys Inconel 718, Hastalloy, A286, Waspalloy, CoCr	2 X D	0.1 X D	93 - 125	3820	8	1910	8	1273	5	955	8	764	8	477	6
		1.5 X D	0.15	84 - 112	3438	6	1719	6	1146	4	860	6	688	6	429	5
		1.0 X D	0.25	70-90	2865	5	1433	5	955	3	716	5	573	5	358	4

Series 1035

HGW5 | 5 FL | Square & Radius | Hurrmill

Material	Axial ↓	Radial →	SFM	1/8		1/4		3/8		1/2		5/8		3/4		
				RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	
P	Carbon Steel 10XX, 11XX, 12XX, 13XX	1 x D	1 x D	220	6723	17	3362	17	2241	20	1681	21	1345	20	1121	19
		1.25 x D	.3 x D	264	8068	24	4034	24	2689	29	2017	30	1614	29	1345	27
		1.5 X D	.1 x D	343	10488	52	5244	52	3496	63	2622	66	2098	63	1748	58
	Alloy Steel 4140, 8620	1 x D	1 x D	180	5501	16	2750	20	1834	16	1375	16	1100	16	917	14
		1.25 x D	.3 x D	225	6876	24	3438	29	2292	24	1719	25	1375	24	1146	22
		1.5 X D	.1 x D	270	8251	47	4126	59	2750	47	2063	49	1650	47	1375	43
	Tool Steel A2, A3, D2, H11, H13	1 x D	.5 x D	180	5501	13	2750	13	1834	16	1375	16	1100	16	917	14
		1.25 x D	.3 x D	225	6876	20	3438	20	2292	24	1719	25	1375	24	1146	22
		1.5 X D	.1 x D	270	8251	39	4126	39	2750	47	2063	49	1650	47	1375	43
M	SS 300 & 400 Series 303, 304, 316, 420, 417	.75 x D	1 x D	140	4278	9	2139	9	1426	10	1070	11	856	11	713	10
		1.25 x D	.3 x D	185	5654	14	2827	14	1885	17	1413	17	1131	17	942	15
		1.5 x D	.1 x D	230	7039	29	3519	29	2346	34	1760	36	1408	35	1173	32
	Precipitation SS 15-5, 16-6, 17-4, 17-6	2 X D	0.07 X D	393 - 800	12000	60	10696	107	7131	107	5348	107	4270	107	4075	107
		1.5 X D	0.15 X D	393 - 800	12000	66	10696	120	7131	120	5348	120	4270	120	4075	120
		1.0 X D	0.25 X D	393 - 800	12000	74	10696	150	7131	150	5348	150	4270	150	4075	150
S	High Temp Alloys Inconel 718, Hastalloy, A286, Waspalloy, CoCr	2 X D	0.07 X D	93 - 125	3820	10	1910	8	1273	5	955	8	764	8	477	6
		1.5 X D	0.15 X D	84 - 112	3438	8	1719	6	1146	4	860	6	688	6	429	5
		1.0 X D	0.25 X D	70-90	2865	6	1433	5	955	3	716	5	573	5	358	4

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Series 1040

HGW7 | 7 FL | Square & Radius | Hurrmill

Material	Axial ↓	Radial →	SFM	1/8		1/4		3/8		1/2		5/8		3/4		
				RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	
P	Carbon Steel 10XX, 11XX, 12XX, 13XX	1 x D	1 x D	220	6723	24	3362	24	2241	28	1681	30	1345	28	1121	26
		1.25 x D	.3 x D	264	8068	34	4034	34	2689	41	2017	43	1614	41	1345	38
		1.5 X D	.1 x D	343	10488	73	5244	73	3496	88	2622	93	2098	89	1748	81
	Alloy Steel 4140, 8620	1 x D	1 x D	180	5501	37	2750	27	1834	22	1375	23	1100	22	917	20
		1.25 x D	.3 x D	225	6876	55	3438	41	2292	33	1719	35	1375	33	1146	30
		1.5 X D	.1 x D	270	8251	110	4126	82	2750	66	2063	69	1650	66	1375	61
	Tool Steel A2 ,A3, D2, H11, H13	1 x D	.5 x D	180	5501	18	2750	18	1834	22	1375	23	1100	22	917	20
		1.25 x D	.3 x D	225	6876	27	3438	27	2292	33	1719	35	1375	33	1146	30
		1.5 X D	.1 x D	270	8251	55	4126	55	2750	66	2063	69	1650	66	1375	61
M	SS 300 & 400 Series 303, 304, 316, 420, 417	.75 x D	1 x D	140	4278	12	2139	12	1426	15	1070	15	856	15	713	14
		1.25 x D	.3 x D	185	5654	19	2827	19	1885	23	1413	24	1131	23	942	21
		1.5 x D	.1 x D	230	7039	40	3519	40	2346	48	1760	51	1408	49	1173	44
	Precipitation SS 15-5, 16-6, 17-4, 17-6	2 X D	0.07 X D	393 - 800	12000	70	10696	107	7131	107	5348	107	4270	107	4075	107
		1.5 X D	0.15 X D	393 - 800	12000	80	10696	122	7131	122	5348	122	4270	122	4075	122
		1.0 X D	0.25 X D	393 - 800	12000	96	10696	146	7131	146	5348	146	4270	146	4075	146
S	High Temp Alloys Inconel 718, Hastalloy, A286, Waspalloy, CoCr	2 X D	0.07 X D	93 - 125	3820	10	1910	8	1273	5	955	8	764	8	477	6
		1.5 X D	0.15 X D	84 - 112	3438	8	1719	6	1146	4	860	6	688	6	429	5
		1.0 X D	0.25 X D	70-90	2865	6	1433	5	955	3	716	5	573	5	358	4

Series 1031

SRF4 | 4 FL | Square | Chip Breaker | Hurrimill

Material	Axial ↓	Radial →	SFM	1/8		1/4		3/8		1/2		5/8		3/4		
				RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	
P	Carbon Steel 10XX, 11XX, 12XX, 13XX	1 x D	1 x D	220	6723	13	3362	13	2241	16	1681	17	1345	16	1121	15
		1.25 x D	.3 x D	264	8068	19	4034	19	2689	23	2017	24	1614	23	1345	21
		1.5 X D	.1 x D	343	10488	42	5244	42	3496	50	2622	53	2098	51	1748	47
	Alloy Steel 4140, 8620	1 x D	1 x D	180	5501	21	2750	16	1834	13	1375	13	1100	13	917	12
		1.25 x D	.3 x D	225	6876	31	3438	24	2292	19	1719	20	1375	19	1146	17
		1.5 X D	.1 x D	270	8251	63	4126	47	2750	38	2063	40	1650	38	1375	35
	Tool Steel A2 ,A3, D2, H11, H13	1 x D	.5 x D	180	5501	10	2750	10	1834	13	1375	13	1100	13	917	12
		1.25 x D	.3 x D	225	6876	16	3438	16	2292	19	1719	20	1375	19	1146	17
		1.5 X D	.1 x D	270	8251	31	4126	31	2750	38	2063	40	1650	38	1375	35
M	SS 300 & 400 Series 303, 304, 316, 420, 416	.75 x D	1 x D	140	4278	7	2139	7	1426	8	1070	9	856	8	713	8
		1.25 x D	.3 x D	185	5654	11	2827	11	1885	13	1413	14	1131	13	942	12
		1.5 x D	.1 x D	230	7039	23	3519	23	2346	28	1760	29	1408	28	1173	25
	Precipitation SS 15-5, 16-6, 17-4, 17-5	2 X D	0.07 X D	393 - 800	12000	50	10696	107	7131	107	5348	107	4270	107	4075	107
		1.5 X D	0.15 X D	393 - 800	12000	55	10696	118	7131	118	5348	118	4270	118	4075	118
		1.0 X D	0.25 X D	393 - 800	12000	62	10696	132	7131	132	5348	132	4270	132	4075	132
K	Cast Iron- Grey GG-10, GG-40	1 x D	1 x D	100	3056	6	1528	6	1019	7	764	7	611	7	509	6
		1.25 x D	.3 x D	125	3820	8	1910	8	1273	10	955	10	764	10	637	9
		1.5 X D	.1 x D	163	4966	18	2483	18	1655	22	1242	23	993	22	828	20
	Cast Iron- Ductile GGG-40, GGG-70	.75 x D	1 x D	155	4737	8	2368	8	1579	10	1184	10	947	10	789	9
		1.25 x D	.3 x D	180	5501	11	2750	11	1834	14	1375	14	1100	14	917	13
		1.5 x D	.1 x D	216	6601	23	3300	23	2200	27	1650	29	1320	27	1100	25
S	High Temp Alloys Inconel 718, Hastalloy, A286, CoCr	2 X D	0.1 X D	93 - 125	3820	8	1910	8	1273	5	955	8	764	8	477	6
		1.5 X D	0.15	84 - 112	3438	6	1719	6	1146	4	860	6	688	6	429	5
		1.0 X D	0.25	70-90	2865	5	1433	5	955	3	716	5	573	5	358	4

INTRO
MILLING
 SPECIALTY
 HOLEMAKING
 THREADING
 INSERTS

Series 1034

AT4 | 4 FL | Square End Radius

Material		Slotting	Side Milling	High Speed Milling
		Aa: 1.25xD	Aa: Loc Ar: 20%D	Aa: Loc Ar: 10%D
		SFM	SFM	SFM
P1	Carbon Steels (1018, 1050)	460 - 675	552 - 810	1050 - 1410
P2	Alloy Steels (4140, 8620)	430 - 615	520 - 740	900 - 1030
P3	Tool Steels (P20, S7, D2)	320 - 480	385 - 570	540 - 810
M1	Stainless Steels (303, 304)	260 - 350	360 - 420	470 - 600
M2	PH Stainless (17-4, 15-5)	200 - 280	250 - 310	320 - 430
K1	Cast Iron (A48, A319)	500 - 605	600 - 675	680 - 800
K2	Ductile Cast Iron (A536, CGI)	420 - 460	475 - 570	580 - 650
S1	Titanium (6Al4V, 5-38)	150 - 205	200 - 250	240 - 310
N1	Aluminum Alloy (6061, 7075)	1500 - 1600	1800 - 2100	2450 - 2710
N2	Cast Aluminum (A356, A319)	1100 - 1150	1250 - 1450	1500 - 1800

Inch Per Tooth									
Diameter	1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1
Ar < 0.5D	0.0007	0.0011	0.0019	0.002	0.0025	0.0032	0.0041	0.0045	0.0052
Ar > 0.5D	0.0005	0.0009	0.0013	0.0015	0.0021	0.0023	0.0033	0.0035	0.0042

Series 1034

Part Entry Guidelines

Material		Part Entry - Drilling								
		Inch Per Tooth								
		1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1
P1	Carbon Steels (1018, 1050)	0.0004	0.0006	0.0008	0.0011	0.0015	0.0017	0.0020	0.0022	0.0030
P2	Alloy Steels (4140, 8620)	0.0003	0.0005	0.0006	0.0008	0.0011	0.0013	0.0015	0.0017	0.0023
P3	Tool Steels (P20, S7, D2)	0.0002	0.0003	0.0004	0.0006	0.0008	0.0009	0.0010	0.0011	0.0015
K1	Cast Iron (A48, A319)	0.0004	0.0006	0.0008	0.0011	0.0015	0.0017	0.0020	0.0022	0.0030
N1	Aluminum Alloy (6061, 7075)	0.0005	0.0007	0.0010	0.0013	0.0018	0.0020	0.0024	0.0026	0.0036
N2	Cast Aluminum (A356, A319)	0.0004	0.0005	0.0007	0.0010	0.0014	0.0015	0.0018	0.0020	0.0027

Series 1034

AT4 | 4 FL | Square End Radius

Material	Ramp Angle	Part Entry - Ramping & Helical Interpolation									
		Inch Per Tooth									
		1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1	
P1 Carbon Steels (1018, 1050)	45 °	0.0004	0.0006	0.0008	0.0011	0.0015	0.0017	0.0020	0.0022	0.0030	
P2 Alloy Steels (4140, 8620)	30 °	0.0004	0.0005	0.0007	0.0010	0.0014	0.0015	0.0018	0.0020	0.0027	
P3 Tool Steels (P20, S7, D2)	30 °	0.0003	0.0005	0.0006	0.0008	0.0011	0.0013	0.0015	0.0017	0.0023	
M1 Stainless Steels (303, 304)	8 °	0.0002	0.0003	0.0004	0.0006	0.0008	0.0009	0.0010	0.0011	0.0015	
M2 PH Stainless (17-4, 15-5)	5 °	0.0002	0.0003	0.0004	0.0006	0.0008	0.0009	0.0010	0.0011	0.0015	
K1 Cast Iron (A48, A319)	45 °	0.0004	0.0007	0.0009	0.0012	0.0017	0.0019	0.0022	0.0024	0.0033	
K2 Ductile Cast Iron (A536, CGI)	20 °	0.0004	0.0006	0.0008	0.0011	0.0015	0.0017	0.0020	0.0022	0.0030	
S1 Titanium (6Al4V, 5-38)	10 °	0.00024	0.00036	0.00048	0.00066	0.0009	0.00102	0.0012	0.00132	0.0018	
N1 Aluminum Alloy (6061, 7075)	30 °	0.0004	0.0006	0.0008	0.0011	0.0015	0.0017	0.0020	0.0022	0.0030	
N2 Cast Aluminum (A356, A319)	30 °	0.0004	0.0005	0.0007	0.0010	0.0014	0.0015	0.0018	0.0020	0.0027	

Series 2150

HXM | Multi Flute | Square | Metrix

Work Material		M	S2
		316L, X2CrNiMo	Ti6Al4V, ASTM B348
m/min		20 - 40	15 - 35
Depth of Cut		Axial: 0.5 X D Radial: 0.1 X D	
Torx type	Diameter (mm)	mm/rev	mm/rev
T4	0.9	0.001 - 0.0015	0.001 - 0.0015
T5	1.0	0.0015 - 0.0025	0.0015 - 0.0025
T6	1.2	0.0025 - 0.0030	0.0025 - 0.0030
T7	1.4	0.0025 - 0.0030	0.0025 - 0.0030
T8	1.6	0.0030 - 0.0045	0.0030 - 0.0045
T10	1.9	0.0050 - 0.0060	0.0050 - 0.0060
T15	2.3	0.0050 - 0.0060	0.0050 - 0.0060
T20	2.7	0.0055 - 0.0065	0.0055 - 0.0065
T25	3.1	0.0073 - 0.0080	0.0073 - 0.0080
T30	3.8	0.0080 - 0.0100	0.0080 - 0.0100

*Helical interpolation only recommended in Titanium Alloys. For helical interpolation, reduce feed by 50-60%. Recommended pitch for helical interpolation = 0.2 to 0.4 X D

Series 1050

Speed & Feed Recommendations for 3-D Machining with GWS Ball End Mills

Diameter	Roughing & Semi-finishing			Finishing		
	RPM			RPM		
	30-40HRC	40-50HRC	50-60 HRC	30-40 HRC	40-50HRC	50-60HRC
1/32	38,400 - 60,000	32,000 - 50,000	24,600 - 40,000	20,000 - 50,000	20,000 - 50,000	20,000 - 50,000
1/16	26,400 - 42,000	22,000 - 35,000	16,600 - 28,000	20,000 - 50,000	20,000 - 50,000	20,000 - 50,000
3/32	21,600 - 31,200	18,000 - 26,000	13,400 - 20,800	20,000 - 50,000	20,000 - 50,000	20,000 - 50,000
1/8	19,200 - 28,800	16,000 - 24,000	11,800 - 19,200	20,000 - 38,000	20,000 - 50,000	20,000 - 30,500
3/16	15,000 - 19,776	12,500 - 16,480	9,000 - 13,184	20,000 - 26,000	20,000 - 34,000	16,000 - 20,300
1/4	12,120 - 16,800	10,100-14,000	7,080 - 11,200	15,000 - 18,000	18,000 - 24,400	12,000 - 15,000
5/16	11,400 - 15,900	9,200 - 13,250	6,360 - 10,600	12,000 - 14,000	14,600 - 19,000	9,700 - 12,000
3/8	10,560 - 14,520	8,800 - 12,100	6,040 - 9,680	10,000 - 12,000	12,000 - 16,200	8,100- 10,000
7/16	9,480 - 12,480	7,900 - 10,400	5,320 - 8,320	8,700 - 10,400	10,000 - 13,900	6,900 - 8,700
1/2	8,280 - 10,920	6,900 - 9,100	4,520 - 7,280	7,800 - 9,800	9,100-12,200	6,100 - 7,600

Chip Load per Tooth

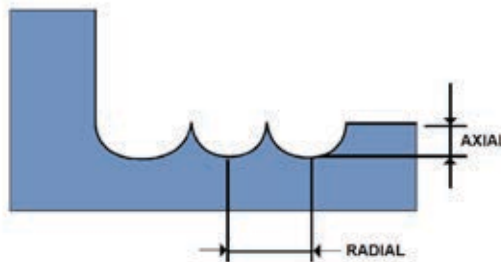
Diameter	30-40 HRC		40-50 HRC		50-60HRC	
	Rough & Semi	Finishing	Rough&Semi	Finishing	Rough & Semi	Finishing
1/32	0.0006 -0.0010	0.0006 -0.0009	0.0006 -0.0008	0.0005 -0.0007	0.0004 -0.0007	0.0004 -0.0006
1/16	0.0012 -0.0016	0.0010 -0.0015	0.0010 -0.0015	0.0010 -0.0014	0.0008 -0.0012	0.0007 -0.0010
3/32	0.0020 -0.0025	0.0014 -0.0024	0.0015 -0.0022	0.0014 -0.0020	0.0012 -0.0020	0.0010 -0.0014
1/8	0.0025 -0.0030	0.0019 -0.0028	0.0020 -0.0027	0.0019 -0.0026	0.0017 -0.0022	0.0015 -0.0020
3/16	0.0035 -0.0043	0.0032 -0.0042	0.0032 -0.0041	0.0030 -0.0040	0.0030 -0.0039	0.0023 -0.0031
1/4	0.0050 -0.0060	0.0040 -0.0053	0.0050 -0.0057	0.0040 -0.0051	0.0040 -0.0050	0.0038 -0.0048
5/16	0.0063 -0.0070	0.0053 -0.0068	0.0052 -0.0066	0.0052 -0.0063	0.0051 -0.0062	0.0046 -0.0054
3/8	0.0070 -0.0080	0.0062 -0.0079	0.0062 -0.0077	0.0054 -0.0065	0.0060 -0.0072	0.0050 -0.0061
7/16	0.0080 -0.0087	0.0068 -0.0086	0.0068 -0.0084	0.0060 -0.0078	0.0066 -0.0080	0.0053 -0.0070
1/2	0.0087 -0.0100	0.0080 -0.0094	0.0080 -0.0092	0.0070 -0.0090	0.0078 -0.0090	0.0062 -0.0081

Axial Depth of Cut

30 - 40 HRC = 0.10 X Diameter
 40 - 50 HRC = 0.07 X Diameter
 50 - 60 HRC = 0.05 X Diameter

Radial Depth of Cut

Roughing - 0.35 X Diameter
 Finishing = 0.02 - 0.05 X Diameter



Series 1010

ART | 3 FL | Radius | Chip Breaker | Alumigator

Material	Axial ↓	Radial →	3/16		1/4		5/16		3/8		1/2		5/8		3/4	
			RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM
N Aluminum, Brass, Copper 6061, 7050, 7075	0.5 X D	0.7 X D	12000	169	12000	227	12000	283	12000	341	12000	454	12000	568	12000	680
	1 X D	.6 X D	12000	155	12000	208	12000	260	12000	312	12000	416	12000	520	12000	624
	2 X D	.4 X D	12000	141	12000	189	12000	236	12000	284	12000	378	12000	473	12000	567
	0.5 X D	0.7 X D	12000	140	12000	188	12000	235	12000	282	12000	376	12000	470	12000	564
	1 X D	.6 X D	12000	133	12000	179	12000	223	12000	268	12000	357	12000	447	12000	536
	2 X D	.4 X D	12000	127	12000	170	12000	212	12000	256	12000	340	12000	426	12000	510

Series 1015

AST | 3 FL | Square & Radius | Chip Breaker | Alumigator

Material	Axial ↓	Radial →	3/16		1/4		5/16		3/8		1/2		5/8		3/4	
			RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM
N Aluminum, Brass, Copper 6061, 7050, 7075	1 X D	1.0 X D	12000	98	12000	132	12000	165	12000	198	12000	263	12000	330	12000	395
	2 X D	1.0 X D	12000	74	12000	99	12000	124	12000	149	12000	198	12000	248	12000	297
	2 X D	.4 X D	12000	141	12000	189	12000	236	12000	284	12000	378	12000	473	12000	567
	1 X D	1.0 X D	12000	89	12000	119	12000	148	12000	178	12000	237	12000	297	12000	356
	2 X D	1.0 X D	12000	67	12000	89	12000	112	12000	134	12000	178	12000	223	12000	267
	2 X D	.4 X D	12000	127	12000	170	12000	212	12000	256	12000	340	12000	426	12000	510

Series 1020

AFT | 3 FL | Radius | Finisher | Alumigator

Material	Axial ↓	Radial →	3/16		1/4		5/16		3/8		1/2		5/8		3/4	
			RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM
N Aluminum, Brass, Copper 6061, 7050, 7075	2 X D	.05 X D	12000	101	12000	135	12000	168	12000	203	12000	270	12000	338	12000	405
	.05 X D	0.65 X D	12000	111	12000	149	12000	185	12000	223	12000	297	12000	372	12000	446
	2 X D	.05 X D	12000	91	12000	122	12000	151	12000	183	12000	243	12000	304	12000	365
	.05 X D	0.65 X D	12000	100	12000	134	12000	166	12000	201	12000	267	12000	335	12000	401

Series 1500

ASR5 | 5 FL | Chip Breaker | Square & Radius | Coolant-Through | Alumigator

Material		Axial ↓	Radial →	SFM		3/8	1/2	5/8	3/4	1
						IPT	IPT	IPT	IPT	IPT
N	Aluminum Alloy 6061, 7075	.25 X D	1 X D	700	3930	0.0030	0.0050	0.0060	0.0080	0.0090
		0.5 X D	0.5 X D			0.0030	0.0050	0.0060	0.0080	0.0090
		2 X D	0.3 X D			0.0033	0.0055	0.0065	0.0087	0.0098
		Loc Max	0.1 X D			0.0051	0.0085	0.0102	0.0136	0.0153
		Loc Max	0.05 X D			0.0069	0.0115	0.0138	0.0184	0.0207
		Loc Max	0.02 X D			0.0105	0.0175	0.021	0.028	0.0315
	High Silicon Aluminum > 12%	.25 X D	1 X D	525	2948	0.0026	0.0045	0.0054	0.0072	0.0081
		0.5 X D	0.5 X D			0.0026	0.0045	0.0054	0.0072	0.0081
		2 X D	0.3 X D			0.0028	0.0049	0.0059	0.0078	0.0088
		Loc Max	0.1 X D			0.0043	0.0077	0.0092	0.0122	0.0138
		Loc Max	0.05 X D			0.0059	0.0104	0.0124	0.0166	0.0186
		Loc Max	0.02 X D			0.0089	0.0158	0.0189	0.0252	0.0284

Series 1502

ASR5 | 5 FL | Chip Breaker | Square & Radius | Solid | Alumigator

Material		Axial ↓	Radial →	SFM		3/8	1/2	5/8	3/4	1
						IPT	IPT	IPT	IPT	IPT
N	Aluminum Alloy 6061, 7075	.25 X D	1 X D	490	2751	0.0030	0.0050	0.0060	0.0080	0.0090
		0.5 X D	0.5 X D			0.0030	0.0050	0.0060	0.0080	0.0090
		2 X D	0.3 X D			0.0033	0.0055	0.0065	0.0087	0.0098
		Loc Max	0.1 X D			0.0051	0.0085	0.0102	0.0136	0.0153
		Loc Max	0.05 X D			0.0069	0.0115	0.0138	0.0184	0.0207
		Loc Max	0.02 X D			0.0105	0.0175	0.021	0.028	0.0315
	High Silicon Aluminum > 12%	.25 X D	1 X D	368	2063	0.0026	0.0045	0.0054	0.0072	0.0081
		0.5 X D	0.5 X D			0.0026	0.0045	0.0054	0.0072	0.0081
		2 X D	0.3 X D			0.0028	0.0049	0.0059	0.0078	0.0088
		Loc Max	0.1 X D			0.0043	0.0077	0.0092	0.0122	0.0138
		Loc Max	0.05 X D			0.0059	0.0104	0.0124	0.0166	0.0186
		Loc Max	0.02 X D			0.0089	0.0158	0.0189	0.0252	0.0284

Series 2100, 2105, 2115, 2117
438 | 4 FL | SQ, CR, BN, CB | PYSTL

Material	Axial ↓	Radial →	SFM	1/8		1/4		3/8		1/2		5/8		3/4	
				RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM
P Carbon Steel 10XX, 11XX, 12XX, 13XX Alloy Steel 4140, 8620 Tool Steel A2, A3, D2, H11, H13	1 x D	1 x D	220	6723	13	3362	13	2241	16	1681	17	1345	16	1121	15
	1.25 x D	.3 x D	264	8068	19	4034	19	2689	23	2017	24	1614	23	1345	21
	1.5 X D	.1 x D	343	10488	42	5244	42	3496	50	2622	53	2098	51	1748	47
	1 x D	1 x D	180	5501	21	2750	16	1834	13	1375	13	1100	13	917	12
	1.25 x D	.3 x D	225	6876	31	3438	24	2292	19	1719	20	1375	19	1146	17
	1.5 X D	.1 x D	270	8251	63	4126	47	2750	38	2063	40	1650	38	1375	35
	1 x D	.5 x D	180	5501	10	2750	10	1834	13	1375	13	1100	13	917	12
	1.25 x D	.3 x D	225	6876	16	3438	16	2292	19	1719	20	1375	19	1146	17
	1.5 X D	.1 x D	270	8251	31	4126	31	2750	38	2063	40	1650	38	1375	35
M SS 300 & 400 Series 303, 304, 316, 420, 416 Precipitation SS 15-5, 16-6, 17-4, 17-5	.75 x D	1 x D	140	4278	7	2139	7	1426	8	1070	9	856	8	713	8
	1.25 x D	.3 x D	185	5654	11	2827	11	1885	13	1413	14	1131	13	942	12
	1.5 x D	.1 x D	230	7039	23	3519	23	2346	28	1760	29	1408	28	1173	25
	0.5	1 x D	115	3514	5	1757	5	1171	7	879	7	703	7	586	6
	1.25 x D	.3 x D	180	5501	10	2750	10	1834	12	1375	13	1100	12	917	11
	1.5 x D	.1 x D	250	7640	24	3820	24	2547	28	1910	30	1528	29	1273	26
K Cast Iron - Grey GG-10 to GG-40 Cast Iron- Ductile GGG-40, to GGG-70	1 x D	1 x D	100	3056	6	1528	6	1019	7	764	7	611	7	509	6
	1.25 x D	.3 x D	125	3820	8	1910	8	1273	10	955	10	764	10	637	9
	1.5 X D	.1 x D	163	4966	18	2483	18	1655	22	1242	23	993	22	828	20
	.75 x D	1 x D	155	4737	8	2368	8	1579	10	1184	10	947	10	789	9
	1.25 x D	.3 x D	180	5501	11	2750	11	1834	14	1375	14	1100	14	917	13
	1.5 x D	.1 x D	216	6601	23	3300	23	2200	27	1650	29	1320	27	1100	25
S High Temp Alloys Inconel 718, Hastalloy, Waspalloy, A286, CoCr Titanium Alloy Ti-6Al4V Grades (5-38)	.25 x D	.4 x D	70	2139	3	1070	3	713	4	535	4	428	4	357	3
	1.25 x D	.2 x D	80	2445	4	1222	4	815	5	611	5	489	5	407	5
	1.5 x D	.07 x D	125	3820	11	1910	11	1273	13	955	14	764	14	637	12
	0.5	1 x D	180	5501	8	2750	8	1834	9	1375	10	1100	9	917	9
	1.25 x D	.3 x D	225	6876	12	3438	12	2292	14	1719	15	1375	14	1146	13
	1.5 x D	.1 x D	360	11002	31	5501	31	3667	37	2750	39	2200	37	1834	34

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Series 2205, 2213

538 | 5 FL | Square & Radius | PYSTL

Material	Axial ↓	Radial →	SFM	1/8		1/4		3/8		1/2		5/8		3/4		
				RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	
P	Carbon Steel 10XX, 11XX, 12XX, 13XX	1 x D	1 x D	220	6723	17	3362	17	2241	20	1681	21	1345	20	1121	19
		1.25 x D	.3 x D	264	8068	24	4034	24	2689	29	2017	30	1614	29	1345	27
		1.5 X D	.1 x D	343	10488	52	5244	52	3496	63	2622	66	2098	63	1748	58
	Alloy Steel 4140, 8620	1 x D	1 x D	180	5501	16	2750	20	1834	16	1375	16	1100	16	917	14
		1.25 x D	.3 x D	225	6876	24	3438	29	2292	24	1719	25	1375	24	1146	22
		1.5 X D	.1 x D	270	8251	47	4126	59	2750	47	2063	49	1650	47	1375	43
	Tool Steel A2 ,A3, D2, H11, H13	1 x D	.5 x D	180	5501	13	2750	13	1834	16	1375	16	1100	16	917	14
		1.25 x D	.3 x D	225	6876	20	3438	20	2292	24	1719	25	1375	24	1146	22
		1.5 X D	.1 x D	270	8251	39	4126	39	2750	47	2063	49	1650	47	1375	43
M	SS 300 & 400 Series 303, 304, 316, 420, 416	.75 x D	1 x D	140	4278	9	2139	9	1426	10	1070	11	856	11	713	10
		1.25 x D	.3 x D	185	5654	14	2827	14	1885	17	1413	17	1131	17	942	15
		1.5 x D	.1 x D	230	7039	29	3519	29	2346	34	1760	36	1408	35	1173	32
	Precipitation SS 15-5, 16-6, 17-4, 17-5	0.5	1 x D	115	3514	7	1757	7	1171	8	879	9	703	8	586	8
		1.25 x D	.3 x D	180	5501	13	2750	13	1834	15	1375	16	1100	15	917	14
		1.5 x D	.1 x D	250	7640	30	3820	30	2547	35	1910	37	1528	36	1273	33
K	Cast Iron - Grey GG-10 to GG-40	1 x D	1 x D	100	3056	7	1528	7	1019	8	764	9	611	8	509	8
		1.25 x D	.3 x D	125	3820	10	1910	10	1273	12	955	13	764	13	637	11
		1.5 X D	.1 x D	163	4966	22	2483	22	1655	27	1242	28	993	27	828	25
	Cast Iron- Ductile GGG-40, to GGG-70	.75 x D	1 x D	155	4737	10	2368	10	1579	12	1184	13	947	12	789	11
		1.25 x D	.3 x D	180	5501	14	2750	14	1834	17	1375	18	1100	17	917	16
		1.5 x D	.1 x D	216	6601	28	3300	28	2200	34	1650	36	1320	34	1100	31
S	High Temp Alloys Inconel 718, Hastalloy, Waspalloy, A286, CoCr	.25 x D	.4 x D	70	2139	4	1070	4	713	5	535	5	428	5	357	4
		1.25 x D	.2 x D	80	2445	5	1222	5	815	6	611	7	489	7	407	6
		1.5 x D	.07 x D	125	3820	14	1910	14	1273	17	955	18	764	17	637	16
	Titanium Alloy Ti-6Al4V Grades (5-38)	0.5	1 x D	180	5501	10	2750	10	1834	12	1375	12	1100	12	917	11
		1.25 x D	.3 x D	225	6876	14	3438	14	2292	17	1719	18	1375	17	1146	16
		1.5 x D	.1 x D	360	11002	38	5501	38	3667	46	2750	48	2200	46	1834	43

Series 2215

738 | 7 FL | Square & Radius | PYSTL

Material	Axial ↓	Radial →	SFM	1/8		1/4		3/8		1/2		5/8		3/4		
				RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	
P	Carbon Steel 10XX, 11XX, 12XX, 13XX	1 x D	1 x D	220	6723	24	3362	24	2241	28	1681	30	1345	28	1121	26
		1.25 x D	.3 x D	264	8068	34	4034	34	2689	41	2017	43	1614	41	1345	38
		1.5 X D	.1 x D	343	10488	73	5244	73	3496	88	2622	93	2098	89	1748	81
	Alloy Steel 4140, 8620	1 x D	1 x D	180	5501	37	2750	27	1834	22	1375	23	1100	22	917	20
		1.25 x D	.3 x D	225	6876	55	3438	41	2292	33	1719	35	1375	33	1146	30
		1.5 X D	.1 x D	270	8251	110	4126	82	2750	66	2063	69	1650	66	1375	61
	Tool Steel A2 ,A3, D2, H11, H13	1 x D	.5 x D	180	5501	18	2750	18	1834	22	1375	23	1100	22	917	20
		1.25 x D	.3 x D	225	6876	27	3438	27	2292	33	1719	35	1375	33	1146	30
		1.5 X D	.1 x D	270	8251	55	4126	55	2750	66	2063	69	1650	66	1375	61
M	SS 300 & 400 Series 303, 304, 316, 420, 416	.75 x D	1 x D	140	4278	12	2139	12	1426	15	1070	15	856	15	713	14
		1.25 x D	.3 x D	185	5654	19	2827	19	1885	23	1413	24	1131	23	942	21
		1.5 x D	.1 x D	230	7039	40	3519	40	2346	48	1760	51	1408	49	1173	44
	Precipitation SS 15-5, 16-6, 17-4, 17-5	0.5	1 x D	115	3514	10	1757	10	1171	11	879	12	703	12	586	11
		1.25 x D	.3 x D	180	5501	18	2750	18	1834	21	1375	23	1100	22	917	20
		1.5 x D	.1 x D	250	7640	41	3820	41	2547	50	1910	52	1528	50	1273	46
K	Cast Iron - Grey, GG-10 to GG-40	1 x D	1 x D	100	3056	10	1528	10	1019	12	764	12	611	12	509	11
		1.25 x D	.3 x D	125	3820	14	1910	14	1273	17	955	18	764	18	637	16
		1.5 X D	.1 x D	163	4966	31	2483	31	1655	38	1242	40	993	38	828	35
	Cast Iron - Ductile GGG-40, to GGG-70	.75 x D	1 x D	155	4737	14	2368	14	1579	17	1184	18	947	17	789	16
		1.25 x D	.3 x D	180	5501	20	2750	20	1834	24	1375	25	1100	24	917	22
		1.5 x D	.1 x D	216	6601	40	3300	40	2200	48	1650	50	1320	48	1100	44
S	High Temp Alloys Inconel 718, Hastalloy, Waspalloy, A286, CoCr	.25 x D	.4 x D	70	2139	6	1070	6	713	7	535	7	428	7	357	6
		1.25 x D	.2 x D	80	2445	8	1222	8	815	9	611	10	489	9	407	8
		1.5 x D	.07 x D	125	3820	20	1910	20	1273	24	955	25	764	24	637	22
	Titanium Alloy Ti-6Al4V Grades (5-38)	0.5	1 x D	180	5501	13	2750	13	1834	16	1375	17	1100	16	917	15
		1.25 x D	.3 x D	225	6876	20	3438	20	2292	24	1719	25	1375	24	1146	22
		1.5 x D	.1 x D	360	11002	54	5501	54	3667	65	2750	68	2200	65	1834	60

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Series 2004, 2004R

Alpha 4 | 4FL | Radius

Profiling				SFM based on RDOC				IPT *(BASELINE)								
				Cutting Diameter Engaged				Cutting Diameter								
Material			Hardness	5%	10%	25%	50%	*1/8	*3/16	*1/4	5/16	3/8	1/2	5/8	1/4	1
P	Steel	Free Machining & Low Carbon: 10XX, 11XX, 12XX, A36	≤ 28 Rc	1475	1150	980	500									
	Steel	Medium Carbon Steels, 1140, 1145	28-38 Rc	1130	900	840	250	0.0012	0.0020	0.0024	0.0031	0.0039	0.0047	0.0060	0.0078	0.0100
	Steel	Alloy, 41XX	28-44 Rc	1035	840	765	200									
	Die Steels	A2, H13, L6, P20, S7	28-44 Rc	900	725	615	200									
M	Stainless Steels	430F, 301, 303, 410, 416 Annealed, 420F, 430, 430F	≤ 28 Rc	675	545	425	360									
	Stainless Steels	Austenitic, 301, 302, 303, 304, 304L, 420, 15-5PH, 17-4PH	≤ 28 Rc	525	430	400	210	0.0012	0.0020	0.0024	0.0031	0.0039	0.0047	0.0060	0.0078	0.0100
	Stainless Steels	Difficult to Machine, 302B, 304B, 309, 310, 316, 316Ti, PH13-8Mo	> 28 Rc	410	330	295	110									
	Stainless Steels	Difficult to Machine, 17-4 PH, PH13-8Mo, Nitronics	> 28 Rc	525	430	395	110	0.0006	0.0010	0.0012	0.0016	0.0020	0.0024	0.0030	0.0040	0.0050
	Stainless Steels	22% Duplex	> 28 Rc	245	195	180	110									
S	Super Alloys	High Temp, Nimonic, Inconel, Monel, Hastelloy	≤ 42 Rc	180	150	130	85									
	Super Alloys	Titanium: Ti 3Al-2.5V, Ti 6Al-4V Ti 10V-2Fe-3Al	≤ 42 Rc	525	425	330	175	0.0003	0.0005	0.0006	0.0008	0.0010	0.0012	0.0016	0.0020	0.0024
H	Hardened Steels	Tool Steel, Die Steel: S7, H13, A2	45-50 Rc	610	495	325	250	0.0006	0.0010	0.0012	0.0016	0.0020	0.0024	0.0030	0.0040	0.0050
	Hardened Steels	Tool Steel, Die Steel: D2, CPM-10V	50-55 Rc	510	410	280	200	0.0003	0.0005	0.0006	0.0008	0.0010	0.0012	0.0016	0.0020	0.0024
K	Cast-Iron	Gray: SAE J431, ASTM A48	≤ 240 HB	1625	1295	870	350									
	Cast-Iron	Ductile & Malleable, ASTM A536, ASTM 897, ASTM A47, ASTM A220 ASTM A602	> 240 HB	675	540	510	260	0.0012	0.0020	0.0024	0.0031	0.0039	0.0047	0.0060	0.0078	0.0100

Slotting				SFM based on RDOC			IPT								
				Cutting Diameter Engaged			Cutting Diameter								
Material			Hardness	25%	50%	100%	*1/8	*3/16	*1/4	5/16	3/8	1/2	5/8	3/4	1
P	Steel	Free Machining & Low Carbon: 10XX, 11XX, 12XX, A36	≤ 28 Rc	550	500	475									
	Steel	Medium Carbon Steels, 1140, 1145	28-38 Rc	275	250	225	0.0004	0.0010	0.0012	0.0016	0.0020	0.0025	0.0031	0.0040	0.0050
	Steel	Alloy, 41XX	28-44 Rc												
	Die Steels	A2, H13, L6, P20, S7	28-44 Rc	225	200	175									
M	Stainless Steels	430F, 301, 303, 410, 416 Annealed, 420F, 430, 430F	≤ 28 Rc	385	360	350									
	Stainless Steels	Austenitic, 301, 302, 303, 304, 304L, 420, 15-5PH, 17-4PH	≤ 28 Rc	225	210	200	0.0004	0.0010	0.0012	0.0016	0.0020	0.0024	0.0031	0.0040	0.0050
	Stainless Steels	Difficult to Machine, 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti	> 28 Rc												
	Stainless Steels	Difficult to Machine, 17-4 PH, PH13-8Mo, Nitronics	> 28 Rc	125	110	100	0.0003	0.0005	0.0006	0.0008	0.0010	0.0012	0.0016	0.0020	0.0024
	Stainless Steels	22% Duplex	> 28 Rc	150	130	120									
S	Super Alloys	High Temp, Nimonic, Inconel, Monel, Hastelloy	≤ 42 Rc	100	85	75	0.0003	0.0005	0.0006	0.0008	0.0010	0.0012	0.0016	0.0020	0.0024
	Super Alloys	Titanium: Ti 3Al-2.5V, Ti 6Al-4V Ti 10V-2Fe-3Al	≤ 42 Rc	180	175	160									
H	Hardened Steels	Tool Steel, Die Steel: S7, H13, A2	45-50 Rc	275	250	225	0.0003	0.0005	0.0006	0.0008	0.0010	0.0012	0.0016	0.0020	0.0024
	Hardened Steels	Tool Steel, Die Steel: D2, CPM-10V	50-55 Rc	225	200	175	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0008	0.0010	0.0015
K	Cast Iron	Gray: SAE J431, ASTM A48	≤ 240 HB	375	350	325									
	Cast Iron	Ductile & Malleable, ASTM A536, ASTM 897, ASTM A47, ASTM A220	> 240 HB	275	260	250	0.0004	0.0010	0.0012	0.0016	0.0020	0.0024	0.0031	0.0040	0.0050

Series 2005, 2005R

Alpha 5 | 5FL | Radius

Profiling			SFM based on RDOC				IPT *(BASELINE)									
			Cutting Diameter Engaged				Cutting Diameter									
Material		Hardness	5%	10%	25%	50%	*1/8	*3/16	*1/4	5/16	3/8	1/2	5/8	1/4	1	
P	Steel	Free Machining & Low Carbon: 10XX, 11XX, 12XX, A36	≤ 28 Rc	1475	1150	980	500									
	Steel	Medium Carbon Steels, 1140, 1145	28-38 Rc	1130	900	830	250	0.0012	0.0020	0.0024	0.0031	0.0039	0.0047	0.0060	0.0078	0.0100
	Steel	Alloy, 41XX	28-44 Rc	1035	840	755										
	Die Steels	A2, H13, L6, P20, S7	28-44 Rc	900	725	615	200									
M	Stainless Steels	430F, 301, 303, 410, 416 Annealed, 420F, 430, 430F	≤ 28 Rc	675	545	425	360									
	Stainless Steels	Austenitic, 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH	≤ 28 Rc	525	430	400	210	0.0012	0.0020	0.0024	0.0031	0.0039	0.0047	0.0060	0.0078	0.0100
	Stainless Steels	Difficult to Machine, 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321	> 28 Rc	410	430	295										
	Stainless Steels	Difficult to Machine, 17-4 PH, PH13-8Mo, Nitronics	> 28 Rc	525	430	395	110	0.0006	0.0010	0.0012	0.0016	0.0020	0.0024	0.0030	0.0040	0.0050
	Stainless Steels	22% Duplex	> 28 Rc	245	195	180										
S	Super Alloys	High Temp, Nimonics, Inconel, Monel, Hastelloy	≤ 42 Rc	180	150	130	85									
	Super Alloys	Titanium: Ti 3Al-2.5V, Ti 6Al-4V Ti 10V-2Fe-3Al	≤ 42 Rc	525	425	330	175	0.0003	0.0005	0.0006	0.0008	0.0010	0.0012	0.0016	0.0020	0.0024
H	Hardened Steels	Tool Steel, Die Steel: S7, H13, A2	45-50 Rc	610	495	325	250	0.0006	0.0010	0.0012	0.0016	0.0020	0.0024	0.0030	0.0040	0.0050
	Hardened Steels	Tool Steel, Die Steel: D2, CPM-10V	50-55 Rc	510	410	280	200	0.0003	0.0005	0.0006	0.0008	0.0010	0.0012	0.0016	0.0020	0.0024
K	Cast Iron	Gray: SAE J431, ASTM A48	≤ 240 HB	1625	1295	870	350									
	Cast Iron	Ductile & Malleable, ASTM A536, ASTM 897, ASTM A47, ASTM A220	> 240 HB	675	540	510	260	0.0012	0.0020	0.0024	0.0031	0.0039	0.0047	0.0060	0.0078	0.0100

Slotting			SFM based on RDOC			IPT									
			Cutting Diameter Engaged			Cutting Diameter									
Material		Hardness	25%	50%	100%	*1/8	*3/16	*1/4	5/16	3/8	1/2	5/8	3/4	1	
P	Steel	Free Machining & Low Carbon: 10XX, 11XX, 12XX, A36	≤ 28 Rc	550	500	475									
	Steel	Medium Carbon Steels, 1140, 1145	28-38 Rc	275	250	225	0.0004	0.0010	0.0012	0.0016	0.0020	0.0025	0.0031	0.0040	0.0050
	Steel	Alloy, 41XX	28-44 Rc												
	Die Steels	A2, H13, L6, P20, S7	28-44 Rc	225	200	175									
M	Stainless Steels	430F, 301, 303, 410, 416 Annealed, 420F, 430, 430F	≤ 28 Rc	275	250	225	0.0003	0.0005	0.0006	0.0008	0.0010	0.0012	0.0016	0.0020	0.0024
	Stainless Steels	Austenitic, 301, 302, 303, 304, 304L, 420, 15-5PH, 17-4PH	≤ 28 Rc	225	200	175	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0008	0.0010	0.0015
	Stainless Steels	Difficult to Machine, 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321	> 28 Rc	385	360	350	0.0002	0.0004	0.0008	0.0012	0.0014	0.0018	0.0022	0.0026	0.0038
	Stainless Steels	Difficult to Machine, 17-4 PH, PH13-8Mo, Nitronics	> 28 Rc	225	210	200									
	Stainless Steels	22% Duplex	> 28 Rc	125	110	100	0.0003	0.0005	0.0006	0.0008	0.0010	0.0012	0.0016	0.0020	0.0024
S	Super Alloys	High Temp, Nimonics, Inconel, Monel, Hastelloy	≤ 42 Rc	135	120	110									
	Super Alloys	Titanium: Ti 3Al-2.5V, Ti 6Al-4V Ti 10V-2Fe-3Al	≤ 42 Rc	100	85	75	0.0003	0.0005	0.0006	0.0008	0.0010	0.0012	0.0016	0.0020	0.0024
H	Hardened Steels	Tool Steel, Die Steel: S7, H13, A2	45-50 Rc	95	85	75									
	Hardened Steels	Tool Steel, Die Steel: D2, CPM-10V	50-55 Rc	225	200	175	0.0003	0.0005	0.0006	0.0008	0.0010	0.0012	0.0016	0.0020	0.0024
K	Cast Iron	Gray: SAE J431, ASTM A48	≤ 240 HB	375	350	325									
	Cast Iron	Ductile & Malleable, ASTM A536, ASTM 897, ASTM A47, ASTM A220	> 240 HB	275	260	250	0.0004	0.0010	0.0012	0.0016	0.0020	0.0024	0.0031	0.0040	0.0050

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Series 2006

Alpha 6 | 6FL | Radius

Profiling			SFM based on RDOC					IPT *(BASELINE)							
			Cutting Diameter Engaged					Cutting Diameter							
Material			Hardness	5%	10%	20%	30%	50%	*1/8	*1/4	3/8	1/2	5/8	3/4	1
P	Steel	Free Machining & Low Carbon: 10XX, 11XX, 12XX, A36	≤ 28 Rc	600	550	500	450	400	0.0011	0.0022	0.0035	0.0042	0.0059	0.0680	0.0900
	Steel	Medium/High Carbon Steels, Alloy Steels: 13XX, 41XX, 43XX, 86XX	28-38 Rc	600	550	500	450	400	0.0011	0.0022	0.0035	0.0042	0.0059	0.0680	0.0900
	Die Steels	A2, H13, L6, P20, S7	28-44 Rc	550	500	450	400	375	0.0011	0.0020	0.0033	0.0040	0.0055	0.0650	0.0850
M	Stainless Steels	Ferritic	≤ 28 Rc	360	370	300	280	260	0.0007	0.0014	0.0024	0.0030	0.0040	0.5200	0.0680
	Stainless Steels	Martensitic	≤ 28 Rc	360	370	300	280	260	0.0004	0.0008	0.0016	0.0018	0.0024	0.0300	0.0400
	Stainless Steels	Difficult to Machine, 302B, 304B, 309, 310, 316, 316Ti, PH13-8Mo	> 28 Rc	320	300	280	260	240	0.0003	0.0006	0.0010	0.0015	0.0018	0.0240	0.0300
S	Super Alloys	High Temp, Nimonics, Inconel, Monel, Hastelloy	≤ 42 Rc	550	525	500	450	425	0.0010	0.0020	0.0033	0.0040	0.0055	0.0700	0.0100
	Super Alloys	Titanium: Ti 3Al-2.5V, Ti 6Al-4V Ti 10V-2Fe-3Al	≤ 42 Rc	550	525	500	450	425	0.0010	0.0020	0.0033	0.0040	0.0055	0.0700	0.0100
H	Hardened Steels	Tool Steel, Die Steel: S7, H13, A2	40-50 Rc	550	525	500	450	425	0.0010	0.0020	0.0033	0.0040	0.0055	0.0700	0.0100
	Hardened Steels	Tool Steel, Die Steel: D2, CPM-10V	50-55 Rc	165	165	130	115	100	0.0004	0.0008	0.0016	0.0018	0.0024	0.0300	0.0400
	Hardened Steels	Tool Steel, Die Steel: D2, CPM-10V	> 55 Rc	400	375	350	300	250	0.0004	0.0008	0.0016	0.0018	0.0024	0.0300	0.0400
K	Cast-Iron	Gray: SAE J431, ASTM A48	≤ 240 HB	1625	1295	900	700	350	0.0012	0.0024	0.0039	0.0047	0.0060	0.0078	0.0100
	Cast-Iron	Ductile & Malleable, ASTM A536, ASTM 897, ASTM A47, ASTM A220 ASTM A602	> 240 HB	675	540	550	400	260	0.0012	0.0024	0.0039	0.0047	0.0060	0.0078	0.0100

Slotting			SFM			IPT *(BASELINE)							
			SFM based on RDOC			Cutting Diameter							
Material			Hardness	25%	50%	100%*	*1/8	*1/4	3/8	1/2	5/8	3/4	1
P	Steel	Free Machining & Low Carbon: 10XX, 11XX, 12XX, A36	≤ 28 Rc	480	480	400	0.0005	0.0011	0.0017	0.0021	0.0029	0.0380	0.0480
	Steel	Medium/High Carbon Steels, Alloy Steels: 13XX, 41XX, 43XX, 86XX	28-38 Rc	480	480	400	0.0005	0.0011	0.0017	0.0021	0.0029	0.0380	0.0480
	Die Steels	A2, H13, L6, P20, S7	28-44 Rc	420	420	380	0.0005	0.0010	0.0016	0.0020	0.0027	0.0360	0.0460
M	Stainless Steels	Ferritic	≤ 28 Rc	420	420	400	0.0005	0.0010	0.0016	0.0020	0.0027	0.0035	0.0045
	Stainless Steels	Martensitic	≤ 28 Rc	420	420	400	0.0005	0.0010	0.0016	0.0020	0.0027	0.0035	0.0045
	Stainless Steels	Difficult to Machine, 302B, 304B, 309, 310, 316, 316Ti, PH13-8Mo	> 28 Rc	400	400	380	0.0005	0.0010	0.0016	0.0009	0.0027	0.0035	0.0045
S	Super Alloys	High Temp, Nimonics, Inconel, Monel, Hastelloy	≤ 42 Rc	120	120	95	0.0002	0.0004	0.0008	0.0009	0.0012	0.0016	0.0020
	Super Alloys	Titanium: Ti 3Al-2.5V, Ti 6Al-4V Ti 10V-2Fe-3Al	≤ 42 Rc	200	200	175	0.0002	0.0004	0.0008	0.0009	0.0012	0.0016	0.0020
H	Hardened Steels	Tool Steel, Die Steel: S7, H13, A2	40-50 Rc	350	350	300	0.003	0.0006	0.0012	0.0015	0.0020	0.0024	0.0030
	Hardened Steels	Tool Steel, Die Steel: D2, CPM-10V	50-55 Rc	180	180	150	0.0002	0.0004	0.0008	0.0009	0.0012	0.0016	0.0020
	Hardened Materials	Tool Steel, Die Steel: D2, CPM-10V	> 55 Rc	150	150	100	0.0002	0.0003	0.0005	0.0007	0.0009	0.0011	0.0014
K	Cast Iron	Gray: SAE J431, ASTM A48	≤ 240 HB	375	350	325	0.0004	0.00012	0.0020	0.0024	0.0031	0.0040	0.0050
	Cast Iron	Ductile & Malleable, ASTM A536, ASTM 897, ASTM A47, ASTM A220	> 240 HB	275	260	250	0.0004	0.00012	0.0020	0.0024	0.0031	0.0040	0.0050

Series 1130
Fusion | 4FL | Square

Profiling			SFM based on RDOC					IPT *(BASELINE)									
			Cutting Diameter Engaged					Cutting Diameter									
Material			Hardness	5%	10%	20%	30%	50%	*1/8	*3/16	*1/4	5/16	3/8	1/2	5/8	3/4	1
P	Steel	Free Machining & Low Carbon: 10XX, 11XX, 12XX, A36	≤ 28 Rc	1050	700	385	375	350	0.00065	0.00097	0.00120	0.032	0.0038	0.0054	0.0065	0.0076	0.0108
	Steel	Medium/High Carbon Steels, Alloy Steels: 13XX, 41XX, 43XX, 86XX	28-38 Rc	630	420	320	250	210	0.00065	0.00097	0.00120	0.0032	0.0038	0.0054	0.0065	0.0076	0.0108
	Die Steels	A2, H13, L6, P20, S7	28-44 Rc	525	350	300	275	250	0.00065	0.00097	0.00120	0.0032	0.0038	0.0054	0.0065	0.0076	0.0108
M	Stainless Steels	Ferritic	≤ 28 Rc	650	600	550	500	450	0.00065	0.00097	0.00120	0.0032	0.0038	0.0054	0.0065	0.0076	0.0108
	Stainless Steels	Martensitic	≤ 28 Rc	525	400	350	300	250	0.00065	0.00097	0.00120	0.0032	0.0038	0.0054	0.0065	0.0076	0.0108
	Stainless Steels	Difficult to Machine, 302B, 304B, 309, 310, 316, 316Ti, PH13-8Mo	> 28 Rc	525	400	350	300	250	0.00065	0.00097	0.00120	0.0032	0.0038	0.0054	0.0065	0.0076	0.0108
S	Super Alloys	High Temp, Nimonic, Inconel, Monel, Hastelloy	≤ 42 Rc	265	200	175	150	100	0.00048	0.00065	0.00096	0.0017	0.0019	0.0028	0.0032	0.0038	0.0054
	Super Alloys	Titanium: Ti 3Al-2.5V, Ti 6Al-4V Ti 10V-2Fe-3Al	≤ 42 Rc	230	200	175	150	125	0.00048	0.00065	0.00096	0.0017	0.0019	0.0028	0.0032	0.0038	0.0054
H	Hardened Steels	Tool Steel, Die Steel: S7, H13, A2	45-55 Rc	250	240	230	210	200	0.00360	0.00432	0.00504	0.0022	0.0025	0.0036	0.0043	0.0050	0.0072
K	Cast-Iron	Gray: SAE J431, ASTM A48	≤ 240 HB	425	400	375	350	300	0.00065	0.00097	0.00120	0.0032	0.0038	0.0054	0.0065	0.0076	0.0108
	Cast-Iron	Ductile & Malleable, ASTM A536, ASTM 897, ASTM A47, ASTM A220, ASTM A602	> 240 HB	320	300	250	225	200	0.00065	0.00097	0.00120	0.0032	0.0038	0.0054	0.0065	0.0076	0.0108
N	Non-Ferrous	Aluminum, Brass, Bronze, Copper, Plastics, Graphite	-	1000	960	920	880	840	0.00048	0.00065	0.00096	0.0032	0.0038	0.0054	0.0065	0.0076	0.0108

Slotting			SFM			IPT *(BASELINE)									
			Cutting Diameter Engaged			Cutting Diameter									
Material			Hardness	25%	50%	100%	*1/8	*3/16	*1/4	5/16	3/8	1/2	5/8	3/4	1
P	Steel	Free Machining & Low Carbon: 10XX, 11XX, 12XX, A36	≤ 28 Rc	462	444	420	0.00060	0.00084	0.00120	0.0019	0.0023	0.0037	0.00046	0.0046	0.0060
	Steel	Medium/High Carbon Steels, Alloy Steels: 13XX, 41XX, 43XX, 86XX	28-38 Rc	294	276	265	0.00048	0.00084	0.00108	0.0019	0.0023	0.0030	0.0037	0.0046	0.0060
	Die Steels	A2, H13, L6, P20, S7	28-44 Rc	252	234	210	0.00048	0.00072	0.00096	0.0019	0.0023	0.0030	0.0037	0.0046	0.0060
M	Stainless Steels	Ferritic	≤ 28 Rc	462	444	420	0.00060	0.00084	0.00120	0.0019	0.0023	0.0030	0.0037	0.0046	0.0060
	Stainless Steels	Martensitic	≤ 28 Rc	294	252	210	0.00048	0.00084	0.00120	0.0019	0.0023	0.0030	0.0037	0.0046	0.0060
	Stainless Steels	Difficult to Machine, 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321, PH13-8Mo, Nitronics	> 28 Rc	252	234	210	0.00036	0.00048	0.00060	0.0019	0.0023	0.0030	0.0037	0.0046	0.0060
S	Super Alloys	High Temp, Nimonic, Inconel, Monel, Hastelloy	≤ 42 Rc	150	126	108	0.00036	0.00048	0.00060	0.0010	0.0012	0.0016	0.0019	0.0020	0.0031
	Super Alloys	Titanium: Ti 3Al-2.5V, Ti 6Al-4V Ti 10V-2Fe-3Al	≤ 42 Rc	120	108	96	0.00036	0.00048	0.00060	0.0010	0.0012	0.0016	0.0019	0.0020	0.0031
H	Hardened Steels	Tool Steel, Die Steel: S7, H13, A2	34-45 Rc	294	276	252	0.00024	0.00036	0.00048	0.0019	0.0023	0.0030	0.0037	0.0046	0.0060
K	Cast Iron	Gray: SAE J431, ASTM A48	≤ 240 HB	540	480	420	0.00060	0.00084	0.00120	0.0019	0.0023	0.0030	0.0037	0.0046	0.0060
	Cast Iron	Ductile & Malleable, ASTM A536, ASTM 897, ASTM A47, ASTM A220	> 240 HB	360	300	270	0.00048	0.00084	0.00108	0.0019	0.0023	0.0030	0.0037	0.0046	0.0060
N	Non-Ferrous	Aluminum, Brass, Bronze, Copper, Plastics, Graphite	-	900	720	540	0.00132	0.00204	0.00264	0.0019	0.0023	0.0030	0.0037	0.0046	0.0060

Series 270

815 | Multi Flute | Square & Radius | Ni-Alloys

Material	Axial ↓	Radial →	SFM	1/8		1/4		3/8		1/2		5/8		3/4		
				RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	
P	Carbon Steel 10XX, 11XX, 12XX, 13XX	1 x D	.3 x D	220	6723	13	3362	13	2241	16	1681	17	1345	16	1121	15
		1.25 x D	.2 x D	264	8068	19	4034	194	2689	23	2017	24	1614	23	1345	21
		1.5 X D	.08 x D	317	9681	39	4841	39	3227	45	2420	47	1936	46	1614	42
		1.5 x D	.05 x D	380	11618	60	5809	51	3873	59	2904	62	2324	59	1936	54
	Alloy Steel 4140, 8620	1 x D	.3 x D	180	5501	11	2750	15	1834	13	1375	14	1100	13	917	12
		1.25 x D	.2 x D	225	6876	17	3438	23	2292	20	1719	21	1375	20	1146	18
		1.5 X D	.08 x D	270	8251	33	4126	462	2750	39	2063	40	1650	39	1375	36
		1.5 x D	.05 x D	297	9076	47	4538	54	3025	46	2269	48	1815	46	1513	42
	Tool Steel A2 ,A3, D2, H11, H13	.5 x D	.3 x D	160	4890	10	2445	14	1630	12	1222	12	978	12	815	11
		1.0 x D	.2 x D	200	6112	15	3056	21	2037	18	1528	18	1222	18	1019	16
		1.5 x D	.08 x D	240	7334	29	3667	411	2445	34	1834	36	1467	35	1222	32
		1.5 x D	.05 x D	264	8068	42	4034	48	2689	41	2017	43	1614	41	1345	38
M	SS 300 & 400 Series 303, 304, 316, 420, 417	.75 x D	.3 x D	140	4278	9	2139	7	1426	10	1070	11	856	10	713	9
		1.25 x D	.2 x D	185	5654	14	2827	11	1885	16	1413	17	1131	16	942	15
		1.5 x D	.08 x D	230	7039	28	3519	23	2346	33	1760	34	1408	33	1173	30
		1.5 x D	.05 x D	276	8446	44	4223	34	2815	43	2112	45	1689	43	1408	40
	Precipitation SS 15-5, 16-6, 17-4, 17-6	.5 x D	.3 x D	115	3514	7	1757	6	1171	7	879	7	703	7	586	6
		1.25 x D	.2 x D	180	5501	13	2750	11	1834	12	1375	12	1100	12	917	11
		1.5 x D	.08 x D	250	7640	31	3820	24	2547	26	1910	28	1528	27	1273	24
		1.5 x D	.05 x D	300	9168	48	4584	37	3056	44	2292	46	1834	44	1528	41
S	High Temp Alloys Inconel 718, Hastalloy, A286, Waspalloy, CoCr	.25 x D	.3 x D	70	2139	4	1070	3	713	4	535	4	428	4	357	4
		1 x D	.2 x D	80	2445	6	1222	5	815	5	611	5	489	5	407	5
		1.25 x D	.08 x D	125	3820	15	1910	12	1273	13	955	14	764	13	637	12
		1.5 x D	.05 x D	160	4890	25	2445	20	1630	23	1222	25	978	24	815	22

Series 280

840 | Multi Flute | Square & Radius | Titanium

Material		Axial ↓	Radial →	SFM	1/2		5/8		3/4	
					RPM	IPM	RPM	IPM	RPM	IPM
P	Carbon Steel 10XX, 11XX, 12XX, 13XX	1 x D	.5 x D	220	1681	32	1345	31	1121	35
		1.25 x D	.3 x D	264	2017	46	1614	45	1345	51
		1.5 X D	.1 x D	343	2622	100	2098	96	1748	110
		1.5 x D	.07 x D	378	2884	155	2307	148	1923	170
M	SS 300 & 400 Series 303, 304, 316, 420, 416	.75 x D	.5 x D	140	1070	18	856	17	713	19
		1.25 x D	.3 x D	185	1413	28	1131	27	942	31
		1.5 x D	.1 x D	230	1760	43	1408	41	1173	47
		1.5 x D	.07 x D	276	2112	68	1689	65	1408	75
S	High Temp Alloys Ti-6Al4V Grades (5-38)	.75 x D	.5 x D	180	1375	28	1100	27	917	30
		1.25 x D	.3 x D	225	1719	42	1375	40	1146	46
		1.5 x D	.1 x D	275	2101	85	1681	81	1401	93
		1.5 x D	.07 x D	303	2311	130	1849	125	1541	144

INTRO
MILLING
 SPECIALTY
 HOLEMAKING
 THREADING
 INSERTS

Series 1103, 1104

Atomic | 3 & 4 FL | Chamfer | Micro

Profiling			Inches Per Tooth (IPT)								
			Cutting Diameter								
Material			Hardness	SFM	0.015	0.031	0.047	0.062	0.078	0.093	0.125
P	Steel	Free Machining & Low Carbon: 10XX, 11XX, 12XX, A36	≤ 28 Rc	400	0.00007	0.00015	0.00023	0.00027	0.00034	0.00040	0.00054
	Steel	Medium/High Carbon Steels, Alloy Steels: 13XX, 41XX, 43XX, 86XX	28 - 38 Rc	300	0.00007	0.00015	0.00023	0.00027	0.00034	0.00040	0.00054
	Die Steels	A2, H13, L6, P20, S7	28 - 44 Rc	200	0.00007	0.00015	0.00023	0.00027	0.00034	0.00040	0.00054
M	Stainless Steels	Easy to Machine, 430F, 301, 303, 410, 416 Annealed, 420F, 430, 430F	≤ 28 Rc	400	0.00007	0.00015	0.00023	0.00027	0.00034	0.00040	0.00054
	Stainless Steels	Moderately Difficult to Machine, Nitronic 50, 301, 303, 304, 304L, 316, 316L, 321, 347	≤ 28 Rc	200	0.00007	0.00015	0.00023	0.00027	0.00034	0.00040	0.00054
	Stainless Steels	Difficult to Machine, 302B, 304B, 309, 310, 316, 316Ti, PH13-8Mo	> 28 Rc	150	0.00007	0.00015	0.00023	0.00027	0.00034	0.00040	0.00054
S	Super Alloys	High Temp, Nimonic, Inconel, Monel, Hastelloy	≤ 42 Rc	70	0.00004	0.00008	0.00015	0.00023	0.00027	0.00034	0.00040
	Super Alloys	Titanium: Ti 3Al-2.5V, Ti 6Al-4V Ti 10V-2Fe-3Al	≤ 42 Rc	150	0.00004	0.00008	0.00015	0.00023	0.00027	0.00034	0.00040
H	Hardened Steels	Tool Steel, Die Steel: S7, H13, A2	45-55 Rc	100	0.00010	0.00030	0.00050	0.00140	0.00180	0.00210	0.00300
K	Cast Iron	Gray: SAE J431, ASTM A48	160-200 HB	400	0.00007	0.00015	0.00023	0.00027	0.00034	0.00040	0.00054
	Cast Iron	Ductile & Malleable, ASTM A536, ASTM 897, ASTM A47, ASTM A220	200-250 HB	250	0.00007	0.00015	0.00023	0.00027	0.00034	0.00040	0.00054
N	Non-Ferrous	Aluminum, Brass, Bronze, Copper, Plastics, Graphite	-	100	0.00004	0.00008	0.00015	0.00023	0.00027	0.00034	0.00040

Slotting			Inches Per Tooth (IPT)								
			Cutting Diameter								
Material			Hardness	SFM	0.015	0.031	0.047	0.062	0.078	0.093	0.125
P	Steel	Free Machining & Low Carbon: 10XX, 11XX, 12XX, A36	≤ 28 Rc	400	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0005
	Steel	Medium/High Carbon Steels, Alloy Steels: 13XX, 41XX, 43XX, 86XX	28-38 Rc	300	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0004
	Die Steels	A2, H13, L6, P20, S7	28-44 Rc	200	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0004
M	Stainless Steels	Easy to Machine, 430F, 301, 303, 410, 416 Annealed, 420F, 430, 430F	≤ 28 Rc	400	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0005
	Stainless Steels	Moderately Difficult to Machine, Nitronic 50, 301, 303, 304, 304L, 316, 316L, 321, 347	≤ 28 Rc	200	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0004
	Stainless Steels	Difficult to Machine, 302B, 304B, 309, 310, 316, 316Ti, PH13-8Mo	> 28 Rc	150	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003
S	Super Alloys	High Temp, Nimonic, Inconel, Monel, Hastelloy	≤ 42 Rc	70	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003
	Super Alloys	Titanium: Ti 3Al-2.5V, Ti 6Al-4V Ti 10V-2Fe-3Al	≤ 42 Rc	150	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003
H	Hardened Steels	Tool Steel, Die Steel: S7, H13, A2	35-45 Rc	100	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002
K	Cast Iron	Gray: SAE J431, ASTM A48	160-200 HB	400	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0005
	Cast Iron	Ductile & Malleable, ASTM A536, ASTM 897, ASTM A47, ASTM A220	200-250 HB	250	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0004
N	Non-Ferrous	Aluminum, Brass, Bronze, Copper, Plastics, Graphite	-	750	0.0002	0.0003	0.0005	0.0006	0.0007	0.0008	0.0011

Series 2010, 2012, 2014, 2015
250 | 2 FL | SQ, CR, BN, RN | Performance-AL

Material	Axial ↓	Radial →	SFM	1/8		1/4		5/16		3/8		1/2		5/8		3/4		
				RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	
N	Aluminum, Brass, Copper 6061, 7050, 7075	.5 x D	1 x D	600	18336	44	9168	48	7334	53	6112	53	4584	55	3667	53	3056	53
		1.25 x D	.3 x D	720	22003	66	11002	70	8801	77	7334	77	5501	80	4401	77	3667	77
		1.5 x D	.1 x D	1200	36672	147	18336	150	14669	154	12224	154	9168	162	7334	155	6112	155
	High Silicon Aluminum 4% - 13% A242, A319, A356, A390	.5 x D	1 x D	600	18336	37	9168	40	7334	44	6112	44	4584	46	3667	44	3056	44
		1.25 x D	.3 x D	720	22003	53	11002	56	8801	63	7334	63	5501	67	4401	64	3667	64
		1.5 x D	.1 x D	1200	36672	117	18336	121	14669	132	12224	132	9168	139	7334	133	6112	133

Series 1025, 1026, 2030, 2031, 2047, 2032
350 | 3FL | SQ, CR, BN, RN | Performance-AL | GWA

Material	Axial ↓	Radial →	SFM	1/8		1/4		5/16		3/8		1/2		5/8		3/4		
				RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	RPM	IPM	
N	Aluminum, Brass, Copper 6061, 7050, 7075	.5 x D	1 x D	600	18336	44	9168	48	7334	53	6112	53	4584	55	3667	53	3056	53
		1.25 x D	.3 x D	720	22003	66	11002	70	8801	77	7334	77	5501	80	4401	77	3667	77
		1.5 x D	.1 x D	1200	36672	147	18336	150	14669	154	12224	154	9168	162	7334	155	6112	155
	High Silicon Aluminum 4% - 13% A242, A319, A356, A390	.5 x D	1 x D	600	18336	37	9168	40	7334	44	6112	44	4584	46	3667	44	3056	44
		1.25 x D	.3 x D	720	22003	53	11002	56	8801	63	7334	63	5501	67	4401	64	3667	64
		1.5 x D	.1 x D	1200	36672	117	18336	121	14669	132	12224	132	9168	139	7334	133	6112	133

Series 2140, 2141, 2142, 2143

Attacker | 3 & 4 FL | Chip Breaker

Profiling			SFM based on RDOC					IPT *(BASELINE)						
			Cutting Diameter Engaged					Cutting Diameter						
Material			Hardness	5%	10%	20%	30%	50%	5/16	3/8	1/2	5/8	3/4	1
P	Steel	Free Machining & Low Carbon: 10XX, 11XX, 12XX, A36	≤ 28 Rc	1050	700	385	375	350	0.0027	0.0032	0.0045	0.0054	0.0063	0.0090
	Steel	Medium/High Carbon Steels, Alloy Steels: 13XX, 41XX, 43XX, 86XX	28-38 Rc	630	420	320	250	210	0.0027	0.0032	0.0045	0.0054	0.0063	0.0090
	Die Steels	A2, H13, L6, P20, S7	28-44 Rc	525	350	300	275	250	0.0027	0.0032	0.0045	0.0054	0.0063	0.0090
M	Stainless Steels	Easy to Machine, 430F, 301, 303, 410, 416 Annealed, 420F, 430, 430F	≤ 28 Rc	650	600	550	500	450	0.0027	0.0032	0.0045	0.0054	0.0063	0.0090
	Stainless Steels	Moderately Difficult to Machine, Nitronic 50, 301, 303, 304, 304L, 316, 316L, 321, 347	≤ 28 Rc	525	400	350	300	250	0.0027	0.0032	0.0045	0.0054	0.0063	0.0090
	Stainless Steels	Difficult to Machine, 302B, 304B, 309, 310, 316, 316Ti, PH13-8Mo	> 28 Rc	525	400	350	300	250	0.0027	0.0032	0.0045	0.0054	0.0063	0.0090
S	Super Alloys	High Temp, Nimonic, Inconel, Monel, Hastelloy	≤ 42 Rc	265	200	175	150	100	0.0014	0.0016	0.0023	0.0027	0.0032	0.0045
	Super Alloys	Titanium: Ti 3Al-2.5V, Ti 6Al-4V Ti 10V-2Fe-3Al	≤ 42 Rc	230	200	175	150	125	0.0014	0.0016	0.0023	0.0027	0.0032	0.0045
H	Hardened Steels	Tool Steel, Die Steel: S7, H13, A2	45-55 Rc	250	240	230	210	200	0.0018	0.0021	0.0030	0.0036	0.0042	0.0060
	Hardened Steels	Tool Steel, Die Steel: D2, CPM-10V	55-65 Rc	200	180	160	150	100	0.0013	0.0014	0.0021	0.0024	0.0029	0.0041
K	Cast Iron	Gray: SAE J431, ASTM A48	≤ 240 HB	425	400	375	350	300	0.0027	0.0032	0.0045	0.0054	0.0063	0.0090
	Cast Iron	Ductile & Malleable, ASTM A536, ASTM 897, ASTM A47, ASTM A220	> 240 HB	320	300	250	225	200	0.0027	0.0032	0.0045	0.0054	0.0063	0.0090
N	Non-Ferrous	Aluminum, Brass, Bronze, Copper, Plastics, Graphite	-	1000	960	920	880	840	0.0027	0.0032	0.0045	0.0054	0.0063	0.0090

Slotting			SFM					IPT *(BASELINE)				
			Cutting Diameter Engaged					Cutting Diameter				
Material			Hardness	25%	50%	100%	5/16	3/8	1/2	5/8	3/4	1
P	Steel	Free Machining & Low Carbon: 10XX, 11XX, 12XX, A36	≤ 28 Rc	385	370	350	0.0016	0.0019	0.0025	0.0031	0.0038	0.0050
	Steel	Medium/High Carbon Steels, Alloy Steels: 13XX, 41XX, 43XX, 86XX	28-38 Rc	245	230	2210	0.0016	0.0019	0.0025	0.0031	0.0038	0.0050
	Die Steels	A2, H13, L6, P20, S7	28-44 Rc	210	195	175	0.0016	0.0019	0.0025	0.0031	0.0038	0.0050
M	Stainless Steels	Easy to Machine, 430F, 301, 303, 410, 416 Annealed, 420F, 430, 430F	≤ 28 Rc	385	370	350	0.0016	0.0019	0.0025	0.0031	0.0038	0.0050
	Stainless Steels	Moderately Difficult to Machine, Nitronic 50, 301, 303, 304, 304L, 316, 316L, 321, 347	≤ 28 Rc	245	210	175	0.0016	0.0019	0.0025	0.0031	0.0038	0.0050
	Stainless Steels	Difficult to Machine, 302B, 304B, 309, 310, 316, 316Ti, PH13-8Mo	> 28 Rc	210	195	175	0.0016	0.0019	0.0025	0.0031	0.0038	0.0050
S	Super Alloys	High Temp, Nimonic, Inconel, Monel, Hastelloy	≤ 42 Rc	125	105	90	0.0008	0.0010	0.0013	0.0016	0.0017	0.0026
	Super Alloys	Titanium: Ti 3Al-2.5V, Ti 6Al-4V Ti 10V-2Fe-3Al	≤ 42 Rc	100	90	80	0.0008	0.0010	0.0013	0.0016	0.0017	0.0026
H	Hardened Steels	Tool Steel, Alloyed Steel: P20, 4140H	35-45 Rc	245	230	210	0.0016	0.0019	0.0025	0.0031	0.0038	0.0050
	Hardened Steels	Tool Steel, Die Steel: S7, H13, A2	45-55 Rc	175	160	140	0.0008	0.0010	0.0013	0.0016	0.0020	0.0025
	Hardened Steels	Tool Steel, Die Steel: D2, CPM-10V	55-65 Rc	150	125	100	0.0004	0.0005	0.0008	0.0008	0.0010	0.0012
K	Cast Iron	Gray: SAE J431, ASTM A48	≤ 240 HB	450	400	350	0.0016	0.0019	0.0025	0.0031	0.0038	0.0050
	Cast Iron	Ductile & Malleable, ASTM A536, ASTM 897, ASTM A47, ASTM A220	> 240 HB	300	250	225	0.0016	0.0019	0.0025	0.0031	0.0038	0.0050
N	Non-Ferrous	Aluminum, Brass, Bronze, Copper, Plastics, Graphite	-	750	600	450	0.0016	0.0019	0.0025	0.0031	0.0038	0.0050

Series 2133

Aggressor-C | 3 FL | Rougher | Aluminum

Profiling		SFM based on RDOC				Inches Per Tooth (IPT)							
		Cutting Diameter Engaged				Cutting Diameter							
Material		10%	20%	30%	50%	*3/16	*1/4	5/16	3/8	1/2	5/8	3/4	
N	Non-Ferrous	Aluminum /Aluminum Alloys < 10% Si	2000	1800	1200	900	0.0037	0.005	0.0062	0.0075	0.01	0.0125	0.015
		Aluminum /Aluminum Alloys > 10% Si	1500	1200	1000	800	0.0037	0.005	0.0062	0.0075	0.01	0.0125	0.015
		Brass	900	800	600	500	0.0037	0.005	0.0062	0.0075	0.01	0.0125	0.015
		Cu/Cu Alloys / Magnesium	1000	800	600	500	0.0037	0.005	0.0062	0.0075	0.01	0.0125	0.015
		Plastics	900	800	600	500	0.0037	0.005	0.0062	0.0075	0.01	0.0125	0.015

Slotting		SFM				Inches Per Tooth (IPT)							
		Cutting Diameter Engaged				Cutting Diameter							
Material		25%	50%	100%	*3/16	*1/4	5/16	3/8	1/2	5/8	3/4	1	
N	Non-Ferrous	Aluminum /Aluminum Alloys < 10% Si	2000	1500	1000	0.0018	0.0025	0.0031	0.0037	0.0050	0.0065	0.0075	0.0100
		Aluminum /Aluminum Alloys > 10% Si	1500	1200	800	0.0018	0.0025	0.0031	0.0037	0.0050	0.0065	0.0075	0.0100
		Brass	600	500	400	0.0025	0.0032	0.0040	0.0050	0.0065	0.0075	0.0100	0.0120
		Cu/Cu Alloys / Magnesium	500	400	300	0.0025	0.0032	0.0040	0.0050	0.0065	0.0075	0.0100	0.0120
		Plastics	1200	1000	800	0.0025	0.0032	0.0040	0.0050	0.0065	0.0075	0.0100	0.0120

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Series 2134, 2135

Aggressor M & F | 3 - 5 FL | Rougher | Corner Chamfer

Profiling			SFM based on RDOC					IPT *(BASELINE)					
			Material	Hardness	Cutting Diameter Engaged					Cutting Diameter			
		5%			10%	20%	30%	50%	5/16	3/8	1/2	5/8	3/4
P	Steel	Free Machining & Low Carbon: 10XX, 11XX, 12XX, A36	≤ 28 Rc	1485	1485	1155	1000	825	0.0033	0.0047	0.0066	0.0078	0.0090
	Steel	Medium/High Carbon Steels, Alloy Steels: 13XX, 41XX, 43XX, 86XX	28-38 Rc	890	890	825	750	660	0.0033	0.0047	0.0066	0.0078	0.0090
	Die Steels	A2, H13, L6, P20, S7	28-44 Rc	750	750	660	560	430	0.0033	0.0047	0.0066	0.0078	0.0090
M	Stainless Steels	Easy to Machine, 430F, 301, 303, 410, 416 Annealed, 420F, 430, 430F	≤ 28 Rc	500	500	430	400	350	0.0033	0.0047	0.0066	0.0078	0.0090
	Stainless Steels	Moderately Difficult to Machine, Nitronic 50, 301, 303, 304, 304L, 316, 316L, 321, 347	≤ 28 Rc	430	430	400	370	330	0.0025	0.0033	0.0049	0.0059	0.0066
	Stainless Steels	Difficult to Machine, 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321, PH13-8Mo, Nitronics	> 28 Rc	430	430	400	360	330	0.0025	0.0033	0.0049	0.0059	0.0066
S	Super Alloys	High Temp, Nimonics, Inconel, Monel, Hastelloy	≤ 42 Rc	165	165	130	115	100	0.0008	0.0011	0.0017	0.0019	0.0023
	Super Alloys	Titanium: Ti 3Al-2.5V, Ti 6Al-4V Ti 10V-2Fe-3Al	≤ 42 Rc	400	400	370	300	250	0.0008	0.0011	0.0017	0.0019	0.0023
H	Hardened Steels	Tool Steel, Die Steel: S7, H13, A2	45-55 Rc	450	450	410	300	165	0.0029	0.0039	0.0059	0.0070	0.0078
	Hardened Steels	Tool Steel, Die Steel: D2, CPM-10V	55-65 Rc	380	380	350	250	150	0.0020	0.0029	0.0039	0.0051	0.0061
K	Cast Iron	Gray: SAE J431, ASTM A48	≤ 240 HB	1180	1180	1120	800	630	0.0033	0.0047	0.0066	0.0078	0.0090
	Cast Iron	Ductile & Malleable, ASTM A536, ASTM 897, ASTM A47, ASTM A220	> 240 HB	530	530	500	460	430	0.0033	0.0047	0.0066	0.0078	0.0090

Slotting			SFM					IPT *(BASELINE)				
			Material	Hardness	Cutting Diameter Engaged					Cutting Diameter		
		25%			50%	100%	5/16	3/8	1/2	5/8	3/4	
P	Steel	Free Machining & Low Carbon: 10XX, 11XX, 12XX, A36	≤ 28 Rc	800	700	500	0.0010	0.0020	0.0025	0.0030	0.0035	
	Steel	Medium/High Carbon Steels, Alloy Steels: 13XX, 41XX, 43XX, 86XX	28-38 Rc	650	550	450	0.0010	0.0020	0.0025	0.0030	0.0035	
	Die Steels	A2, H13, L6, P20, S7	28-44 Rc	500	450	400	0.0010	0.0020	0.0025	0.0030	0.0035	
M	Stainless Steels	Easy to Machine, 430F, 301, 303, 410, 416 Annealed, 420F, 430, 430F	≤ 28 Rc	400	350	325	0.0010	0.0020	0.0025	0.0030	0.0035	
	Stainless Steels	Moderately Difficult to Machine, Nitronic 50, 301, 303, 304, 304L, 316, 316L, 321, 347	≤ 28 Rc	320	275	250	0.0010	0.0020	0.0025	0.0030	0.0035	
	Stainless Steels	Difficult to Machine, 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321, PH13-8Mo, Nitronics	> 28 Rc	330	275	250	0.0010	0.0020	0.0025	0.0030	0.0035	
S	Super Alloys	High Temp, Nimonics, Inconel, Monel, Hastelloy	≤ 42 Rc	110	100	95	0.0005	0.0010	0.0010	0.0015	0.0020	
	Super Alloys	Titanium: Ti 3Al-2.5V, Ti 6Al-4V Ti 10V-2Fe-3Al	≤ 42 Rc	230	210	195	0.0008	0.0009	0.0011	0.0017	0.0019	
H	Hardened Steels	Tool Steel, Die Steel: S7, H13, A2	35-45 Rc	200	180	150	0.0010	0.0020	0.0025	0.0030	0.0035	
	Hardened Steels	Tool Steel, Die Steel: D2, CPM-10V	45-55 Rc	180	150	125	0.0005	0.0010	0.0010	0.0015	0.0020	
K	Cast Iron	Gray: SAE J431, ASTM A48	≤ 240 HB	600	550	500	0.0010	0.0020	0.0025	0.0030	0.0035	
	Cast Iron	Ductile & Malleable, ASTM A536, ASTM 897, ASTM A47, ASTM A220	> 240 HB	320	275	250	0.0010	0.0020	0.0025	0.0030	0.0035	

General Purpose End Mills
GP End Mills | 2, 3, 4 FL | SQ, CR, BN

Profiling				SFM based on RDOC					IPT					
				Cutting Diameter Engaged					Cutting Diameter					
Material			Hardness	5%	10%	20%	30%	50%	5/16	3/8	1/2	5/8	3/4	1
P	Steel	Free Machining & Low Carbon: 10XX, 11XX, 12XX, A36	≤ 28 Rc	1050	700	385	375	350						
	Steel	Medium/High Carbon Steels, Alloy Steels: 13XX, 41XX, 43XX, 86XX	28-38 Rc	630	420	320	250	210	0.0027	0.0032	0.0045	0.0054	0.0063	0.0090
	Die Steels	A2, H13, L6, P20, S7	28-44 Rc	525	350	300	275	250						
M	Stainless Steels	Ferritic	≤ 28 Rc	650	600	550	500	450						
	Stainless Steels	Martensitic	≤ 28 Rc	525	400	350	300	250	0.0027	0.0032	0.0045	0.0054	0.0063	0.0090
	Stainless Steels	Difficult to Machine, 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321, PH13-8Mo, Nitronics	> 28 Rc	525	400	350	300	250						
S	Super Alloys	High Temp, Nimonics, Inconel, Monel, Hastelloy	≤ 42 Rc	265	200	175	150	100						
	Super Alloys	Titanium: Ti 3Al-2.5V, Ti 6Al-4V Ti 10V-2Fe-3Al	≤ 42 Rc	230	200	175	150	125	0.0014	0.0016	0.0023	0.0027	0.0032	0.0045
H	Hardened Steels	34-65 Rc	45-55 Rc	250	240	230	210	200	0.0018	0.0021	0.0030	0.0036	0.0042	0.0060
			55-65 Rc	200	180	160	150	100	0.0013	0.0014	0.0021	0.0024	0.0029	0.0041
K	Cast Iron	Gray: SAE J431, ASTM A48	≤ 240 HB	425	400	375	350	300						
	Cast Iron	Ductile & Malleable, ASTM A536, ASTM 897, ASTM A47, ASTM A220	> 240 HB	320	300	250	225	200	0.0027	0.0032	0.0045	0.0054	0.0063	0.0090
N	Non-Ferrous	Aluminum, Brass, Bronze, Copper, Plastics, Graphite	-	1000	960	920	880	840	0.0027	0.0032	0.0045	0.0054	0.0063	0.0090

Slotting				SFM			IPT					
				Cutting Diameter Engaged			Cutting Diameter					
Material			Hardness	25%	50%	100%	5/16	3/8	1/2	5/8	3/4	1
P	Steel	Free Machining & Low Carbon: 10XX, 11XX, 12XX, A36	≤ 28 Rc	385	370	350						
	Steel	Medium/High Carbon Steels, Alloy Steels: 13XX, 41XX, 43XX, 86XX	28-38 Rc	245	230	2210	0.0016	0.0019	0.0025	0.0031	0.0038	0.0050
	Die Steels	A2, H13, L6, P20, S7	28-44 Rc	210	195	175						
M	Stainless Steels	Ferritic	≤ 28 Rc	385	370	350						
	Stainless Steels	Martensitic	≤ 28 Rc	245	210	175	0.0016	0.0019	0.0025	0.0031	0.0038	0.0050
	Stainless Steels	Difficult to Machine, 302B, 304B, 309, 310, 316, 316Ti, PH13-8Mo	> 28 Rc	210	195	175						
S	Super Alloys	High Temp, Nimonics, Inconel, Monel, Hastelloy	≤ 42 Rc	125	105	90						
	Super Alloys	Titanium: Ti 3Al-2.5V, Ti 6Al-4V Ti 10V-2Fe-3Al	≤ 42 Rc	100	90	80	0.0008	0.0010	0.0013	0.0016	0.0017	0.0026
H	Hardened Steels	34-65 Rc	34-45 Rc	245	230	210	0.0016	0.0019	0.0025	0.0031	0.0038	0.0050
			45-55 Rc	175	160	140	0.0008	0.0010	0.0013	0.0016	0.0020	0.0025
			55-65 Rc	150	125	100	0.0004	0.0005	0.0008	0.0008	0.0010	0.0012
K	Cast Iron	Gray: SAE J431, ASTM A48	≤ 240 HB	450	400	350						
	Cast Iron	Ductile & Malleable, ASTM A536, ASTM 897, ASTM A47, ASTM A220	> 240 HB	300	250	225	0.0016	0.0019	0.0025	0.0031	0.0038	0.0050
N	Non-Ferrous	Aluminum, Brass, Bronze, Copper, Plastics, Graphite	-	750	600	450	0.0016	0.0019	0.0025	0.0031	0.0038	0.0050

Series 250 - 252, 254 - 256

GP | Micro End Mills | 2 - 4 FL | SQ, CR, BN

Profiling			Inches Per Tooth (IPT)										
			Cutting Diameter										
Material		Hardness	SFM	0.015	0.031	0.047	0.062	0.078	0.093	0.125	0.187	0.250	
P	Steel	Free Machining & Low Carbon: 10XX, 11XX, 12XX, A36	≤ 28 Rc	400									
	Steel	Medium/High Carbon Steels, Alloy Steels: 13XX, 41XX, 43XX, 86XX	28 - 38 Rc	300	0.00007	0.00015	0.00023	0.00027	0.00034	0.00040	0.00054	0.00081	0.00100
	Die Steels	A2, H13, L6, P20, S7	28 - 44 Rc	200									
M	Stainless Steels	Easy to Machine, 430F, 301, 303, 410, 416 Annealed, 420F, 430, 430F	≤ 28 Rc	400									
	Stainless Steels	Moderately Difficult to Machine, Nitronic 50, 301, 303, 304, 304L, 316, 316L, 321, 347	≤ 28 Rc	200	0.00007	0.00015	0.00023	0.00027	0.00034	0.00040	0.00054	0.00081	0.00100
	Stainless Steels	Difficult to Machine, 302B, 304B, 309, 310, 316, 316Ti, PH13-8Mo	> 28 Rc	150									
S	Super Alloys	High Temp, Nimonics, Inconel, Monel, Hastelloy	≤ 42 Rc	70									
	Super Alloys	Titanium: Ti 3Al-2.5V, Ti 6Al-4V Ti 10V-2Fe-3Al	≤ 42 Rc	150	0.00004	0.00008	0.00015	0.00023	0.00027	0.00034	0.00040	0.00054	0.00080
H	Hardened Steels	Tool Steel, Die Steel: D2, CPM-10V	45-55 Rc	100	0.00010	0.00030	0.00050	0.00140	0.00180	0.00210	0.00300	0.00360	0.00420
K	Cast Iron	Gray: SAE J431, ASTM A48	160-200 HB	400									
	Cast Iron	Ductile & Malleable, ASTM A536, ASTM 897, ASTM A47, ASTM A220	200-250 HB	250	0.00007	0.00015	0.00023	0.00027	0.00034	0.00040	0.00054	0.00081	0.00100
N	Non-Ferrous	Aluminum, Brass, Bronze, Copper, Plastics, Graphite	-	100	0.00004	0.00008	0.00015	0.00023	0.00027	0.00034	0.00040	0.00054	0.00080

Slotting			Inches Per Tooth (IPT)										
			Cutting Diameter										
Material		Hardness	SFM	0.015	0.031	0.047	0.062	0.078	0.093	0.125	0.187	0.250	
P	Steel	Free Machining & Low Carbon: 10XX, 11XX, 12XX, A36	≤ 28 Rc	400					0.0003	0.0004	0.0005	0.0007	0.0010
	Steel	Medium/High Carbon Steels, Alloy Steels: 13XX, 41XX, 43XX, 86XX	28 - 38 Rc	300	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0004	0.0007	0.0009
	Die Steels	A2, H13, L6, P20, S7	28 - 44 Rc	200					0.0002	0.0003	0.0004	0.0006	0.0008
M	Stainless Steels	Easy to Machine, 430F, 301, 303, 410, 416 Annealed, 420F, 430, 430F	≤ 28 Rc	400			0.0002	0.0002	0.0003	0.0004	0.0005	0.0007	0.0010
	Stainless Steels	Moderately Difficult to Machine, Nitronic 50, 301, 303, 304, 304L, 316, 316L, 321, 347	≤ 28 Rc	200	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0004	0.0007	0.0009
	Stainless Steels	Difficult to Machine, 302B, 304B, 309, 310, 316, 316Ti, PH13-8Mo	> 28 Rc	150			0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0005
S	Super Alloys	High Temp, Nimonics, Inconel, Monel, Hastelloy	≤ 42 Rc	70									
	Super Alloys	Titanium: Ti 3Al-2.5V, Ti 6Al-4V Ti 10V-2Fe-3Al	≤ 42 Rc	150	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0005
H	Hardened Steels	Tool Steel, Die Steel: S7, H13, A2	35-45 Rc	100	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004
K	Cast Iron	Gray: SAE J431, ASTM A48	160-200 HB	400						0.0004	0.0005	0.0007	0.0010
	Cast Iron	Ductile & Malleable, ASTM A536, ASTM 897, ASTM A47, ASTM A220	200-250 HB	250	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0004	0.0007	0.0009
N	Non-Ferrous	Aluminum, Brass, Bronze, Copper, Plastics, Graphite	-	750	0.0002	0.0003	0.0005	0.0006	0.0007	0.0008	0.0011	0.0017	0.0022

Series 209, 209D

GP | Chamfer Mills | 2 - 4 FL | 60° - 90°

Material		SFM	1/4 – 5/16"	3/8 – 1/2"
P	Free Machining & Low/Med/High Carbon, Tool & Die Steels	25-175	0.0010	0.0020
M	Easy/Moderate/Difficult to Machine	50-150	0.0007	0.0015
S	High Temp, Nimonics, Inconel, Monel, Hastelloy, Titanium	25-125	0.0010	0.0015
H	55 Rc	25-100	0.0010	0.0015
K	Gray, Ductile & Malleable	50-250	0.0014	0.0021
N	Aluminum	50-1000	0.0025	0.0035
	Composites	100-200	0.0060	0.0090
	Copper	400-800	0.0020	0.0030
	Magnesium	400-700	0.0025	0.0035
	Plastics	150-300	0.0030	0.0040

Series 2052, 2053

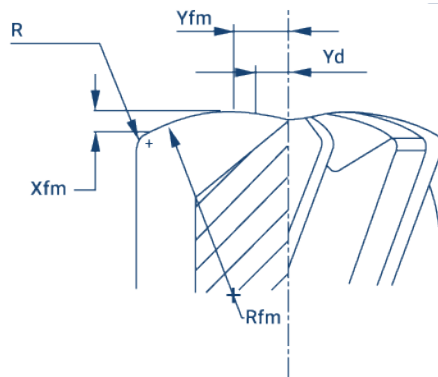
Ti-Feed | 5-7FL | Corner Radius | High Feed

Material		Axial	Radial	SFM	1/4	3/8	1/2	5/8	3/4	1
					IPM	IPM	IPM	IPM	IPM	IPM
M	SS 300 & 400 Series	.05 X D	.40D	210-290	314	333	283	299	300	299
	303, 304, 316, 420, 417									
M	Precipitation SS	.05 X D	.40D	180-225	194	129	195	206	206	206
	15-5, 16-6, 17-4, 17-6									
S	High Temp Alloys	.05 X D	.30D	80-110	72	76	70	68	63	61
	Inconel 718, Hastalloy, A286, Waspally, CoCr									
S	Titanium & Ti Alloys	.05 X D	.40D	120-200	126	132	125	133	133	132
	Ti-6Al4V, Grades (5-38)									

Part Entry Programming Data

Tool Geometry							Part Entry Guide						
							Circular Interpolation		Linear Ramping (Length per Angle - inch)				
Dia.	Xfm	R	Rfm	Yfm	YD	FL	Hole Dia. (Min)	Hole Dia. (Max)	1 °	2 °	3 °	4 °	5 °
1/4	.0125	0.015	.1490	.0563	.0195	5	.3550	.500	.030	.015	.010	.007	.006
3/8	.0188	0.023	.2235	.0844	.0295	5	.5325	.750	.045	.022	.015	.011	.009
1/2	0.250	0.030	.2981	.1125	.0421	7	.7100	1.00	.060	.030	.020	.015	.012
5/8	.0313	0.037	.3726	.1406	.0495	7	.8875	1.25	.075	.037	.025	.019	.015
3/4	.0375	0.040	.4471	.1688	.0595	7	1.065	1.50	.090	.045	.030	.022	.018
1	.0500	0.060	.5961	.2250	.0795	7	1.420	2.00	.120	.060	.040	.030	.024

Recommended Feed Rate: Reduce 10-30%
Dimensional tool drawings available upon request



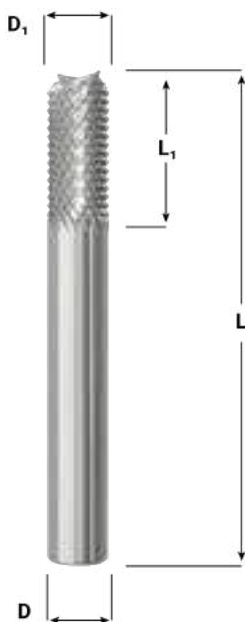
SPECIALTY

A complete offering of specialty cutting tool solutions including routers, die tools, burrs, engraving tools, carbide square blanks and round blanks.

Custom Comes Standard - If we don't have the perfect tool on the shelf, we can build it for you.







FEATURES/DESCRIPTION		APPLICATION	FEATURES		
Diamond Cut Routers <ul style="list-style-type: none"> Multiple end-types available Diamond-cut flute geometry for maximum cutting action Ideal for printed circuit boards, plastics, epoxy resins, and various composite materials Shank Tol.: +0/-0.0005" 					
STEEL	STAINLESS	CAST IRON	NON-FERROUS	HRSA	HARDENED STEEL
P1 P2 P3	M1 M2	K1 K2	N1 N2	S1 S2	H1 H2
			○ ○		○



● Best ○ Good

Series 780 DCR | Style A-F

Style A - No End Cut	Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	EDP
Edge Routing / Finishing					
	1/16	3/16	1-1/2	1/8	780-001001
	3/32	3/8	1-1/2	1/8	780-001010
	1/8	1/2	1-1/2	1/8	780-001020
	1/8	7/16	1-1/2	1/8	780-001022
	3/16	5/8	2	3/16	780-001030
	3/16	5/8	2	1/4	780-001040
	1/4	3/4	2	1/4	780-001050
	1/4	3/4	2-1/2	1/4	780-001060
	1/4	1	3	1/4	780-001070
	5/16	1	2-1/2	5/16	780-001080
	3/8	1	2-1/2	3/8	780-001090
	1/2	1	3	1/2	780-001100
Style B - Burr End Cut	Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	EDP
Grooving / Bottom Cutting					
	1/16	3/16	1-1/2	1/8	781-001001
	3/32	3/8	1-1/2	1/8	781-001010
	3/32	5/16	1-1/2	1/8	781-001012
	1/8	1/2	1-1/2	1/8	781-001020
	1/8	7/16	1-1/2	1/8	781-001022
	3/16	5/8	2	3/16	781-001030
	3/16	5/8	2	1/4	781-001040
	1/4	3/4	2	1/4	781-001050
	1/4	3/4	2-1/2	1/4	781-001060
	1/4	1	3	1/4	781-001070
	5/16	1	2-1/2	5/16	781-001080
	3/8	1	2-1/2	3/8	781-001090
	1/2	1	3	1/2	781-001100
Style C - End Mill Style	Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	EDP
Grooving / Bottom Cutting					
	1/16	3/16	1-1/2	1/8	782-001001
	3/32	3/8	1-1/2	1/8	782-001010
	3/32	5/16	1-1/2	1/8	782-001012
	1/8	1/2	1-1/2	1/8	782-001020
	1/8	7/16	1-1/2	1/8	782-001022
	3/16	5/8	2	3/16	782-001030
	3/16	5/8	2	1/4	782-001040
	1/4	3/4	2	1/4	782-001050
	1/4	3/4	2-1/2	1/4	782-001060
	1/4	1	3	1/4	782-001070
	5/16	1	2-1/2	5/16	782-001080
	3/8	1	2-1/2	3/8	782-001090
	1/2	1	3	1/2	782-001100

*bold numbers are EDPs for ordering

Series 780 DCR | Style A-F

Style D - Drill Point	Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	EDP
 <p>Plunge Feeding - 135° Drill Point</p>	1/16	3/16	1-1/2	1/8	783-001001
	3/32	3/8	1-1/2	1/8	783-001010
	3/32	5/16	1-1/2	1/8	783-001012
	1/8	1/2	1-1/2	1/8	783-001020
	1/8	7/16	1-1/2	1/8	783-001022
	3/16	5/8	2	3/16	783-001030
	3/16	5/8	2	1/4	783-001040
	1/4	3/4	2	1/4	783-001050
	1/4	3/4	2-1/2	1/4	783-001060
	1/4	1	3	1/4	783-001070
	5/16	1	2-1/2	5/16	783-001080
	3/8	1	2-1/2	3/8	783-001090
	1/2	1	3	1/2	783-001100
Style F - Fishtail End	Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	EDP
 <p>Plunge Feeding</p>	1/16	3/16	1-1/2	1/8	784-001001
	3/32	3/8	1-1/2	1/8	784-001010
	1/8	1/2	1-1/2	1/8	784-001020
	3/16	5/8	2	3/16	784-001030
	3/16	5/8	2	1/4	784-001040
	1/4	3/4	2	1/4	784-001050
	1/4	3/4	2-1/2	1/4	784-001060
	1/4	1	3	1/4	784-001070
	5/16	1	2-1/2	5/16	784-001080
	3/8	1	2-1/2	3/8	784-001090
	1/2	1	3	1/2	784-001100

*bold numbers are EDPs for ordering

Popular Custom Specialty Options

- Longer lengths
- Variety of enhanced PVD tool coatings
- Special diameters for some series available

**CUSTOM
COMES
STANDARD**



GENERAL PURPOSE

Solid Carbide Straight Flute Routers



INTRO

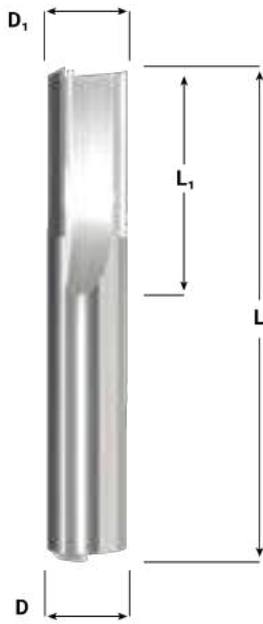
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Straight Flute Router</p> <ul style="list-style-type: none"> • Double edge cutting action for supreme top and bottom finishes • End mill point geometry • Straight flute geometry excels in all plastics • Shank Tol.: +0/-0.0005" 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
							○	○			○	

● Best ○ Good

Series 787 SFR | Multiple Flute | Straight Flute | Router

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Flutes	EDP
3/32	3/8	1-1/2	1/8	2	787-920001
1/8	1/2	1-1/2	1/8		787-920002
3/16	5/8	2	3/16		787-920003
1/4	3/4	2-1/2	1/4		787-920004
5/16	13/16	2-1/2	5/16		787-920005
3/8	7/8	2-1/2	3/8		787-920006
7/16	1	2-1/2	7/16		787-920007
1/2	1	3	1/2		787-920008
3/32	3/8	1-1/2	1/8	3	787-930001
1/8	1/2	1-1/2	1/8		787-930002
3/16	5/8	2	3/16		787-930003
1/4	3/4	2-1/2	1/4		787-930004
5/16	13/16	2-1/2	5/16		787-930005
3/8	7/8	2-1/2	3/8		787-930006
7/16	1	2-1/2	7/16		787-930007
1/2	1	3	1/2		787-930008

*bold numbers are EDPs for ordering



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Conical Engraving Cutters</p> <ul style="list-style-type: none"> • Single flute end mills • Economical alternative for cutting non-ferrous materials like plastics and phenolics • Ideal for engraving, marking, and shallow cutting operations • Available in double-end geometry • Diameter Tol.: +0/-0.0005" 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○	○	○	○	○	○	○	○	○	○	○

● Best ○ Good

Series 713 Engraving | 30°, 60°, 90° | Single End | Double End

Diameter(D ₁)	OAL(L)	Split Length(L ₁)	Style	30°	60°	90°
1/8	1-1/2	3/8	Single End	713-125150	716-125150	719-125150
3/16	2	7/16		713-187200	716-187200	719-187200
1/4	2-1/2	1/2		713-250250	716-250250	719-250250
5/16	2-1/2	1/2		713-312250	716-312250	719-312250
3/8	2-1/2	1/2		713-375250	716-375250	719-375250
1/2	3	5/8		713-500300	716-500300	719-500300
1/8	2	3/8	Double End	723-125150	726-125150	729-125150
1/8	3	3/8		723-125300	726-125300	729-125300
3/16	2	7/16		723-187200	726-187200	729-187200
3/16	3	7/16		723-187300	726-187300	729-187300
1/4	2-1/2	1/2		723-250250	726-250250	729-250250
1/4	4	1/2		723-250400	726-250400	729-250400
5/16	2-1/2	1/2		723-312250	726-312250	729-312250
5/16	4	1/2		723-312400	726-312400	729-312400
3/8	2-1/2	1/2		723-375250	726-375250	729-375250
3/8	4	1/2		723-375400	726-375400	729-375400
1/2	3	5/8		723-500300	726-500300	729-500300
1/2	4	5/8		723-500400	726-500400	729-500400

*bold numbers are EDPs for ordering

Popular Custom Specialty Options

- Longer lengths
- Variety of enhanced PVD tool coatings
- Special diameters for some series available

CUSTOM
COMES
STANDARD

GENERAL PURPOSE

Carbide Ground Split Blanks



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION

Carbide Split End Blanks

- C2 sub-micron grade carbide
- Ground finish and available in both single and double ends
- Offers a solution for custom engraving and specialized marking
- Diameter Tol.: +0/-0.0005"

Series 710

Ground

Diameter(D ₁)	OAL(L)	Split Length(L ₁)	Single Cut	Double Cut
1/8	1-1/2	3/8	710-125150	720-125150
1/8	2	3/8	710-125200	720-125200
1/8	3	3/8	710-125300	720-125300
1/8	4	3/8	710-125400	720-125400
1/8	6	3/8	710-125600	720-125600
3/16	2	1/2	710-187200	720-187200
3/16	2-1/2	1/2	710-187250	720-187250
3/16	3	1/2	710-187300	720-187300
3/16	4	1/2	710-187400	720-187400
3/16	6	1/2	710-187600	720-187600
1/4	2	1/2	710-250200	720-250200
1/4	2-1/2	1/2	710-250250	720-250250
1/4	3	1/2	710-250300	720-250300
1/4	4	1/2	710-250400	720-250400
1/4	6	1/2	710-250600	720-250600
5/16	2-1/2	1/2	710-312250	720-312250
5/16	3	1/2	710-312300	720-312300
5/16	4	1/2	710-312400	720-312400
5/16	6	1/2	710-312600	720-312600
3/8	2-1/2	1/2	710-375250	720-375250
3/8	3	1/2	710-375300	720-375300
3/8	4	1/2	710-375400	720-375400
3/8	6	1/2	710-375600	720-375600
7/16	2-1/2	5/8	710-437250	720-437250
7/16	3	5/8	710-437300	720-437300
7/16	4	5/8	710-437400	720-437400
7/16	6	5/8	710-437600	720-437600
1/2	3	5/8	710-500300	720-500300
1/2	4	5/8	710-500400	720-500400
1/2	6	5/8	710-500600	720-500600

*bold numbers are EDPs for ordering



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Cylinder Shape - No End Cut</p> <ul style="list-style-type: none"> • Universal surface grinding • L2 = 2" OAL, L3 = 3" OAL • L6 = 6" Shank Length • Single Cut = Finishing • Double Cut = Material Removal • Aluma Cut = Non-Ferrous 		
Single Cut Double Cut Aluma Cut		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○	○	○	○	○	○	○	○	○	○	○

● Best ○ Good

Series 310A SA | Cylinder Shape | No End Cut

Tool	Diameter(D ₁)	LOC(L ₁)	Shank(D)	Single Cut	Double Cut	Aluma Cut
SA-41	1/16	1/4	1/8	310-001002	310-002002	-
SA-41 L2	1/16	1/4	1/8	310-001002B	310-002002B	-
SA-41 L3	1/16	1/4	1/8	310-00100C	310-002002C	-
SA-61	1/16	1/4	3/32	310-001001	310-002001	-
SA-42	3/32	7/16	1/8	310-001004	310-002004	-
SA-42 L2	3/32	7/16	1/8	310-001004B	310-002004B	-
SA-42 L3	3/32	7/16	1/8	310-001004A	310-002004A	-
SA-63	3/32	3/8	3/32	310-001007	310-002007	-
SA-11	1/8	1/2	1/4	310-001005C	310-002005C	-
SA-12	1/8	5/8	1/4	310-001005D	310-002005D	-
SA-43	1/8	9/16	1/8	310-001006	310-002006	-
SA-43 L2	1/8	9/16	1/8	310-006025	310-006050	-
SA-43 L3	1/8	9/16	1/8	310-002631	310-002006A	-
SA-13	5/32	5/8	1/4	310-001009	310-002009C	-
SA-52	5/32	1/2	1/8	310-001008	310-002008	-
SA-14	3/16	5/8	1/4	310-001012C	310-002012C	-
SA-53	3/16	1/2	1/8	310-001010	310-002010	-
SA-81	3/16	5/8	3/16	310-001011	310-002011	-
SA-1 L6	1/4	1/2	1/4	310-002601	310-002701	-
SA-1	1/4	5/8	1/4	310-001017C	310-002017C	-
SA-1NF	1/4	5/8	1/4	-	-	310-002518
SA-1L	1/4	1	1/4	310-001936	310-002936	-
SA-51	1/4	1/2	1/8	310-001015	310-002015	-
SA-2	5/16	3/4	1/4	310-001018	310-002018	-
SA-3	3/8	3/4	1/4	310-001019	310-002019	-
SA-3 L6	3/8	3/4	1/4	310-002602	310-002702A	-
SA-3NF	3/8	3/4	1/4	-	-	310-002500
SA-3L	3/8	1	1/4	310-001937	310-002937	-
SA-3X	3/8	1-1/2	1/4	310-001702X	310-002702X	-
SA-4	7/16	1	1/4	310-001020	310-002020	-
SA-5	1/2	1	1/4	310-001021	310-002021	-
SA-5 L6	1/2	1	1/4	310-002603	310-002703	-
SA-5NF	1/2	1	1/4	-	-	310-002501
SA-6	5/8	1	1/4	310-001022	310-002022	-
SA-6NF	5/8	1	1/4	-	-	310-002502
SA-15	3/4	1/2	1/4	310-001023	310-002023	-
SA-16	3/4	3/4	1/4	310-001024	310-002024	-
SA-7	3/4	1	1/4	310-001025	310-002025	-
SA-7NF	3/4	1	1/4	-	-	310-002539
SA-8	7/8	1	1/4	310-001025A	310-002025A	-
SA-9	1	1	1/4	310-001026	310-002026	-

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Carbide Cylinder Shape Burrs



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION		APPLICATION	FEATURES																																								
Cylinder Shape - End Cut <ul style="list-style-type: none"> Blind holes and inner contours L2 = 2" OAL, L3 = 3" OAL L6 = 6" Shank Length DE = Double End Cut, ECO = End Cut Only Single Cut = Finishing Double Cut = Material Removal Aluma Cut = Non-Ferrous 																																											
<table border="1"> <thead> <tr> <th colspan="3">STEEL</th> <th colspan="2">STAINLESS</th> <th colspan="2">CAST IRON</th> <th colspan="2">NON-FERROUS</th> <th colspan="2">HBSA</th> <th colspan="2">HARDENED STEEL</th> </tr> <tr> <th>P1</th> <th>P2</th> <th>P3</th> <th>M1</th> <th>M2</th> <th>K1</th> <th>K2</th> <th>N1</th> <th>N2</th> <th>S1</th> <th>S2</th> <th>H1</th> <th>H2</th> </tr> </thead> <tbody> <tr> <td>○</td> <td>○</td> <td>○</td> <td>○</td> <td>○</td> <td>○</td> <td>○</td> <td>○</td> <td>○</td> <td>○</td> <td>○</td> <td>○</td> <td>○</td> </tr> </tbody> </table>					STEEL			STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL		P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2	○	○	○	○	○	○	○	○	○	○	○	○	○
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL																																
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																															
○	○	○	○	○	○	○	○	○	○	○	○	○																															

● Best ○ Good

Series 310B SB | Cylinder Shape | End Cut

Tool	Diameter(D ₁)	LOC(L ₁)	Shank(D)	Single Cut	Double Cut	Aluma Cut
SB-41	1/16	1/4	1/8	310-001031	310-002031	-
SB-41 L2	1/16	1/4	1/8	310-001056	310-002056	-
SB-41 L3	1/16	1/4	1/8	310-001057	310-002057	-
SB-42	3/32	7/16	1/8	310-001033	310-002033	-
SB-42 L2	3/32	7/16	1/8	310-001033A	310-002033A	-
SB-42 L3	3/32	7/16	1/8	310-001033B	310-002033B	-
SB-12	1/8	5/8	1/4	310-001029	310-002029	-
SB-11	1/8	1/2	1/4	310-001034C	310-002034C	-
SB-43	1/8	9/16	1/8	310-001035	310-002035	-
SB-43 L2	1/8	9/16	1/8	310-001035E	310-002035A	-
SB-43 L3	1/8	9/16	1/8	310-001036A	310-002036A	-
SB-13	5/32	5/8	1/4	310-001038C	310-002038C	-
SB-53	3/16	1/2	1/8	310-001039	310-002039	-
SB-81	3/16	5/8	3/16	310-001040	-	-
SB-14	3/16	5/8	1/4	310-001041C	310-002041	-
SB-81	3/16	5/8	3/16	-	310-002040	-
SB-1 L6	1/4	5/8	1/4	310-001027	310-002027A	-
SB-51	1/4	3/16	1/8	310-001044	310-002044	-
SB-51A	1/4	1/2	1/8	310-001044A	310-002044AA	-
SB-1	1/4	5/8	1/4	310-001046C	310-002046C	-
SB-1L	1/4	1	1/4	310-001968	310-002938	-
SB-1NF	1/4	5/8	1/4	-	-	310-002546
SB-2	5/16	3/4	1/4	310-001047	310-002048	-
SB-3	3/8	3/4	1/4	310-001048	310-002047	-
SB-3X	3/8	1-1/2	1/4	310-001048A	310-002047X	-
SB-3L	3/8	1	1/4	310-001939	310-002939	-
SB-3NF	3/8	3/4	1/4	-	-	310-002588
SB-3 L6	3/8	3/4	1/4	310-002941	310-002941A	-
SB-4	7/16	1	1/4	310-001049	310-002049	-
SB-5	1/2	1	1/4	310-001055	310-002055	-
SB-5NF	1/2	1	1/4	-	-	310-002589
SB-5 L6	1/2	1	1/4	310-004299	310-004300	-
SB-6	5/8	1	1/4	310-001050	310-002050	-
SB-6NF	5/8	1	1/4	-	-	310-002590
SB-15	3/4	1/2	1/4	310-001051	310-002051	-
SB-16	3/4	3/4	1/4	310-001052	310-002052	-
SB-7	3/4	1	1/4	310-001053	310-002053	-
SB-7NF	3/4	1	1/4	-	-	310-002591
SB-8	7/8	1	1/4	310-001053A	310-002053A	-
SB-9	1	1	1/4	310-001054	310-002054	-

*bold numbers are EDPs for ordering



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Cylinder Shape - Radius End</p> <ul style="list-style-type: none"> Contouring & bore holes L2 = 2" OAL, L3 = 3" OAL L6 = 6" Shank Length Single Cut = Finishing Double Cut = Material Removal Aluma Cut = Non-Ferrous 		
Single Cut Double Cut Aluma Cut		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○	○	○	○	○	○	○	○	○	○	○

● Best ○ Good

Series 310C **SC | Cylinder Shape | Radius End**

Tool	Diameter(D ₁)	LOC(L ₁)	Shank(D)	Single Cut	Double Cut	Aluma Cut
SC-61	3/32	3/8	3/32	310-001060	310-002060	-
SC-41	3/32	7/16	1/8	310-001061	310-002061	-
SC-41 L3	3/32	7/16	1/8	310-001061B	310-002061B	-
SC-11	1/8	1/2	1/4	310-001062C	310-002062C	-
SC-12	1/8	5/8	1/4	310-001062D	310-002062D	-
SC-42	1/8	9/16	1/8	310-001063	310-002063	-
SC-42 L2	1/8	9/16	1/8	310-006100	310-006075	-
SC-42 L3	1/8	9/16	1/8	310-001063A	310-002732	-
SC-13	5/32	5/8	1/4	310-001065C	310-002065C	-
SC-52	5/32	1/2	1/8	310-001070	310-002070	-
SC-53	3/16	1/2	1/8	310-001066	310-002066	-
SC-81	3/16	5/8	3/16	310-001067	310-002067	-
SC-14	3/16	5/8	1/4	310-001068C	310-002068C	-
SC-51	1/4	1/2	1/8	310-001069	310-002069	-
SC-1	1/4	5/8	1/4	310-001071C	310-002072C	-
SC-1L	1/4	1	1/4	310-001250	310-002250	-
SC-1NF	1/4	5/8	1/4	-	-	310-002519
SC-1 L6	1/4	1/2	1/4	310-002605	310-002705	-
SC-2	5/16	3/4	1/4	310-001072	310-002071	-
SC-3	3/8	3/4	1/4	310-001073	310-002073	-
SC-3NF	3/8	3/4	1/4	-	-	310-002503
SC-3 L6	3/8	3/4	1/4	310-002606	310-002706	-
SC-3x	3/8	1-1/2	1/4	310-001706X	310-002706X	-
SC-3L	3/8	1	1/4	310-001940	310-002940	-
SC-4	7/16	1	1/4	310-001074	310-002074	-
SC-4NF	7/16	1	1/4	-	-	310-003008
SC-5	1/2	1	1/4	310-001075	310-002075	-
SC-5NF	1/2	1	1/4	-	-	310-002504
SC-5 L6	1/2	1	1/4	310-002607	310-002707	-
SC-6	5/8	1	1/4	310-001076	310-002076	-
SC-6NF	5/8	1	1/4	-	-	310-002505
SC-15	3/4	1/2	1/4	310-001068A	310-002068A	-
SC-7	3/4	1	1/4	310-001077	310-002077	-
SC-16	3/4	3/4	1/4	310-001078A	310-002078A	-
SC-7NF	3/4	1	1/4	-	-	310-002525
SC-9	1	1	1/4	310-001079	310-002078	-

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Carbide Ball Shape Burrs



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Ball Shape</p> <ul style="list-style-type: none"> Contouring & bore holes L2 = 2" OAL, L3 = 3" OAL L6 = 6" Shank Length Single Cut = Finishing Double Cut = Material Removal Aluma Cut = Non-Ferrous 		
Single Cut Double Cut Aluma Cut		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○	○	○	○	○	○	○	○	○	○	○

● Best ○ Good

Series 310D SD | Ball Shape

Tool	Diameter(D ₁)	LOC(L ₁)	Shank(D)	Single Cut	Double Cut	Aluma Cut
SD-40	1/16	1/16	1/8	310-001079A	310-002079	-
SD-61	3/32	3/32	3/32	310-001080	310-002080	-
SD-41	3/32	3/32	1/8	310-001081	310-002081	-
SD-41 L2	3/32	3/32	1/8	310-001081C	310-002081C	-
SD-41 L3	3/32	3/32	1/8	310-001081B	310-002081A	-
SD-42	1/8	1/8	1/8	310-001082	310-002082	-
SD-11	1/8	3/32	1/4	310-001083C	310-002083C	-
SD-42 L2	1/8	1/8	1/8	310-006125	310-006125	-
SD-42 L3	1/8	1/8	1/8	310-001082A	310-002733	-
SD-52	5/32	5/32	1/8	310-001088	310-002088	-
SD-53	3/16	5/32	1/8	310-001084	310-002084	-
SD-81	3/16	5/32	3/16	310-001085	310-002085	-
SD-14	3/16	1/8	1/4	310-001086C	310-002086C	-
SD-51	1/4	7/32	1/8	310-001087	310-002087	-
SD-1	1/4	7/32	1/4	310-001089C	310-002089C	-
SD-1NF	1/4	7/32	1/4	-	-	310-002520
SD-1 L6	1/4	7/32	1/4	310-002609	310-002709	-
SD-2	5/16	1/4	1/4	310-001090	310-002090	-
SD-2 L6	5/16	1/4	1/4	310-002609A	310-002708	-
SD-3	3/8	5/16	1/4	310-001091	310-002091	-
SD-3NF	3/8	5/16	1/4	-	-	310-002506
SD-3 L6	3/8	5/16	1/4	310-002610	310-002710	-
SD-4	7/16	3/8	1/4	310-001092	310-002092	-
SD-4 L6	7/16	3/8	1/4	310-002610P	310-002710B	-
SD-5	1/2	7/16	1/4	310-001093	310-002093	-
SD-5NF	1/2	7/16	1/4	-	-	310-002507
SD-5 L6	1/2	7/16	1/4	310-002611	310-002711	-
SD-6	5/8	9/16	1/4	310-001094	310-002094	-
SD-6NF	5/8	9/16	1/4	-	-	310-002508
SD-7	3/4	11/16	1/4	310-001095	310-002095	-
SD-7NF	3/4	11/16	1/4	-	-	310-003005
SD-9	1	15/16	1/4	310-001096	310-002096	-

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES																																							
<p>Oval/Egg Shape</p> <ul style="list-style-type: none"> Molds & fillet welds L2 = 2" OAL, L3 = 3" OAL L6 = 6" Shank Length Single Cut = Finishing Double Cut = Material Removal Aluma Cut = Non-Ferrous 																																									
Single Cut Double Cut Aluma Cut																																									
<table border="1"> <thead> <tr> <th colspan="3">STEEL</th> <th colspan="2">STAINLESS</th> <th colspan="2">CAST IRON</th> <th colspan="2">NON-FERROUS</th> <th colspan="2">HRSA</th> <th colspan="2">HARDENED STEEL</th> </tr> <tr> <th>P1</th><th>P2</th><th>P3</th> <th>M1</th><th>M2</th> <th>K1</th><th>K2</th> <th>N1</th><th>N2</th> <th>S1</th><th>S2</th> <th>H1</th><th>H2</th> </tr> </thead> <tbody> <tr> <td>○</td><td>○</td><td>○</td> <td>○</td><td>○</td> <td>○</td><td>○</td> <td>○</td><td>○</td> <td>○</td><td>○</td> <td>○</td><td>○</td> </tr> </tbody> </table>			STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL		P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2	○	○	○	○	○	○	○	○	○	○	○	○	○
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL																														
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																													
○	○	○	○	○	○	○	○	○	○	○	○	○																													

● Best ○ Good

Series 310E SE | Oval/Egg Shape

Tool	Diameter(D ₁)	LOC(L ₁)	Shank(D)	Single Cut	Double Cut	Aluma Cut
SE-61	3/32	1/8	3/32	310-001108A	310-002108A	-
SE-41	1/8	7/32	1/8	310-001100	310-002100	-
SE-41 L2	1/8	7/32	1/8	310-006200	310-006175	-
SE-41 L3	1/8	7/32	1/8	310-001100B	310-002100A	-
SE-53	3/16	9/32	1/8	310-001101	310-002101	-
SE-81	3/16	9/32	3/16	310-001102	310-002102	-
SE-11	3/16	5/16	1/4	310-004127	310-004128	-
SE-51	1/4	3/8	1/8	310-001103	310-002103	-
SE-1	1/4	3/8	1/4	310-001105C	310-002105C	-
SE-1 L6	1/4	3/8	1/4	310-002613	310-002713	-
SE-3	3/8	5/8	1/4	310-001106	310-002106	-
SE-3NF	3/8	5/8	1/4	-	-	310-002509
SE-3 L6	3/8	5/8	1/4	310-002614	310-002714	-
SE-5	1/2	7/8	1/4	310-001107	310-002107	-
SE-5NF	1/2	7/8	1/4	-	-	310-002510
SE-5 L6	1/2	7/8	1/4	310-005020	310-002715	-
SE-6	5/8	1	1/4	310-001108	310-002108	-
SE-6NF	5/8	1	1/4	-	-	310-002511
SE-7	3/4	1	1/4	310-001109	310-002109	-
SE-7NF	3/4	1	1/4	-	-	310-004302

*bold numbers are EDPs for ordering

Popular Custom Specialty Options

- Longer lengths
- Variety of enhanced PVD tool coatings
- Special diameters for some series available

CUSTOM COMES STANDARD

GENERAL PURPOSE

Carbide Tree Shape Burrs



FEATURES/DESCRIPTION		APPLICATION	FEATURES																																							
Tree Shape - Radius <ul style="list-style-type: none"> Molds and contouring L2 = 2" OAL, L3 = 3" OAL L6 = 6" Shank Length Single Cut = Finishing Double Cut = Material Removal Aluma Cut = Non-Ferrous 			 																																							
		<table border="1"> <thead> <tr> <th colspan="3">STEEL</th> <th colspan="2">STAINLESS</th> <th colspan="2">CAST IRON</th> <th colspan="2">NON-FERROUS</th> <th colspan="2">HRSA</th> <th colspan="2">HARDENED STEEL</th> </tr> <tr> <th>P1</th><th>P2</th><th>P3</th> <th>M1</th><th>M2</th> <th>K1</th><th>K2</th> <th>N1</th><th>N2</th> <th>S1</th><th>S2</th> <th>H1</th><th>H2</th> </tr> </thead> <tbody> <tr> <td>○</td><td>○</td><td>○</td> <td>○</td><td>○</td> <td>○</td><td>○</td> <td>○</td><td>○</td> <td>○</td><td>○</td> <td>○</td><td>○</td> </tr> </tbody> </table>	STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL		P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2	○	○	○	○	○	○	○	○	○	○	○	○	○	
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL																															
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																														
○	○	○	○	○	○	○	○	○	○	○	○	○																														

● Best ○ Good

Series 310F | SF | Tree Shape | Radius

Tool	Diameter(D ₁)	LOC(L ₁)	Shank(D)	Single Cut	Double Cut	Aluma Cut
SF-61	3/32	1/4	3/32	310-003702A	310-003702	-
SF-41	1/8	1/4	1/8	310-001110	310-002110	-
SF-42	1/8	1/2	1/8	310-001111	310-002111	-
SF-11	1/8	1/2	1/4	310-001112C	310-002112C	-
SF-42 L2	1/8	1/2	1/8	310-006250	310-006225	-
SF-42 L3	1/8	1/2	1/8	310-001146	310-002735	-
SF-53	3/16	1/2	1/8	310-001113	310-002113	-
SF-81	3/16	1/2	3/16	310-001114	310-002114	-
SF-51	1/4	1/2	1/8	310-001115	310-002115	-
SF-1	1/4	5/8	1/4	310-001117C	310-002117C	-
SF-1NF	1/4	5/8	1/4	-	-	310-002521
SF-1 L6	1/4	1/2	1/4	310-002617	310-002717	-
SF-3	3/8	3/4	1/4	310-001118	310-002118	-
SF-3NF	3/8	3/4	1/4	-	-	310-002512
SF-3 L6	3/8	3/4	1/4	310-002618	310-002718	-
SF-4	7/16	1	1/4	310-001119	310-002119	-
SF-4 L6	7/16	1	1/4	310-002616	-	-
SF-4 L6	7/16	1	1/4	-	310-002774A	-
SF-13	1/2	3/4	1/4	310-001120	310-002120	-
SF-5	1/2	1	1/4	310-001121	310-002121	-
SF-5NF	1/2	1	1/4	-	-	310-002513
SF-5 L6	1/2	1	1/4	310-002619	310-002719	-
SF-6	5/8	1	1/4	310-001122	310-002122	-
SF-6NF	5/8	1	1/4	-	-	310-002514
SF-7	3/4	1	1/4	310-001123	310-002123	-
SF-14	3/4	1-1/4	1/4	310-001124	310-002124C	-
SF-15	3/4	1-1/2	1/4	310-001125	310-002125	-
SF-7NF	3/4	1	1/4	-	-	310-002544
SF-14NF	3/4	1-1/4	1/4	-	-	310-003006

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Tree Shape - Pointed</p> <ul style="list-style-type: none"> Chamfering and bore holes L2 = 2" OAL, L3 = 3" OAL L6 = 6" Shank Length Single Cut = Finishing Double Cut = Material Removal <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Single Cut</p> </div> <div style="text-align: center;"> <p>Double Cut</p> </div> </div>		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○	○	○	○	○	○	○	○	○	○	○

● Best ○ Good

Series 310G | SG | Tree Shape | Pointed





Tool	Diameter(D ₁)	LOC(L ₁)	Shank(D)	Single Cut	Double Cut
SG-61	3/32	1/4	3/32	310-002148	310-002147
SG-41	1/8	1/4	1/8	310-001130	310-002130
SG-42	1/8	5/16	1/8	310-001131	310-002131
SG-43	1/8	3/8	1/8	310-001132	310-002132
SG-44	1/8	1/2	1/8	310-001145	310-002145
SG-44 L2	1/8	1/2	1/8	310-006300	310-006275
SG-44 L3	1/8	1/2	1/8	310-006900	310-006875
SG-53	3/16	1/2	1/8	310-001133	310-002133
SG-81	3/16	1/2	3/16	310-001134	310-002134
SG-51	1/4	1/2	1/8	310-001135	310-002135
SG-1	1/4	5/8	1/4	310-001137C	310-002137C
SG-1 L6	1/4	1/2	1/4	310-002621	310-002721
SG-2	5/16	3/4	1/4	310-001138	310-002138
SG-3	3/8	3/4	1/4	310-001139	310-002139
SG-3 L6	3/8	3/4	1/4	310-002622	310-002722
SG-13	1/2	3/4	1/4	310-001140	310-002140
SG-5	1/2	1	1/4	310-001141	310-002141
SG-5 L6	1/2	1	1/4	310-002623	310-002723
SG-6	5/8	1	1/4	310-001142	310-002142
SG-7	3/4	1	1/4	310-001143	310-002143
SG-15	3/4	1-1/2	1/4	310-001144	310-002144

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Carbide Flame Shape Burrs



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Flame Shape</p> <ul style="list-style-type: none"> Molds and contouring L2 = 2" OAL, L3 = 3" OAL L6 = 6" Shank Length Single Cut = Finishing Double Cut = Material Removal <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>Single Cut</p> </div> <div style="text-align: center;">  <p>Double Cut</p> </div> </div>		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○	○	○	○	○	○	○	○	○	○	○

● Best ○ Good

Series 310H SH | Flame Shape

Tool	Diameter(D ₁)	LOC(L ₁)	Shank(D)	Single Cut	Double Cut
SH-41	1/8	1/4	1/8	310-001150	310-002150
SH-41 L2	1/8	1/4	1/8	310-006350	310-006325
SH-41 L3	1/8	1/4	1/8	310-002637	310-002737
SH-53	3/16	3/8	1/8	310-001151	310-002151
SH-81	3/16	3/8	3/16	310-001152	310-002152
SH-1	1/4	5/8	1/4	310-001157C	310-002157C
SH-1 L6	1/4	5/8	1/4	310-002629A	310-002751
SH-2	5/16	3/4	1/4	310-001153	310-002153
SH-2 L6	5/16	3/4	1/4	310-002629	310-002729
SH-5	1/2	1-1/4	1/4	310-001154	310-002154
SH-5 L6	1/2	1-1/4	1/4	310-002630	310-002730
SH-6	5/8	1-7/16	1/4	310-001155	310-002155
SH-7	3/4	1-5/8	1/4	310-001156	310-002156

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Carbide Cone Shape Burrs



INTRO

MILLING





SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Cone Shape - 60°</p> <ul style="list-style-type: none"> Chamfering, beveling and countersinking DE = Double End Tool Single Cut = Finishing Double Cut = Material Removal <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>Single Cut</p> </div> <div style="text-align: center;">  <p>Double Cut</p> </div> </div>		<div style="display: flex; gap: 5px;"> <div style="border: 1px solid black; padding: 2px;">CARBIDE</div> <div style="border: 1px solid black; padding: 2px;">P249</div> </div> <div style="margin-top: 5px;">  </div>

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○	○	○	○	○	○	○	○	○	○	○

● Best ○ Good

Series 310J **SJ | Cone Shape | 60°**

Tool	Diameter(D ₁)	LOC(L ₁)	Shank(D)	Single Cut	Double Cut
SJ-42	1/8	3/32	1/8	310-001160	310-002160
SJ-81	3/16	9/64	3/16	310-001168	310-002161
SJ-1	1/4	3/16	1/4	310-001162	310-002162
SJ-3	3/8	5/16	1/4	310-001163	310-002163
SJ-5	1/2	7/16	1/4	310-001164	310-002164
SJ-6	5/8	9/16	1/4	310-001165	310-002165
SJ-7	3/4	11/16	1/4	310-001166	310-002166
SJ-9	1	15/16	1/4	310-001167	310-002167

*bold numbers are EDPs for ordering

Popular Custom Specialty Options

- Longer lengths
- Variety of enhanced PVD tool coatings
- Special diameters for some series available






**CUSTOM
COMES
STANDARD**



GENERAL PURPOSE

Carbide Cone Shape Burrs



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Cone Shape - 90°</p> <ul style="list-style-type: none"> Chamfering, beveling and countersinking DE = Double End Tool Single Cut = Finishing Double Cut = Material Removal <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>Single Cut</p> </div> <div style="text-align: center;">  <p>Double Cut</p> </div> </div>		 

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSPA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○	○	○	○	○	○	○	○	○	○	○

● Best ○ Good

Series 310K SK | Cone Shape | 90°

Tool	Diameter(D ₁)	LOC(L ₁)	Shank(D)	Single Cut	Double Cut
SK-42 DE	1/8	1/16	1/8	310-001169	310-002169
SK-81 DE	3/16	3/32	3/16	310-001171	310-002171
SK-1 DE	1/4	1/8	1/4	310-001172	310-002172C
SK-3	3/8	3/16	1/4	310-001173	310-002173
SK-5	1/2	1/4	1/4	310-001174	310-002174
SK-6	5/8	5/16	1/4	310-001175	310-002175
SK-7	3/4	3/8	1/4	310-001176	310-002176
SK-9	1	1/2	1/4	310-001177C	310-002177

*bold numbers are EDPs for ordering

Popular Custom Specialty Options

- Longer lengths
- Variety of enhanced PVD tool coatings
- Special diameters for some series available

CUSTOM
COMES
STANDARD



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Carbide Taper Shape Burrs



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Taper Shape - Radius</p> <ul style="list-style-type: none"> Contouring & difficult to access areas 14° Included Angle L2 = 2" OAL, L3 = 3" OAL L6 = 6" Shank Length Single Cut = Finishing Double Cut = Material Removal Aluma Cut = Non-Ferrous 		
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Single Cut</p> </div> <div style="text-align: center;"> <p>Double Cut</p> </div> <div style="text-align: center;"> <p>Aluma Cut</p> </div> </div>		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○	○	○	○	○	○	○	○	○	○	○

● Best ○ Good

Series 310L | SL | Taper Shape | Radius

Tool	Diameter(D ₁)	LOC(L ₁)	Shank(D)	Single Cut	Double Cut	Aluma Cut
SL-41	1/8	3/8	1/8	310-001180	310-002180	-
SL-42	1/8	1/2	1/8	310-001181	310-002181	-
SL-42 L2	1/8	1/2	1/8	310-001181A	310-002181A	-
SL-42 L3	1/8	1/2	1/8	310-002640	310-002740	-
SL-53	3/16	1/2	1/8	310-001182	310-002182	-
SL-81	3/16	1/2	3/16	310-001183	310-002183	-
SL-1	1/4	5/8	1/4	310-001184	310-002184	-
SL-1NF	1/4	5/8	1/4	-	-	310-002547
SL-1 L6	1/4	5/8	1/4	310-002625	310-002725	-
SL-2	5/16	7/8	1/4	310-001185	310-002185	-
SL-3	3/8	1-1/16	1/4	310-001186	310-002186	-
SL-3NF	3/8	1-1/16	1/4	-	-	310-002515
SL-3 L6	3/8	1-1/16	1/4	310-002626	310-002726	-
SL-4	1/2	1-1/8	1/4	310-001187	310-002187	-
SL-4 L6	1/2	1-1/8	1/4	310-001187B	310-002187B	-
SL-4NF	1/2	1-1/8	1/4	-	-	310-002516
SL-6	5/8	1-5/16	1/4	310-001179	310-002179	-
SL-6NF	5/8	1-5/16	1/4	-	-	310-002517
SL-5	5/8	1-3/16	1/4	310-001188	310-002188	-
SL-5NF	5/8	1-3/16	1/4	-	-	310-003007
SL-7	3/4	1-1/2	1/4	310-001189	310-002189	-
SL-7NF	3/4	1-1/2	1/4	-	-	310-004303

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Carbide Cone Shape Burrs



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Cone Shape - Pointed</p> <ul style="list-style-type: none"> Conical holes, grooves, and model building L2 = 2" OAL, L3 = 3" OAL L6 = 6" Shank Length Single Cut = Finishing Double Cut = Material Removal 		
<p>Single Cut</p> <p>Double Cut</p>		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○	○	○	○	○	○	○	○	○	○	○

● Best ○ Good

Series 310M SM | Cone Shape | Pointed

Tool	Diameter(D ₁)	LOC(L ₁)	Shank(D)	Incl. Angle	Single Cut	Double Cut
SM-61	3/32	1/4	3/32	10°	310-001190	310-002190
SM-41	1/8	11/32	1/8	12°	310-001191	310-002191
SM-42	1/8	7/16	1/8	14°	310-001192	310-002192
SM-43	1/8	5/8	1/8	7°	310-001193	310-002193
SM-42 L2	1/8	7/16	1/8	14°	310-001192A	310-002192A
SM-43 L2	1/8	5/8	1/8	7°	310-001193A	310-002193A
SM-42 L3	1/8	7/16	1/8	14°	310-001192B	310-002192B
SM-43 L3	1/8	5/8	1/8	7°	310-001193B	310-002193B
SM-53	3/16	1/2	1/8	16°	310-001194	310-002194
SM-81	3/16	1/4	3/16	12°	310-001195	310-002195
SM-51	1/4	1/2	1/8	22°	310-001196	310-002196
SM-1	1/4	1/2	1/4	22°	310-001198C	310-002198C
SM-2	1/4	3/4	1/4	14°	310-001199	310-002199
SM-3	1/4	1	1/4	10°	310-001200	310-002200
SM-1 L6	1/4	1/2	1/4	22°	310-002753	310-002754
SM-3 L6	1/4	1	1/4	10°	310-002850	310-002851A
SM-4	3/8	5/8	1/4	28°	310-001201	310-002201
SM-4 L6	3/8	5/8	1/4	28°	310-002632	310-002849
SM-5	1/2	7/8	1/4	28°	310-001202	310-002202
SM-5 L6	1/2	7/8	1/4	28°	310-002636	310-002204
SM-6	5/8	1	1/4	31°	310-001203	310-002203

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Carbide Cone Shape Burrs



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Cone Shape - Inverted</p> <ul style="list-style-type: none"> • Inner edges and conical profiles • Single Cut = Finishing • Double Cut = Material Removal <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Single Cut</p> </div> <div style="text-align: center;"> <p>Double Cut</p> </div> </div>		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○	○	○	○	○	○	○	○	○	○	○

● Best ○ Good

Series 310N SN | Cone Shape | Inverted

Tool	Diameter(D ₁)	LOC(L ₁)	Shank(D)	Single Cut	Double Cut
SN-61	3/32	1/8	3/32	310-001220	310-002220
SN-41	3/32	1/8	1/8	310-001221	310-002221
SN-41 L2	3/32	1/8	1/8	310-001221A	310-002221A
SN-41 L3	3/32	1/8	1/8	310-001221B	310-002221B
SN-42	1/8	3/16	1/8	310-001222	310-002222
SN-42 L2	1/8	3/16	1/8	310-001221C	310-002221C
SN-42 L3	1/8	3/16	1/8	310-001221D	310-002221D
SN-53	3/16	1/4	1/8	310-001223	310-002223
SN-81	3/16	1/4	3/16	310-001224	310-002224
SN-51	1/4	1/4	1/8	310-001225	310-002225
SN-1	1/4	5/16	1/4	310-001227	310-002227
SN-2	3/8	3/8	1/4	310-001231	310-002231
SN-2 L6	3/8	3/8	1/4	310-002736	-
SN-4	1/2	1/2	1/4	310-001228	310-002228
SN-4 L6	1/2	1/2	1/4	-	310-002734
SN-6	5/8	3/4	1/4	310-001229	310-002229
SN-7	3/4	5/8	1/4	310-001230	310-002230

*bold numbers are EDPs for ordering

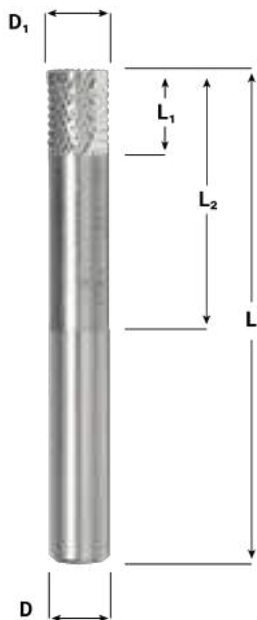
Popular Custom Specialty Options

- Longer lengths
- Variety of enhanced PVD tool coatings
- Special diameters for some series available

**CUSTOM
COMES
STANDARD**

GENERAL PURPOSE

Solid Carbide Deburring/Internal Grind Tools



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Internal Grind Tool</p> <ul style="list-style-type: none"> Internal ID grind tool for deburring Suited for ferrous materials Features end cutting and back taper Sub-micron grade carbide substrate for wear resistance RHC/RHS < 9/32 = Reduced Neck, > 1/4 = Reduced Shank Diameter Tol.: +0.002"/-0.000" Shank Tol.: +0/-0.0005" 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○	○	○	○	○			○	○	○	○

● Best ○ Good

Series 312 ID Grinding

Diameter(D ₁)	LOC(L ₁)	LBS(L ₂)	OAL(L)	Shank(D)	EDP
.030	3/32	1/8	1-1/2	1/8	312-708030
.040	3/32	1/8	1-1/2	1/8	312-708040
.050	1/8	1/4	1-1/2	1/8	312-708050
1/16	1/8	3/8	1-1/2	1/8	312-708062
5/64	5/32	3/8	1-1/2	1/8	312-708078
3/32	5/32	3/8	1-1/2	1/8	312-708093
7/64	3/16	1/2	1-1/2	1/8	312-708110
1/8	3/16	1/2	1-1/2	1/8	312-708125
9/64	7/32	5/8	2	3/16	312-708141
5/32	7/32	5/8	2	3/16	312-708156
11/64	1/4	5/8	2	3/16	312-708172
3/16	1/4	5/8	2	3/16	312-708187
13/64	9/32	3/4	2	1/4	312-708203
7/32	9/32	3/4	2	1/4	312-708218
15/64	5/16	3/4	2	1/4	312-708235
1/4	5/16	3/4	2	1/4	312-708250
9/32	11/32	-	2-1/2	1/4	312-708281
5/16	11/32	-	2-1/2	1/4	312-708312
11/32	3/8	-	2-1/2	1/4	312-708343
3/8	3/8	-	2-1/2	1/4	312-708375
1/2	3/8	-	3-1/2	3/8	312-708500

*bold numbers are EDPs for ordering

INTRO

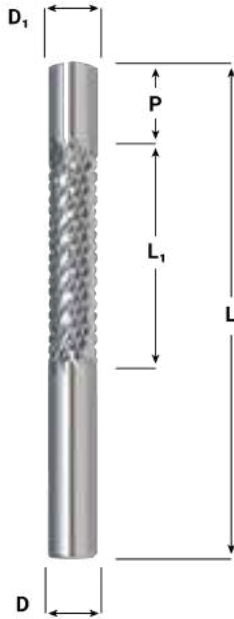
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Piloted Die Trimmer</p> <ul style="list-style-type: none"> • For deburring • The double-cut style allows for easy operator control and rapid material removal • Sub-micron grade carbide substrate for wear resistance • RHC/RHS • Shank Tol.: +0/-0.0005" 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○	○	○	○	○	○	○	○	○	○	○

● Best ○ Good

Series 312P Piloted Die Trimmer

Diameter(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Pilot(D)	EDP
1/8	1	3-	1/8	1/2	310-006997
1/8	1	2-1/2	1/8	1/2	310-006998
3/16	1	2-1/2	3/16	1/2	310-006995
1/4	1	3-	1/4	1/2	310-006996
1/4	1	2-1/2	1/4	1/2	310-006999
3/8	1	2-1/2	3/8	1/2	310-007001
1/2	1	2-1/2	1/2	1/2	310-007002

*bold numbers are EDPs for ordering

Popular Custom Specialty Options

- Longer lengths
- Variety of enhanced PVD tool coatings
- Special diameters for some series available

**CUSTOM
COMES
STANDARD**

GENERAL PURPOSE

STB & STBL Carbide Strips



FEATURES/DESCRIPTION

Carbide Strips - Unground + Grind Stock

- Grind stock (material) allows for the blank to be polished/finished while remaining on-size
- C2 sub-micron grade carbide - unparalleled versatility
- Used as shims or raw material for custom part and tool making
- Thickness: +0.008" | Width: +0.012" | Length: +0.008"

Series 777 STB & STBL | Carbide Strips

Style	Thickness(D ₁)	Width(D)	OAL(L)	EDP
STB-12	1/32	1/16	1	777-001038
STB-12A	1/32	1/16	1-1/2	777-001039
STB-13	3/64	3/32	1	777-001040
STB-13A	3/64	3/32	13/16	777-001041
STB-220L	1/16	1/16	6	777-001067B
STB-24A	1/16	1/8	1	777-001047
STB-24B	1/16	1/8	3	777-001047B
STB-24C	1/16	1/8	1-1/4	777-001047E
STB-24D	1/16	1/8	1-1/2	777-001047F
STB-24L	1/16	1/8	6	777-001047G
STB-26A	1/16	3/16	1	777-001048
STB-26C	1/16	3/16	3	777-001048C
STB-26L	1/16	3/16	6	777-001048H
STB-28A	1/16	1/4	1	777-001059
STB-28B	1/16	1/4	1-1/4	777-001059A
STB-28D	1/16	1/4	3	777-001060
STB-28L	1/16	1/4	6	777-001061
STB-210L	1/16	5/16	6	777-001062
STB-212L	1/16	3/8	6	777-001067
STB-216L	1/16	1/2	6	777-001067A
STB-224L	1/16	3/4	6	777-001067C
STB-232L	1/16	1	6	777-001067D
STB-14	5/64	1/8	1-1/8	777-001045
STB-320	3/32	1/16	6	777-001079
STB-320L	3/32	1/16	8	777-001079A
STB-34	3/32	1/8	5	777-001068
STB-34L	3/32	1/8	8	777-001068A
STB-36	3/32	3/16	1-1/8	777-001064
STB-36A	3/32	3/16	1-1/4	777-001069
STB-36L	3/32	3/16	8	777-001069A
STB-38D	3/32	1/4	5	777-001050
STB-38A	3/32	1/4	1	777-001050C
STB-38B	3/32	1/4	1-1/2	777-001050D
STB-38L	3/32	1/4	8	777-001050E
STB-310A	3/32	5/16	2	777-001065
STB-310B	3/32	5/16	3	777-001065A
STB-310C	3/32	5/16	5	777-001066
STB-310L	3/32	5/16	8	777-001066C
STB-312	3/32	3/8	5	777-001070
STB-312L	3/32	3/8	8	777-001070C
STB-312C	3/32	3/8	6	777-001070D
STB-316	3/32	1/2	6	777-001072
STB-316L	3/32	1/2	8	777-001072A
STB-324	3/32	3/4	6	777-001073
STB-328	3/32	7/8	6	777-001074
STB-332	3/32	1	6	777-001076
STB-336	3/32	1-1/8	6	777-001077
STB-340	3/32	1-1/4	6	777-001078
STB-348	3/32	1-1/2	6	777-001080
STB-420	1/8	1/16	6	777-001091
STB-420L	1/8	1/16	12	777-001091A
STB-44L	1/8	1/8	12	777-001083
STB-46	1/8	3/16	6	777-001086
STB-46L	1/8	3/16	12	777-001086A
STB-48A	1/8	1/4	1	777-001052C

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

STB & STBL Carbide Strips



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Series 777 | **STB & STBL | Carbide Strips**

Style	Thickness(D ₁)	Width(D)	OAL(L)	EDP
STB-48B	1/8	1/4	1-1/4	777-001052D
STB-48F	1/8	1/4	1-1/2	777-001052E
STB-48C	1/8	1/4	2-1/4	777-001052F
STB-48D	1/8	1/4	3	777-001052G
STB-48E	1/8	1/4	6	777-001052H
STB-48L	1/8	1/4	12	777-001052I
STB-410	1/8	5/16	6	777-001080B
STB-410A	1/8	5/16	1-1/2	777-001080E
STB-410B	1/8	5/16	3	777-001080F
STB-410L	1/8	5/16	12	777-001080G
STB-412B	1/8	3/8	3	777-001081
STB-412A	1/8	3/8	2	777-001081D
STB-412D	1/8	3/8	1	777-001082
STB-412C	1/8	3/8	6	777-001082A
STB-412L	1/8	3/8	12	777-001082E
STB-416	1/8	1/2	6	777-001084
STB-416L	1/8	1/2	12	777-001084A
STB-416A	1/8	1/2	1	777-001085
STB-416C	1/8	1/2	3	777-001087
STB-416B	1/8	1/2	1-1/2	777-001090
STB-424	1/8	3/4	6	777-001095
STB-424L	1/8	3/4	12	777-001095A
STB-428	1/8	7/8	6	777-001096
STB-432	1/8	1	6	777-001055
STB-432L	1/8	1	12	777-001055A
STB-436	1/8	1-1/8	6	777-010555
STB-440	1/8	1-1/4	6	777-0140554
STB-448	1/8	1-1/2	6	777-010553
STB-456	1/8	1-3/4	6	777-010552
STB-520	5/32	1/16	6	777-010549
STB-512C	5/32	3/8	6	777-010551
STB-516	5/32	1/2	6	777-010550
STB-524	5/32	3/4	6	777-010548
STB-528	5/32	7/8	6	777-010547
STB-532	5/32	1	6	777-010546
STB-536	5/32	1-1/8	6	777-010545
STB-540	5/32	1-1/4	6	777-010544
STB-544	5/32	1-3/8	6	777-010543
STB-548	5/32	1-1/2	6	777-010542
STB-564	5/32	2	6	777-010541
STB-620	3/16	1/16	6	777-001057
STB-620A	3/16	1/16	3	777-001057A
STB-620L	3/16	1/16	12	777-001057B
STB-66L	3/16	3/16	12	777-001056
STB-68	3/16	1/4	6	777-001058
STB-68L	3/16	1/4	12	777-001058A
STB-68A	3/16	1/4	3	777-001058B
STB-610A	3/16	5/16	3	777-001115
STB-610	3/16	5/16	6	777-001116
STB-610L	3/16	5/16	12	777-001117
STB-612	3/16	3/8	6	777-001100
STB-612A	3/16	3/8	3	777-001100A
STB-612L	3/16	3/8	12	777-001100B
STB-616A	3/16	1/2	3	777-001110
STB-616	3/16	1/2	6	777-001110A
STB-616L	3/16	1/2	12	777-001110B
STB-624	3/16	3/4	6	777-001051
STB-624A	3/16	3/4	4	777-001051A
STB-624B	3/16	3/4	2	777-001051B
STB-624L	3/16	3/4	12	777-001051C
STB-628	3/16	7/8	6	777-001151
STB-632L	3/16	1	12	777-001114
STB-632	3/16	1	6	777-001114A
STB-640L	3/16	1-1/4	12	777-001113
STB-640	3/16	1-1/4	6	777-001113A
STB-648	3/16	1-1/2	6	777-010113
STB-820	1/4	1/16	6	777-001210
STB-820L	1/4	1/16	12	777-001210A
STB-820A	1/4	1/16	3	777-001210B
STB-88L	1/4	1/4	12	777-001450
STB-812	1/4	3/8	6	777-001188
STB-812A	1/4	3/8	3	777-001190
STB-812L	1/4	3/8	12	777-001190A
STB-816	1/4	1/2	6	777-001195
STB-816A	1/4	1/2	3	777-001195A
STB-816B	1/4	1/2	4	777-001195B

*bold numbers are EDPs for ordering

GENERAL PURPOSE

STB & STBL Carbide Strips



Series 777

STB & STBL | Carbide Strips

Style	Thickness(D ₁)	Width(D)	OAL(L)	EDP
STB-816C	1/4	1/2	2	777-001195C
STB-816L	1/4	1/2	12	777-001195D
STB-824	1/4	3/4	6	777-001290
STB-824A	1/4	3/4	3	777-001290A
STB-824L	1/4	3/4	12	777-001290B
STB-832	1/4	1	6	777-001350
STB-832L	1/4	1	12	777-001400
STB-840L	1/4	1-1/4	12	777-001420
STB-1010L	5/16	5/16	12	777-001427
STB-1212L	3/8	3/8	12	777-001421
STB-1216L	3/8	1/2	12	777-001422
STB-1224L	3/8	3/4	12	777-001423
STB-1232L	3/8	1	12	777-001424
STB-1616L	1/2	1/2	12	777-001425
STB-1624L	1/2	3/4	12	777-001426
STB-22L	5/8	1/16	6	777-001042

*bold numbers are EDPs for ordering

INTRO

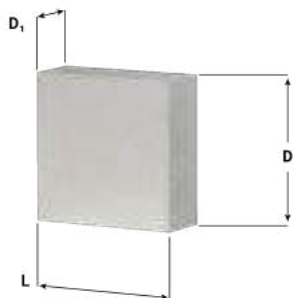
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS


FEATURES/DESCRIPTION
Carbide Square Blanks: Unground + Grind Stock

- Grind stock (material) allows for the blank to be polished/finished while remaining on-size
- C2 and C5 grades available
- Higher TRS versus HSS
- Used as shims or ram material
- Minimum Grind Stock: Thickness $\leq 5/16$: +0.004 to +0.015"
- Minimum Grind Stock: Thickness $\geq 3/8$: +0.006 to +0.020"

Series 1000 C2 10% Grade | C5 8% Grade

Style	Thickness(D ₁)	Width(D)	OAL(L)	C2	C5
1010	1/16	1/8	5/8	700-007001	700-007001A
2010	1/16	1/8	5/8	700-007208A	-
1020	1/16	3/16	1/4	700-007005	700-007005A
2020	1/16	3/16	1/4	700-007209A	700-007209D
1030	1/16	1/4	5/16	700-007010	700-007010A
1040	3/32	3/16	5/16	700-007012	700-007012A
1050	3/32	3/16	1/2	700-007012B	700-007012C
1060	3/32	1/4	3/8	700-007011	700-007011A
1070	3/32	1/4	1/2	700-007013	700-007013A
1080	3/32	5/16	3/8	700-007014	700-007014A
1090	3/32	3/8	3/8	700-007016	700-007017
1100	3/32	3/8	1/2	700-007020	700-007020A
1105	3/32	7/16	1/2	700-007030	700-007032
1110	1/8	3/16	3/4	700-007035	700-007035A
1140	1/8	1/4	3/4	700-007049A	700-007049
1120	1/8	1/4	1/2	700-007055	700-007056
1130	1/8	1/4	5/8	700-007057	700-007057A
1150	1/8	5/16	7/16	700-007050	-
1160	1/8	5/16	1/2	700-007059	700-007060
1170	1/8	5/16	5/8	700-007070	-
1180	1/8	3/8	1/2	700-007080	700-007081
1190	1/8	3/8	3/4	700-007082	700-007083
1200	1/8	1/2	1/2	700-007084	700-007085
1210	1/8	1/2	3/4	700-007086	700-007087
1215	1/8	3/4	3/4	700-007088	700-007088A
1240	5/32	5/8	5/8	700-007099	-
1220	5/32	3/8	9/16	700-007089	-
1230	5/32	3/8	3/4	700-007098A	-
1250	3/16	5/16	7/16	700-007099A	700-007099D
1260	3/16	5/16	5/8	700-007099B	700-007099C
1290	3/16	3/8	3/4	700-007090	700-007100
1270	3/16	3/8	1/2	700-007091	-
1280	3/16	3/8	5/8	700-007092	700-007093
1300	3/16	7/16	5/8	700-007110	-
1310	3/16	7/16	13/16	700-007150	700-007150A
1320	3/16	1/2	1/2	700-007160	700-007160A
1330	3/16	1/2	3/4	700-007180	700-007180A
1340	3/16	3/4	3/4	700-007190	700-007190A
1400	1/4	5/8	5/8	700-007208	-
1350	1/4	3/8	9/16	700-007200	-
1360	1/4	3/8	3/4	700-007200A	-
1370	1/4	7/16	5/8	700-007311	-
1380	1/4	1/2	3/4	700-007203	700-007204
1390	1/4	9/16	1	700-007202	-
1410	1/4	3/4	1	700-007201	700-007206

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Carbide Unground Square Blanks



Series 1000 C2 10% Grade | C5 8% Grade

Style	Thickness(D ₁)	Width(D)	OAL(L)	C2	C5
1405	1/4	3/4	3/4	700-007208B	-
1460	5/16	5/8	1	700-007314	-
1430	5/16	7/16	15/16	700-007312	-
1440	5/16	1/2	3/4	700-007209	-
1450	5/16	1/2	1	700-007313	-
1470	5/16	3/4	3/4	700-007315	-
1480	5/16	3/4	1-1/4	700-007316	-
1475	5/16	3/4	1	700-007317	-
1510	3/8	5/8	1	700-007318	-
1490	3/8	1/2	3/4	700-007209B	-
1500	3/8	1/2	1	700-007209C	-
1520	3/8	3/4	1-1/4	700-007319	-
1525	3/8	3/4	1-1/2	700-007320	-
1530	1/2	3/4	1	700-007321	-
1540	1/2	3/4	1-1/4	700-007322	-
1550	1/2	3/4	1-1/2	700-007323	-

*bold numbers are EDPs for ordering

INTRO

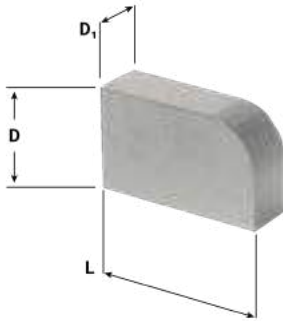
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION

Carbide Radius Blanks - Unground + Grind Stock

- Grind stock (material) allows for the blank to be polished/finished while remaining on-size
- C2 and C5 grades available
- Higher TRS versus HSS
- Used as shims or ram material
- Minimum Grind Stock: Thickness \leq 5/16: +0.004 to +0.015"
- Minimum Grind Stock: Thickness \geq 3/8: +0.006 to +0.020"

Series 2000 C2 10% Grade | C5 8% Grade

Style	Thickness(D ₁)	Width(D)	OAL(L)	C2	C5
2030	1/16	1/4	5/16	700-007210	700-007210A
2040	3/32	3/16	5/16	700-007211	700-007211A
2050	3/32	3/16	1/2	700-007213	700-007214
2060	3/32	1/4	3/8	700-007215	700-007216
2070	3/32	1/4	1/2	700-007218	700-007219
2080	3/32	5/16	3/8	700-007220	-
2090	3/32	3/8	3/8	700-007221	-
2100	3/32	3/8	1/2	700-007226	700-007226A
2105	3/32	7/16	1/2	700-007228	700-007228.5
2110	1/8	3/16	3/4	700-007230	700-007231
2120	1/8	1/4	1/2	700-007232	700-007232A
2130	1/8	1/4	5/8	700-007233	700-007234
2140	1/8	1/4	3/4	700-007235	700-007235A
2150	1/8	5/16	7/16	700-007236	-
2160	1/8	5/16	1/2	700-007237	-
2170	1/8	5/16	5/8	700-007241	-
2170	1/8	5/16	5/8	-	700-007242
2180	1/8	3/8	1/2	700-007243	700-007244
2190	1/8	3/8	3/4	700-007245B	700-007245A
2200	1/8	1/2	1/2	700-007247	700-007247B
2210	1/8	1/2	3/4	700-007260	700-007265
2215	1/8	3/4	3/4	700-007270	700-007275
2240	5/32	5/8	5/8	700-007282	-
2220	5/32	3/8	9/16	700-007276	-
2230	5/32	3/8	3/4	700-007280	-
2250	3/16	5/16	7/16	700-007284	-
2260	3/16	5/16	5/8	700-007290	-
2270	3/16	3/8	1/2	700-007292	-
2280	3/16	3/8	5/8	700-007294	-
2290	3/16	3/8	3/4	700-007300	-
2300	3/16	7/16	5/8	700-007302	-
2310	3/16	7/16	13/16	700-007304	700-007304A
2320	3/16	1/2	1/2	700-007306	700-007306A
2330	3/16	1/2	3/4	700-007308	700-007308A
2340	3/16	3/4	3/4	700-007310	-

*bold numbers are EDPs for ordering



FEATURES/DESCRIPTION

Carbide Round Tool Blanks

- C2 sub-micron grade carbide - unparalleled versatility and wear resistance
- Centerless ground for premium finish and precision
- Diameter Tol.: +0/-0.0005"

Series 701 Ground

Diameter(D ₁)	OAL(L)	EDP
1/32	1-1/2	701-001150
3/64	1-1/2	701-001350
3/64	2	701-001450
1/16	1-1/2	701-001550
1/16	3	701-001595
5/64	1-1/2	701-001740
5/64	2	701-001750
3/32	1-1/2	701-001850
3/32	2	701-001950
3/32	2-1/2	701-002050
3/32	3	701-002055
7/64	2	701-002250
7/64	2-1/2	701-002350
1/8	1	701-002370
1/8	1-1/2	701-002450
1/8	2	701-002550
1/8	2-1/4	701-002650
1/8	2-1/2	701-002750
1/8	3	701-002850
1/8	4	701-002950
5/32	1-1/2	701-003050
5/32	2	701-003053
5/32	2-1/2	701-003066
5/32	3	701-003067
3/16	1-1/2	701-003250
3/16	2	701-003350
3/16	2-1/2	701-003550
3/16	3	701-003650
3/16	4	701-003750
1/4	2	701-003850
1/4	2-1/2	701-004050
1/4	3	701-004150
1/4	4	701-004250
5/16	2	701-004350
5/16	2-1/8	701-004360
5/16	2-1/2	701-004450
5/16	3	701-004550
5/16	3-1/4	701-004551
5/16	4	701-004650
3/8	1-1/2	701-004690
3/8	2	701-004750
3/8	2-1/2	701-004850
3/8	3	701-004950
3/8	3-1/2	701-005050
3/8	4	701-005150
3/8	6	701-005250
7/16	2-1/2	701-005350
7/16	2-3/4	701-005450
7/16	3	701-005490
7/16	4	701-005550
7/16	6	701-005650
1/2	2	701-005750
1/2	2-1/2	701-005850
1/2	3	701-005950
1/2	3	701-005950A

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Carbide Ground Round Blanks



Series 701		Ground	
Diameter(D ₁)	OAL(L)	EDP	
1/2	4	701-006050	
1/2	5	701-006080	
1/2	6	701-006150	
1/2	7	701-006155	
1/2	8	701-006160	
9/16	3-1/2	701-006250	
9/16	4	701-006255	
5/8	3	701-006280	
5/8	3-1/2	701-006350	
5/8	4	701-006355	
5/8	5	701-006450	
5/8	6	701-006550	
5/8	7	701-006555	
5/8	8	701-006556	
5/8	9	701-006557	
3/4	3	701-006690	
3/4	4	701-006750	
3/4	5	701-006850	
3/4	6	701-006950	
3/4	7	701-007050	
3/4	8	701-007057	
3/4	9	701-007058	
7/8	4	701-007150	
7/8	6	701-007155	
1	4	701-007250	
1	5	701-007350	
1	6	701-007450	
1	7	701-007550	

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Carbide Ground Round Blanks Short



FEATURES/DESCRIPTION

Carbide Round Tool Blanks - Short

- C2 sub-micron grade carbide - unparalleled versatility
- Centerless ground for premium finish and precision
- Phenomenal shock and heat resistance
- Diameter Tol.: +0/-0.0005"

Series 702 Ground

Style	Diameter(D ₁)	OAL(L)	EDP
SR-34	3/32	1/2	702-000200
SR-44	1/8	1/2	702-000300
SR-46	1/8	3/4	702-000400
SR-48	1/8	1	702-000500
SR-55	5/32	5/8	702-000600
SR-63	3/16	3/8	702-000700
SR-64	3/16	1/2	702-000800
SR-65	3/16	5/8	702-000890
SR-66	3/16	3/4	702-000900
SR-68	3/16	1	702-000950
SR-69	3/16	1-1/8	702-001000
SR-77	7/32	7/8	702-001100
SR-84	1/4	1/2	702-001190
SR-86	1/4	3/4	702-001195
SR-88	1/4	1	702-001200
SR-810	1/4	1-1/4	702-001300
SR-812	1/4	1-1/2	702-001400
SR-814	1/4	1-3/4	702-001500
SR-1010	5/16	1-1/4	702-001600
SR-1210	3/8	1-1/2	702-001700
SR-1610	1/2	1-1/2	702-001800

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION

12" Carbide Round Blanks

- C2 sub-micron grade carbide - unparalleled versatility
- Centerless ground for premium finish and precision
- Phenomenal shock and heat resistance
- Diameter Tol.: +0/-0.0005"

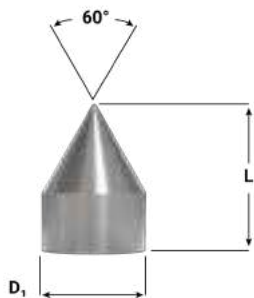
Series 702L Ground and Unground

Diameter(D ₁)	OAL(L)	Ground	Unground
1/32	12	702-100200	-
3/64	12	702-100350	702-100300
1/16	12	702-100450	702-100400
5/64	12	702-100550	-
3/32	12	702-100650	702-100600
7/64	12	702-100750	-
1/8	12	702-100900	-
9/64	12	702-101000	702-100950
5/32	12	702-101100	702-101050
11/64	12	702-101200	-
3/16	12	702-101300	702-101250
13/64	12	702-101450	-
7/32	12	702-101550	-
15/64	12	702-101650	702-101600
1/4	12	702-101750	702-101700
17/64	12	702-101850	702-101800
9/32	12	702-101950	702-101900
5/16	12	702-102150	702-102100
21/64	12	702-102250	-
11/32	12	702-102350	702-102300
23/64	12	702-102450	-
3/8	12	702-102550	702-102500
25/64	12	702-102650	702-102600
13/32	12	702-102750	702-102700
27/64	12	702-102770	702-102760
7/16	12	702-102850	702-102800
29/64	12	702-102890	702-102880
15/32	12	702-102950	702-102900
31/64	12	-	702-102990
1/2	12	702-103050	702-103000
17/32	12	702-103080	702-103070
9/16	12	702-103150	702-103100
5/8	12	702-103250	-
11/16	12	702-103350	-
3/4	12	702-103450	702-103400
13/16	12	702-103550	702-103500
7/8	12	702-103650	702-103600
1	12	702-103850	702-103800

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Carbide Ground Center Tip Blanks



FEATURES/DESCRIPTION

Carbide Center Tips

- C2 sub-micron grade carbide
- 60° included angle
- Diameter Tol.: +0/-0.0005"
- Angle Tol.: +/- 1.0"

Series 716C 60°

Style	Diameter(D ₁)	Height(L)	EDP
CT-40	1/4	7/16	716-000001
CT-50	5/16	9/16	716-000002
CT-60	3/8	11/16	716-000003
CT-80	1/2	7/8	716-000004
CT-100	5/8	1-1/16	716-000005
CT-120	3/4	1-1/4	716-000006
CT-140	7/8	1-3/8	716-000007
CT-160	1	1-1/2	716-000008
CT-200	1-1/4	1-3/4	716-000009

*bold numbers are EDPs for ordering



High Performance Endmill Sets

- Five Piece Sets - 1/8, 3/16, 1/4, 3/8, & 1/2 sizes
- Regular/standard flute and overall lengths
- Engineered nano-foam cushioning for ultimate tool protection
- Rugged plastic index can be reused to house future tooling
- Uncoated and coated options offered

FUSION

Flutes	End Style		
4	Square	284-888881	284-888882

ALPHA

Flutes	End Style	
4	Corner Radius	294-888881

ATTACKER

Flutes	End Style		
3	Corner Radius	267-888881	267-888882

AGGRESSOR

Flutes	Profile			
4	Fine Pitch	255-888811	-	255-888812
4	Medium Pitch	256-888881	-	256-888882
3	Coarse Pitch	255-888801	255-888802	-



General Purpose Endmill Sets

- Five Piece Sets - 1/8, 3/16, 1/4, 3/8, & 1/2 sizes
- Regular/standard flute and overall lengths
- Engineered nano-foam cushioning for ultimate tool protection
- Rugged plastic index can be reused to house future tooling
- Uncoated and coated options offered

Flutes	End Style			
2	Square	204-888881	204-888882	-
3		205-888881	-	205-888882
4		206-888881	-	206-888882
2	Ballnose	221-888881	221-888882	-
3		222-888881	-	222-888882
4		223-888881	-	223-888882



Drill Mill Sets

- Five Piece Sets - 1/8, 3/16, 1/4, 3/8, & 1/2 sizes
- Regular/standard flute and overall lengths
- Engineered nano-foam cushioning for ultimate tool protection
- Rugged plastic index can be reused to house future tooling
- Uncoated and coated options offered

Drill Mill Sets

Flutes	Included Angle		
2	90°	208-888821	208-888822
4	90°	208-888841	208-888842



5 Spade Drill Set

Included Angle	Diameters Included	
118°	1/8, 3/16, 1/4, 3/8 & 1/2"	400-888881



5 Piece N/C Spot Drill Sets

Drill Style	Diameters Included		
90°	1/8, 3/16, 1/4, 3/8 & 1/2"	402-888801	402-888802
120°	1/8, 3/16, 1/4, 3/8 & 1/2"	402-888811	402-888812
140°	1/8, 3/16, 1/4, 3/8 & 1/2"	402-888821	402-888822



15 Piece Drill Sets

Drill Style	Diameters Included		
Twist	1/16" - 1/2" x 32nds	450-000015	450-000015B
Screw Machine		460-000015	460-000015B
Straight Flute		470-000015	470-000015B

21 Piece Drill Sets

Drill Style	Diameters Included		
Twist	1/16" - 3/8" x 64ths	450-000021	450-000021B
Screw Machine		460-000021	460-000021B
Straight Flute		470-000021	470-000021B



24 Piece Drill Sets




Drill Style	Diameters Included		
Twist	1.0mm - 12.5mm x 0.5mm	450-000024	450-000024B
Screw Machine		460-000024	460-000024B
Straight Flute		470-000024	470-000024B

29 Piece Drill Sets

Drill Style	Diameters Included		
Twist	1/16" - 1/2" x 64ths	450-000029	450-000029B
Screw Machine		460-000029	460-000029B
Straight Flute		470-000029	470-000029B



4 Piece Countersink Sets

Flutes	Diameters Included	Included Angle	
	1/4, 1/2, 3/4 & 1	60°	331-100060
		82°	331-100082
		90°	331-100090
		100°	331-100100
		120°	331-100120
	1/4, 1/2, 3/4 & 1	60°	333-100060
		82°	333-100082
		90°	333-100090
		100°	333-100100
		120°	333-100120
	1/4, 1/2, 3/4 & 1	60°	336-100060
		82°	336-100082
		90°	336-100090
		100°	336-100100
		120°	336-100120



Aluma Burr Sets



Set Letter	Number Of Pieces	Diameters Included	Burrs Included	Aluma Cut
AL1	10	1/4 & 3/8	SA-1NF, SA-3NF, SB-3NF, SC-1NF, SC-3NF, SD-1NF, SD-3NF, SE-3NF, SF-3NF, SL-3NF	310-130001
AL2	12	1/4, 3/8 & 1/2	SA-1NF, SA-3NF, SA-5NF, SC-1NF, SC-3NF, SC-5NF, SD-1NF, SD-3NF, SD-5NF, SF-1NF, SF-3NF, SF-5NF	310-130002
AL3	12	1/4, 3/8 & 1/2	SA-1NF, SA-3NF, SA-5NF, SB-5NF, SD-1NF, SD-3NF, SD-5NF, SF-1NF, SF-3NF, SF-5NF, SL-3NF, SL-4NF	310-130003
AL4	11	1/4, 3/8 & 1/2	SA-1NF, SA-3NF, SA-5NF, SC-1NF, SC-3NF, SC-5NF, SF-1NF, SF-3NF, SF-5NF, SL-3NF, SL-4NF	310-130004
AL5	8	1/2 & 3/8	SA-5NF, SB-5NF, SC-5NF, SD-5NF, SE-5NF, SF-5NF, SL-3NF, SL-4NF	310-130005
AL6	10	3/8 & 1/2	SA-3NF, SA-5NF, SD-3NF, SD-5NF, SE-3NF, SE-5NF, SF-3NF, SF-5NF, SL-3NF, SL-4NF	310-130006



Miniature Burr Sets



Set Letter	# of Pieces	Diameters Included	Burrs Included	Single Cut	Double Cut
A	12	3/32 & 1/8	SA-42, SA-43, SC-42, SD-42, SE-41, SF-41, SF-42, SG-41, SL-42, SM-43, SN-41, SN-42	310-130001	310-120001
B	12	1/16, 3/32 & 1/8	SA-41, SA-42, SC-41, SC-42, SD-42, SE-41, SF-41, SF-42, SH-41, SL-41, SL-42, SN-42	310-130002	310-120002
C	11	1/16, 3/32 & 1/8	SA-41, SB-41, SC-41, SD-41, SE-41, SF-41, SG-41, SH-41, SL-41, SM-41, SN-41	310-130003	310-120003
D	11	3/32 & 1/8	SA-42, SB-42, SC-42, SD-42, SF-42, SG-42, SJ-42, SK-42, SL-42, SM-42, SN-42	310-130004	310-120004



Standard Burr Sets



Set Letter	# of Pieces	Diameters Included	Burrs Included	Single Cut	Double Cut
K	12	1/8, 5/32, 3/16 & 1/4	SA-11, SB-14, SC-13, SD-14, SE-11, SF-11, SG-1, SH-1, SJ-1, SK-1, SM-1, SN-1	310-110011	310-120011
F	12	5/32 & 3/16	SA-52, SA-53, SC-52, SC-53, SD-52, SD-53, SE-53, SF-53, SG-53, SH-53, SM-53, SN-53	310-110006	310-120006
H	12	5/32 & 1/4	SA-51, SA-52, SB-51, SC-51, SC-52, SD-51, SD-52, SE-51, SF-51, SG-51, SM-51, SN-51	310-110008	310-120008
E	10	3/16	SA-53, SC-53, SD-53, SE-53, SF-53, SG-53, SH-53, SL-53, SM-53, SN-53	310-110005	310-120005
L	12	3/16 & 1/4	SA-1, SA-14, SC-1, SC-14, SD-1, SE-1, SF-1, SG-1, SJ-1, SL-1, SH-1, SN-1	310-110012	310-120012
AA	12	1/4	SA-1, SB-1, SC-1, SD-1, SE-1, SF-1, SG-1, SH-1, SJ-1, SK-1, SL-1, SM-1	310-110026	310-120026
G	9	1/4	SA-51, SB-51, SC-51, SD-51, SE-51, SF-51, SG-51, SM-51, SN-51	310-110007	310-120007
I	12	1/4	SA-1, SB-1, SC-1, SD-1, SE-1, SF-1, SG-1, SH-1, SJ-1, SK-1, SM-1, SN-1	310-110009	310-120009
J	12	1/4	SB-1, SC-1, SD-1, SE-1, SF-1, SG-1, SH-1, SJ-1, SK-1, SL-1, SM-1, SN-1	310-110010	310-120010
M	9	1/4 & 3/8	SA-3, SC-3, SD-3, SE-3, SF-3, SG-3, SJ-3, SM-3, SN-2	310-110013	310-120013
N	9	1/4 & 3/8	SB-3, SC-3, SD-3, SE-3, SF-3, SG-3, SK-3, SL-3, SM-3	310-110014	310-120014
O	12	1/4, 3/8 & 1/2	SA-1, SA-3, SA-5, SD-1, SD-3, SD-5, SF-1, SF-3, SF-5, SG-1, SG-3, SG-5	310-110021	310-120021
P	9	1/4, 3/8 & 1/2	SA-1, SA-3, SA-5, SC-1, SC-3, SC-5, SF-1, SF-3, SF-5	310-110015	310-120015
Q	9	1/4, 3/8 & 1/2	SB-1, SB-3, SB-5, SD-1, SD-3, SD-5, SE-1, SE-3, SE-5	310-110016	310-120016
R	9	1/4, 3/8 & 1/2	SA-1, SA-3, SA-5, SE-1, SE-3, SE-5, SN-1, SN-2, SN-4	310-110017	310-120017
S	9	1/4, 3/8 & 1/2	SB-1, SB-3, SB-5, SC-1, SC-3, SC-5, SF-1, SF-3, SF-5	310-110018	310-120018
V	12	1/4, 3/8 & 1/2	SA-1, SA-3, SA-5, SC-1, SC-3, SC-5, SE-1, SE-3, SE-5, SM-1, SM-3, SM-5	310-110022	310-120022
W	12	1/4, 3/8 & 1/2	SB-1, SB-3, SB-5, SD-1, SD-3, SD-5, SF-1, SF-3, SF-5, SN-1, SN-2, SN-4	310-110023	310-120023
X	12	1/4, 3/8 & 1/2	SA-1, SA-3, SA-5, SC-1, SC-3, SC-5, SG-1, SG-3, SG-5, SM-1, SM-3, SM-5	310-110024	310-120024
Y	12	1/4, 3/8 & 1/2	SF-1, SF-3, SF-5, SG-1, SG-3, SG-5, SL-1, SL-3, SL-4, SM-1, SM-3, SM-5	310-110025	310-120025
AB	12	3/8	SA-3, SB-3, SC-3, SD-3, SE-3, SF-3, SG-3, SJ-3, SK-3, SL-3, SM-4, SN-2	310-110027	310-120027
AC	12	1/2	SA-5, SB-5, SC-5, SD-5, SE-5, SF-5, SG-5, SH-5, SJ-5, SK-5, SL-4, SM-5	310-110028	310-120028
T	8	1/2	SA-5, SC-5, SD-5, SE-5, SG-5, SH-5, SK-5, SM-5	310-110019	310-120019
U	8	1/2	SB-5, SC-5, SD-5, SF-5, SG-5, SH-5, SJ-5, SK-5	310-110020	310-120020

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ARMORY TOOLS

SOLID CARBIDE TOOLS FOR DEFENSE SYSTEMS

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



EJECTION DOOR KEYWAY

100468	EDP
KW10125-008.26	DESCRIPTION
5000 RPM, 50-60 IPM	TECHNICAL

GAS TUBE COUNTER BORE DRILL

EDP	118025
DESCRIPTION	DR201845.9X9.3/8SHK
TECHNICAL	5000 RPM, 30 IPM



CHARGING HANDLE BROACH

118021	EDP
BR-.420-015X2X4	DESCRIPTION
60-300 IPM .005 PER STEP OVER	TECHNICAL

CHARGING HANDLE KEYWAY

EDP	100472
DESCRIPTION	KW60507.127.5/8SHK
TECHNICAL	6000 RPM, 90 IPM



CHARGING CLEARANCE ENDMILL

100473	EDP
GWASU30420.25	DESCRIPTION
7000 RPM, 65 IPM	TECHNICAL

CHARGING HANDLE LOCK POSITION FORM

EDP	118024
DESCRIPTION	GWA30300-08X45DC
TECHNICAL	12000 RPM, 60 IPM



FORWARD ASSIST COMBO FORM DRILL

122266	EDP
SD20315.5/8SHK	DESCRIPTION
5000 RPM, 30 IPM	TECHNICAL

EJECTOR DOOR DETENT GROOVE CUTTER

EDP	120283
DESCRIPTION	RFC40400-0625.1/2SHK
TECHNICAL	5000 RPM, 60 IPM



THREAD UNDERCUT CHAMFER

120207 EDP

FT50800.65 1.00SHKFZ DESCRIPTION

12000 RPM, 200 IPM TECHNICAL

BARREL NUT THREADMILL

EDP 1013007

DESCRIPTION TMM 1-1/4-18 AR-15

TECHNICAL 10000 RPM, 61 IPM



CHARGING HANDLE SLOT & GROOVE COMBO

123707 EDP

FT30440.678.9/16SHK DESCRIPTION

6000 RPM, 90 IPM TECHNICAL



MAGAZINE WELL ROUGHER

105259 EDP

ARTLSU306025-02 DESCRIPTION

12000 RPM, 250 IPM
RAMPING UP TO 45° TECHNICAL

MAGAZINE WELL BROACH

EDP 119050

DESCRIPTION BR-630X.47

TECHNICAL 60-300 IPM,
.005 STEP OVER



TRIGGER POCKET ROUGHER

105277 EDP

ARTSU30375-015.5 DESCRIPTION

12000 RPM, 200 IPM
RAMPING UP TO 45° TECHNICAL

LOWER RECEIVER THREADMILL

EDP 109808

DESCRIPTION TMM 3/4-16 - 4 FL, 30°

TECHNICAL 10000 RPM, 61 IPM



ARMORY TOOLS

SOLID CARBIDE TOOLS FOR DEFENSE SYSTEMS

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



LOCKING LUG FORM TOOL

122267	EDP
FT60950-312NA	DESCRIPTION
1625 RPM, 30 IPM	TECHNICAL

FIRING PIN REAMER

EDP	122274
DESCRIPTION	RMR401575RHC/LHSNA
TECHNICAL	200 SFM, .001" IPR



BEARING SURFACE UNDERCUT FORM TOOL

122275	EDP
FT4091475X	DESCRIPTION
1525 RPM, 37 IPM	TECHNICAL

FIRING PIN HOLE & FORM

EDP	122276
DESCRIPTION	SD20068 3X5 4MM SHK
TECHNICAL	200 SFM, .001 IPR



RAIL PROFILE CUTTER

100469	EDP
FT80940-02STR	DESCRIPTION
12000 RPM, 190 IPM 3200 SFM, .002 IPT	TECHNICAL

RAIL GROOVE ROUGHER

EDP	118022
DESCRIPTION	RFA30200.25X2
TECHNICAL	12000 RPM, 100 IPM



RAIL GROOVE FINISHER WITH DEBURR

104474	EDP
FT302125-01 1/4SHK	DESCRIPTION
12000 RPM, 150 IPM	TECHNICAL

RAIL GROOVE FINISHER

EDP	101043
DESCRIPTION	GWAS30212
TECHNICAL	12000 RPM, 150 IPM

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CUSTOM
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TECHNICAL DATA

SPECIALTY



Series 787

GP | Straight Flute Router

Diameter	RPM	IPM
1/16	20,000 - 35,000	30 - 55
3/32	12,000 - 25,000	25-50
1/8	9,000 - 18,000	23 - 46
3/16	6,000 - 12,000	18 - 36
1/4	5,000 - 10,000	17 - 34
5/16	3,500 - 7,000	15 - 30
3/8	2,500 - 5,000	12-24
1/2	2,000 - 4,000	10 - 20

Series 713

GP | Engraving Tool | 30° - 90°

Material		RPM	Inches Per Minute (IPM)
P	Steels	2500-5000	2-8
		5000-10000	8-14
M	Stainless Steels	2500-5000	2-5
		5000-10000	5-10
S	Super Alloys	2500-5000	2-5
		5000-10000	5-10
H	Hardened Steels	2500-5000	2-5
		5000-10000	5-10
K	Cast Iron	2500-5000	3-8
		5000-10000	8-14
N	Non-Ferrous	2500-5000	5-10
		5000-10000	10-15

Series 310A - 310N

GP | Carbide Burrs

Burr Diameter	Minimum RPM	Medium RPM	Maximum RPM (Stainless)
1/16	50000	75000	100000
1/8	30000	60000	90000
3/16	25000	50000	75000
1/4	20000	40000	65000
5/16	15000	35000	60000
3/8	15000	35000	60000
7/16	15000	35000	60000
1/2	10000	30000	80000
5/8	10000	30000	50000
3/4	10000	20000	35000
1	5000	15000	30000

Industry Designation	Shape	Application
SA	Cylinder	Universal Surface Grinding
SB	Cylinder with End Cut	Blind holes & Inner Contours
SC	Cylinder with Radius	Contouring & Bore holes
SD	Ball	Contouring & Bore holes
SE	Oval / Egg	Molds & Fillet Welds
SF	Radius Tree	Molds & Contouring
SG	Pointed Tree	Chamfering & Bore Holes
SH	Flame	Molds & Contouring
SJ	60° Cone	Chamfering & Beveling & Countersinking
SK	90° Cone	Chamfering & Beveling & Countersinking
SL	Taper with Radius	Contouring & Difficult to Access Areas
SM	Pointed Cone	Conical Holes & Grooves & Model Building
SN	Inverted Cone	Inner Edges & Conical Profiles

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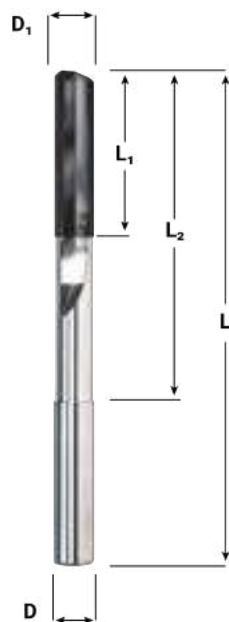
Custom Comes Standard - If we don't have the perfect tool on the shelf, we can build it for you.





ULTIMATE PERFORMANCE

Self-Locating Carbide Reamers For Ferrous Materials



FEATURES/DESCRIPTION		APPLICATION	FEATURES																																							
<p>PACREAMER</p> <p>Self-Centering Reamer</p> <ul style="list-style-type: none"> Precise - Accurate - Concentric Micrograin carbide substrate for wear resistance Burnishing pad for mirror-like finishes Proprietary geometry ensures perfect straightness Available in stocked sizes for press and slip fit applications >0.6240 has reduced shank 																																										
<table border="1"> <thead> <tr> <th colspan="3">STEEL</th> <th colspan="2">STAINLESS</th> <th colspan="2">CAST IRON</th> <th colspan="2">NON-FERROUS</th> <th colspan="2">HSSA</th> <th colspan="2">HARDENED STEEL</th> </tr> <tr> <th>P1</th><th>P2</th><th>P3</th> <th>M1</th><th>M2</th> <th>K1</th><th>K2</th> <th>N1</th><th>N2</th> <th>S1</th><th>S2</th> <th>H1</th><th>H2</th> </tr> </thead> <tbody> <tr> <td>●</td><td>●</td><td>○</td> <td>○</td><td>○</td> <td>●</td><td>●</td> <td></td><td></td> <td></td><td></td> <td>○</td><td></td> </tr> </tbody> </table>		STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL		P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2	●	●	○	○	○	●	●					○			
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL																															
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																														
●	●	○	○	○	●	●					○																															

● Best ○ Good

Series 4050 PAC | 1FL | Solid Carbide | Inch & Metric | Reamer

Diameter(D ₁)		Flute Length(L ₁)	LBS(L ₂)	OAL(L)	Shank(D)	PAC Drill Size	EDP
mm	in						
3.1496	0.1240	1	2	3	1/8	2.5mm	427113
3.1623	0.1245	1	2	3	1/8	2.5mm	427115
3.1750	0.1250	1	2	3	1/8	2.5mm	427118
3.1877	0.1255	1	2	3	1/8	2.5mm	427122
3.2004	0.1260	1	2	3	1/8	2.5mm	427123
4.7371	0.1865	1-1/2	3	4	3/16	4.0mm	427126
4.7498	0.1870	1-1/2	3	4	3/16	4.0mm	427127
4.7625	0.1875	1-1/2	3	4	3/16	4.0mm	427130
4.7752	0.1880	1-1/2	3	4	3/16	4.0mm	427131
4.7879	0.1885	1-1/2	3	4	3/16	4.0mm	427134
5.9750	0.2352	38mm	-	101mm	6mm	5.5mm	427136
5.9870	0.2357	38mm	-	101mm	6mm	5.5mm	427137
6.0000	0.2362	38mm	-	101mm	6mm	5.5mm	427141
6.0130	0.2367	38mm	-	101mm	6mm	5.5mm	427142
6.0250	0.2372	38mm	-	101mm	6mm	5.5mm	427145
6.3246	0.2490	1-1/2	3	4	1/4	6.0mm	427147
6.3373	0.2495	1-1/2	3	4	1/4	6.0mm	427151
6.3500	0.2500	1-1/2	3	4	1/4	6.0mm	427154
6.3627	0.2505	1-1/2	3	4	1/4	6.0mm	427157
6.3754	0.2510	1-1/2	3	4	1/4	6.0mm	427161
7.9121	0.3115	1-1/2	3	4	5/16	7.5mm	427163
7.9121	0.3115	2	4	6	5/16	7.5mm	427164
7.9248	0.3120	1-1/2	3	4	5/16	7.5mm	427168
7.9248	0.3120	2	4	6	5/16	7.5mm	427170
7.9375	0.3125	1-1/2	3	4	5/16	7.5mm	427173
7.9375	0.3125	2	4	6	5/16	7.5mm	427177
7.9502	0.3130	1-1/2	3	4	5/16	7.5mm	427178
7.9502	0.3130	2	4	6	5/16	7.5mm	427179
7.9629	0.3135	1-1/2	3	4	5/16	7.5mm	427181
7.9629	0.3135	2	4	6	5/16	7.5mm	427182
7.9750	0.3140	38mm	-	101mm	8mm	7.5mm	427185
7.9750	0.3140	50mm	-	152mm	8mm	7.5mm	427188
7.9870	0.3144	38mm	-	101mm	8mm	7.5mm	427192
7.9870	0.3144	50mm	-	152mm	8mm	7.5mm	427196
8.0000	0.3150	38mm	-	101mm	8mm	7.5mm	427198
8.0000	0.3150	50mm	-	152mm	8mm	7.5mm	427199
8.0130	0.3155	38mm	-	101mm	8mm	7.5mm	427202
8.0130	0.3155	50mm	-	152mm	8mm	7.5mm	427204
8.0250	0.3159	38mm	-	101mm	8mm	7.5mm	427206
8.0250	0.3159	50mm	-	152mm	8mm	7.5mm	427207
9.4996	0.3740	1-1/2	3	4	3/8	9.0mm	427210
9.4996	0.3740	2	4	6	3/8	9.0mm	427214
9.5123	0.3745	1-1/2	3	4	3/8	9.0mm	427215
9.5123	0.3745	2	4	6	3/8	9.0mm	427219
9.5250	0.3750	1-1/2	3	4	3/8	9.0mm	427222

*bold numbers are EDPs for ordering

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Self-Locating Carbide Reamers For Ferrous Materials



Series 4050 PAC | 1FL | Solid Carbide | Inch & Metric | Reamer

Diameter(D ₁)		Flute Length(L ₁)	LBS(L ₂)	OAL(L)	Shank(D)	PAC Drill Size	EDP
mm	in						
9.5250	0.3750	2	4	6	3/8	9.0mm	427225
9.5377	0.3755	1-1/2	3	4	3/8	9.0mm	427226
9.5377	0.3755	2	4	6	3/8	9.0mm	427229
9.5504	0.3760	1-1/2	3	4	3/8	9.0mm	427231
9.5504	0.3760	2	4	6	3/8	9.0mm	427233
9.9750	0.3927	50mm	-	152mm	10mm	9.5mm	427235
9.9870	0.3932	50mm	-	152mm	10mm	9.5mm	427238
10mm	0.3937	50mm	-	152mm	10mm	9.5mm	427239
10.0130	0.3942	50mm	-	152mm	10mm	9.5mm	427242
10.0250	0.3947	50mm	-	152mm	10mm	9.5mm	427243
11.0871	0.4365	2	4	6	7/16	10.5mm	427247
11.0998	0.4370	2	4	6	7/16	10.5mm	427250
11.1125	0.4375	2	4	6	7/16	10.5mm	427252
11.1252	0.4380	2	4	6	7/16	10.5mm	427255
11.1379	0.4385	2	4	6	7/16	10.5mm	427256
11.9750	0.4715	50mm	-	152mm	12mm	11.5mm	427257
11.9870	0.4719	50mm	-	152mm	12mm	11.5mm	427258
12.0000	0.4724	50mm	-	152mm	12mm	11.5mm	427262
12.0130	0.4730	50mm	-	152mm	12mm	11.5mm	427266
12.0250	0.4734	50mm	-	152mm	12mm	11.5mm	427269
12.6746	0.4990	2	4	6	1/2	12mm	427271
12.6873	0.4995	2	4	6	1/2	12mm	427273
12.7000	0.5000	2	4	6	1/2	12mm	427275
12.7127	0.5005	2	4	6	1/2	12mm	427277
12.7254	0.5010	2	4	6	1/2	12mm	427279
13.9750	0.5502	50mm	-	152mm	14mm	13.5mm	427281
13.9870	0.5507	50mm	-	152mm	14mm	13.5mm	427285
14.0000	0.5512	50mm	-	152mm	14mm	13.5mm	427289
14.0130	0.5517	50mm	-	152mm	14mm	13.5mm	427293
14.0250	0.5522	50mm	-	152mm	14mm	13.5mm	427297
15.8496	0.6240	2	4	6	9/16	15mm	427300
15.8623	0.6245	2	4	6	9/16	15mm	427302
15.8750	0.6250	2	4	6	9/16	15mm	427305
15.8877	0.6255	2	4	6	9/16	15mm	427308
15.9004	0.6260	2	4	6	9/16	15mm	427312
15.9750	0.6289	50mm	-	152mm	14mm	15.5mm	427316
15.9870	0.6294	50mm	-	152mm	14mm	15.5mm	427320
16.0000	0.6299	50mm	-	152mm	14mm	15.5mm	427324
16.0130	0.6304	50mm	-	152mm	14mm	15.5mm	427325
16.0250	0.6309	50mm	-	152mm	14mm	15.5mm	427329
19.0246	0.7490	2	4	6	5/8	18.5mm	427333
19.0373	0.7495	2	4	6	5/8	18.5mm	427337
19.0500	0.7500	2	4	6	5/8	18.5mm	427339
19.0627	0.7505	2	4	6	5/8	18.5mm	427341
19.0754	0.7510	2	4	6	5/8	18.5mm	427344

*bold numbers are EDPs for ordering

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ULTIMATE PERFORMANCE

5D Solid Carbide Drills For Cast Iron, Steel And Other Ferrous Materials



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>PACDRILL</p> <p>Ideal With PAC Reamer</p> <ul style="list-style-type: none"> Precise - Accurate - Concentric AlTiN coating for ultimate wear resistance and lubricity S-Point design reduces thrust force for increased penetration rates 		<ul style="list-style-type: none"> CARBIDE 30° 2-FL 140° RAD h6 P371 Bright AlTiN

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	○	○	○	●	●	●	●	●	●	○	○

● Best ○ Good

Series 4005 PAC-D | 2FL | 5xD | Solid | Inch & Metric

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
2.5mm	0.0984	12.5mm	69mm	3mm	427001
4mm	0.1575	20mm	80mm	4mm	427002
5mm	0.1969	25mm	88mm	6mm	427004
5.5mm	0.2165	27.5mm	91mm	6mm	427007
6mm	0.2362	30mm	95mm	6mm	427010
1/4	0.2500	1-1/4	3-7/8	1/4	427014
7mm	0.2756	35mm	103mm	8mm	427016
7.5mm	0.2953	37.5mm	106mm	8mm	427018
5/16	0.3125	1-9/16	4-11/32	5/16	427020
8mm	0.3150	40mm	110mm	8mm	427021
9mm	0.3543	45mm	118mm	10mm	427023
9.5mm	0.3740	47.5mm	121mm	10mm	427027
3/8	0.3750	1-7/8	4-13/16	3/8	427028
10mm	0.3937	50mm	125mm	10mm	427029
10.5mm	0.4134	52.5mm	129mm	12mm	427032
11.5mm	0.4528	57.5mm	136mm	12mm	427034
12mm	0.4724	60mm	140mm	12mm	427037
1/2	0.5000	2-1/2	5-3/4	1/2	427040
13.5mm	0.5315	67.5mm	151mm	14mm	427044
15mm	0.5906	75mm	163mm	16mm	427045
15.5mm	0.6102	77.5mm	166mm	16mm	427047
18.5mm	0.7283	92.5mm	189mm	20mm	427048

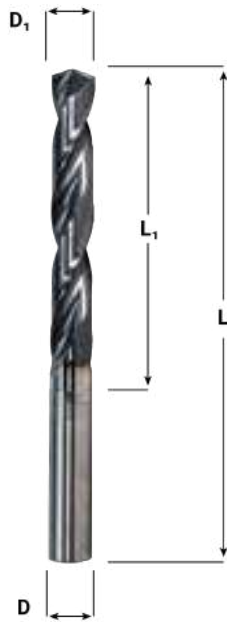
*bold numbers are EDPs for ordering

Popular Custom Holmaking Options

- Material-specific point geometry
- Longer flute lengths
- Internal coolant supply
- Proprietary GWS tool coatings

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FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>PACDRILL</p> <p>Ideal With PAC Reamer</p> <ul style="list-style-type: none"> Precise - Accurate - Concentric FX5 coating for ultimate wear resistance and lubricity S-Point design reduces thrust force for increased penetration rates 		<ul style="list-style-type: none"> CARBIDE 30° 2FL 140° h6 P372 TiCN AITiN FX5

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	○	○	○	●	●	●	●	○	○	○	○

● Best ○ Good

Series 4105 PAC-D | 2FL | 5xD | Coolant-Through | Inch & Metric

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	AITiN	FX5
Size	Dec.					
2.5mm	0.0984	12.5mm	69mm	3mm	427051	400355
4mm	0.1575	20mm	80mm	4mm	427055	400357
5mm	0.1969	25mm	88mm	6mm	427057	400361
5.5mm	0.2165	27.5mm	91mm	6mm	427060	400365
6mm	0.2362	30mm	95mm	6mm	427064	400368
1/4	0.2500	1-1/4	3-7/8	1/4	427065	400369
7mm	0.2756	35mm	103mm	8mm	427069	400373
7.5mm	0.2953	37.5mm	106mm	8mm	427071	400377
5/16	0.3125	1-9/16	4-11/32	5/16	427075	400378
8mm	0.3150	40mm	110mm	8mm	427079	400382
9mm	0.3543	45mm	118mm	10mm	427082	400385
9.5mm	0.3740	47.5mm	121mm	10mm	427084	400386
3/8	0.3750	1-7/8	4-13/16	3/8	427087	400388
10mm	0.3937	50mm	125mm	10mm	427089	400390
10.5mm	0.4134	52.5mm	129mm	12mm	427092	400393
11.5mm	0.4528	57.5mm	136mm	12mm	427093	400397
12mm	0.4724	60mm	140mm	12mm	427096	400399
1/2	0.5000	2-1/2	5-3/4	1/2	427097	400402
13.5mm	0.5315	67.5mm	151mm	14mm	427100	400403
15mm	0.5906	75mm	163mm	16mm	427104	400407
15.5mm	0.6102	77.5mm	166mm	16mm	427107	400408
18.5mm	0.7283	92.5mm	189mm	20mm	427109	400411

*bold numbers are EDPs for ordering

ULTIMATE PERFORMANCE

Carbide Hexalobe Step Drills For Bone Screws



INTRO

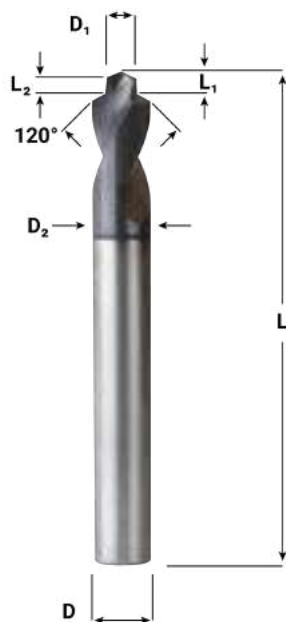
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THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>HEXADRILL</p> <p>Drill - Chamfer - Deburr For Torx Screw</p> <ul style="list-style-type: none"> Designed for the drilling and deburring of bone screws Standard diameters for pre-hole drilling "Torx" socket from T4 to T30 Chrome-free coating Designed for use with Hexamill - Series 2150 		<ul style="list-style-type: none"> CARBIDE 30° 2FL 140° h6 P369 FX5

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○	●	●	○	○			○	○	○	

● Best ○ Good

Series 4060 **HXD | 2FL | Metric**

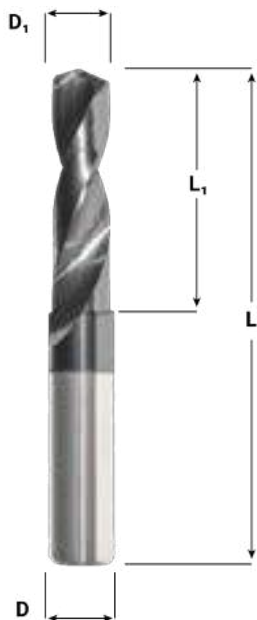
Torx Type	Diameter(D ₁)	L ₁	D ₂	L ₂	Shank(D)	OAL(L)	EDP
T4	0.9	0.70	1.7	0.56	3	40	4060001
T5	1	0.87	2.0	0.72	3	40	4060002
T5	1	0.75	2.0	0.59	3	40	4060003
T6	1.2	1.06	2.2	0.88	3	40	4060004
T6	1.2	0.86	2.2	0.67	3	40	4060005
T7	1.4	1.05	3.0	0.83	3	40	4060006
T7	1.4	1.01	3.0	0.79	3	40	4060007
T8	1.6	1.40	3.0	1.15	3	40	4060008
T8	1.6	1.05	3.0	0.81	3	40	4060009
T10	1.9	1.42	4.0	1.13	4	40	4060010
T15	2.3	1.78	4.0	1.42	4	50	4060011
T20	2.7	2.12	5.0	1.70	6	50	4060012
T25	3.1	2.84	6.0	2.36	6	50	4060013
T30	3.8	3.52	6.0	2.93	6	50	4060014
T30	3.8	3.04	6.0	2.45	6	50	4060015

*bold numbers are EDPs for ordering

Popular Custom Holemaking Options

- Material-specific point geometry
- Longer flute lengths
- Internal coolant supply
- Proprietary GWS tool coatings

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FEATURES/DESCRIPTION	APPLICATION	FEATURES																																							
<h3>APERTURE</h3> <h4>4xD Drill</h4> <ul style="list-style-type: none"> Micrograin carbide substrate for wear resistance Proprietary drill point technology produces reduced thrust forces and increases penetration rates FX2 coating provides unrivaled lubricity and temperature reduction 		<table border="1"> <tr> <td>CARBIDE</td> <td>25°</td> </tr> <tr> <td>2FL</td> <td>140°</td> </tr> <tr> <td>h6</td> <td>P373</td> </tr> <tr> <td>FX2</td> <td></td> </tr> </table>	CARBIDE	25°	2FL	140°	h6	P373	FX2																																
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STEEL			STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL																														
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																													
○	○	○	○	○	●	●					○																														

● Best ○ Good

Series 4001 4xD | 2FL | Solid

Size	Diameter(D ₁) Dec.	Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
3/64	0.0469	9/32	1-1/2	1/8	434-000469B
#55	0.0520	0.309	1-1/2	1/8	434-000520B
#54	0.0550	0.325	1-1/2	1/8	434-000550B
1.5mm	0.0591	8.8mm	38mm	3mm	434-000591B
#53	0.0595	0.348	1-1/2	1/8	434-000595B
1/16	0.0625	0.363	1-1/2	1/8	434-000625B
#52	0.0635	0.365	1-1/2	1/8	434-000635B
#50	0.0700	0.399	2	1/8	434-000700B
#49	0.0730	0.412	2	1/8	434-000730B
#48	0.0760	0.426	2	1/8	434-000760B
5/64	0.0781	0.433	2	1/8	434-000781B
2mm	0.0787	10.9mm	38mm	3mm	434-000787B
#46	0.0810	0.446	2	1/8	434-000810B
#45	0.0820	0.447	2	1/8	434-000820B
#44	0.0860	0.464	2	1/8	434-000860B
#43	0.0890	0.476	2	1/8	434-000890B
#42	0.0935	0.496	2	1/8	434-000935B
3/32	0.0938	0.492	2	1/8	434-000938B
#41	0.0960	1/2	2	1/8	434-000960B
#40	0.0980	0.505	2	1/8	434-000980B
2.5mm	0.0984	12.5mm	38mm	3mm	434-000984B
#39	0.0995	0.507	2	1/8	434-000995B
#38	0.1015	0.513	2	1/8	434-001015B
#37	0.1040	0.52	2	1/8	434-001040B
#36	0.1065	0.527	2	1/8	434-001065B
7/64	0.1094	0.536	2	1/8	434-001094B
3mm	0.1181	14.1mm	38mm	3mm	434-001181B
#31	0.1200	0.582	2	1/8	434-001200B
1/8	0.1250	0.6	2	1/8	434-001250B
#30	0.1285	39/64	2	3/16	434-001285B
#29	0.1360	0.639	2	3/16	434-001360B
3.5mm	0.1378	15.6mm	50mm	4mm	434-001378B
#28	0.1405	0.653	2	3/16	434-001405B
9/64	0.1406	0.647	2	3/16	434-001406B
#25	0.1495	0.68	2-1/2	3/16	434-001495B
5/32	0.1563	45/64	2-1/2	3/16	434-001562B
4mm	0.1575	16.8mm	50mm	4mm	434-001575B
#21	0.1590	0.708	2-1/2	3/16	434-001590B
#20	0.1610	0.644	2-1/2	3/16	434-001610B
11/64	0.1719	11/16	2-1/2	3/16	434-001719B
#16	0.1770	0.708	2-1/2	3/16	434-001770B
4.5mm	0.1772	18mm	50mm	5mm	434-001772B
3/16	0.1875	3/4	2-1/2	3/16	434-001875B
#11	0.1910	0.764	2-1/2	1/4	434-001910B
#10	0.1935	0.774	2-1/2	1/4	434-001935B

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

4D Solid Carbide Drills For Ferrous Materials



Series 4001 4xD | 2FL | Solid

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
5mm	0.1969	20mm	50mm	5mm	434-001969B
#7	0.2010	0.804	2-1/2	1/4	434-002010B
13/64	0.2031	13/16	2-1/2	1/4	434-002031B
#5	0.2055	0.822	2-1/2	1/4	434-002055B
#3	0.2130	0.852	2-1/2	1/4	434-002130B
7/32	0.2188	7/8	2-1/2	1/4	434-002188B
15/64	0.2344	15/16	2-1/2	1/4	434-002344B
6mm	0.2362	24mm	63mm	6mm	434-002362B
1/4	0.2500	1	2-1/2	1/4	434-002500B
6.5mm	0.2559	26mm	75mm	8mm	434-002559B
F	0.2570	1.028	3	5/16	434-002570B
17/64	0.2656	1-1/16	3	5/16	434-002656B
I	0.2720	1.088	3	5/16	434-002720B
7mm	0.2756	28mm	75mm	8mm	434-002756B
9/32	0.2813	1-1/8	3	5/16	434-002812B
7.5mm	0.2953	30mm	75mm	8mm	434-002953B
19/64	0.2969	1-3/16	3	5/16	434-002969B
5/16	0.3125	1-1/4	3	5/16	434-003125B
8mm	0.3150	32mm	75mm	8mm	434-003150B
21/64	0.3281	1-5/16	3	3/8	434-003281B
Q	0.3320	1-21/64	3	3/8	434-003320B
8.5mm	0.3346	34mm	100mm	10mm	434-003346B
11/32	0.3438	1-3/8	3	3/8	434-003438B
9mm	0.3543	36mm	100mm	10mm	434-003543B
23/64	0.3594	1-7/16	3	3/8	434-003594B
U	0.3680	1.472	3	3/8	434-003680B
9.5mm	0.3740	38mm	100mm	10mm	434-003740B
3/8	0.3750	1-1/2	3	3/8	434-003750B
25/64	0.3906	1-9/16	4	7/16	434-003906B
10mm	0.3937	40mm	100mm	10mm	434-003937B
13/32	0.4063	1-5/8	4	7/16	434-004063B
10.5mm	0.4134	42mm	100mm	12mm	434-004134B
27/64	0.4219	1-11/16	4	7/16	434-004219B
11mm	0.4331	44mm	100mm	12mm	434-004331B
7/16	0.4375	1-3/4	4	7/16	434-004375B
11.5mm	0.4528	46mm	100mm	12mm	434-004528B
29/64	0.4531	1-13/16	4	1/2	434-004531B
12mm	0.4724	48mm	100mm	12mm	434-004724B
31/64	0.4844	1-15/16	4	1/2	434-004844B
12.5mm	0.4921	50mm	100mm	14mm	434-004921B
1/2	0.5000	2	4	1/2	434-005000B
13mm	0.5118	52mm	100mm	14mm	434-005118B
33/64	0.5156	2-1/16	4	9/16	434-005156B
17/32	0.5313	2-1/8	4	9/16	434-005313B
13.5mm	0.5315	54mm	100mm	14mm	434-005315B
35/64	0.5469	2-3/16	4	9/16	434-005469B
9/16	0.5625	2-1/4	4	9/16	434-005625B
37/64	0.5781	2-5/16	5	5/8	434-005781B
19/32	0.5938	2-3/8	5	5/8	434-005938B
5/8	0.6250	2-1/2	5	5/8	434-006250B
21/32	0.6563	2.428	5	3/4	434-006563B
11/16	0.6875	2.544	5	3/4	434-006875B
3/4	0.7500	2.775	5	3/4	434-007500B

*bold numbers are EDPs for ordering

INTRO

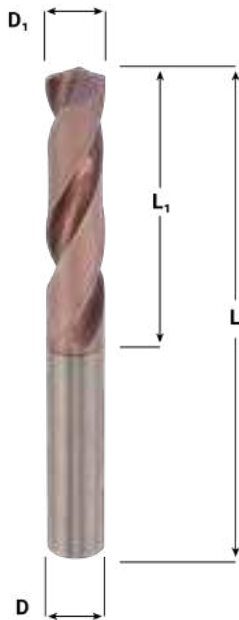
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES																																							
<ul style="list-style-type: none"> Steel cutting carbide grade for thermal and shock resistance in soft steel materials Heavy web allows 3XD drilling depth without spot drilling Flute shape designed for high feeds and breaking small chips in low carbon steels and aluminum alloys 140° self-centering double split point reduces chisel pressure TiCN coating adds lubricity and prevents edge build up 		<ul style="list-style-type: none"> CARBIDE 30° 2FL 140° h6 P363 TiCN 																																							
<table border="1"> <thead> <tr> <th colspan="3">STEEL</th> <th colspan="2">STAINLESS</th> <th colspan="2">CAST IRON</th> <th colspan="2">NON-FERROUS</th> <th colspan="2">HSSA</th> <th colspan="2">HARDENED STEEL</th> </tr> <tr> <th>P1</th> <th>P2</th> <th>P3</th> <th>M1</th> <th>M2</th> <th>K1</th> <th>K2</th> <th>N1</th> <th>N2</th> <th>S1</th> <th>S2</th> <th>H1</th> <th>H2</th> </tr> </thead> <tbody> <tr> <td>●</td> <td>○</td> <td>○</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>● Best ○ Good</p>			STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL		P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2	●	○	○										
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL																														
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																													
●	○	○																																							

Series 113 Durapoint | 2FL | Stub Length

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
1/8	0.1250	11/16	2-1/16	1/8	11301250
3.2mm	0.1260	11/16	2-1/16	1/8	11301260
#30	0.1290	11/16	2-1/16	0.1285	11301285
3.4mm	0.1340	11/16	2-1/16	0.1339	11301339
#29	0.1360	11/16	2-1/16	0.1360	11301360
3.5mm	0.1380	25/32	2-5/32	0.1378	11301378
#28	0.1410	25/32	2-5/32	9/64	11301405
9/64	0.1410	25/32	2-5/32	9/64	11301406
#27	0.1440	25/32	2-5/32	0.1440	11301440
#26	0.1470	25/32	2-5/32	0.1470	11301470
#25	0.1495	25/32	2-5/32	0.1495	11301495
#24	0.1520	25/32	2-5/32	0.1520	11301520
#23	0.1540	27/32	2-7/32	0.1540	11301540
5/32	0.1562	27/32	2-7/32	5/32	11301562
#22	0.1570	27/32	2-7/32	5/32	11301570
4mm	0.1575	21mm	56mm	4mm	11301575
#21	0.1590	27/32	2-7/32	0.1590	11301590
#20	0.1610	27/32	2-7/32	0.1610	11301610
4.125mm	0.1624	27/32	2-7/32	0.1624	11301624
#19	0.1660	27/32	2-7/32	0.1660	11301660
4.25mm	0.1673	29/32	2-9/32	0.1673	11301673
#18	0.1695	29/32	2-9/32	0.1695	11301695
11/64	0.1719	29/32	2-9/32	11/64	11301719
#17	0.1730	29/32	2-9/32	11/64	11301730
#16	0.1770	29/32	2-9/32	0.1770	11301770
4.5mm	0.1772	29/32	2-9/32	0.1772	11301772
#15	0.1800	29/32	2-9/32	0.1800	11301800
#14	0.1820	1	2-3/8	0.1820	11301820
#13	0.1850	1	2-3/8	0.1850	11301850
3/16	0.1875	1	2-3/8	3/16	11301875
#12	0.1890	1	2-3/8	3/16	11301890
#11	0.1910	1	2-3/8	0.1910	11301910
#10	0.1935	1	2-3/8	0.1935	11301935
#9	0.1960	1	2-3/8	0.1960	11301960
5mm	0.1969	27mm	62mm	5mm	11301969
#8	0.1990	1-1/16	2-7/16	0.1990	11301990
#7	0.2010	1-1/16	2-7/16	0.2010	11302010
13/64	0.2031	1-1/16	2-7/16	13/64	11302031
#6	0.2040	1-1/16	2-7/16	13/64	11302040
#5	0.2055	1-1/16	2-7/16	0.2055	11302055
#4	0.2090	1-1/8	2-1/2	0.2090	11302090
#3	0.2130	1-1/8	2-1/2	0.2130	11302130
5.5mm	0.2165	1-1/8	2-1/2	0.2165	11302165
7/32	0.2188	1-1/8	2-1/2	7/32	11302188
5.6mm	0.2205	1-1/8	2-1/2	0.2205	11302205

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Solid Carbide Stub Length Drill



Series 113

Durapoint | 2FL | Stub Length

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
#2	0.2210	1-1/8	2-1/2	0.2210	11302210
#1	0.2280	1-1/8	2-1/2	0.2280	11302280
A	0.2340	1-5/32	2-17/32	15/64	11302340
15/64	0.2344	1-5/32	2-17/32	15/64	11302344
6mm	0.2362	29mm	64mm	6mm	11302362
B	0.2380	1-5/32	2-17/32	0.2380	11302380
6.1mm	0.2402	1-5/32	2-17/32	0.2402	11302402
C	0.2420	1-5/32	2-17/32	0.2420	11302420
D	0.2460	1-7/32	2-19/32	0.2460	11302460
1/4	0.2500	1-7/32	2-19/32	1/4	11302500
6.5mm	0.2559	1-7/32	2-19/32	0.2559	11302559
F	0.2570	1-7/32	2-19/32	0.2570	11302570
G	0.2610	1-7/32	2-19/32	0.2610	11302610
6.68mm	0.2630	1-7/32	2-19/32	0.2630	11302630
17/64	0.2656	1-7/32	2-19/32	17/64	11302656
H	0.2660	1-1/4	2-5/8	17/64	11302660
6.85mm	0.2697	1-1/4	2-5/8	0.2697	11302697
I	0.2720	1-1/4	2-5/8	0.2720	11302720
7mm	0.2756	32mm	67mm	7mm	11302756
J	0.2770	1-5/16	2-11/16	0.2770	11302770
7.1mm	0.2795	1-5/16	2-11/16	0.2795	11302795
K	0.2810	1-5/16	2-11/16	9/32	11302810
9/32	0.2812	1-5/16	2-11/16	9/32	11302812
L	0.2900	1-5/16	2-11/16	0.2900	11302900
M	0.2950	1-3/8	2-3/4	0.2950	11302950
7.5mm	0.2953	1-3/8	2-3/4	0.2953	11302953
19/64	0.2969	1-3/8	2-3/4	19/64	11302969
N	0.3020	1-3/8	2-3/4	0.3020	11303020
7.8mm	0.3071	1-7/16	2-13/16	0.3071	11303071
5/16	0.3125	1-7/16	2-13/16	5/16	11303125
8mm	0.3150	37mm	71mm	8mm	11303150
O	0.3160	1-7/16	2-13/16	0.3160	11303160
8.1mm	0.3189	1-7/16	2-13/16	0.3189	11303189
P	0.3230	1-7/16	2-13/16	0.3230	11303230
21/64	0.3281	1-1/2	2-7/8	21/64	11303281
Q	0.3320	1-1/2	2-7/8	0.3320	11303320
8.5mm	0.3346	1-1/2	2-7/8	0.3346	11303346
8.56mm	0.3370	1-9/16	2-15/16	0.3370	11303370
R	0.3390	1-9/16	2-15/16	0.3390	11303390
11/32	0.3438	1-9/16	2-15/16	11/32	11303438
S	0.3480	1-9/16	2-15/16	0.3480	11303480
9mm	0.3543	41mm	76mm	9mm	11303543
T	0.3580	1-5/8	3	23/64	11303580
23/64	0.3594	1-5/8	3	23/64	11303594
U	0.3680	1-5/8	3	0.3680	11303680
9.5mm	0.3740	1-3/4	3-1/4	3/8	11303740
3/8	0.3750	1-3/4	3-1/4	3/8	11303750
V	0.3770	1-3/4	3-1/4	0.3770	11303770
9.7mm	0.3819	1-13/16	3-5/16	0.3819	11303819
W	0.3860	1-13/16	3-5/16	0.3860	11303860
25/64	0.3906	1-13/16	3-5/16	25/64	11303906
10mm	0.3937	46mm	84mm	10mm	11303937
X	0.3970	1-13/16	3-5/16	0.3970	11303970
Y	0.4040	1-13/16	3-5/16	0.4040	11304040
13/32	0.4062	1-13/16	3-5/16	13/32	11304062
10.4mm	0.4094	1-7/8	3-3/8	0.4094	11304094
Z	0.4130	1-7/8	3-3/8	0.4130	11304130
10.5mm	0.4134	1-7/8	3-3/8	0.4134	11304134
10.6mm	0.4173	1-7/8	3-3/8	0.4173	11304173
27/64	0.4219	1-15/16	3-7/16	27/64	11304219
10.8mm	0.4252	1-15/16	3-7/16	0.4252	11304252
10.95mm	0.4311	1-15/16	3-7/16	0.4311	11304311
11mm	0.4331	49mm	87mm	11mm	11304331
7/16	0.4375	2	3-1/2	7/16	11304375
11.4mm	0.4488	2	3-1/2	0.4488	11304488
11.5mm	0.4528	2	3-1/2	29/64	11304528
29/64	0.4531	2	3-1/2	29/64	11304531
11.6mm	0.4567	2	3-1/2	0.4567	11304567
15/32	0.4688	2-3/16	3-15/16	15/32	11304688
12mm	0.4724	56mm	100mm	12mm	11304724
12.1mm	0.4764	2-3/16	3-15/16	0.4764	11304764
31/64	0.4844	2-3/16	3-15/16	31/64	11304844

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

ADVANCED PERFORMANCE

Solid Carbide Stub Length Drill



Series 113 Durapoint | 2FL | Stub Length

Diameter(ϕ_1)		Flute Length(L_1)	OAL(L)	Shank(ϕ)	EDP
Size	Dec.				
12.35mm	0.4862	2-3/16	3-15/16	0.4862	11304862
12.4mm	0.4882	2-3/16	3-15/16	0.4882	11304882
12.5mm	0.4921	2-3/16	3-15/16	0.4921	11304921
12.6mm	0.4961	2-3/16	3-15/16	0.4961	11304961
1/2	0.5000	2-3/16	3-15/16	1/2	11305000
12.9mm	0.5079	2-3/16	3-15/16	0.5079	11305079
13mm	0.5118	60mm	113mm	13mm	11305118
33/64	0.5156	2-3/8	4-7/16	33/64	11305156
17/32	0.5312	2-3/8	4-7/16	17/32	11305312
13.5mm	0.5315	2-3/8	4-7/16	17/32	11305315
13.6mm	0.5354	2-1/2	4-1/2	0.5354	11305354
13.8mm	0.5433	2-1/2	4-1/2	0.5433	11305433
35/64	0.5469	2-1/2	4-1/2	35/64	11305469
14mm	0.5512	64mm	114mm	14mm	11305512
14.1mm	0.5551	2-1/2	4-1/2	0.5551	11305551
14.15mm	0.5571	2-1/2	4-1/2	0.5571	11305571
9/16	0.5625	2-1/2	4-1/2	9/16	11305625
14.5mm	0.5709	2-5/8	4-5/8	0.5709	11305709
14.6mm	0.5748	2-5/8	4-5/8	0.5748	11305748
37/64	0.5781	2-5/8	4-5/8	37/64	11305781
15mm	0.5906	67mm	117mm	15mm	11305906
19/32	0.5938	2-5/8	4-5/8	19/32	11305938
39/64	0.6094	2-3/4	4-3/4	39/64	11306094
15.5mm	0.6102	3	5	39/64	11306102
5/8	0.6250	3	5	5/8	11306250
16mm	0.6299	76mm	127mm	16mm	11306299
16.08mm	0.6331	3	5	0.6331	11306331
41/64	0.6406	3	5	41/64	11306406
16.5mm	0.6496	3	5	0.6496	11306496
21/32	0.6562	3	5	21/32	11306562
16.75mm	0.6594	3	5	0.6594	11306594
17mm	0.6693	76mm	127mm	17mm	11306693
43/64	0.6719	3	5	43/64	11306719
11/16	0.6875	3	5	11/16	11306875
17.5mm	0.6890	3-1/4	5-1/4	11/16	11306890
17.6mm	0.6929	3-1/4	5-1/4	0.6929	11306929
45/64	0.7031	3-1/4	5-1/4	45/64	11307031
18mm	0.7087	83mm	133mm	18mm	11307087
23/32	0.7188	3-1/4	5-1/4	23/32	11307188
18.5mm	0.7283	3-1/4	5-1/4	0.7283	11307283
47/64	0.7344	3-1/4	5-1/4	47/64	11307344
19mm	0.7480	89mm	140mm	19mm	11307480
3/4	0.7500	3-1/2	5-1/2	3/4	11307500
19.28mm	0.7579	3-1/2	5-1/2	0.7579	11307579

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

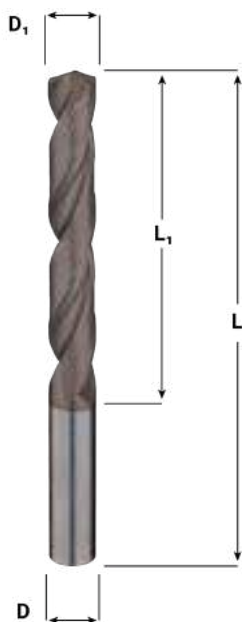
HOLEMAKING

THREADING

INSERTS

ADVANCED PERFORMANCE

Solid Carbide Stub Length Drill



FEATURES/DESCRIPTION	APPLICATION	FEATURES																								
<ul style="list-style-type: none"> Sub-micrograin carbide grade for wear resistance and edge strength Heavy web allows 3XD drilling depth without spot drilling 140° self-centering double split point requires no spotting and reduces chisel pressure Can be used to produce on size starting hole drill before longer deep hole drills Available TiN or TiAlN 		<table border="1"> <tr> <td>CARBIDE</td> <td>30°</td> </tr> <tr> <td>2FL</td> <td>140°</td> </tr> <tr> <td>h6</td> <td>P363</td> </tr> <tr> <td>TiAlN</td> <td>TiN</td> </tr> </table>	CARBIDE	30°	2FL	140°	h6	P363	TiAlN	TiN																
CARBIDE	30°																									
2FL	140°																									
h6	P363																									
TiAlN	TiN																									
<table border="1"> <thead> <tr> <th>STEEL</th> <th>STAINLESS</th> <th>CAST IRON</th> <th>NON-FERROUS</th> <th>HRSA</th> <th>HARDENED STEEL</th> </tr> </thead> <tbody> <tr> <td>P1</td> <td>M1</td> <td>K1</td> <td>N1</td> <td>S1</td> <td>H1</td> </tr> <tr> <td>P2</td> <td>M2</td> <td>K2</td> <td>N2</td> <td>S2</td> <td>H2</td> </tr> <tr> <td>P3</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>			STEEL	STAINLESS	CAST IRON	NON-FERROUS	HRSA	HARDENED STEEL	P1	M1	K1	N1	S1	H1	P2	M2	K2	N2	S2	H2	P3					
STEEL	STAINLESS	CAST IRON	NON-FERROUS	HRSA	HARDENED STEEL																					
P1	M1	K1	N1	S1	H1																					
P2	M2	K2	N2	S2	H2																					
P3																										

● Best ○ Good

Series 114 Durapoint | 2FL | 140° | Stub Length

Diameter(D ₁) Size	Dec.	Flute Length(L ₁)	OAL(L)	Shank(D)	TiN	TiAlN
#40	0.0980	9/16	1-15/16	0.0980	11400980	11400980A
2.5mm	0.0984	9/16	1-15/16	0.0984	11400984	11400984A
#39	0.0995	9/16	1-15/16	0.0995	11400995	11400995A
#38	0.1015	9/16	1-15/16	0.1015	11401015	11401015A
#37	0.1040	5/8	2	0.1040	11401040	11401040A
#36	0.1065	5/8	2	0.1065	11401065	11401065A
7/64	0.1094	5/8	2	7/64	11401094	11401094A
#35	0.1100	5/8	2	7/64	11401100	11401100A
#34	0.1110	5/8	2	0.1110	11401110	11401110A
#33	0.1130	5/8	2	0.1130	11401130	11401130A
#32	0.1160	11/16	2-1/16	0.1160	11401160	11401160A
3mm	0.1181	17mm	52mm	3mm	11401181	11401181A
#31	0.1200	11/16	2-1/16	0.1200	11401200	11401200A
1/8	0.1250	11/16	2-1/16	1/8	11401250	11401250A
3.2mm	0.126	11/16	2-1/16	1/8	11401260	11401260A
#30	0.1285	11/16	2-1/16	0.1285	11401285	11401285A
3.3mm	0.1299	11/16	2-1/16	0.1299	11401299	11401299A
3.4mm	0.1339	11/16	2-1/16	0.1339	11401339	11401339A
#29	0.1360	11/16	2-1/16	0.1360	11401360	11401360A
3.5mm	0.1378	25/32	2-5/32	0.1378	11401378	11401378A
#28	0.1405	25/32	2-5/32	9/64	11401405	11401405A
9/64	0.1406	25/32	2-5/32	9/64	11401406	11401406A
3.6mm	0.1417	25/32	2-5/32	9/64	11401417	11401417A
#27	0.1440	25/32	2-5/32	0.1440	11401440	11401440A
#26	0.1470	25/32	2-5/32	0.1470	11401470	11401470A
#25	0.1495	25/32	2-5/32	0.1495	11401495	11401495A
#24	0.1520	25/32	2-5/32	0.1520	11401520	11401520A
#23	0.1540	27/32	2-7/32	0.1540	11401540	11401540A
5/32	0.1562	27/32	2-7/32	5/32	11401562	11401562A
#22	0.1570	27/32	2-7/32	5/32	11401570	11401570A
4mm	0.1575	21mm	56mm	4mm	11401575	11401575A
#21	0.1590	27/32	2-7/32	0.1590	11401590	11401590A
#20	0.1610	27/32	2-7/32	0.1610	11401610	11401610A
4.1mm	0.1614	27/32	2-7/32	0.1614	11401614	11401614A
4.125mm	0.1624	27/32	2-7/32	0.1624	11401624	11401624A
4.2mm	0.1654	27/32	2-7/32	0.1654	11401654	11401654A
#19	0.1660	27/32	2-7/32	0.1660	11401660	11401660A
4.25mm	0.1673	27/32	2-7/32	0.1673	11401673	11401673A
#18	0.1695	27/32	2-7/32	0.1695	11401695	11401695A
11/64	0.1719	27/32	2-7/32	11/64	11401719	11401719A
#17	0.1730	29/32	2-9/32	11/64	11401730	11401730A
#16	0.1770	29/32	2-9/32	0.1770	11401770	11401770A
4.5mm	0.1772	29/32	2-9/32	0.1772	11401772	11401772A
#15	0.1800	29/32	2-9/32	0.1800	11401800	11401800A
#14	0.1820	1	2-3/8	0.1820	11401820	11401820A

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

ADVANCED PERFORMANCE

Solid Carbide Stub Length Drill



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Series 114		Durapoint | 2FL | 140° | Stub Length					
Diameter(D ₁)	Flute Length(L ₁)	OAL(L)	Shank(D)	TiN	TiAlN		
Size	Dec.						
#13	0.1850	1	2-3/8	0.1850	11401850	11401850A	
3/16	0.1875	1	2-3/8	3/16	11401875	11401875A	
#12	0.1890	1	2-3/8	3/16	11401890	11401890A	
#11	0.1910	1	2-3/8	0.1910	11401910	11401910A	
4.9mm	0.1929	1	2-3/8	0.1929	11401929	11401929A	
#10	0.1935	1	2-3/8	0.1935	11401935	11401935A	
#9	0.1960	1	2-3/8	0.1960	11401960	11401960A	
5mm	0.1969	27mm	62mm	5mm	11401969	11401969A	
#8	0.1990	1-1/16	2-7/16	0.1990	11401990	11401990A	
#7	0.2010	1-1/16	2-7/16	0.2010	11402010	11402010A	
13/64	0.2031	1-1/16	2-7/16	13/64	11402031	11402031A	
#6	0.2040	1-1/16	2-7/16	13/64	11402040	11402040A	
#5	0.2055	1-1/16	2-7/16	0.2055	11402055	11402055A	
#4	0.2090	1-1/8	2-1/2	0.2090	11402090	11402090A	
#3	0.2130	1-1/8	2-1/2	0.2130	11402130	11402130A	
5.5mm	0.2165	1-1/8	2-1/2	0.2165	11402165	11402165A	
7/32	0.2188	1-1/8	2-1/2	7/32	11402188	11402188A	
5.6mm	0.2205	1-1/8	2-1/2	0.2205	11402205	11402205A	
#2	0.2210	1-1/8	2-1/2	0.2210	11402210	11402210A	
#1	0.2280	1-1/8	2-1/2	0.2280	11402280	11402280A	
A	0.2340	1-5/32	2-17/32	15/64	11402340	11402340A	
15/64	0.2344	1-5/32	2-17/32	15/64	11402344	11402344A	
6mm	0.2362	29mm	64mm	6mm	11402362	11402362A	
B	0.2380	1-5/32	2-17/32	0.2380	11402380	11402380A	
6.1mm	0.2402	1-5/32	2-17/32	0.2402	11402402	11402402A	
C	0.2420	1-5/32	2-17/32	0.2420	11402420	11402420A	
D	0.2460	1-7/32	2-19/32	0.2460	11402460	11402460A	
6.3mm	0.248	1-7/32	2-19/32	0.2480	11402480	11402480A	
1/4	0.2500	1-7/32	2-19/32	1/4	11402500	11402500A	
6.4mm	0.252	1-7/32	2-19/32	0.2520	11402520	11402520A	
6.5mm	0.2559	1-7/32	2-19/32	0.2559	11402559	11402559A	
F	0.2570	1-7/32	2-19/32	0.2570	11402570	11402570A	
6.6mm	0.2598	1-1/4	2-5/8	0.2598	11402598	11402598A	
G	0.2610	1-1/4	2-5/8	0.2610	11402610	11402610A	
6.68mm	0.263	1-1/4	2-5/8	0.2630	11402630	11402630A	
17/64	0.2656	1-1/4	2-5/8	17/64	11402656	11402656A	
H	0.2660	1-1/4	2-5/8	17/64	11402660	11402660A	
6.85mm	0.2697	1-1/4	2-5/8	0.2697	11402697	11402697A	
I	0.2720	1-1/4	2-5/8	0.2720	11402720	11402720A	
7mm	0.2756	32mm	67mm	7mm	11402756	11402756A	
J	0.2770	1-5/16	2-11/16	0.2770	11402770	11402770A	
7.1mm	0.2795	1-5/16	2-11/16	0.2795	11402795	11402795A	
K	0.2810	1-5/16	2-11/16	9/32	11402810	11402810A	
9/32	0.2812	1-5/16	2-11/16	9/32	11402812	11402812A	
7.2mm	0.2835	1-5/16	2-11/16	0.2835	11402835	11402835A	
L	0.2900	1-5/16	2-11/16	0.2900	11402900	11402900A	
M	0.2950	1-3/8	2-3/4	0.2950	11402950	11402950A	
7.5mm	0.2953	1-3/8	2-3/4	0.2953	11402953	11402953A	
19/64	0.2969	1-3/8	2-3/4	19/64	11402969	11402969A	
7.6mm	0.2992	1-3/8	2-3/4	0.2992	11402992	11402992A	
N	0.3020	1-3/8	2-3/4	0.3020	11403020	11403020A	
7.8mm	0.3071	1-7/16	2-13/16	0.3071	11403071	11403071A	
5/16	0.3125	1-7/16	2-13/16	5/16	11403125	11403125A	
8mm	0.3150	37mm	71mm	8mm	11403150	11403150A	
O	0.3160	1-7/16	2-13/16	0.3160	11403160	11403160A	
8.1mm	0.3189	1-7/16	2-13/16	0.3189	11403189	11403189A	
P	0.3230	1-7/16	2-13/16	0.3230	11403230	11403230A	
21/64	0.3281	1-1/2	2-7/8	21/64	11403281	11403281A	
Q	0.3320	1-1/2	2-7/8	0.3320	11403320	11403320A	
8.5mm	0.3346	1-1/2	2-7/8	0.3346	11403346	11403346A	
8.56mm	0.337	1-9/16	2-15/16	0.3370	11403370	11403370A	
R	0.3390	1-9/16	2-15/16	0.3390	11403390	11403390A	
11/32	0.3438	1-9/16	2-15/16	11/32	11403438	11403438A	
S	0.3480	1-9/16	2-15/16	0.3480	11403480	11403480A	
9mm	0.3543	41mm	76mm	9mm	11403543	11403543A	
T	0.3580	1-5/8	3	23/64	11403580	11403580A	
23/64	0.3594	1-5/8	3	23/64	11403594	11403594A	
U	0.3680	1-5/8	3	0.3680	11403680	11403680A	
9.5mm	0.374	1-3/4	3-1/4	3/8	11403740	11403740A	
3/8	0.3750	1-3/4	3-1/4	3/8	11403750	11403750A	
V	0.3770	1-3/4	3-1/4	0.3770	11403770	11403770A	
9.7mm	0.3819	1-13/16	3-5/16	0.3819	11403819	11403819A	

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Solid Carbide Stub Length Drill



Series 114 Durapoint | 2FL | 140° | Stub Length

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	TiN	TiAlN
Size	Dec.					
W	0.3860	1-13/16	3-5/16	0.3860	11403860	11403860A
25/64	0.3906	1-13/16	3-5/16	25/64	11403906	11403906A
10mm	0.3937	46mm	84mm	10mm	11403937	11403937A
X	0.3970	1-7/8	3-3/8	0.3970	11403970	11403970A
Y	0.4040	1-7/8	3-3/8	0.4040	11404040	11404040A
13/32	0.4062	1-7/8	3-3/8	13/32	11404062	11404062A
10.4mm	0.4094	1-7/8	3-3/8	0.4094	11404094	11404094A
Z	0.4130	1-7/8	3-3/8	0.4130	11404130	11404130A
10.5mm	0.4134	1-7/8	3-3/8	0.4134	11404134	11404134A
10.6mm	0.4173	1-7/8	3-3/8	0.4173	11404173	11404173A
27/64	0.4219	1-15/16	3-7/16	27/64	11404219	11404219A
10.8mm	0.4252	1-15/16	3-7/16	0.4252	11404252	11404252A
10.95mm	0.4311	1-15/16	3-7/16	0.4311	11404311	11404311A
11mm	0.4331	49mm	87mm	11mm	11404331	11404331A
7/16	0.4375	2	3-1/2	7/16	11404375	11404375A
11.4mm	0.4488	2	3-1/2	0.4488	11404488	11404488A
11.5mm	0.4528	2	3-1/2	29/64	11404528	11404528A
29/64	0.4531	2	3-1/2	29/64	11404531	11404531A
11.6mm	0.4567	2	3-1/2	0.4567	11404567	11404567A
15/32	0.4688	2-3/16	3-15/16	15/32	11404688	11404688A
12mm	0.4724	56mm	100mm	12mm	11404724	11404724A
12.1mm	0.4764	2-3/16	3-15/16	0.4764	11404764	11404764A
31/64	0.4844	2-3/16	3-15/16	31/64	11404844	11404844A
12.35mm	0.4862	2-3/16	3-15/16	0.4862	11404862	11404862A
12.4mm	0.4882	2-3/16	3-15/16	0.4882	11404882	11404882A
12.5mm	0.4921	2-3/16	3-15/16	0.4921	11404921	11404921A
12.6mm	0.4961	2-3/8	4-7/16	0.4961	11404961	11404961A
1/2	0.5000	2-3/8	4-7/16	1/2	11405000	11405000A
12.8mm	0.5039	2-3/8	4-7/16	0.5039	11405039	11405039A
12.9mm	0.5079	2-3/8	4-7/16	0.5079	11405079	11405079A
13mm	0.5118	60mm	113mm	13mm	11405118	11405118A
33/64	0.5156	2-3/8	4-7/16	33/64	11405156	11405156A
17/32	0.5312	2-3/8	4-7/16	17/32	11405312	11405312A
13.5mm	0.5315	2-3/8	4-7/16	17/32	11405315	11405315A
13.6mm	0.5354	2-1/2	4-1/2	0.5354	11405354	11405354A
13.8mm	0.5433	2-1/2	4-1/2	0.5433	11405433	11405433A
35/64	0.5469	2-1/2	4-1/2	35/64	11405469	11405469A
14mm	0.5512	64mm	114mm	14mm	11405512	11405512A
14.1mm	0.5551	2-1/2	4-1/2	0.5551	11405551	11405551A
14.15mm	0.5571	2-1/2	4-1/2	0.5571	11405571	11405571A
9/16	0.5625	2-1/2	4-1/2	9/16	11405625	11405625A
14.5mm	0.5709	2-5/8	4-5/8	0.5709	11405709	11405709A
14.6mm	0.5748	2-5/8	4-5/8	0.5748	11405748	11405748A
37/64	0.5781	2-5/8	4-5/8	37/64	11405781	11405781A
15mm	0.5906	67mm	117mm	15mm	11405906	11405906A
19/32	0.5938	2-5/8	4-5/8	19/32	11405938	11405938A
39/64	0.6094	2-3/4	4-3/4	39/64	11406094	11406094A
15.5mm	0.6102	2-3/4	4-3/4	39/64	11406102	11406102A
5/8	0.6250	2-3/4	4-3/4	5/8	11406250	11406250A
16mm	0.6299	70mm	121mm	16mm	11406299	11406299A
41/64	0.6406	3	5	41/64	11406406	11406406A
16.5mm	0.6496	3	5	0.6496	11406496	11406496A
21/32	0.6562	3	5	21/32	11406562	11406562A
16.75mm	0.6594	3	5	0.6594	11406594	11406594A
17mm	0.6693	76mm	127mm	17mm	11406693	11406693A
43/64	0.6719	3	5	43/64	11406719	11406719A
11/16	0.6875	3	5	11/16	11406875	11406875A
17.5mm	0.689	3-1/4	5-1/4	11/16	11406890	11406890A
17.6mm	0.6929	3-1/4	5-1/4	0.6929	11406929	11406929A
45/64	0.7031	3-1/4	5-1/4	45/64	11407031	11407031A
18mm	0.7087	83mm	133mm	18mm	11407087	11407087A
23/32	0.7188	3-1/4	5-1/4	23/32	11407188	11407188A
18.5mm	0.7283	3-1/4	5-1/4	0.7283	11407283	11407283A
47/64	0.7344	3-1/4	5-1/4	47/64	11407344	11407344A
19mm	0.7480	89mm	140mm	19mm	11407480	11407480A
3/4	0.7500	3-1/2	5-1/2	3/4	11407500	11407500A

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

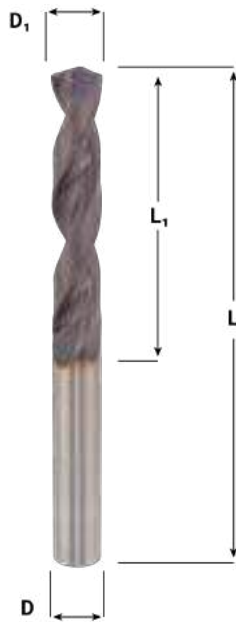
HOLEMAKING

THREADING

INSERTS

ADVANCED PERFORMANCE

Solid Carbide Jobber Length Drill



FEATURES/DESCRIPTION	APPLICATION	FEATURES						
<ul style="list-style-type: none"> Sub-micrograin carbide grade for wear resistance and edge strength Heavy web allows 4.5XD drilling depth without spot drilling 140° self-centering double split point requires no spotting and reduces chisel pressure TiAlN coating is high abrasion and heat resistant Shank Tol.: +0/- 0.0005" 		<table border="1"> <tr> <td>CARBIDE</td> <td>30°</td> </tr> <tr> <td>2FL</td> <td>140°</td> </tr> <tr> <td>P363</td> <td>TiAlN</td> </tr> </table>	CARBIDE	30°	2FL	140°	P363	TiAlN
CARBIDE	30°							
2FL	140°							
P363	TiAlN							

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	●	●	●	●	●	●	●	●	●	●	○	

● Best ○ Good

Series 118 Durapoint | 2FL | 140° | Jobber Length

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
1/8	0.1250	7/8	2-1/4	1/8	11801250A
3.5mm	0.1378	31/32	2-11/32	0.1378	11801378A
9/64	0.1406	1	2-3/8	9/64	11801406A
5/32	0.1562	1-1/8	2-15/32	5/32	11801562A
4mm	0.1575	29mm	63mm	4mm	11801575A
11/64	0.1719	1-1/4	2-5/8	11/64	11801719A
4.5mm	0.1772	1-1/4	2-5/8	0.1772	11801772A
3/16	0.1875	1-5/16	2-11/16	3/16	11801875A
5mm	0.1969	35mm	70mm	5mm	11801969A
#7	0.2010	1-7/16	2-13/16	0.2010	11802010A
13/64	0.2031	1-7/16	2-13/16	13/64	11802031A
5.5mm	0.2165	1-17/32	2-15/16	0.2165	11802165A
7/32	0.2188	1-17/32	2-15/16	7/32	11802188A
15/64	0.2344	1-5/8	3	15/64	11802344A
6mm	0.2362	41mm	76mm	6mm	11802362A
D	0.2460	1-5/8	3-3/16	0.2460	11802460A
1/4	0.2500	1-5/8	3-3/16	1/4	11802500A
6.5mm	0.2559	1-5/8	3-3/16	0.2559	11802559A
F	0.2570	1-5/8	3-3/16	0.2570	11802570A
17/64	0.2656	1-23/32	3-1/4	17/64	11802656A
I	0.2720	1-23/32	3-1/4	0.2720	11802720A
7mm	0.2756	44mm	83mm	7mm	11802756A
9/32	0.2812	1-25/32	3-7/16	9/32	11802812A
7.5mm	0.2953	1-25/32	3-7/16	0.2953	11802953A
19/64	0.2969	1-31/32	3-9/16	19/64	11802969A
5/16	0.3125	1-31/32	3-9/16	5/16	11803125A
8mm	0.3150	48mm	90mm	8mm	11803150A
P	0.3230	2-3/32	3-25/32	0.3230	11803230A
21/64	0.3281	2-3/32	3-25/32	21/64	11803281A
Q	0.3320	2-3/32	3-25/32	0.3320	11803320A
8.5mm	0.3346	2-3/16	3-7/8	0.3346	11803346A
11/32	0.3438	2-3/16	3-7/8	11/32	11803438A
S	0.3480	2-3/16	3-7/8	0.3480	11803480A
9mm	0.3543	56mm	98mm	9mm	11803543A
23/64	0.3594	2-9/32	4-1/32	23/64	11803594A
U	0.3680	2-9/32	4-1/32	0.3680	11803680A
9.5mm	0.3740	2-9/32	4-1/32	3/8	11803740A
3/8	0.3750	2-9/32	4-1/32	3/8	11803750A
W	0.3860	2-3/8	4-1/8	0.3860	11803860A
25/64	0.3906	2-3/8	4-1/8	25/64	11803906A
10mm	0.3937	60mm	105mm	10mm	11803937A
13/32	0.4062	2-19/32	4-1/8	13/32	11804062A
10.5mm	0.4134	2-19/32	4-1/8	0.4134	11804134A
27/64	0.4219	2-11/16	4-1/2	27/64	11804219A
11mm	0.4331	68mm	114mm	11mm	11804331A

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Solid Carbide Jobber Length Drill



Series 118 Durapoint | 2FL | 140° | Jobber Length

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
7/16	0.4375	2-13/16	4-21/32	7/16	11804375A
11.5mm	0.4528	2-13/16	4-21/32	29/64	11804528A
29/64	0.4531	2-13/16	4-21/32	29/64	11804531A
15/32	0.4688	2-7/8	4-25/32	15/32	11804688A
12mm	0.4724	73mm	121mm	12mm	11804724A
31/64	0.4844	3	5-5/16	31/64	11804844A
12.5mm	0.4921	3-3/32	5-13/32	0.4921	11804921A
1/2	0.5000	3-3/32	5-13/32	1/2	11805000A
13mm	0.5118	79mm	137mm	13mm	11805118A
33/64	0.5156	3-5/16	5-11/16	33/64	11805156A
17/32	0.5312	3-5/16	5-11/16	17/32	11805312A
13.5mm	0.5315	3-5/16	5-11/16	17/32	11805315A
35/64	0.5469	3-13/32	5-15/16	35/64	11805469A
14mm	0.5512	87mm	151mm	14mm	11805512A
9/16	0.5625	3-1/2	5-15/16	9/16	11805625A
14.5mm	0.5709	3-1/2	5-15/16	0.5709	11805709A
37/64	0.5781	3-11/16	6-3/16	37/64	11805781A
15mm	0.5906	94mm	157mm	15mm	11805906A
19/32	0.5938	3-11/16	6-3/16	19/32	11805938A
39/64	0.6094	3-11/16	6-3/16	39/64	11806094A
15.5mm	0.6102	3-11/16	6-3/16	39/64	11806102A
5/8	0.6250	3-25/32	6-5/16	5/8	11806250A
16mm	0.6299	96mm	160mm	16mm	11806299A
16.5mm	0.6496	4-1/8	6-19/32	0.6496	11806496A
21/32	0.6562	4-1/8	6-19/32	21/32	11806562A
17mm	0.6693	103mm	167mm	17mm	11806693A
43/64	0.6719	4-1/8	6-19/32	43/64	11806719A
11/16	0.6875	4-1/8	6-19/32	11/16	11806875A
17.5mm	0.6890	4-1/8	6-19/32	11/16	11806890A
45/64	0.7031	4-1/8	6-19/32	45/64	11807031A
18mm	0.7087	103mm	167mm	18mm	11807087A
18.5mm	0.7283	4-1/2	7-1/16	0.7283	11807283A
47/64	0.7344	4-1/2	7-1/16	47/64	11807344A
19mm	0.7480	114mm	179mm	19mm	11807480A
3/4	0.7500	4-1/2	7-1/16	3/4	11807500A

*bold numbers are EDPs for ordering

Popular Custom Holemaking Options

Material-specific point geometry
 Longer flute lengths
 Internal coolant supply
 Proprietary GWS tool coatings

CUSTOM COMES STANDARD

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

ADVANCED PERFORMANCE

Solid Carbide Jobber Length Drill



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES						
<ul style="list-style-type: none"> Steel cutting carbide grade for thermal and shock resistance in soft steel materials Heavy web allows 4.5XD drilling depth without spot drilling Flute shape designed for high feeds and breaking small chips in low carbon steels and alloy aluminums 140° self-centering double split point reduces chisel pressure TiCN coating adds lubricity and prevents edge build up Shank Tol.: +0/- 0.0005" 		<table border="1"> <tr> <td>CARBIDE</td> <td>30°</td> </tr> <tr> <td>2FL</td> <td>140°</td> </tr> <tr> <td>P363</td> <td>TiCN</td> </tr> </table>	CARBIDE	30°	2FL	140°	P363	TiCN
CARBIDE	30°							
2FL	140°							
P363	TiCN							

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	○	○										

● Best ○ Good

Series 116 Durapoint | 2FL | 140° | Jobber Length

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
1/8	0.1250	7/8	2-1/4	1/8	11601250
3.5mm	0.1378	31/32	2-11/32	0.1378	11601378
9/64	0.1406	1	2-3/8	9/64	11601406
5/32	0.1562	1-1/8	2-15/32	5/32	11601562
4mm	0.1575	29mm	63mm	4mm	11601575
11/64	0.1719	1-1/4	2-5/8	11/64	11601719
4.5mm	0.1772	1-1/4	2-5/8	0.1772	11601772
3/16	0.1875	1-5/16	2-11/16	3/16	11601875
5mm	0.1969	35mm	70mm	5mm	11601969
#7	0.2010	1-7/16	2-13/16	0.2010	11602010
13/64	0.2031	1-7/16	2-13/16	13/64	11602031
5.5mm	0.2165	1-17/32	2-15/16	0.2165	11602165
7/32	0.2188	1-17/32	2-15/16	7/32	11602188
15/64	0.2344	1-5/8	3	15/64	11602344
6mm	0.2362	41mm	76mm	6mm	11602362
D	0.2460	1-5/8	3-3/16	0.2460	11602460
1/4	0.2500	1-5/8	3-3/16	1/4	11602500
6.5mm	0.2559	1-5/8	3-3/16	0.2559	11602559
F	0.2570	1-5/8	3-3/16	0.2570	11602570
17/64	0.2656	1-23/32	3-1/4	17/64	11602656
I	0.2720	1-23/32	3-1/4	0.2720	11602720
7mm	0.2756	44mm	83mm	7mm	11602756
9/32	0.2812	1-25/32	3-7/16	9/32	11602812
7.5mm	0.2953	1-25/32	3-7/16	0.2953	11602953
19/64	0.2969	1-31/32	3-9/16	19/64	11602969
5/16	0.3125	1-31/32	3-9/16	5/16	11603125
8mm	0.3150	48mm	90mm	8mm	11603150
P	0.3230	2-3/32	3-25/32	0.3230	11603230
21/64	0.3281	2-3/32	3-25/32	21/64	11603281
Q	0.3320	2-3/32	3-25/32	0.3320	11603320
8.5mm	0.3346	2-3/16	3-7/8	0.3346	11603346
11/32	0.3438	2-3/16	3-7/8	11/32	11603438
S	0.3480	2-3/16	3-7/8	0.3480	11603480
9mm	0.3543	56mm	98mm	9mm	11603543
23/64	0.3594	2-9/32	4-1/32	23/64	11603594
U	0.3680	2-9/32	4-1/32	0.3680	11603680
9.5mm	0.3740	2-9/32	4-1/32	3/8	11603740
3/8	0.3750	2-9/32	4-1/32	3/8	11603750
W	0.3860	2-3/8	4-1/8	0.3860	11603860
25/64	0.3906	2-3/8	4-1/8	25/64	11603906
10mm	0.3937	60mm	105mm	10mm	11603937
13/32	0.4062	2-19/32	4-1/8	13/32	11604062
10.5mm	0.4134	2-19/32	4-1/8	0.4134	11604134
27/64	0.4219	2-11/16	4-1/2	27/64	11604219
11mm	0.4331	68mm	114mm	11mm	11604331

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Solid Carbide Jobber Length Drill



Series 116 Durapoint | 2FL | 140° | Jobber Length

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
7/16	0.4375	2-13/16	4-21/32	7/16	11604375
11.5mm	0.4528	2-13/16	4-21/32	29/64	11604528
29/64	0.4531	2-13/16	4-21/32	29/64	11604531
15/32	0.4688	2-7/8	4-25/32	15/32	11604688
12mm	0.4724	73mm	121mm	12mm	11604724
31/64	0.4844	3	5-5/16	31/64	11604844
1/2	0.5000	3-3/32	5-13/32	1/2	11605000
13mm	0.5118	79mm	137mm	13mm	11605118
33/64	0.5156	3-5/16	5-11/16	33/64	11605156
17/32	0.5312	3-5/16	5-11/16	17/32	11605312
13.5mm	0.5315	3-5/16	5-11/16	17/32	11605315
35/64	0.5469	3-13/32	5-15/16	35/64	11605469
14mm	0.5512	87mm	151mm	14mm	11605512
9/16	0.5625	3-1/2	5-15/16	9/16	11605625
14.5mm	0.5709	3-1/2	5-15/16	0.5709	11605709
15mm	0.5906	94mm	157mm	15mm	11605906
19/32	0.5938	3-11/16	6-3/16	19/32	11605938
15.5mm	0.6102	3-11/16	6-3/16	39/64	11606102
5/8	0.6250	3-25/32	6-5/16	5/8	11606250
16mm	0.6299	96mm	160mm	16mm	11606299
16.5mm	0.6496	4-1/8	6-19/32	0.6496	11606496
21/32	0.6562	4-1/8	6-19/32	21/32	11606562
17mm	0.6693	103mm	167mm	17mm	11606693
11/16	0.6875	4-1/8	6-19/32	11/16	11606875
17.5mm	0.6890	4-1/8	6-19/32	11/16	11606890
45/64	0.7031	4-1/8	6-19/32	45/64	11607031
18mm	0.7087	103mm	167mm	18mm	11607087
18.5mm	0.7283	4-1/2	7-1/16	0.7283	11607283
47/64	0.7344	4-1/2	7-1/16	47/64	11607344
19mm	0.7480	114mm	179mm	19mm	11607480
3/4	0.7500	4-1/2	7-1/16	3/4	11607500

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

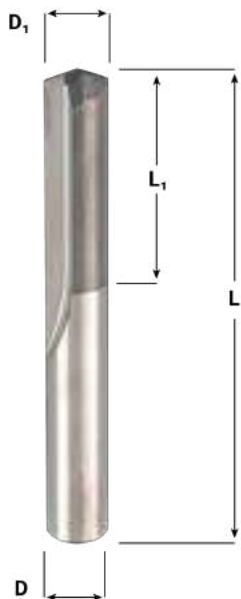
HOLEMAKING

THREADING

INSERTS

ADVANCED PERFORMANCE

Solid Carbide Drill For Die Steels



FEATURES/DESCRIPTION		APPLICATION	FEATURES																																							
<ul style="list-style-type: none"> Sub-micrograin carbide grade for wear resistance and edge strength Heavy duty straight flute designed for shallow hole drilling in chrome alloys, nickel alloys, titanium, and hardened steels 135° notch thin point best suited for difficult-to-machine materials 																																										
<table border="1"> <thead> <tr> <th colspan="3">STEEL</th> <th colspan="2">STAINLESS</th> <th colspan="2">CAST IRON</th> <th colspan="2">NON-FERROUS</th> <th colspan="2">HSSA</th> <th colspan="2">HARDENED STEEL</th> </tr> <tr> <th>P1</th> <th>P2</th> <th>P3</th> <th>M1</th> <th>M2</th> <th>K1</th> <th>K2</th> <th>N1</th> <th>N2</th> <th>S1</th> <th>S2</th> <th>H1</th> <th>H2</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td>○</td> <td>○</td> <td></td> <td></td> <td></td> <td></td> <td>●</td> <td>●</td> <td>●</td> <td>○</td> </tr> </tbody> </table> <p>● Best ○ Good</p>				STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL		P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2				○	○					●	●	●	○
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL																															
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																														
			○	○					●	●	●	○																														

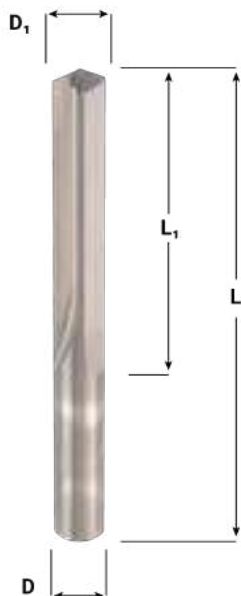
Series 155 Durapoint | 2FL | Straight Flute

Diameter(D ₁)	Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
3/64	1/2	1-1/2	3/64	15500469
1/16	5/8	1-1/2	1/16	15500625
5/64	11/16	1-11/16	5/64	15500781
3/32	3/4	1-3/4	3/32	15500938
7/64	13/16	1-13/16	7/64	15501094
1/8	7/8	1-7/8	1/8	15501250
9/64	15/16	1-15/16	9/64	15501406
5/32	1	2-1/16	5/32	15501562
11/64	1-1/16	2-1/8	11/64	15501719
3/16	1-1/8	2-3/16	3/16	15501875
13/64	1-3/16	2-1/4	13/64	15502031
7/32	1-1/4	2-3/8	7/32	15502188
15/64	1-5/16	2-7/16	15/64	15502344
1/4	1-3/8	2-1/2	1/4	15502500
17/64	1-7/16	2-5/8	17/64	15502656
9/32	1-1/2	2-11/16	9/32	15502812
19/64	1-9/16	2-3/4	19/64	15502969
5/16	1-5/8	2-13/16	5/16	15503125
21/64	1-11/16	2-15/16	21/64	15503281
11/32	1-11/16	3	11/32	15503438
23/64	1-3/4	3-1/16	23/64	15503594
3/8	1-13/16	3-1/8	3/8	15503750
25/64	1-7/8	3-1/4	25/64	15503906
13/32	1-15/16	3-5/16	13/32	15504062
27/64	2	3-3/8	27/64	15504219
7/16	2-1/16	3-7/16	7/16	15504375
15/32	2-1/8	3-5/8	15/32	15504688
1/2	2-1/4	3-3/4	1/2	15505000

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Solid Carbide Double Margin Short Bore Drill



FEATURES/DESCRIPTION		APPLICATION	FEATURES																																							
<ul style="list-style-type: none"> High hardness carbide grade for very abrasive materials Double margin flat clearance burnishing drill to produce reamer like finish in cutting cast iron, ductile iron, bronze, and cast aluminums Design also works well in cored holes and angular exits 135° four facet thin web penetrates easily 																																										
<table border="1"> <thead> <tr> <th colspan="3">STEEL</th> <th colspan="2">STAINLESS</th> <th colspan="2">CAST IRON</th> <th colspan="2">NON-FERROUS</th> <th colspan="2">HSSA</th> <th colspan="2">HARDENED STEEL</th> </tr> <tr> <th>P1</th> <th>P2</th> <th>P3</th> <th>M1</th> <th>M2</th> <th>K1</th> <th>K2</th> <th>N1</th> <th>N2</th> <th>S1</th> <th>S2</th> <th>H1</th> <th>H2</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td>●</td> <td>●</td> <td></td> <td>●</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>				STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL		P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2						●	●		●				
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL																															
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																														
					●	●		●																																		

● Best ○ Good

Series 153 Durapoint | 2FL | Short Length | Straight Flute

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
3/32	0.0938	1	2	3/32	15300938
2.5mm	0.0984	1	2	0.0984	15300984
7/64	0.1094	1-1/4	2-1/4	7/64	15301094
3mm	0.1181	32mm	57mm	3mm	15301181
1/8	0.1250	1-1/4	2-1/4	1/8	15301250
3.5mm	0.1378	1-3/8	2-1/2	0.1378	15301378
9/64	0.1406	1-3/8	2-1/2	9/64	15301406
5/32	0.1562	1-3/8	2-1/2	5/32	15301562
4mm	0.1575	35mm	64mm	4mm	15301575
11/64	0.1719	1-5/8	2-3/4	11/64	15301719
4.5mm	0.1772	1-5/8	2-3/4	0.1772	15301772
3/16	0.1875	1-5/8	2-3/4	3/16	15301875
5mm	0.1969	44mm	76mm	5mm	15301969
13/64	0.2031	1-3/4	3	13/64	15302031
5.5mm	0.2165	1-3/4	3	0.2165	15302165
7/32	0.2188	1-3/4	3	7/32	15302188
15/64	0.2344	2	3-1/4	15/64	15302344
6mm	0.2362	51mm	83mm	6mm	15302362
1/4	0.2500	2	3-1/4	1/4	15302500
6.5mm	0.2559	2	3-1/4	0.2559	15302559
17/64	0.2656	2-1/8	3-1/2	17/64	15302656
7mm	0.2756	54mm	89mm	7mm	15302756
9/32	0.2812	2-1/8	3-1/2	9/32	15302812
7.5mm	0.2953	2-3/8	3-3/4	0.2953	15302953
19/64	0.2969	2-3/8	3-3/4	19/64	15302969
5/16	0.3125	2-3/8	3-3/4	5/16	15303125
8mm	0.3150	60mm	95mm	8mm	15303150
21/64	0.3281	2-1/2	4	21/64	15303281
8.5mm	0.3346	2-1/2	4	0.3346	15303346
11/32	0.3438	2-1/2	4	11/32	15303438
9mm	0.3543	64mm	102mm	9mm	15303543
23/64	0.3594	2-3/4	4-1/4	23/64	15303594
9.5mm	0.3740	2-3/4	4-1/4	3/8	15303740
3/8	0.3750	2-3/4	4-1/4	3/8	15303750
25/64	0.3906	2-7/8	4-1/2	25/64	15303906
10mm	0.3937	73mm	114mm	10mm	15303937
13/32	0.4062	2-7/8	4-1/2	13/32	15304062
10.5mm	0.4134	2-7/8	4-1/2	0.4134	15304134
27/64	0.4219	2-7/8	4-1/2	27/64	15304219
11mm	0.4331	73mm	114mm	11mm	15304331
7/16	0.4375	2-7/8	4-1/2	7/16	15304375
11.5mm	0.4528	2-7/8	4-1/2	29/64	15304528
29/64	0.4531	3	4-3/4	29/64	15304531
15/32	0.4688	3	4-3/4	15/32	15304688
12mm	0.4724	76mm	121mm	12mm	15304724

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

ADVANCED PERFORMANCE

Solid Carbide Double Margin Short Bore Drill



Series 153 Durapoint | 2FL | Short Length | Straight Flute

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
31/64	0.4844	3	4-3/4	31/64	15304844
12.5mm	0.4921	3	4-3/4	0.4921	15304921
1/2	0.5000	3	4-3/4	1/2	15305000
13mm	0.5118	83mm	127mm	13mm	15305118
33/64	0.5156	3-1/4	5	33/64	15305156
17/32	0.5312	3-1/4	5	17/32	15305312
13.5mm	0.5315	3-1/4	5	17/32	15305315
35/64	0.5469	3-1/4	5	35/64	15305469
14mm	0.5512	83mm	127mm	14mm	15305512
9/16	0.5625	3-1/4	5	9/16	15305625
14.5mm	0.5709	3-1/2	5-1/4	0.5709	15305709
37/64	0.5781	3-1/2	5-1/4	37/64	15305781
15mm	0.5906	89mm	133mm	15mm	15305906
19/32	0.5938	3-1/2	5-1/4	19/32	15305938
39/64	0.6094	3-1/2	5-1/4	39/64	15306094
15.5mm	0.6102	3-1/2	5-1/4	39/64	15306102
5/8	0.6250	3-1/2	5-1/4	5/8	15306250
16mm	0.6299	89mm	133mm	16mm	15306299
11/16	0.6875	3-5/8	5-1/2	11/16	15306875

*bold numbers are EDPs for ordering

Popular Custom Holemaking Options

- Material-specific point geometry
- Longer flute lengths
- Internal coolant supply
- Proprietary GWS tool coatings

**CUSTOM
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ADVANCED PERFORMANCE

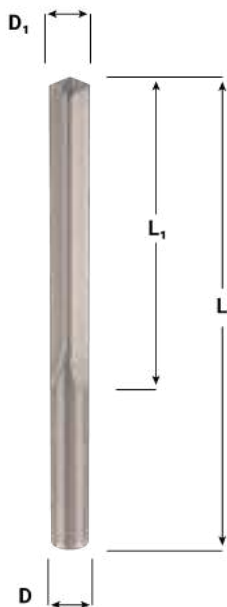
Solid Carbide Double Margin Long Bore Drill



INTRO

MILLING

SPECIALTY



FEATURES/DESCRIPTION		APPLICATION	FEATURES																																							
<ul style="list-style-type: none"> High hardness carbide grade for very abrasive materials Double margin flat clearance burnishing drill to produce reamer like finish in cutting cast iron, ductile iron, bronze, and cast aluminums Design also works well in cored holes and angular exits 135° four facet thin web penetrates easily 																																										
<table border="1"> <thead> <tr> <th colspan="3">STEEL</th> <th colspan="2">STAINLESS</th> <th colspan="2">CAST IRON</th> <th colspan="2">NON-FERROUS</th> <th colspan="2">HSSA</th> <th colspan="2">HARDENED STEEL</th> </tr> <tr> <th>P1</th> <th>P2</th> <th>P3</th> <th>M1</th> <th>M2</th> <th>K1</th> <th>K2</th> <th>N1</th> <th>N2</th> <th>S1</th> <th>S2</th> <th>H1</th> <th>H2</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td>●</td> <td>●</td> <td></td> <td>●</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL		P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2						●	●		●						
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL																															
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																														
					●	●		●																																		

● Best ○ Good

Series 154 Durapoint | 2FL | Long Length | Straight Flute

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
3/32	0.0938	31/32	2-15/16	3/32	15400938
2.5mm	0.0984	1-9/32	3-9/32	0.0984	15400984
7/64	0.1094	1-9/32	3-9/32	7/64	15401094
3mm	0.1181	33mm	83mm	3mm	15401181
1/8	0.1250	1-9/32	3-9/32	1/8	15401250
3.5mm	0.1378	1-9/16	3-1/2	0.1378	15401378
9/64	0.1406	1-9/16	3-1/2	9/64	15401406
5/32	0.1562	1-9/16	3-1/2	5/32	15401562
4mm	0.1575	48mm	99mm	4mm	15401575
11/64	0.1719	1-7/8	3-29/32	11/64	15401719
4.5mm	0.1772	1-7/8	3-29/32	0.1772	15401772
3/16	0.1875	1-7/8	3-29/32	3/16	15401875
5mm	0.1969	52mm	99mm	5mm	15401969
13/64	0.2031	2-1/16	3-29/32	13/64	15402031
5.5mm	0.2165	2-1/16	3-29/32	0.2165	15402165
7/32	0.2188	2-1/16	3-29/32	7/32	15402188
15/64	0.2344	2-5/16	5	15/64	15402344
6mm	0.2362	59mm	127mm	6mm	15402362
1/4	0.2500	2-5/16	5	1/4	15402500
6.5mm	0.2559	2-9/16	5	0.2559	15402559
17/64	0.2656	2-9/16	5	17/64	15402656
7mm	0.2756	65mm	127mm	7mm	15402756
9/32	0.2812	2-9/16	5	9/32	15402812
7.5mm	0.2953	2-13/16	5	0.2953	15402953
19/64	0.2969	2-13/16	5	19/64	15402969
5/16	0.3125	2-13/16	5	5/16	15403125
8mm	0.3150	76mm	140mm	8mm	15403150
21/64	0.3281	3	5-1/2	21/64	15403281
8.5mm	0.3346	3	5-1/2	0.3346	15403346
11/32	0.3438	3	5-1/2	11/32	15403438
9mm	0.3543	81mm	140mm	9mm	15403543
23/64	0.3594	3-3/16	5-1/2	23/64	15403594
9.5mm	0.3740	3-7/16	5-1/2	3/8	15403740
3/8	0.3750	3-7/16	5-1/2	3/8	15403750
25/64	0.3906	3-7/16	5-1/2	25/64	15403906
10mm	0.3937	87mm	140mm	10mm	15403937
13/32	0.4062	3-7/16	5-1/2	13/32	15404062
10.5mm	0.4134	3-11/16	5-7/8	0.4134	15404134
27/64	0.4219	3-11/16	5-7/8	27/64	15404219
11mm	0.4331	94mm	149mm	11mm	15404331
7/16	0.4375	3-11/16	5-7/8	7/16	15404375
11.5mm	0.4528	3-29/32	5-7/8	29/64	15404528
29/64	0.4531	3-29/32	5-7/8	29/64	15404531
15/32	0.4688	3-29/32	5-7/8	15/32	15404688
12mm	0.4724	105mm	160mm	12mm	15404724

*bold numbers are EDPs for ordering

HOLEMAKING

THREADING

INSERTS

ADVANCED PERFORMANCE

Solid Carbide Double Margin Long Bore Drill



Series 154 Durapoint | 2FL | Long Length | Straight Flute

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
31/64	0.4844	4-1/8	6-5/16	31/64	15404844
12.5mm	0.4921	4-1/8	6-5/16	0.4921	15404921
1/2	0.5000	4-1/8	6-5/16	1/2	15405000
13mm	0.5118	113mm	168mm	13mm	15405118
33/64	0.5156	4-7/16	6-5/8	33/64	15405156
17/32	0.5312	4-7/16	6-5/8	17/32	15405312
13.5mm	0.5315	4-7/16	6-5/8	17/32	15405315
35/64	0.5469	4-7/16	6-5/8	35/64	15405469
14mm	0.5512	113mm	168mm	14mm	15405512
9/16	0.5625	4-7/16	6-5/8	9/16	15405625
14.5mm	0.5709	4-7/8	6-11/16	0.5709	15405709
37/64	0.5781	4-7/8	6-11/16	37/64	15405781
15mm	0.5906	124mm	170mm	15mm	15405906
19/32	0.5938	4-7/8	6-11/16	19/32	15405938
39/64	0.6094	4-7/8	6-11/16	39/64	15406094
15.5mm	0.6102	4-7/8	6-11/16	39/64	15406102
5/8	0.6250	4-7/8	6-11/16	5/8	15406250
16mm	0.6299	124mm	170mm	16mm	15406299
11/16	0.6875	4-7/8	6-11/16	11/16	15406875

*bold numbers are EDPs for ordering

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Popular Custom Holemaking Options

- Material-specific point geometry
- Longer flute lengths
- Internal coolant supply
- Proprietary GWS tool coatings

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ADVANCED PERFORMANCE

Solid Carbide Coolant-Through Short Length Drill



FEATURES/DESCRIPTION		APPLICATION	FEATURES	
<ul style="list-style-type: none"> Sub-micrograin carbide grade for wear resistance and edge strength Kooltwist coolant-through drill design allows 4XD drill depth without spotting at high penetration rates Protective flat cutting edge design reduces edge chipping when drilling 140° self-centering double split point reduces chisel pressure and clears chips away from point center Can be used to produce on size starting hole drill before longer deep hole drills Available with TiN or TiAlN coatings 				

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	●	●	●	●	●	●	●	●	●	●	○	○

● Best ○ Good

Series 294 Kooltwist | Stub Length | Coolant-Through

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	TiN	TiAlN
Size	Dec.					
1/8	0.1250	13/16	2-13/16	1/8	29401250	29401250A
3.2mm	0.1260	13/16	2-13/16	1/8	29401260	29401260A
#30	0.1285	13/16	2-13/16	0.1285	29401285	29401285A
3.3mm	0.1299	15/16	3	0.1299	29401299	29401299A
3.4mm	0.1339	15/16	3	0.1339	29401339	29401339A
#29	0.1360	15/16	3	0.1360	29401360	29401360A
3.5mm	0.1378	15/16	3	0.1378	29401378	29401378A
#28	0.1405	15/16	3	9/64	29401405	29401405A
9/64	0.1406	15/16	3	9/64	29401406	29401406A
3.6mm	0.1417	15/16	3	9/64	29401417	29401417A
#27	0.1440	15/16	3	0.1440	29401440	29401440A
#26	0.1470	15/16	3	0.1470	29401470	29401470A
#25	0.1495	15/16	3	0.1495	29401495	29401495A
#24	0.1520	15/16	3	0.1520	29401520	29401520A
#23	0.1540	15/16	3	0.1540	29401540	29401540A
5/32	0.1562	15/16	3	5/32	29401562	29401562A
#22	0.1570	15/16	3	5/32	29401570	29401570A
4mm	0.1575	24mm	76mm	4mm	29401575	29401575A
#21	0.1590	1	3	0.1590	29401590	29401590A
#20	0.1610	1	3	0.1610	29401610	29401610A
4.1mm	0.1614	1	3	0.1614	29401614	29401614A
4.125mm	0.1624	1	3	0.1624	29401624	29401624A
4.2mm	0.1654	1	3	0.1654	29401654	29401654A
#19	0.1660	1-1/8	3	0.1660	29401660	29401660A
4.25mm	0.1673	1-1/8	3	0.1673	29401673	29401673A
#18	0.1695	1-1/8	3	0.1695	29401695	29401695A
11/64	0.1719	1-1/8	3	11/64	29401719	29401719A
#17	0.1730	1-1/8	3	11/64	29401730	29401730A
#16	0.1770	1-1/8	3	0.1770	29401770	29401770A
4.5mm	0.1772	1-1/8	3	0.1772	29401772	29401772A
#15	0.1800	1-1/8	3	0.1800	29401800	29401800A
#14	0.1820	1-1/8	3	0.1820	29401820	29401820A
#13	0.1850	1-1/8	3	0.1850	29401850	29401850A
3/16	0.1875	1-1/8	3	3/16	29401875	29401875A
#12	0.1890	1-1/8	3	3/16	29401890	29401890A
#11	0.1910	1-1/8	3	0.1910	29401910	29401910A
4.9mm	0.1929	1-1/8	3	0.1929	29401929	29401929A
#10	0.1935	1-1/8	3	0.1935	29401935	29401935A
#9	0.1960	1-1/8	3	0.1960	29401960	29401960A
5mm	0.1969	29mm	76mm	5mm	29401969	29401969A
#8	0.1990	1-1/8	3	0.1990	29401990	29401990A
#7	0.2010	1-1/8	3	0.2010	29402010	29402010A
13/64	0.2031	1-1/8	3	13/64	29402031	29402031A
#6	0.2040	1-1/8	3	13/64	29402040	29402040A
#5	0.2055	1-1/8	3	0.2055	29402055	29402055A

*bold numbers are EDPs for ordering

INTRO

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INSERTS

ADVANCED PERFORMANCE

Solid Carbide Coolant-Through Short Length Drill



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Series 294 | Kooltwist | Stub Length | Coolant-Through

Diameter(D ₁) Size	Flute Length(L ₁) Dec.	OAL(L)	Shank(D)	TiN	TiAlN	
5.25mm	0.2067	1-1/8	3	0.2067	29402067	29402067A
#4	0.2090	1-1/8	3	0.2090	29402090	29402090A
#3	0.2130	1-5/16	3-1/4	0.2130	29402130	29402130A
5.5mm	0.2165	1-5/16	3-1/4	0.2165	29402165	29402165A
7/32	0.2188	1-5/16	3-1/4	7/32	29402188	29402188A
5.6mm	0.2205	1-5/16	3-1/4	0.2205	29402205	29402205A
#2	0.2210	1-5/16	3-1/4	0.2210	29402210	29402210A
#1	0.2280	1-5/16	3-1/4	0.2280	29402280	29402280A
A	0.2340	1-5/16	3-1/4	15/64	29402340	29402340A
15/64	0.2344	1-5/16	3-1/4	15/64	29402344	29402344A
6mm	0.2362	33mm	83mm	6mm	29402362	29402362A
B	0.2380	1-5/16	3-1/4	0.2380	29402380	29402380A
6.1mm	0.2402	1-5/8	3-5/8	0.2402	29402402	29402402A
C	0.2420	1-5/8	3-5/8	0.2420	29402420	29402420A
D	0.2460	1-5/8	3-5/8	0.2460	29402460	29402460A
6.3mm	0.2480	1-5/8	3-5/8	0.2480	29402480	29402480A
1/4	0.2500	1-5/8	3-5/8	1/4	29402500	29402500A
6.4mm	0.2520	1-5/8	3-5/8	0.2520	29402520	29402520A
6.5mm	0.2559	1-3/4	3-3/4	0.2559	29402559	29402559A
F	0.2570	1-3/4	3-3/4	0.2570	29402570	29402570A
6.6mm	0.2598	1-3/4	3-3/4	0.2598	29402598	29402598A
G	0.2610	1-3/4	3-3/4	0.2610	29402610	29402610A
6.68mm	0.2630	1-3/4	3-3/4	0.2630	29402630	29402630A
17/64	0.2656	1-3/4	3-3/4	17/64	29402656	29402656A
H	0.2660	1-3/4	3-3/4	17/64	29402660	29402660A
6.85mm	0.2697	1-3/4	3-3/4	0.2697	29402697	29402697A
I	0.2720	1-3/4	3-3/4	0.2720	29402720	29402720A
7mm	0.2756	44mm	95mm	7mm	29402756	29402756A
J	0.2770	1-3/4	3-3/4	0.2770	29402770	29402770A
7.1mm	0.2795	1-3/4	3-3/4	0.2795	29402795	29402795A
K	0.2810	1-3/4	3-3/4	9/32	29402810	29402810A
9/32	0.2812	1-3/4	3-3/4	9/32	29402812	29402812A
7.2mm	0.2835	1-3/4	3-3/4	0.2835	29402835	29402835A
L	0.2900	1-3/4	3-3/4	0.2900	29402900	29402900A
M	0.2950	1-3/4	3-3/4	0.2950	29402950	29402950A
7.5mm	0.2953	1-3/4	3-3/4	0.2953	29402953	29402953A
19/64	0.2969	1-3/4	3-3/4	19/64	29402969	29402969A
7.6mm	0.2992	1-3/4	3-3/4	0.2992	29402992	29402992A
N	0.3020	1-3/4	3-3/4	0.3020	29403020	29403020A
7.8mm	0.3071	1-3/4	3-3/4	0.3071	29403071	29403071A
5/16	0.3125	1-3/4	3-3/4	5/16	29403125	29403125A
8mm	0.3150	44mm	95mm	8mm	29403150	29403150A
O	0.3160	1-3/4	3-3/4	0.3160	29403160	29403160A
8.1mm	0.3189	1-7/8	4	0.3189	29403189	29403189A
P	0.3230	1-7/8	4	0.3230	29403230	29403230A
21/64	0.3281	1-7/8	4	21/64	29403281	29403281A
Q	0.3320	1-7/8	4	0.3320	29403320	29403320A
8.5mm	0.3346	1-7/8	4	0.3346	29403346	29403346A
8.56mm	0.3370	2	4-1/8	0.3370	29403370	29403370A
R	0.3390	2	4-1/8	0.3390	29403390	29403390A
11/32	0.3438	2	4-1/8	11/32	29403438	29403438A
S	0.3480	2	4-1/8	0.3480	29403480	29403480A
9mm	0.3543	51mm	105mm	9mm	29403543	29403543A
T	0.3580	2-1/8	4-1/4	23/64	29403580	29403580A
23/64	0.3594	2-1/8	4-1/4	23/64	29403594	29403594A
U	0.3680	2-1/8	4-1/4	0.3680	29403680	29403680A
9.5mm	0.3740	2-1/8	4-1/4	3/8	29403740	29403740A
3/8	0.3750	2-1/8	4-1/4	3/8	29403750	29403750A
V	0.3770	2-1/4	4-3/8	0.3770	29403770	29403770A
9.7mm	0.3819	2-1/4	4-3/8	0.3819	29403819	29403819A
W	0.3860	2-1/4	4-3/8	0.3860	29403860	29403860A
25/64	0.3906	2-1/4	4-3/8	25/64	29403906	29403906A
10mm	0.3937	57mm	111mm	10mm	29403937	29403937A
X	0.3970	2-1/4	4-3/8	0.3970	29403970	29403970A
Y	0.4040	2-1/4	4-3/8	0.4040	29404040	29404040A
13/32	0.4062	2-1/4	4-3/8	13/32	29404062	29404062A
10.4mm	0.4094	2-1/4	4-3/8	0.4094	29404094	29404094A
Z	0.4130	2-3/8	4-1/2	0.4130	29404130	29404130A
10.5mm	0.4134	2-3/8	4-1/2	0.4134	29404134	29404134A
10.6mm	0.4173	2-3/8	4-1/2	0.4173	29404173	29404173A
27/64	0.4219	2-3/8	4-1/2	27/64	29404219	29404219A
10.8mm	0.4252	2-1/2	4-5/8	0.4252	29404252	29404252A

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Solid Carbide Coolant-Through Short Length Drill



Series 294

Kooltwist | Stub Length | Coolant-Through

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	TiN	TiAIN
Size	Dec.					
10.95mm	0.4311	2-1/2	4-5/8	0.4311	29404311	29404311A
11mm	0.4331	64mm	117mm	11mm	29404331	29404331A
7/16	0.4375	2-1/2	4-5/8	7/16	29404375	29404375A
11.4mm	0.4488	2-5/8	4-3/4	0.4488	29404488	29404488A
11.5mm	0.4528	2-5/8	4-3/4	29/64	29404528	29404528A
29/64	0.4531	2-5/8	4-3/4	29/64	29404531	29404531A
11.6mm	0.4567	2-5/8	4-3/4	0.4567	29404567	29404567A
15/32	0.4688	2-3/4	5	15/32	29404688	29404688A
12mm	0.4724	70mm	127mm	12mm	29404724	29404724A
12.1mm	0.4764	2-3/4	5	0.4764	29404764	29404764A
31/64	0.4844	2-3/4	5	31/64	29404844	29404844A
12.35mm	0.4862	2-3/4	5	0.4862	29404862	29404862A
12.4mm	0.4882	2-3/4	5	0.4882	29404882	29404882A
12.5mm	0.4921	3	5-1/4	0.4921	29404921	29404921A
12.6mm	0.4961	3	5-1/4	0.4961	29404961	29404961A
1/2	0.5000	3	5-1/4	1/2	29405000	29405000A
12.9mm	0.5079	3	5-5/16	0.5079	29405079	29405079A
13mm	0.5118	76mm	135mm	13mm	29405118	29405118A
33/64	0.5156	3	5-5/16	33/64	29405156	29405156A
17/32	0.5312	3	5-5/16	17/32	29405312	29405312A
13.5mm	0.5315	3	5-5/16	17/32	29405315	29405315A
13.6mm	0.5354	3	5-5/16	0.5354	29405354	29405354A
13.8mm	0.5433	3	5-5/16	0.5433	29405433	29405433A
35/64	0.5469	3	5-5/16	35/64	29405469	29405469A
14mm	0.5512	76mm	135mm	14mm	29405512	29405512A
14.1mm	0.5551	3	5-5/16	0.5551	29405551	29405551A
14.15mm	0.5571	3	5-5/16	0.5571	29405571	29405571A
9/16	0.5625	3	5-5/16	9/16	29405625	29405625A
14.5mm	0.5709	3-1/4	5-5/8	0.5709	29405709	29405709A
14.6mm	0.5748	3-1/4	5-5/8	0.5748	29405748	29405748A
37/64	0.5781	3-1/4	5-5/8	37/64	29405781	29405781A
15mm	0.5906	83mm	143mm	15mm	29405906	29405906A
19/32	0.5938	3-1/4	5-5/8	19/32	29405938	29405938A
39/64	0.6094	3-3/8	5-5/8	39/64	29406094	29406094A
15.5mm	0.6102	3-3/8	5-5/8	39/64	29406102	29406102A
5/8	0.6250	3-3/8	5-5/8	5/8	29406250	29406250A
16mm	0.6299	86mm	143mm	16mm	29406299	29406299A
16.08mm	0.6331	3-3/8	5-5/8	0.6331	29406331	29406331A
16.116mm	0.6345	3-3/8	5-5/8	0.6345	29406345	29406345A
41/64	0.6406	3-1/2	5-7/8	41/64	29406406	29406406A
16.5mm	0.6496	3-1/2	5-7/8	0.6496	29406496	29406496A
21/32	0.6562	3-1/2	5-7/8	21/32	29406562	29406562A
16.75mm	0.6594	3-1/2	5-7/8	0.6594	29406594	29406594A
17mm	0.6693	92mm	149mm	17mm	29406693	29406693A
43/64	0.6719	3-5/8	5-7/8	43/64	29406719	29406719A
11/16	0.6875	3-5/8	5-7/8	11/16	29406875	29406875A
17.5mm	0.6890	3-5/8	5-7/8	11/16	29406890	29406890A
17.6mm	0.6929	3-3/4	6	0.6929	29406929	29406929A
45/64	0.7031	3-3/4	6	45/64	29407031	29407031A
18mm	0.7087	95mm	152mm	18mm	29407087	29407087A
23/32	0.7188	3-3/4	6	23/32	29407188	29407188A
18.5mm	0.7283	3-3/4	6	0.7283	29407283	29407283A
47/64	0.7344	3-7/8	6-5/32	47/64	29407344	29407344A
19mm	0.7480	98mm	156mm	19mm	29407480	29407480A
3/4	0.7500	3-7/8	6-5/32	3/4	29407500	29407500A
19.25mm	0.7579	4	6-5/32	0.7579	29407579	29407579A
19.279mm	0.7590	4	6-5/32	0.7590	29407590	29407590A

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

ADVANCED PERFORMANCE

Solid Carbide Coolant-Through Jobber Length Drill



INTRO

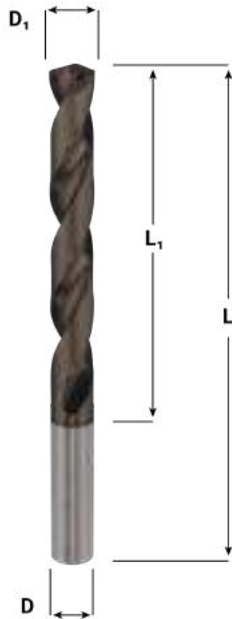
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES																																							
<ul style="list-style-type: none"> Sub-micrograin carbide grade for wear resistance and edge strength Kooltwist coolant-through drill design allows 7XD drill at high penetration rates Protective flat cutting edge design reduces edge chipping when drilling 140° self-centering double split point reduces chisel pressure and clears chips away from point center Offered in TiN coating or TiAlN coating 		<table border="1"> <tr> <td>CARBIDE</td> <td>30°</td> </tr> <tr> <td>2FL</td> <td>140°</td> </tr> <tr> <td>THRU</td> <td>P364</td> </tr> <tr> <td>TiN</td> <td>TiAlN</td> </tr> </table>	CARBIDE	30°	2FL	140°	THRU	P364	TiN	TiAlN																															
CARBIDE	30°																																								
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THRU	P364																																								
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<table border="1"> <thead> <tr> <th colspan="3">STEEL</th> <th colspan="2">STAINLESS</th> <th colspan="2">CAST IRON</th> <th colspan="2">NON-FERROUS</th> <th colspan="2">HSSA</th> <th colspan="2">HARDENED STEEL</th> </tr> <tr> <th>P1</th> <th>P2</th> <th>P3</th> <th>M1</th> <th>M2</th> <th>K1</th> <th>K2</th> <th>N1</th> <th>N2</th> <th>S1</th> <th>S2</th> <th>H1</th> <th>H2</th> </tr> </thead> <tbody> <tr> <td>○</td> <td>●</td> <td>●</td> <td>●</td> <td>●</td> <td>●</td> <td>●</td> <td>●</td> <td>●</td> <td>●</td> <td>●</td> <td>○</td> <td>○</td> </tr> </tbody> </table> <p>● Best ○ Good</p>			STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL		P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2	○	●	●	●	●	●	●	●	●	●	●	○	○
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL																														
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																													
○	●	●	●	●	●	●	●	●	●	●	○	○																													

Series 293 Kooltwist | 2FL | Jobber Length | Coolant-Through

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	TiN	TiAlN
Size	Dec.					
1/8	0.1250	1-1/8	3-11/32	1/8	29301250	29301250A
3.2mm	0.1260	1-1/8	3-11/32	1/8	29301260	29301260A
#30	0.1285	1-1/8	3-11/32	0.1285	29301285	29301285A
3.3mm	0.1299	1-13/32	3-5/8	0.1299	29301299	29301299A
3.4mm	0.1339	1-13/32	3-5/8	0.1339	29301339	29301339A
#29	0.1360	1-13/32	3-5/8	0.1360	29301360	29301360A
3.5mm	0.1378	1-13/32	3-5/8	0.1378	29301378	29301378A
#28	0.1405	1-13/32	3-5/8	9/64	29301405	29301405A
9/64	0.1406	1-13/32	3-5/8	9/64	29301406	29301406A
3.6mm	0.1417	1-13/32	3-5/8	9/64	29301417	29301417A
#27	0.1440	1-13/32	3-5/8	0.1440	29301440	29301440A
#26	0.1470	1-13/32	3-5/8	0.1470	29301470	29301470A
#25	0.1495	1-13/32	3-5/8	0.1495	29301495	29301495A
#24	0.1520	1-13/32	3-5/8	0.1520	29301520	29301520A
#23	0.1540	1-13/32	3-5/8	0.1540	29301540	29301540A
5/32	0.1562	1-13/32	3-5/8	5/32	29301562	29301562A
#22	0.1570	1-13/32	3-5/8	5/32	29301570	29301570A
4mm	0.1575	36mm	92mm	4mm	29301575	29301575A
#21	0.1590	1-13/32	3-5/8	0.1590	29301590	29301590A
#20	0.1610	1-13/32	3-5/8	0.1610	29301610	29301610A
4.1mm	0.1614	1-13/32	3-5/8	0.1614	29301614	29301614A
4.125mm	0.1624	1-13/32	3-5/8	0.1624	29301624	29301624A
4.2mm	0.1654	1-13/32	3-5/8	0.1654	29301654	29301654A
#19	0.1660	1-13/32	3-5/8	0.1660	29301660	29301660A
4.25mm	0.1673	1-13/32	3-5/8	0.1673	29301673	29301673A
#18	0.1695	1-13/32	3-5/8	0.1695	29301695	29301695A
11/64	0.1719	1-13/32	3-5/8	11/64	29301719	29301719A
#17	0.1730	1-13/32	3-5/8	11/64	29301730	29301730A
#16	0.1770	1-9/16	3-25/32	0.1770	29301770	29301770A
4.5mm	0.1772	1-9/16	3-25/32	0.1772	29301772	29301772A
#15	0.1800	1-9/16	3-25/32	0.1800	29301800	29301800A
#14	0.1820	1-9/16	3-25/32	0.1820	29301820	29301820A
#13	0.1850	1-9/16	3-25/32	0.1850	29301850	29301850A
3/16	0.1875	1-9/16	3-25/32	3/16	29301875	29301875A
#12	0.1890	1-9/16	3-25/32	3/16	29301890	29301890A
#11	0.1910	1-9/16	3-25/32	0.1910	29301910	29301910A
4.9mm	0.1929	1-23/32	3-15/16	0.1929	29301929	29301929A
#10	0.1935	1-23/32	3-15/16	0.1935	29301935	29301935A
#9	0.1960	1-23/32	3-15/16	0.1960	29301960	29301960A
5mm	0.1969	44mm	100mm	5mm	29301969	29301969A
#8	0.1990	1-23/32	3-15/16	0.1990	29301990	29301990A
#7	0.2010	1-23/32	3-15/16	0.2010	29302010	29302010A
13/64	0.2031	1-23/32	3-15/16	13/64	29302031	29302031A
#6	0.2040	1-23/32	3-15/16	13/64	29302040	29302040A
#5	0.2055	1-23/32	3-15/16	0.2055	29302055	29302055A

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Solid Carbide Coolant-Through Jobber Length Drill



Series 293 Kooltwist | 2FL | Jobber Length | Coolant-Through

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	TiN	TiAlN
Size	Dec.					
#4	0.2090	1-23/32	3-15/16	0.2090	29302090	29302090A
#3	0.2130	1-29/32	4-1/8	0.2130	29302130	29302130A
5.5mm	0.2165	1-29/32	4-1/8	0.2165	29302165	29302165A
7/32	0.2188	1-29/32	4-1/8	7/32	29302188	29302188A
5.6mm	0.2205	1-29/32	4-1/8	0.2205	29302205	29302205A
2	0.2210	1-29/32	4-1/8	0.2210	29302210	29302210A
1	0.2280	2-1/8	4-5/16	0.2280	29302280	29302280A
A	0.2340	2-1/8	4-5/16	15/64	29302340	29302340A
15/64	0.2344	2-1/8	4-5/16	15/64	29302344	29302344A
6mm	0.2362	54mm	110mm	6mm	29302362	29302362A
B	0.2380	2-1/8	4-5/16	0.2380	29302380	29302380A
6.1mm	0.2402	2-1/8	4-5/16	0.2402	29302402	29302402A
C	0.2420	2-1/8	4-5/16	0.2420	29302420	29302420A
D	0.2460	2-1/8	4-5/16	0.2460	29302460	29302460A
6.3mm	0.2480	2-1/8	4-5/16	0.2480	29302480	29302480A
1/4	0.2500	2-1/8	4-5/16	1/4	29302500	29302500A
6.4mm	0.2520	2-1/8	4-5/16	0.2520	29302520	29302520A
6.5mm	0.2559	2-1/8	4-5/16	0.2559	29302559	29302559A
F	0.2570	2-1/4	4-1/2	0.2570	29302570	29302570A
6.6mm	0.2598	2-1/4	4-1/2	0.2598	29302598	29302598A
G	0.2610	2-1/4	4-1/2	0.2610	29302610	29302610A
6.68mm	0.2630	2-1/4	4-1/2	0.2630	29302630	29302630A
17/64	0.2656	2-1/4	4-1/2	17/64	29302656	29302656A
H	0.2660	2-1/4	4-1/2	17/64	29302660	29302660A
6.85mm	0.2697	2-1/4	4-1/2	0.2697	29302697	29302697A
I	0.2720	2-1/4	4-1/2	0.2720	29302720	29302720A
7mm	0.2756	57mm	114mm	7mm	29302756	29302756A
J	0.2770	2-1/4	4-1/2	0.2770	29302770	29302770A
7.1mm	0.2795	2-1/4	4-1/2	0.2795	29302795	29302795A
K	0.2810	2-1/4	4-1/2	9/32	29302810	29302810A
9/32	0.2812	2-1/4	4-1/2	9/32	29302812	29302812A
7.2mm	0.2835	2-1/4	4-1/2	0.2835	29302835	29302835A
L	0.2900	2-17/32	4-3/4	0.2900	29302900	29302900A
M	0.2950	2-17/32	4-3/4	0.2950	29302950	29302950A
7.5mm	0.2953	2-17/32	4-3/4	0.2953	29302953	29302953A
19/64	0.2969	2-17/32	4-3/4	19/64	29302969	29302969A
7.6mm	0.2992	2-17/32	4-3/4	0.2992	29302992	29302992A
N	0.3020	2-17/32	4-3/4	0.3020	29303020	29303020A
7.8mm	0.3071	2-17/32	4-3/4	0.3071	29303071	29303071A
5/16	0.3125	2-17/32	4-3/4	5/16	29303125	29303125A
8mm	0.3150	64mm	121mm	8mm	29303150	29303150A
O	0.3160	2-17/32	4-3/4	0.3160	29303160	29303160A
8.1mm	0.3189	2-17/32	4-3/4	0.3189	29303189	29303189A
P	0.3230	2-27/32	5	0.3230	29303230	29303230A
21/64	0.3281	2-27/32	5	21/64	29303281	29303281A
Q	0.3320	2-27/32	5	0.3320	29303320	29303320A
8.5mm	0.3346	2-27/32	5	0.3346	29303346	29303346A
8.56mm	0.3370	2-27/32	5	0.3370	29303370	29303370A
R	0.3390	2-27/32	5	0.3390	29303390	29303390A
11/32	0.3438	2-27/32	5	11/32	29303438	29303438A
S	0.3480	3-5/32	5-3/8	0.3480	29303480	29303480A
9mm	0.3543	80mm	136mm	9mm	29303543	29303543A
T	0.3580	3-5/32	5-3/8	23/64	29303580	29303580A
23/64	0.3594	3-5/32	5-3/8	23/64	29303594	29303594A
U	0.3680	3-5/32	5-3/8	0.3680	29303680	29303680A
9.5mm	0.3740	3-5/32	5-3/8	3/8	29303740	29303740A
3/8	0.3750	3-5/32	5-3/8	3/8	29303750	29303750A
V	0.3770	3-5/32	5-3/8	0.3770	29303770	29303770A
9.7mm	0.3819	3-5/16	5-7/8	0.3819	29303819	29303819A
W	0.3860	3-5/16	5-7/8	0.3860	29303860	29303860A
25/64	0.3906	3-5/16	5-7/8	25/64	29303906	29303906A
10mm	0.3937	84mm	149mm	10mm	29303937	29303937A
X	0.3970	3-5/16	5-7/8	0.3970	29303970	29303970A
Y	0.4040	3-5/16	5-7/8	0.4040	29304040	29304040A
13/32	0.4062	3-5/16	5-7/8	13/32	29304062	29304062A
10.4mm	0.4094	3-5/16	5-7/8	0.4094	29304094	29304094A
Z	0.4130	3-5/16	5-7/8	0.4130	29304130	29304130A
10.5mm	0.4134	3-5/16	5-7/8	0.4134	29304134	29304134A
10.6mm	0.4173	3-5/16	5-7/8	0.4173	29304173	29304173A
27/64	0.4219	3-5/8	6-7/32	27/64	29304219	29304219A
10.8mm	0.4252	3-5/8	6-7/32	0.4252	29304252	29304252A
10.95mm	0.4311	3-5/8	6-7/32	0.4311	29304311	29304311A

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INTRO

MILLING

SPECIALTY

HOLEMAKING

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INSERTS

ADVANCED PERFORMANCE

Solid Carbide Coolant-Through Jobber Length Drill



Series 293 | Kooltwist | 2FL | Jobber Length | Coolant-Through

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	TiN	TiAlN
Size	Dec.					
11mm	0.4331	92mm	158mm	11mm	29304331	29304331A
7/16	0.4375	3-5/8	6-7/32	7/16	29304375	29304375A
11.4mm	0.4488	3-5/8	6-7/32	0.4488	29304488	29304488A
11.5mm	0.4528	3-5/8	6-7/32	29/64	29304528	29304528A
29/64	0.4531	3-25/32	6-7/32	29/64	29304531	29304531A
11.6mm	0.4567	3-25/32	6-7/32	0.4567	29304567	29304567A
15/32	0.4688	3-25/32	6-7/32	15/32	29304688	29304688A
12mm	0.4724	96mm	158mm	12mm	29304724	29304724A
12.1mm	0.4764	3-25/32	6-7/32	0.4764	29304764	29304764A
31/64	0.4844	4-3/32	6-9/32	31/64	29304844	29304844A
12.4mm	0.4882	4-3/32	6-9/32	0.4882	29304882	29304882A
12.5mm	0.4921	4-3/32	6-9/32	0.4921	29304921	29304921A
12.6mm	0.4961	4-3/32	6-9/32	0.4961	29304961	29304961A
1/2	0.5000	4-3/32	6-9/32	1/2	29305000	29305000A
12.9mm	0.5079	4-7/32	6-9/32	0.5079	29305079	29305079A
13mm	0.5118	107mm	160mm	13mm	29305118	29305118A
33/64	0.5156	4-7/32	6-9/32	33/64	29305156	29305156A
17/32	0.5312	4-7/32	6-9/32	17/32	29305312	29305312A
13.5mm	0.5315	4-7/32	6-9/32	17/32	29305315	29305315A
13.6mm	0.5354	4-7/32	6-9/32	0.5354	29305354	29305354A
13.8mm	0.5433	4-7/32	6-9/32	0.5433	29305433	29305433A
35/64	0.5469	4-7/32	6-9/32	35/64	29305469	29305469A
14mm	0.5512	107mm	160mm	14mm	29305512	29305512A
9/16	0.5625	4-7/32	6-9/32	9/16	29305625	29305625A
14.5mm	0.5709	4-7/32	6-9/32	0.5709	29305709	29305709A
14.6mm	0.5748	4-7/32	6-9/32	0.5748	29305748	29305748A
37/64	0.5781	4-7/32	6-9/32	37/64	29305781	29305781A
15mm	0.5906	107mm	160mm	15mm	29305906	29305906A
19/32	0.5938	4-7/32	6-9/32	19/32	29305938	29305938A

*bold numbers are EDPs for ordering

Popular Custom Holemaking Options

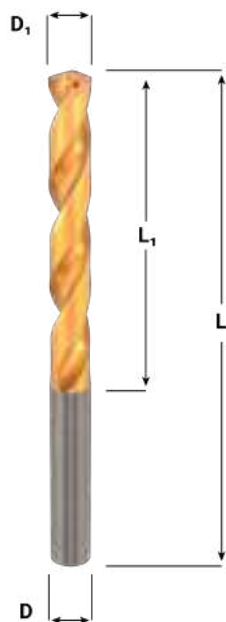
- Material-specific point geometry
- Longer flute lengths
- Internal coolant supply
- Proprietary GWS tool coatings

**CUSTOM
COMES
STANDARD**



ADVANCED PERFORMANCE

Solid Carbide Coolant-Through Jobber Length Drill



FEATURES/DESCRIPTION		APPLICATION	FEATURES	
<ul style="list-style-type: none"> Sub-micrograin carbide grade for wear resistance and edge strength Kooltwist coolant-through drill design allows 6XD drill at high penetration rates Protective flat cutting edge design reduces edge chipping when drilling 140° self-centering double split point reduces chisel pressure and clears chips away from point center Available in TiN or TiAlN coating 				

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	●	●	●	●	●	●	●	●	●	●	○	○

● Best ○ Good

Series 292 Kooltwist | 2FL | Jobber Length | Coolant-Through

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	TiN	TiAlN
Size	Dec.					
39/64	0.6094	4-29/32	7-15/16	39/64	29206094	29206094A
15.5mm	0.6102	4-29/32	7-15/16	39/64	29206102	29206102A
5/8	0.6250	4-29/32	7-15/16	5/8	29206250	29206250A
16mm	0.6299	131mm	208mm	16mm	29206299	29206299A
41/64	0.6406	5-5/32	8-3/16	41/64	29206406	29206406A
16.5mm	0.6496	5-5/32	8-3/16	0.6496	29206496	29206496A
21/32	0.6562	5-5/32	8-3/16	21/32	29206562	29206562A
17mm	0.6693	137mm	214mm	17mm	29206693	29206693A
43/64	0.6719	5-3/8	8-13/32	43/64	29206719	29206719A
11/16	0.6875	5-3/8	8-13/32	11/16	29206875	29206875A
17.5mm	0.6890	5-3/8	8-13/32	11/16	29206890	29206890A
45/64	0.7031	5-5/16	8-13/32	45/64	29207031	29207031A
18mm	0.7087	135mm	214mm	18mm	29207087	29207087A
23/32	0.7188	5-5/16	8-13/32	23/32	29207188	29207188A
18.5mm	0.7283	5-5/16	8-13/32	0.7283	29207283	29207283A
47/64	0.7344	5-5/16	8-13/32	47/64	29207344	29207344A
19mm	0.7480	135mm	214mm	19mm	29207480	29207480A
3/4	0.7500	5-5/16	8-13/32	3/4	29207500	29207500A

*bold numbers are EDPs for ordering

INTRO

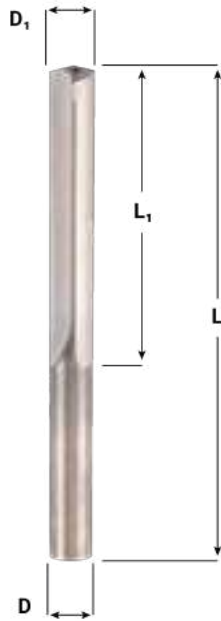
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<ul style="list-style-type: none"> Sub-micrograin carbide grade for wear resistance and edge strength Koolcarb coolant-through double margin design produces straightest holes to reamer like finish For use in cast iron, ductile iron, cast aluminum, and titanium Not suited for continuous chip low carbon steels or alloy aluminums 125° four facet point is a self-centering point with notch thinning for ease in chisel penetration Requires on size starting hole with greater point angle and high pressure coolant 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○	●	●	●	●	●	●	○	○		

● Best ○ Good

Series 174 | Koolcarb | 2FL | Intermediate Length | Coolant-Through | Straight Flute

Diameter(D ₁) Size	Dec.	Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
1/8	0.1250	1-13/16	4-1/4	1/8	17401250
3.5mm	0.1378	2	4-7/16	0.1378	17401378
9/64	0.1406	2	4-7/16	9/64	17401406
5/32	0.1562	2-7/32	4-21/32	5/32	17401562
4mm	0.1575	56mm	118mm	4mm	17401575
11/64	0.1719	2-7/16	4-7/8	11/64	17401719
4.5mm	0.1772	2-5/8	5	0.1772	17401772
3/16	0.1875	2-5/8	5	3/16	17401875
5mm	0.1969	71mm	133mm	5mm	17401969
13/64	0.2031	2-13/16	5-1/4	13/64	17402031
5.5mm	0.2165	3	5-7/16	0.2165	17402165
7/32	0.2188	3	5-7/16	7/32	17402188
16/64	0.2344	3-9/32	5-3/4	1/4	17402344
6mm	0.2362	83mm	146mm	6mm	17402362
1/4	0.2500	3-7/16	5-7/8	1/4	17402500
17/64	0.2656	3-9/16	6	17/64	17402656
9/32	0.2812	3-9/16	6	9/32	17402812
19/64	0.2969	3-11/16	6-1/8	19/64	17402969
5/16	0.3125	3-11/16	6-1/8	5/16	17403125
21/64	0.3281	3-13/16	6-1/4	21/64	17403281
11/32	0.3438	3-13/16	6-1/4	11/32	17403438
23/64	0.3594	3-15/16	6-3/8	23/64	17403594
3/8	0.3750	3-15/16	6-3/8	3/8	17403750
25/64	0.3906	4-1/16	6-1/2	25/64	17403906
13/32	0.4062	4-1/16	6-1/2	13/32	17404062
27/64	0.4219	4-3/16	6-5/8	27/64	17404219
7/16	0.4375	4-3/16	6-5/8	7/16	17404375
29/64	0.4531	4-5/16	6-3/4	29/64	17404531
15/32	0.4688	4-5/16	6-3/4	15/32	17404688
31/64	0.4844	4-9/16	7	31/64	17404844
1/2	0.5000	4-9/16	7	1/2	17405000
33/64	0.5156	4-11/16	7-1/8	33/64	17405156
17/32	0.5312	4-11/16	7-1/8	17/32	17405312
9/16	0.5625	4-13/16	7-1/4	9/16	17405625
19/32	0.5938	4-13/16	7-1/4	19/32	17405938
5/8	0.6250	4-15/16	7-3/8	5/8	17406250
21/32	0.6562	5-1/16	7-1/2	21/32	17406562
11/16	0.6875	5-3/16	7-5/8	11/16	17406875
23/32	0.7188	5-5/16	7-3/4	23/32	17407188
3/4	0.7500	5-7/16	7-7/8	3/4	17407500

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Solid Carbide Coolant-Through Drill



INTRO

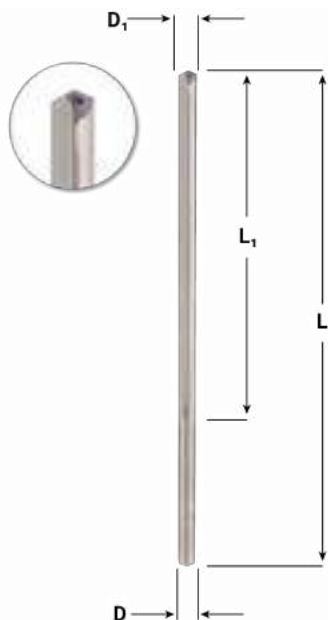
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<ul style="list-style-type: none"> Sub-micrograin carbide grade for wear resistance and edge strength Koolcarb coolant-through double margin design produces straightest holes to reamer like finish For use in cast iron, ductile iron, cast aluminum, and titanium Not suited for continuous chip low carbon steels or alloy aluminums 125° four facet point is a self-centering point with notch thinning for ease in chisel penetration Requires on size starting hole with greater point angle and high pressure coolant 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
	○	○	●	●	●	●		●		○		

● Best ○ Good

Series 175 Koolcarb | 2FL | X-Long Length | Coolant-Through | Straight Flute

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
1/8	0.1250	2-7/8	5-1/4	1/8	17501250
3.5mm	0.1378	3-1/8	5-9/16	0.1378	17501378
9/64	0.1406	3-1/8	5-9/16	9/64	17501406
5/32	0.1562	3-15/32	5-29/32	5/32	17501562
4mm	0.1575	88mm	150mm	4mm	17501575
11/64	0.1719	3-3/4	6-7/32	11/64	17501719
4.5mm	0.1772	4-1/8	6-9/16	0.1772	17501772
3/16	0.1875	4-1/8	6-9/16	3/16	17501875
5mm	0.1969	113mm	175mm	5mm	17501969
13/64	0.2031	4-7/16	6-7/8	13/64	17502031
5.5mm	0.2165	4-3/4	7-7/32	0.2165	17502165
7/32	0.2188	4-3/4	7-7/32	7/32	17502188
15/64	0.2344	5	7-1/2	15/64	17502344
6mm	0.2362	127mm	191mm	6mm	17502362
1/4	0.2500	5-7/16	7-7/8	1/4	17502500

*bold numbers are EDPs for ordering



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>PCD Double-Angle Drill</p> <ul style="list-style-type: none"> Polycrystalline Diamond Double-angle 8-facet Prevents delamination and uncut fibers in CFRP PCD extends tool life 10-100X over carbide Unlike CVD diamond, PCD creates dead-sharp (unrounded) cutting edge ideal for composite materials 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2

● Best ○ Good

Series 4221 D-PCD | 2FL | PCD | Double Angle

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
#40	0.0980	1-1/8	2	#40	422102
1/8	0.1250	1-1/8	2	1/8	422103
#30	0.1285	1-1/8	2	#30	422104
#21	0.1590	1.0	3	#21	422107
#20	0.1610	1.0	3	#20	422108
3/16	0.1875	1.0	3	3/16	422109
#11	0.1910	1.0	3	#11	422110
#10	0.1935	1.0	3	#10	422111
1/4	0.2500	1.0	3	1/4	422115
5/16	0.3125	1-1/2	4	5/16	422117
3/8	0.3750	1-1/2	4	3/8	422118

*bold numbers are EDPs for ordering

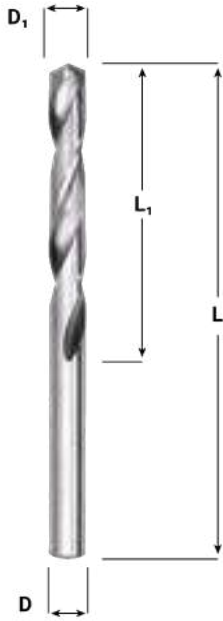
Popular Custom Holmaking Options

- Material-specific point geometry
- Longer flute lengths
- Internal coolant supply
- Proprietary GWS tool coatings

**CUSTOM
COMES
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GENERAL PURPOSE

Solid Carbide 4-Facet Drills For Aircraft



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>4-Facet Drill</p> <ul style="list-style-type: none"> Structural aircraft drill for manual or CNC applications Sub-micron grade carbide substrate for wear resistance 4-facet Ideal for composites and Aluminum Per NAS 907 specifications 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
							●	●				

● Best ○ Good

Series 4210 **DRS | 2FL | 4-Facet**

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
3/32	0.0938	7/8	2-1/8	3/32	421001
#40	0.0980	7/8	2-1/8	#40	421002
1/8	0.1250	7/8	2-1/8	1/8	421003
#30	0.1285	1-1/8	2-1/8	#30	421004
#26	0.1470	1-1/8	2-1/8	#26	421005
5/32	0.1562	1-1/8	2-1/8	5/32	421006
#21	0.1590	1-1/8	2-1/8	#21	421007
#20	0.1610	1-1/8	2-1/8	#20	421008
3/16	0.1875	1-1/8	2-1/8	3/16	421009
#11	0.1910	1-1/8	2-1/8	#11	421010
#10	0.1935	1-1/8	2-1/8	#10	421011
#9	0.1960	1-1/8	2-1/8	#9	421012
#8	0.1990	1-1/8	2-1/8	#8	421013
7/32	0.2188	1-1/8	2-1/8	7/32	421014
1/4	0.2500	1-1/8	2-1/8	1/4	421015
F	0.2570	1-1/8	2-1/8	F	421016
5/16	0.3125	1-1/8	2-1/8	5/16	421017
3/8	0.3750	1-1/8	2-1/8	3/8	421018

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Solid Carbide 4-Facet Drills For Aircraft



INTRO

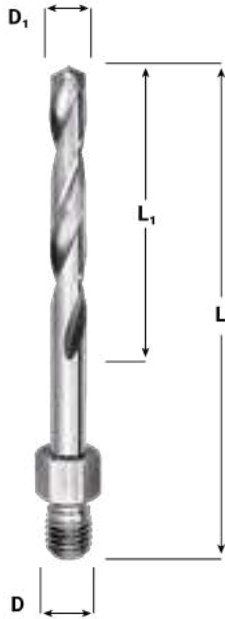
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>4-Facet Drill</p> <ul style="list-style-type: none"> Structural aircraft drill Sub-micron grade carbide substrate for wear resistance 4-facet Threaded Shank Ideal for composites and Aluminum For manual or pneumatic drilling operations Adapter = 1/4-28 HSS Per NAS 907 specifications 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
							●	●				

● Best ○ Good

Series 4211 **DRS | 2FL | Threaded Shank**

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
3/32	0.0938	7/8	2-1/8	3/32	421101
#40	0.0980	7/8	2-1/8	0.0980	421102
1/8	0.1250	7/8	2-1/8	1/8	421103
#30	0.1285	1-1/8	2-1/8	0.1285	421104
#26	0.1470	1-1/8	2-1/8	0.1470	421105
5/32	0.1562	1-1/8	2-1/8	5/32	421106
#21	0.1590	1-1/8	2-1/8	0.1590	421107
#20	0.1610	1-1/8	2-1/8	0.1610	421108
3/16	0.1875	1-1/8	2-1/8	3/16	421109
#11	0.1910	1-1/8	2-1/8	0.1910	421110
#10	0.1935	1-1/8	2-1/8	0.1935	421111
#9	0.1960	1-1/8	2-1/8	0.1960	421112
#8	0.1990	1-1/8	2-1/8	0.1990	421113
7/32	0.2188	1-1/8	2-1/8	7/32	421114
1/4	0.2500	1-1/8	2-1/8	1/4	421115
F	0.2570	1-1/8	2-1/8	0.2570	421116
5/16	0.3125	1-1/8	2-1/8	5/16	421117
3/8	0.3750	1-1/8	2-1/8	3/8	421118

*bold numbers are EDPs for ordering

Popular Custom Holemaking Options

- Material-specific point geometry
- Longer flute lengths
- Internal coolant supply
- Proprietary GWS tool coatings

**CUSTOM
COMES
STANDARD**

GENERAL PURPOSE

Solid Carbide Dagger Drills For Aircraft



FEATURES/DESCRIPTION				APPLICATION		FEATURES						
Dagger Drill <ul style="list-style-type: none"> Structural aircraft drill for manual or CNC applications Sub-micron grade carbide substrate for wear resistance High shear Ideal for composites 												
STEEL		STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL		
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
							●	●				

● Best ○ Good

Series 4205 **DGR | 1FL | 4" & 6" OAL**

Size	Diameter(D ₁) Dec.	OAL(L)	Shank(D)	EDP
3/32	0.0938	4	3/32	420502
3/32	0.0938	6	3/32	420501
#40	0.0980	4	#40	420504
#40	0.0980	6	#40	420503
1/8	0.1250	4	1/8	420506
1/8	0.1250	6	1/8	420505
#30	0.1285	4	#30	420508
#30	0.1285	6	#30	420507
#28	0.1405	4	#28	420510
#28	0.1405	6	#28	420509
#27	0.1440	4	#27	420512
#27	0.1440	6	#27	420511
#26	0.1470	4	#26	420514
#26	0.1470	6	#26	420513
5/32	0.1562	4	5/32	420516
5/32	0.1562	6	5/32	420515
#21	0.1590	4	#21	420518
#21	0.1590	6	#21	420517
#20	0.1610	4	#20	420520
#20	0.1610	6	#20	420519
3/16	0.1875	4	3/16	420522
3/16	0.1875	6	3/16	420521
#11	0.1910	4	#11	420524
#11	0.1910	6	#11	420523
#10	0.1935	4	#10	420526
#10	0.1935	6	#10	420525
#9	0.1960	4	#9	420528
#9	0.1960	6	#9	420527
#8	0.1990	4	#8	420530
#8	0.1990	6	#8	420529
1/4	0.2500	4	1/4	420532
1/4	0.2500	6	1/4	420531
5/16	0.3125	4	5/16	420534
5/16	0.3125	6	5/16	420533
3/8	0.3750	4	3/8	420536
3/8	0.3750	6	3/8	420535

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Solid Carbide Dagger Drills For Aircraft



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Dagger Drill</p> <ul style="list-style-type: none"> Structural aircraft drill Sub-micron grade carbide substrate for wear resistance High shear Threaded Shank Ideal for composites For manual or pneumatic drilling operations Adapter = 1/4-28 HSS 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
							●	●				

● Best ○ Good

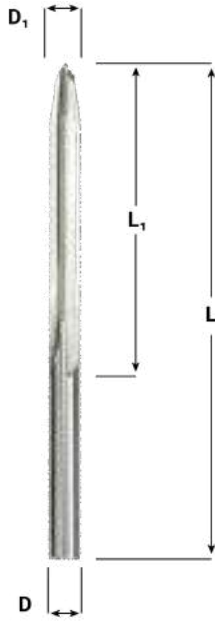
Series 4206 DGRT | 1FL | 1.5" & 2.5" OAL | Threaded Shank

Diameter(D ₁)		OAL(L)	Shank(D)	EDP
Size	Dec.			
3/32	0.0938	1-1/2	3/32	420602
3/32	0.0938	2-1/2	3/32	420601
#40	0.0980	1-1/2	0.098	420604
#40	0.0980	2-1/2	0.098	420603
1/8	0.1250	1-1/2	1/8	420606
1/8	0.1250	2-1/2	1/8	420605
#30	0.1285	1-1/2	0.1285	420608
#30	0.1285	2-1/2	0.1285	420607
#28	0.1405	1-1/2	9/64	420610
#28	0.1405	2-1/2	9/64	420609
#27	0.1440	1-1/2	0.144	420612
#27	0.1440	2-1/2	0.144	420611
#26	0.1470	1-1/2	0.147	420614
#26	0.1470	2-1/2	0.147	420613
5/32	0.1562	1-1/2	5/32	420616
5/32	0.1562	2-1/2	5/32	420615
#21	0.1590	1-1/2	0.159	420617
#21	0.1590	2-1/2	0.159	420618
#20	0.1610	1-1/2	0.161	420619
#20	0.1610	2-1/2	0.161	420620
3/16	0.1875	1-1/2	3/16	420621
3/16	0.1875	2-1/2	3/16	420622
#11	0.1910	1-1/2	0.191	420623
#11	0.1910	2-1/2	0.191	420624
#10	0.1935	1-1/2	0.1935	420625
#10	0.1935	2-1/2	0.1935	420626
#9	0.1960	1-1/2	0.196	420627
#9	0.1960	2-1/2	0.196	420628
#8	0.1990	1-1/2	0.199	420629
#8	0.1990	2-1/2	0.199	420630
1/4	0.2500	1-1/2	1/4	420631
1/4	0.2500	2-1/2	1/4	420632
5/16	0.3125	1-1/2	5/16	420633
5/16	0.3125	2-1/2	5/16	420634
3/8	0.3750	1-1/2	3/8	420635
3/8	0.3750	2-1/2	3/8	420636

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide Drill/Reamers For Aircraft



FEATURES/DESCRIPTION		APPLICATION	FEATURES																																							
<p>Dreamer Drills</p> <ul style="list-style-type: none"> Structural aircraft Dreamer drill for manual or CNC applications Sub-micron grade carbide substrate for wear resistance Drill and Reamer In-One Ideal for composites and Aluminum 																																										
<table border="1"> <thead> <tr> <th colspan="3">STEEL</th> <th colspan="2">STAINLESS</th> <th colspan="2">CAST IRON</th> <th colspan="2">NON-FERROUS</th> <th colspan="2">HSSA</th> <th colspan="2">HARDENED STEEL</th> </tr> <tr> <th>P1</th> <th>P2</th> <th>P3</th> <th>M1</th> <th>M2</th> <th>K1</th> <th>K2</th> <th>N1</th> <th>N2</th> <th>S1</th> <th>S2</th> <th>H1</th> <th>H2</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>●</td> <td>●</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL		P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2								●	●						
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL																															
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																														
							●	●																																		

● Best ○ Good

Series 4207 | DRM | 4FL | 4" & 6" OAL

Size	Diameter(D ₁) Dec.	Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
3/32	0.0938	1	4	3/32	420702
3/32	0.0938	1	6	3/32	420701
#40	0.0980	1	4	0.098	420704
#40	0.0980	1	6	0.098	420703
1/8	0.1250	1-1/2	4	1/8	420706
1/8	0.1250	1-1/2	6	1/8	420705
#30	0.1285	1-1/2	4	0.1285	420708
#30	0.1285	1-1/2	6	0.1285	420707
5/32	0.1562	1-1/2	4	5/32	420710
5/32	0.1562	1-1/2	6	5/32	420709
#21	0.1590	1-1/2	4	0.1590	420712
#21	0.1590	1-1/2	6	0.1590	420711
#20	0.1610	1-1/2	4	0.1610	420714
#20	0.1610	1-1/2	6	0.1610	420713
3/16	0.1875	1-1/2	4	3/16	420716
3/16	0.1875	1-1/2	6	3/16	420715
#11	0.1910	1-1/2	4	0.1910	420718
#11	0.1910	1-1/2	6	0.1910	420717
#10	0.1935	1-1/2	4	0.1935	420720
#10	0.1935	1-1/2	6	0.1935	420719
#9	0.1960	1-1/2	4	0.1960	420722
#9	0.1960	1-1/2	6	0.1960	420721
#8	0.1990	1-1/2	4	0.1990	420724
#8	0.1990	1-1/2	6	0.1990	420723
1/4	0.2500	1-1/2	4	1/4	420726
1/4	0.2500	1-1/2	6	1/4	420725
5/16	0.3125	1-1/2	4	5/16	420728
5/16	0.3125	1-1/2	6	5/16	420727
3/8	0.3750	1-1/2	4	3/8	420730
3/8	0.3750	1-1/2	6	3/8	420729

*bold numbers are EDPs for ordering

INTRO

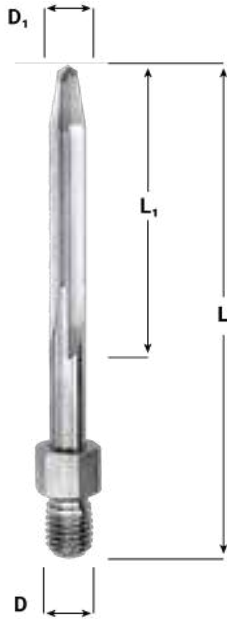
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Dreamer Drills</p> <ul style="list-style-type: none"> Structural aircraft Dreamer drill Sub-micron grade carbide substrate for wear resistance Drill and Reamer In-One Threaded Shank Ideal for composites and Aluminum For manual or pneumatic drilling operations Adapter = 1/4-28 HSS 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
							●	●				

● Best ○ Good

Series 4208 DRMT | 4FL | 1.5" & 2.5" OAL | Threaded Shank

Diameter(D ₁) Size	Dec.	Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
3/32	0.0938	1	1-1/2	3/32	420802
3/32	0.0938	1	2-1/2	3/32	420801
#40	0.0980	1	1-1/2	0.0980	420804
#40	0.0980	1	2-1/2	0.0980	420803
1/8	0.1250	1	1-1/2	1/8	420806
1/8	0.1250	1-1/2	2-1/2	1/8	420805
#30	0.1285	1	1-1/2	0.1285	420808
#30	0.1285	1-1/2	2-1/2	0.1285	420807
5/32	0.1562	1	1-1/2	5/32	420810
5/32	0.1562	1-1/2	2-1/2	5/32	420809
#21	0.1590	1	1-1/2	0.1590	420812
#21	0.1590	1-1/2	2-1/2	0.1590	420811
#20	0.1610	1	1-1/2	0.1610	420814
#20	0.1610	1-1/2	2-1/2	0.1610	420813
3/16	0.1875	1	1-1/2	3/16	420816
3/16	0.1875	1-1/2	2-1/2	3/16	420815
#11	0.1910	1	1-1/2	0.1910	420818
#11	0.1910	1-1/2	2-1/2	0.1910	420817
#10	0.1935	1	1-1/2	0.1935	420820
#10	0.1935	1-1/2	2-1/2	0.1935	420819
#9	0.1960	1	1-1/2	0.1960	420822
#9	0.1960	1-1/2	2-1/2	0.1960	420821
#8	0.1990	1	1-1/2	0.1990	420824
#8	0.1990	1-1/2	2-1/2	0.1990	420823
1/4	0.2500	1	1-1/2	1/4	420826
1/4	0.2500	1-1/2	2-1/2	1/4	420825
5/16	0.3125	1	1-1/2	5/16	420828
5/16	0.3125	1-1/2	2-1/2	5/16	420827
3/8	0.3750	1	1-1/2	3/8	420830
3/8	0.3750	1-1/2	2-1/2	3/8	420829

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide Countersinks For Aircraft



INTRO

MILLING

SPECIALTY



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Piloted Countersink</p> <ul style="list-style-type: none"> Brazed Sub-micron grade carbide substrate for wear resistance Piloted Countersink Threaded Shank Ideal for composites and Aluminum For manual or pneumatic drilling operations Adapter = 1/4-28 HSS 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
							●	●				

● Best ○ Good

Series 4215 CS | Threaded Shank | Piloted

Body(D)	Pilot(D)	EDP	Body(D)	Pilot(D)	EDP
82°			100°		
3/8	3/32	421501	3/8	3/16	421535
3/8	1/8	421502	3/8	#11	421536
3/8	5/32	421503	3/8	#10	421537
3/8	3/16	421504	7/16	3/32	421538
7/16	3/32	421505	7/16	1/8	421539
7/16	1/8	421506	7/16	5/32	421540
7/16	5/32	421507	7/16	3/16	421541
7/16	3/16	421508	1/2	3/32	421542
7/16	3/32	421509	1/2	#40	421543
1/2	1/8	421510	1/2	1/8	421544
1/2	5/32	421511	1/2	#30	421545
1/2	3/16	421512	1/2	5/32	421546
5/8	3/32	421513	1/2	#21	421547
5/8	1/8	421514	1/2	#20	421548
5/8	5/32	421515	1/2	3/16	421549
5/8	3/16	421516	1/2	#11	421550
5/8	1/4	421517	1/2	#10	421551
90°			130°		
3/8	3/32	421518	3/8	3/32	421557
3/8	1/8	421519	3/8	#40	421558
3/8	5/32	421520	3/8	1/8	421559
3/8	3/16	421521	3/8	#30	421560
7/16	3/32	421522	3/8	5/32	421561
7/16	1/8	421523	3/8	#21	421562
7/16	5/32	421524	3/8	#20	421563
7/16	3/16	421525	3/8	3/16	421564
1/2	3/32	421526	3/8	#11	421565
1/2	1/8	421527	3/8	#10	421566
1/2	5/32	421528			
1/2	3/16	421529			
5/8	3/32	421530			
5/8	1/8	421531			
5/8	5/32	421532			
5/8	3/16	421533			
5/8	1/4	421534			

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Brazed Carbide Rivet Shavers For Aircraft



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Rivet Shaver</p> <ul style="list-style-type: none"> Brazed Sub-micron grade carbide substrate for wear resistance Ideal for composites and Aluminum For manual or pneumatic drilling operations 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
							●	●				

● Best ○ Good

Series 4218 HT | Threaded Shank | Brazed Carbide

Body(D ₁)	Thread	EDP
5/16	1/4-28	421801
3/8	1/4-28	421802
7/16	1/4-28	421803
1/2	1/4-28	421804
9/16	1/4-28	421805
5/8	1/4-28	421806
3/4	1/4-28	421807
7/8	1/4-28	421808
1	1/4-28	421809

*bold numbers are EDPs for ordering

Popular Custom Holemaking Options

- Material-specific point geometry
- Longer flute lengths
- Internal coolant supply
- Proprietary GWS tool coatings

CUSTOM COMES STANDARD

GENERAL PURPOSE

High Speed Steel Reverse Spot Facers For Aircraft



INTRO
 MILLING
 SPECIALTY
 HOLEMAKING
 THREADING
 INSERTS



FEATURES/DESCRIPTION		APPLICATION	FEATURES
Reverse Spot Facers <ul style="list-style-type: none"> HSS Spot Facer HSS Pilot Structural aerospace components and rivets 			

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
							●	●				

● Best ○ Good

Series 4219 **RSF | HSS Body | HSS Pilots**

Diameter(D ₁)	Radius(R)	Pilot(D)	EDP
1/4	0.030	3/32	421901
1/4	0.030	1/8	421902
5/16	0.030	3/32	421903
5/16	0.030	1/8	421904
3/8	0.030	5/32	421905
3/8	0.030	1/8	421906
3/8	0.030	3/16	421907
7/16	0.030	1/8	421908
7/16	0.030	5/32	421909
7/16	0.030	3/16	421910
1/2	0.030	3/16	421911
1/2	0.030	1/4	421912
9/16	0.030	3/16	421913
9/16	0.030	1/4	421914
5/8	0.030	3/16	421915
5/8	0.030	1/4	421916
5/8	0.030	5/16	421917
11/16	0.030	1/4	421918
11/16	0.030	5/16	421919
3/4	0.030	1/4	421920
3/4	0.030	5/16	421921
3/4	0.030	3/8	421922
7/8	0.030	5/16	421923
7/8	0.030	3/8	421924
1	0.030	5/16	421925
1	0.030	3/8	421926
1	0.030	1/2	421927
1-1/4	0.030	3/8	421928
1-1/4	0.030	1/2	421929

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide Reverse Spot Facers For Aircraft



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION		APPLICATION	FEATURES																																							
Reverse Spot Facers <ul style="list-style-type: none"> Solid carbide spot facer HSS Pilot Structural aerospace components and rivets 																																										
<table border="1"> <thead> <tr> <th colspan="3">STEEL</th> <th colspan="2">STAINLESS</th> <th colspan="2">CAST IRON</th> <th colspan="2">NON-FERROUS</th> <th colspan="2">HSSA</th> <th colspan="2">HARDENED STEEL</th> </tr> <tr> <th>P1</th> <th>P2</th> <th>P3</th> <th>M1</th> <th>M2</th> <th>K1</th> <th>K2</th> <th>N1</th> <th>N2</th> <th>S1</th> <th>S2</th> <th>H1</th> <th>H2</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>●</td> <td>●</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>				STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL		P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2								●	●				
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL																															
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																														
							●	●																																		

● Best ○ Good

Series 4220 **RSF-SC | Carbide Body | HSS Pilots**

Diameter(D ₁)	Radius(R)	Pilot(D)	EDP
1/4	0.030	3/32	422001
1/4	0.030	1/8	422002
5/16	0.030	3/32	422003
5/16	0.030	1/8	422004
3/8	0.030	5/32	422005
3/8	0.030	1/8	422006
3/8	0.030	3/16	422007
7/16	0.030	1/8	422008
7/16	0.030	5/32	422009
7/16	0.030	3/16	422010
1/2	0.030	3/16	422011
1/2	0.030	1/4	422012
9/16	0.030	3/16	422013
9/16	0.030	1/4	422014
5/8	0.030	3/16	422015
5/8	0.030	1/4	422016
5/8	0.030	3/16	422017
11/16	0.030	1/4	422018
11/16	0.030	5/16	422019
3/4	0.030	1/4	422020
3/4	0.030	5/16	422021
3/4	0.030	1/4	422022
7/8	0.030	5/16	422023
7/8	0.030	3/8	422024
1	0.030	5/16	422025
1	0.030	3/8	422026
1	0.030	1/2	422027
1-1/4	0.030	3/8	422028
1-1/4	0.030	1/2	422029

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide N/C Spot Drills



INTRO

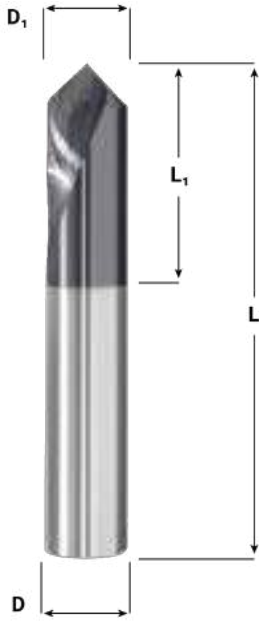
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Spot Drills</p> <ul style="list-style-type: none"> Sub-micrograin carbide substrate for wear resistance Used for spotting holes to ensure positionality 		<div style="display: flex; flex-wrap: wrap; gap: 5px;"> <div style="border: 1px solid black; padding: 2px;">CARBIDE</div> <div style="border: 1px solid black; padding: 2px;">0°</div> <div style="border: 1px solid black; padding: 2px;">2FL</div> <div style="border: 1px solid black; padding: 2px;">P373</div> <div style="border: 1px solid black; padding: 2px;">Bright</div> <div style="border: 1px solid black; padding: 2px;">AlTiN</div> </div>

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	○			●	●	○	○				

● Best ○ Good

Series 402 | 2FL | 82°, 90°, 100°, 120°, 140° | Spotting

Diameter(D ₁)	Flute Length(L ₁)	OAL(L)	Shank(D)	Incl. Angle	Bright	AlTiN
1/8	5/8	2	1/8	90°	402-125090	402-125090B
1/8	5/8	2	1/8	120°	402-125120	402-125120B
1/8	5/8	2	1/8	140°	402-125140	402-125140B
3/16	3/4	2	3/16	90°	402-187090	402-187090B
3/16	3/4	2	3/16	120°	402-187120	402-187120B
3/16	3/4	2	3/16	140°	402-187140	402-187140B
1/4	3/4	2-1/2	1/4	82°	402-250082	402-250082B
1/4	3/4	2-1/2	1/4	90°	402-250090	402-250090B
1/4	3/4	2-1/2	1/4	100°	402-250100	402-250100B
1/4	3/4	2-1/2	1/4	120°	402-250120	402-250120B
1/4	3/4	2-1/2	1/4	140°	402-250140	402-250140B
5/16	1	2-1/2	5/16	90°	402-312090	402-312090B
5/16	1	2-1/2	5/16	120°	402-312120	402-312120B
5/16	1	2-1/2	5/16	140°	402-312140	402-312140B
3/8	1	2-1/2	3/8	82°	402-375082	402-375082B
3/8	1	2-1/2	3/8	90°	402-375090	402-375090B
3/8	1	2-1/2	3/8	100°	402-375100	402-375100B
3/8	1	2-1/2	3/8	120°	402-375120	402-375120B
3/8	1	2-1/2	3/8	140°	402-375140	402-375140B
1/2	1-1/4	3	1/2	82°	402-500082	402-500082B
1/2	1-1/4	3	1/2	90°	402-500090	402-500090B
1/2	1-1/4	3	1/2	100°	402-500100	402-500100B
1/2	1-1/4	3	1/2	120°	402-500120	402-500120B
1/2	1-1/4	3	1/2	140°	402-500140	402-500140B

*bold numbers are EDPs for ordering



FEATURES/DESCRIPTION	APPLICATION	FEATURES																																							
Spade Drills <ul style="list-style-type: none"> Sub-micrograin carbide substrate for wear resistance Used for spotting or shallow hole drilling utmost strength Perfect for shallow drilling (less than 2xD) 																																									
<table border="1"> <thead> <tr> <th colspan="3">STEEL</th> <th colspan="2">STAINLESS</th> <th colspan="2">CAST IRON</th> <th colspan="2">NON-FERROUS</th> <th colspan="2">HSSA</th> <th colspan="2">HARDENED STEEL</th> </tr> <tr> <th>P1</th> <th>P2</th> <th>P3</th> <th>M1</th> <th>M2</th> <th>K1</th> <th>K2</th> <th>N1</th> <th>N2</th> <th>S1</th> <th>S2</th> <th>H1</th> <th>H2</th> </tr> </thead> <tbody> <tr> <td>●</td> <td>●</td> <td>○</td> <td></td> <td></td> <td>●</td> <td>●</td> <td>○</td> <td>○</td> <td></td> <td></td> <td>○</td> <td></td> </tr> </tbody> </table> <p style="text-align: right;">● Best ○ Good</p>			STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL		P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2	●	●	○			●	●	○	○			○	
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL																														
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																													
●	●	○			●	●	○	○			○																														

Series 400 **2FL | Spade**

Diameter(D ₁)	Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
1/32	3/16	1-1/2	1/32	400-001002
3/64	7/32	1-1/2	3/64	400-001005
1/16	5/16	1-1/2	1/16	400-001007
3/32	7/16	1-1/2	3/32	400-001010
7/64	7/16	1-1/2	7/64	400-001011
1/8	1/2	1-1/2	1/8	400-001020
9/64	1/2	2	9/64	400-001021
5/32	9/16	2	5/32	400-001030
11/64	9/16	2	11/64	400-001031
3/16	11/16	2	3/16	400-001040
7/32	19/32	2	7/32	400-001050
1/4	11/16	2	1/4	400-001060
9/32	7/8	2-1/2	9/32	400-001070
5/16	7/8	2-1/2	5/16	400-001080
11/32	15/16	2-1/2	11/32	400-001090
3/8	1-1/8	2-1/2	3/8	400-001100
13/32	1-1/8	2-3/4	13/32	400-001110
7/16	1-3/16	2-3/4	7/16	400-001120
15/32	1-3/16	3	15/32	400-001130
1/2	1-3/16	3	1/2	400-001140

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide Twist Drills



FEATURES/DESCRIPTION	APPLICATION	FEATURES																		
Twist Drills <ul style="list-style-type: none"> Sub-micrograin carbide substrate for wear resistance General purpose drilling operations 4-facet 118° split point 																				
<table border="1"> <thead> <tr> <th>STEEL</th> <th>STAINLESS</th> <th>CAST IRON</th> <th>NON-FERROUS</th> <th>HRSA</th> <th>HARDENED STEEL</th> </tr> </thead> <tbody> <tr> <td>P1 ●</td> <td>P2 ● P3 ○</td> <td>M1 M2</td> <td>K1 ● K2 ●</td> <td>N1 ○ N2 ○</td> <td>S1 S2</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td>H1 ○ H2 ○</td> </tr> </tbody> </table>	STEEL	STAINLESS	CAST IRON	NON-FERROUS	HRSA	HARDENED STEEL	P1 ●	P2 ● P3 ○	M1 M2	K1 ● K2 ●	N1 ○ N2 ○	S1 S2						H1 ○ H2 ○		
STEEL	STAINLESS	CAST IRON	NON-FERROUS	HRSA	HARDENED STEEL															
P1 ●	P2 ● P3 ○	M1 M2	K1 ● K2 ●	N1 ○ N2 ○	S1 S2															
					H1 ○ H2 ○															

● Best ○ Good

Series 450 | 2FL | Jobber Length | Twist

Diameter(D ₁) Size Dec.	Flute Length(L ₁)	OAL(L)	Bright	TiN	AITiN	
#80	0.0135	3/16	1-1/4	450-300135	450-300135A	450-300135B
#79	0.0145	3/16	1-1/4	450-300145	450-300145A	450-300145B
1/64	0.0156	3/16	1-1/4	450-100156	450-100156A	450-100156B
#78	0.0160	3/16	1-1/4	450-300160	450-300160A	450-300160B
#77	0.0180	3/16	1-1/4	450-300180	450-300180A	450-300180B
#76	0.0200	1/4	1-1/4	450-300200	450-300200A	450-300200B
#75	0.0210	1/4	1-1/4	450-300210	450-300210A	450-300210B
#74	0.0225	1/4	1-1/4	450-300225	450-300225A	450-300225B
#73	0.0240	1/4	1-1/4	450-300240	450-300240A	450-300240B
#72	0.0250	5/16	1-1/4	450-300250	450-300250A	450-300250B
#71	0.0260	5/16	1-1/4	450-300260	450-300260A	450-300260B
#70	0.0280	5/16	1-1/4	450-300280	450-300280A	450-300280B
#69	0.0292	5/16	1-1/4	450-300292	450-300292A	450-300292B
#68	0.0310	5/16	1-1/4	450-300310	450-300310A	450-300310B
1/32	0.0313	5/16	1-1/4	450-100312	450-100312A	450-100312B
#67	0.0320	5/16	1-1/4	450-300320	450-300320A	450-300320B
#66	0.0330	5/16	1-1/4	450-300330	450-300330A	450-300330B
#65	0.0350	5/8	1-3/8	450-300350	450-300350A	450-300350B
#64	0.0360	5/8	1-3/8	450-300360	450-300360A	450-300360B
#63	0.0370	5/8	1-3/8	450-300370	450-300370A	450-300370B
#62	0.0380	5/8	1-3/8	450-300380	450-300380A	450-300380B
#61	0.0390	5/8	1-3/8	450-300390	450-300390A	450-300390B
1mm	0.0394	16mm	38mm	450-400394	450-400394A	450-400394B
#60	0.0400	3/4	1-1/2	450-300400	450-300400A	450-300400B
#59	0.0410	3/4	1-1/2	450-300410	450-300410A	450-300410B
#58	0.0420	3/4	1-1/2	450-300420	450-300420A	450-300420B
#57	0.0430	3/4	1-1/2	450-300430	450-300430A	450-300430B
#56	0.0465	3/4	1-1/2	450-300465	450-300465A	450-300465B
3/64	0.0469	3/4	1-1/2	450-100469	450-100469A	450-100469B
#55	0.0520	3/4	1-1/2	450-300520	450-300520A	450-300520B
#54	0.0550	3/4	1-1/2	450-300550	450-300550A	450-300550B
1.5mm	0.0591	19mm	38mm	450-400591	450-400591A	450-400591B
#53	0.0595	3/4	1-1/2	450-300595	450-300595A	450-300595B
1/16	0.0625	3/4	1-1/2	450-100625	450-100625A	450-100625B
#52	0.0635	3/4	1-1/2	450-300635	450-300635A	450-300635B
#51	0.0670	3/4	1-1/2	450-300670	450-300670A	450-300670B
#50	0.0700	7/8	1-3/4	450-300700	450-300700A	450-300700B
#49	0.0730	7/8	1-3/4	450-300730	450-300730A	450-300730B
#48	0.0760	7/8	1-3/4	450-300760	450-300760A	450-300760B
5/64	0.0781	7/8	1-3/4	450-100781	450-100781A	450-100781B
#47	0.0785	7/8	1-3/4	450-300785	450-300785A	450-300785B
2mm	0.0787	22mm	45mm	450-400787	450-400787A	450-400787B
#46	0.0810	7/8	1-3/4	450-300810	450-300810A	450-300810B
#45	0.0820	7/8	1-3/4	450-300820	450-300820A	450-300820B
#44	0.0860	1	2	450-300860	450-300860A	450-300860B

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Solid Carbide Twist Drills



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Series 450		2FL | Jobber Length | Twist				
Diameter(D ₁)	Flute Length(L ₁)	OAL(L)	Bright	TiN	AITiN	
Size	Dec.					
#43	0.0890	1	2	450-300890	450-300890A	450-300890B
#42	0.0935	1	2	450-300935	450-300935A	450-300935B
3/32	0.0938	1	2	450-100938	450-100938A	450-100938B
#41	0.0960	1	2	450-300960	450-300960A	450-300960B
#40	0.0980	1	2	450-300980	450-300980A	450-300980B
2.5mm	0.0984	25mm	51mm	450-400984	450-400984A	450-400984B
#39	0.0995	1-1/4	2-1/4	450-300995	450-300995A	450-300995B
#38	0.1015	1-1/4	2-1/4	450-301015	450-301015A	450-301015B
#37	0.1040	1-1/4	2-1/4	450-301040	450-301040A	450-301040B
#36	0.1065	1-1/4	2-1/4	450-301065	450-301065A	450-301065B
7/64	0.1094	1-1/4	2-1/4	450-101094	450-101094A	450-101094B
#35	0.1100	1-1/4	2-1/4	450-301100	450-301100A	450-301100B
#34	0.1110	1-1/4	2-1/4	450-301110	450-301110A	450-301110B
#33	0.1130	1-1/4	2-1/4	450-301130	450-301130A	450-301130B
#32	0.1160	1-1/4	2-1/4	450-301160	450-301160A	450-301160B
3mm	0.1181	32mm	57mm	450-401181	450-401181A	450-401181B
#31	0.1200	1-1/4	2-1/4	450-301200	450-301200A	450-301200B
1/8	0.1250	1-1/4	2-1/4	450-101250	450-101250A	450-101250B
#30	0.1285	1-1/4	2-1/4	450-301285	450-301285A	450-301285B
#29	0.1360	1-3/8	2-1/2	450-301360	450-301360A	450-301360B
3.5mm	0.1378	35mm	64mm	450-401378	450-401378A	450-401378B
#28	0.1405	1-3/8	2-1/2	450-301405	450-301405A	450-301405B
9/64	0.1406	1-3/8	2-1/2	450-101406	450-101406A	450-101406B
#27	0.1440	1-3/8	2-1/2	450-301440	450-301440A	450-301440B
#26	0.1470	1-3/8	2-1/2	450-301470	450-301470A	450-301470B
#25	0.1495	1-3/8	2-1/2	450-301495	450-301495A	450-301495B
#24	0.1520	1-3/8	2-1/2	450-301520	450-301520A	450-301520B
#23	0.1540	1-3/8	2-1/2	450-301540	450-301540A	450-301540B
5/32	0.1563	1-3/8	2-1/2	450-101562	450-101562A	450-101562B
#22	0.1570	1-3/8	2-1/2	450-301570	450-301570A	450-301570B
4mm	0.1575	35mm	64mm	450-401575	450-401575A	450-401575B
#21	0.1590	1-3/8	2-1/2	450-301590	450-301590A	450-301590B
#20	0.1610	1-3/8	2-1/2	450-301610	450-301610A	450-301610B
#19	0.1660	1-5/8	2-3/4	450-301660	450-301660A	450-301660B
#18	0.1695	1-5/8	2-3/4	450-301695	450-301695A	450-301695B
11/64	0.1719	1-5/8	2-3/4	450-101719	450-101719A	450-101719B
#17	0.1730	1-5/8	2-3/4	450-301730	450-301730A	450-301730B
#16	0.1770	1-5/8	2-3/4	450-301770	450-301770A	450-301770B
4.5mm	0.1772	41mm	70mm	450-401772	450-401772A	450-401772B
#15	0.1800	1-5/8	2-3/4	450-301800	450-301800A	450-301800B
#14	0.1820	1-5/8	2-3/4	450-301820	450-301820A	450-301820B
#13	0.1850	1-5/8	2-3/4	450-301850	450-301850A	450-301850B
3/16	0.1875	1-5/8	2-3/4	450-101875	450-101875A	450-101875B
#12	0.1890	1-5/8	2-3/4	450-301890	450-301890A	450-301890B
#11	0.1910	1-5/8	2-3/4	450-301910	450-301910A	450-301910B
#10	0.1935	1-5/8	2-3/4	450-301935	450-301935A	450-301935B
#9	0.1960	1-3/4	3	450-301960	450-301960A	450-301960B
5mm	0.1969	45mm	76mm	450-401969	450-401969A	450-401969B
#8	0.1990	1-3/4	3	450-301990	450-301990A	450-301990B
#7	0.2010	1-3/4	3	450-302010	450-302010A	450-302010B
13/64	0.2031	1-3/4	3	450-102031	450-102031A	450-102031B
#6	0.2040	1-3/4	3	450-302040	450-302040A	450-302040B
#5	0.2055	1-3/4	3	450-302055	450-302055A	450-302055B
#4	0.2090	1-3/4	3	450-302090	450-302090A	450-302090B
#3	0.2130	1-3/4	3	450-302130	450-302130A	450-302130B
5.5mm	0.2165	45mm	76mm	450-402165	450-402165A	450-402165B
7/32	0.2188	1-3/4	3	450-102188	450-102188A	450-102188B
#2	0.2210	1-3/4	3	450-302210	450-302210A	450-302210B
#1	0.2280	1-3/4	3	450-302280	450-302280A	450-302280B
A	0.2340	2	3-1/4	450-202340	450-202340A	450-202340B
15/64	0.2344	2	3-1/4	450-102344	450-102344A	450-102344B
6mm	0.2362	51mm	83mm	450-402362	450-402362A	450-402362B
B	0.2380	2	3-1/4	450-202380	450-202380A	450-202380B
C	0.2420	2	3-1/4	450-202420	450-202420A	450-202420B
D	0.2460	2	3-1/4	450-202460	450-202460A	450-202460B
1/4	0.2500	2	3-1/4	450-102500	450-102500A	450-102500B
E	0.2500	2	3-1/4	450-202500	450-202500A	450-202500B
6.5mm	0.2559	51mm	83mm	450-402559	450-402559A	450-402559B
F	0.2570	2	3-1/4	450-202570	450-202570A	450-202570B
G	0.2610	2-1/8	3-1/2	450-202610	450-202610A	450-202610B
17/64	0.2656	2-1/8	3-1/2	450-102656	450-102656A	450-102656B
H	0.2660	2-1/8	3-1/2	450-202660	450-202660A	450-202660B

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide Twist Drills



Series 450

2FL | Jobber Length | Twist

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Bright	TiN	AlTiN
Size	Dec.					
I	0.2720	2-1/8	3-1/2	450-202720	450-202720A	450-202720B
7mm	0.2756	54mm	89mm	450-402756	450-402756A	450-402756B
J	0.2770	2-1/8	3-1/2	450-202770	450-202770A	450-202770B
K	0.2810	2-1/8	3-1/2	450-202810	450-202810A	450-202810B
9/32	0.2813	2-1/8	3-1/2	450-102812	450-102812A	450-102812B
L	0.2900	2-1/8	3-1/2	450-202900	450-202900A	450-202900B
M	0.2950	2-3/8	3-3/4	450-202950	450-202950A	450-202950B
7.5mm	0.2953	60mm	95mm	450-402953	450-402953A	450-402953B
19/64	0.2969	2-3/8	3-3/4	450-102969	450-102969A	450-102969B
N	0.3020	2-3/8	3-3/4	450-203020	450-203020A	450-203020B
5/16	0.3125	2-3/8	3-3/4	450-103125	450-103125A	450-103125B
8mm	0.3150	60mm	95mm	450-403150	450-403150A	450-403150B
O	0.3160	2-3/8	3-3/4	450-203160	450-203160A	450-203160B
P	0.3230	2-3/8	3-3/4	450-203230	450-203230A	450-203230B
21/64	0.3281	2-1/2	4	450-103281	450-103281A	450-103281B
Q	0.3320	2-1/2	4	450-203320	450-203320A	450-203320B
8.5mm	0.3346	64mm	102mm	450-403346	450-403346A	450-403346B
R	0.3390	2-1/2	4	450-203390	450-203390A	450-203390B
11/32	0.3438	2-1/2	4	450-103438	450-103438A	450-103438B
S	0.3480	2-1/2	4	450-203480	450-203480A	450-203480B
9mm	0.3543	64mm	102mm	450-403543	450-403543A	450-403543B
T	0.3580	2-3/4	4-1/4	450-203580	450-203580A	450-203580B
23/64	0.3594	2-3/4	4-1/4	450-103594	450-103594A	450-103594B
U	0.3680	2-3/4	4-1/4	450-203680	450-203680A	450-203680B
9.5mm	0.3740	70mm	108mm	450-403740	450-403740A	450-403740B
3/8	0.3750	2-3/4	4-1/4	450-103750	450-103750A	450-103750B
V	0.3770	2-3/4	4-1/4	450-203770	450-203770A	450-203770B
W	0.3860	2-7/8	4-1/2	450-203860	450-203860A	450-203860B
25/64	0.3906	2-7/8	4-1/2	450-103906	450-103906A	450-103906B
1mm	0.3937	73mm	114mm	450-403937	450-403937A	450-403937B
X	0.3970	2-7/8	4-1/2	450-203970	450-203970A	450-203970B
Y	0.4040	2-7/8	4-1/2	450-204040	450-204040A	450-204040B
13/32	0.4063	2-7/8	4-1/2	450-104062	450-104062A	450-104062B
Z	0.4130	2-7/8	4-1/2	450-204130	450-204130A	450-204130B
10.5mm	0.4134	73mm	114mm	450-404134	450-404134A	450-404134B
27/64	0.4219	2-7/8	4-1/2	450-104219	450-104219A	450-104219B
11mm	0.4331	73mm	114mm	450-404331	450-404331A	450-404331B
7/16	0.4375	2-7/8	4-1/2	450-104375	450-104375A	450-104375B
11.5mm	0.4528	76mm	121mm	450-404528	450-404528A	450-404528B
29/64	0.4531	3	4-3/4	450-104531	450-104531A	450-104531B
15/32	0.4688	3	4-3/4	450-104688	450-104688A	450-104688B
12mm	0.4724	76mm	121mm	450-404724	450-404724A	450-404724B
31/64	0.4844	3	4-3/4	450-104844	450-104844A	450-104844B
12.5mm	0.4921	76mm	121mm	450-404921	450-404921A	450-404921B
1/2	0.5000	3	4-3/4	450-105000	450-105000A	450-105000B

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Screw Machine Drills</p> <ul style="list-style-type: none"> Sub-micrograin carbide substrate for wear resistance General purpose drilling operations 4-facet split point 15° helix for increased rigidity in demanding jobs 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	○			●	●	○	○			○	

● Best ○ Good

Series 460 2FL | Screw Machine

Diameter(D ₁) Size	Dec.	Flute Length(L ₁)	OAL(L)	Shank(D)	Bright	TiN	AlTiN
1/32	0.0313	1/2	1-1/2	1/32	460-100312	-	460-100312B
1mm	0.0394	13mm	38mm	1mm	460-400394	-	460-400394B
#60	0.0400	1/2	1-1/2	0.0400	460-300400	-	460-300400B
#59	0.0410	1/2	1-1/2	0.0410	460-300410	-	460-300410B
#58	0.0420	1/2	1-1/2	0.0420	460-300420	-	460-300420B
#57	0.0430	1/2	1-1/2	0.0430	460-300430	-	460-300430B
#56	0.0465	1/2	1-1/2	3/64	460-300465	-	460-300465B
3/64	0.0469	1/2	1-1/2	3/64	460-100469	-	460-100469B
#55	0.0520	1/2	1-1/2	0.0520	460-300520	-	460-300520B
#54	0.0550	1/2	1-1/2	0.0550	460-300550	-	460-300550B
1.5mm	0.0591	13mm	38mm	1.5mm	460-400591	-	460-400591B
#53	0.0595	1/2	1-1/2	0.0595	460-300595	-	460-300595B
1/16	0.0625	5/8	1-5/8	1/16	460-100625	460-100625A	460-100625B
#52	0.0635	11/16	1-11/16	1/16	460-300635	-	460-300635B
#51	0.0670	11/16	1-11/16	0.0670	460-300670	-	460-300670B
#50	0.0700	11/16	1-11/16	0.0700	460-300700	-	460-300700B
#49	0.0730	11/16	1-11/16	0.0730	460-300730	-	460-300730B
#48	0.0760	11/16	1-11/16	0.0760	460-300760	-	460-300760B
5/64	0.0781	11/16	1-11/16	5/64	460-100781	460-100781A	460-100781B
#47	0.0785	3/4	1-3/4	5/64	460-300785	-	460-300785B
2mm	0.0787	19mm	45mm	2mm	460-400787	-	460-400787B
#46	0.0810	3/4	1-3/4	0.0810	460-300810	-	460-300810B
#45	0.0820	3/4	1-3/4	0.0820	460-300820	-	460-300820B
#44	0.0860	3/4	1-3/4	0.0860	460-300860	-	460-300860B
#43	0.0890	3/4	1-3/4	0.0890	460-300890	-	460-300890B
#42	0.0935	3/4	1-3/4	3/32	460-300935	-	460-300935B
3/32	0.0938	3/4	1-3/4	3/32	460-100938	460-100938A	460-100938B
#41	0.0960	13/16	1-13/16	0.0960	460-300960	-	460-300960B
#40	0.0980	13/16	1-13/16	0.0980	460-300980	-	460-300980B
2.5mm	0.0984	21mm	46mm	2.5mm	460-400984	-	460-400984B
#39	0.0995	13/16	1-13/16	0.0995	460-300995	-	460-300995B
#38	0.1015	13/16	1-13/16	0.1015	460-301015	-	460-301015B
#37	0.1040	13/16	1-13/16	0.1040	460-301040	-	460-301040B
#36	0.1065	13/16	1-13/16	0.1065	460-301065	-	460-301065B
7/64	0.1094	13/16	1-13/16	7/64	460-101094	460-101094A	460-101094B
#35	0.1100	7/8	1-7/8	7/64	460-301100	-	460-301100B
#34	0.1110	7/8	1-7/8	0.1110	460-301110	-	460-301110B
#33	0.1130	7/8	1-7/8	0.1130	460-301130	-	460-301130B
#32	0.1160	7/8	1-7/8	0.1160	460-301160	-	460-301160B
3mm	0.1181	22mm	48mm	3mm	460-401181	-	460-401181B
#31	0.1200	7/8	1-7/8	0.1200	460-301200	-	460-301200B
1/8	0.1250	7/8	1-7/8	1/8	460-101250	460-101250A	460-101250B
#30	0.1285	15/16	1-15/16	0.1285	460-301285	-	460-301285B
#29	0.1360	15/16	1-15/16	0.1360	460-301360	-	460-301360B
3.5mm	0.1378	24mm	49mm	3.5mm	460-401378	-	460-401378B

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide Screw Machine Drills



Series 460		2FL | Screw Machine					
Diameter(D ₁)	Flute Length(L ₁)	OAL(L)	Shank(D)	Bright	TiN	AITiN	
Size	Dec.						
#28	0.1405	15/16	1-15/16	9/64	460-301405	-	460-301405B
9/64	0.1406	15/16	1-15/16	9/64	460-101406	460-101406A	460-101406B
#27	0.1440	1	2-1/16	0.1440	460-301440	-	460-301440B
#26	0.1470	1	2-1/16	0.1470	460-301470	-	460-301470B
#25	0.1495	1	2-1/16	0.1495	460-301495	-	460-301495B
#24	0.1520	1	2-1/16	0.1520	460-301520	-	460-301520B
#23	0.1540	1	2-1/16	0.1540	460-301540	-	460-301540B
5/32	0.1563	1	2-1/16	5/32	460-101562	460-101562A	460-101562B
#22	0.1570	1-1/16	2-1/8	5/32	460-301570	-	460-301570B
4mm	0.1575	27mm	54mm	4mm	460-401575	-	460-401575B
#21	0.1590	1-1/16	2-1/8	0.1590	460-301590	-	460-301590B
#20	0.1610	1-1/16	2-1/8	0.1610	460-301610	-	460-301610B
#19	0.1660	1-1/16	2-1/8	0.1660	460-301660	-	460-301660B
#18	0.1695	1-1/16	2-1/8	0.1695	460-301695	-	460-301695B
11/64	0.1719	1-1/16	2-1/8	11/64	460-101719	460-101719A	460-101719B
#17	0.1730	1-1/8	2-3/16	11/64	460-301730	-	460-301730B
#16	0.1770	1-1/8	2-3/16	0.1770	460-301770	-	460-301770B
4.5mm	0.1772	29mm	56mm	4.5mm	460-401772	-	460-401772B
#15	0.1800	1-1/8	2-3/16	0.1800	460-301800	-	460-301800B
#14	0.1820	1-1/8	2-3/16	0.1820	460-301820	-	460-301820B
#13	0.1850	1-1/8	2-3/16	0.1850	460-301850	-	460-301850B
3/16	0.1875	1-1/8	2-3/16	3/16	460-101875	460-101875A	460-101875B
#12	0.1890	1-3/16	2-1/4	3/16	460-301890	-	460-301890B
#11	0.1910	1-3/16	2-1/4	0.1910	460-301910	-	460-301910B
#10	0.1935	1-3/16	2-1/4	0.1935	460-301935	-	460-301935B
#9	0.1960	1-3/16	2-1/4	0.1960	460-301960	-	460-301960B
5mm	0.1969	30mm	57mm	5mm	460-401969	-	460-401969B
#8	0.1990	1-3/16	2-1/4	0.1990	460-301990	-	460-301990B
#7	0.2010	1-3/16	2-1/4	0.2010	460-302010	-	460-302010B
13/64	0.2031	1-3/16	2-1/4	13/64	460-102031	460-102031A	460-102031B
#6	0.2040	1-1/4	2-3/8	13/64	460-302040	-	460-302040B
#5	0.2055	1-1/4	2-3/8	0.2055	460-302055	-	460-302055B
#4	0.2090	1-1/4	2-3/8	0.2090	460-302090	-	460-302090B
#3	0.2130	1-1/4	2-3/8	0.2130	460-302130	-	460-302130B
5.5mm	0.2165	32mm	60mm	5.5mm	460-402165	-	460-402165B
7/32	0.2188	1-1/4	2-3/8	7/32	460-102188	460-102188A	460-102188B
#2	0.2210	1-5/16	2-7/16	0.2210	460-302210	-	460-302210B
#1	0.2280	1-5/16	2-7/16	0.2280	460-302280	-	460-302280B
A	0.2340	1-5/16	2-7/16	15/64	460-202340	-	460-202340B
15/64	0.2344	1-5/16	2-7/16	15/64	460-102344	460-102344A	460-102344B
6mm	0.2362	33mm	62mm	6mm	460-402362	-	460-402362B
B	0.2380	1-3/8	2-1/2	0.2380	460-202380	-	460-202380B
C	0.2420	1-3/8	2-1/2	0.2420	460-202420	-	460-202420B
D	0.2460	1-3/8	2-1/2	0.2460	460-202460	-	460-202460B
1/4	0.2500	1-3/8	2-1/2	1/4	460-102500	460-102500A	460-102500B
E	0.2500	1-3/8	2-1/2	1/4	460-202500	-	460-202500B
6.5mm	0.2559	35mm	64mm	6.5mm	460-402559	-	460-402559B
F	0.2570	1-7/16	2-5/8	0.2570	460-202570	-	460-202570B
G	0.2610	1-7/16	2-5/8	0.2610	460-202610	-	460-202610B
17/64	0.2656	1-7/16	2-5/8	17/64	460-102656	460-102656A	460-102656B
H	0.2660	1-1/2	2-11/16	17/64	460-202660	-	460-202660B
I	0.2720	1-1/2	2-11/16	0.2720	460-202720	-	460-202720B
7mm	0.2756	38mm	68mm	7mm	460-402756	-	460-402756B
J	0.2770	1-1/2	2-11/16	0.2770	460-202770	-	460-202770B
K	0.2810	1-1/2	2-11/16	9/32	460-202810	-	460-202810B
9/32	0.2813	1-1/2	2-11/16	9/32	460-102812	460-102812A	460-102812B
L	0.2900	1-9/16	2-3/4	0.2900	460-202900	-	460-202900B
M	0.2950	1-9/16	2-3/4	0.2950	460-202950	-	460-202950B
7.5mm	0.2953	40mm	70mm	7.5mm	460-402953	-	460-402953B
19/64	0.2969	1-9/16	2-3/4	19/64	460-102969	460-102969A	460-102969B
N	0.3020	1-5/8	2-13/16	0.3020	460-203020	-	460-203020B
5/16	0.3125	1-5/8	2-13/16	5/16	460-103125	460-103125A	460-103125B
8mm	0.3150	41mm	72mm	8mm	460-403150	-	460-403150B
O	0.3160	1-11/16	2-15/16	0.3160	460-203160	-	460-203160B
P	0.3230	1-11/16	2-15/16	0.3230	460-203230	-	460-203230B
21/64	0.3281	1-11/16	2-15/16	21/64	460-103281	460-103281A	460-103281B
Q	0.3320	1-11/16	3	0.3320	460-203320	-	460-203320B
8.5mm	0.3346	43mm	76mm	8.5mm	460-403346	-	460-403346B
R	0.3390	1-11/16	3	0.3390	460-203390	-	460-203390B
11/32	0.3438	1-11/16	3	11/32	460-103438	460-103438A	460-103438B
S	0.3480	1-3/4	3-1/16	0.3480	460-203480	-	460-203480B
9mm	0.3543	45mm	78mm	9mm	460-403543	-	460-403543B
T	0.3580	1-3/4	3-1/16	23/64	460-203580	-	460-203580B
23/64	0.3594	1-3/4	3-1/16	23/64	460-103594	460-103594A	460-103594B
U	0.3680	1-13/16	3-1/8	0.3680	460-203680	-	460-203680B
9.5mm	0.3740	46mm	79mm	9.5mm	460-403740	-	460-403740B

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Series 460		2FL | Screw Machine					
Diameter(D ₁) Size	Dec.	Flute Length(L ₁)	OAL(L)	Shank(D)	Bright	TiN	AlTiN
3/8	0.3750	1-13/16	3-1/8	3/8	460-103750	460-103750A	460-103750B
V	0.3770	1-7/8	3-1/4	0.3770	460-203770	-	460-203770B
W	0.3860	1-7/8	3-1/4	0.3860	460-203860	-	460-203860B
25/64	0.3906	1-7/8	3-1/4	25/64	460-103906	460-103906A	460-103906B
1mm	0.3937	48mm	83mm	10mm	460-403937	-	460-403937B
X	0.3970	1-15/16	3-5/16	0.3970	460-203970	-	460-203970B
Y	0.4040	1-15/16	3-5/16	0.4040	460-204040	-	460-204040B
13/32	0.4063	1-15/16	3-5/16	13/32	460-104062	460-104062A	460-104062B
Z	0.4130	2	3-3/8	0.4130	460-204130	-	460-204130B
10.5mm	0.4134	51mm	86mm	10.5mm	460-404134	-	460-404134B
27/64	0.4219	2	3-3/8	27/64	460-104219	460-104219A	460-104219B
11mm	0.4331	51mm	86mm	11mm	460-404331	-	460-404331B
7/16	0.4375	2-1/16	3-7/16	7/16	460-104375	460-104375A	460-104375B
11.5mm	0.4528	52mm	88mm	11.5mm	460-404528	-	460-404528B
29/64	0.4531	2-1/8	3-9/16	29/64	460-104531	460-104531A	460-104531B
15/32	0.4688	2-1/8	3-5/8	15/32	460-104688	460-104688A	460-104688B
12mm	0.4724	54mm	92mm	12mm	460-404724	-	460-404724B
31/64	0.4844	2-3/16	3-11/16	31/64	460-104844	460-104844A	460-104844B
12.5mm	0.4921	56mm	94mm	12.5mm	460-404921	-	460-404921B
1/2	0.5000	2-1/4	3-3/4	1/2	460-105000	460-105000A	460-105000B
13mm	0.5118	2-3/8	3-7/8	13mm	460-405118	-	460-405118B
33/64	0.5156	2-3/8	3-7/8	33/64	460-105156	-	460-105156B
17/32	0.5313	2-3/8	3-7/8	17/32	460-105312	-	460-105312B
35/64	0.5469	2-1/2	4	35/64	460-105469	-	460-105469B
9/16	0.5625	2-1/2	4	9/16	460-105625	-	460-105625B
5/8	0.6250	2-3/4	4-1/4	5/8	460-106250	-	460-106250B
11/16	0.6875	3	4-5/8	11/16	460-106875	-	460-106875B
3/4	0.7500	3-1/8	5	3/4	460-107500	-	460-107500B

*bold numbers are EDPs for ordering

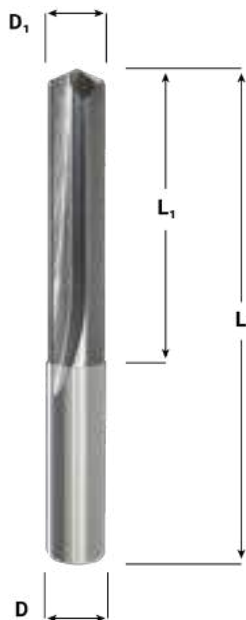
Popular Custom Holemaking Options

- Material-specific point geometry
- Longer flute lengths
- Internal coolant supply
- Proprietary GWS tool coatings

**CUSTOM
COMES
STANDARD**

GENERAL PURPOSE

Solid Carbide Straight Flute Drill



FEATURES/DESCRIPTION	APPLICATION	FEATURES																																							
<p>Straight Flute Drills</p> <ul style="list-style-type: none"> Sub-micrograin carbide substrate for wear resistance Capable of producing reamer type finishes in work hardened and abrasive materials Designed for: chrome alloys, heat alloys, nickel alloys, titanium alloys, steel and stainless steel weldments 140° split point 		<ul style="list-style-type: none"> CARBIDE 2FL 0° 140° P374 Bright AlTiN 																																							
<table border="1"> <thead> <tr> <th colspan="3">STEEL</th> <th colspan="2">STAINLESS</th> <th colspan="2">CAST IRON</th> <th colspan="2">NON-FERROUS</th> <th colspan="2">HRSA</th> <th colspan="2">HARDENED STEEL</th> </tr> <tr> <th>P1</th> <th>P2</th> <th>P3</th> <th>M1</th> <th>M2</th> <th>K1</th> <th>K2</th> <th>N1</th> <th>N2</th> <th>S1</th> <th>S2</th> <th>H1</th> <th>H2</th> </tr> </thead> <tbody> <tr> <td>●</td> <td>●</td> <td>○</td> <td></td> <td></td> <td>●</td> <td>●</td> <td>○</td> <td>○</td> <td></td> <td></td> <td>○</td> <td></td> </tr> </tbody> </table>			STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL		P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2	●	●	○			●	●	○	○			○	
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL																														
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																													
●	●	○			●	●	○	○			○																														

● Best ○ Good

Series 470 2FL | Straight Flute

Diameter(D ₁) Size Dec.	Flute Length(L ₁)	OAL(L)	Shank(D)	Bright	AlTiN	
1/32	0.0313	1/2	1-1/2	1/32	470-100312	470-100312B
#65	0.0350	1/2	1-1/2	0.0350	470-300350	470-300350B
#64	0.0360	1/2	1-1/2	0.0360	470-300360	470-300360B
#63	0.0370	1/2	1-1/2	0.0370	470-300370	470-300370B
#62	0.0380	1/2	1-1/2	0.0380	470-300380	470-300380B
#61	0.0390	1/2	1-1/2	0.0390	470-300390	470-300390B
1mm	0.0394	13mm	38mm	1mm	470-400394	470-400394B
#60	0.0400	1/2	1-1/2	0.0400	470-300400	470-300400B
#59	0.0410	1/2	1-1/2	0.0410	470-300410	470-300410B
#58	0.0420	1/2	1-1/2	0.0420	470-300420	470-300420B
#57	0.0430	1/2	1-1/2	0.0430	470-300430	470-300430B
#56	0.0465	1/2	1-1/2	0.0465	470-300465	470-300465B
3/64	0.0469	1/2	1-1/2	3/64	470-100469	470-100469B
#55	0.0520	1/2	1-1/2	0.0520	470-300520	470-300520B
#54	0.0550	1/2	1-1/2	0.0550	470-300550	470-300550B
1.5mm	0.0591	13mm	38mm	1.5mm	470-400591	470-400591B
#53	0.0595	1/2	1-1/2	0.0595	470-300595	470-300595B
1/16	0.0625	5/8	1-5/8	1/16	470-100625	470-100625B
#52	0.0635	11/16	1-11/16	0.0635	470-300635	470-300635B
#51	0.0670	11/16	1-11/16	0.0670	470-300670	470-300670B
#50	0.0700	11/16	1-11/16	0.0700	470-300700	470-300700B
#49	0.0730	11/16	1-11/16	0.0730	470-300730	470-300730B
#48	0.0760	11/16	1-11/16	0.0760	470-300760	470-300760B
5/64	0.0781	11/16	1-11/16	5/64	470-100781	470-100781B
#47	0.0785	3/4	1-3/4	0.0785	470-300785	470-300785B
2mm	0.0787	19mm	45mm	2mm	470-400787	470-400787B
#46	0.0810	3/4	1-3/4	0.0810	470-300810	470-300810B
#45	0.0820	3/4	1-3/4	0.0820	470-300820	470-300820B
#44	0.0860	3/4	1-3/4	0.0860	470-300860	470-300860B
#43	0.0890	3/4	1-3/4	0.0890	470-300890	470-300890B
#42	0.0935	3/4	1-3/4	0.0935	470-300935	470-300935B
3/32	0.0938	3/4	1-3/4	3/32	470-100938	470-100938B
#41	0.0960	13/16	1-13/16	0.0960	470-300960	470-300960B
#40	0.0980	13/16	1-13/16	0.0980	470-300980	470-300980B
2.5mm	0.0984	21mm	46mm	2.5mm	470-400984	470-400984B
#39	0.0995	13/16	1-13/16	0.0995	470-300995	470-300995B
#38	0.1015	13/16	1-13/16	0.1015	470-301015	470-301015B
#37	0.1040	13/16	1-13/16	0.1040	470-301040	470-301040B
#36	0.1065	13/16	1-13/16	0.1065	470-301065	470-301065B
7/64	0.1094	13/16	1-13/16	7/64	470-101094	470-101094B
#35	0.1100	7/8	1-7/8	0.1100	470-301100	470-301100B
#34	0.1110	7/8	1-7/8	0.1110	470-301110	470-301110B
#33	0.1130	7/8	1-7/8	0.1130	470-301130	470-301130B
#32	0.1160	7/8	1-7/8	0.1160	470-301160	470-301160B
3mm	0.1181	22mm	48mm	3mm	470-401181	470-401181B

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Solid Carbide Straight Flute Drill



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Series 470		2FL | Straight Flute				
Diameter(D ₁) Size Dec.	Flute Length(L ₁)	OAL(L)	Shank(D)	Bright	AITiN	
#31	0.1200	7/8	1-7/8	0.1200	470-301200	470-301200B
1/8	0.1250	7/8	1-7/8	1/8	470-101250	470-101250B
#30	0.1285	15/16	1-15/16	0.1285	470-301285	470-301285B
#29	0.1360	15/16	1-15/16	0.1360	470-301360	470-301360B
3.5mm	0.1378	24mm	49mm	3.5mm	470-401378	470-401378B
#28	0.1405	15/16	1-15/16	0.1405	470-301405	470-301405B
9/64	0.1406	15/16	1-15/16	9/64	470-101406	470-101406B
#27	0.1440	1	2-1/16	0.1440	470-301440	470-301440B
#26	0.1470	1	2-1/16	0.1470	470-301470	470-301470B
#25	0.1495	1	2-1/16	0.1495	470-301495	470-301495B
#24	0.1520	1	2-1/16	0.1520	470-301520	470-301520B
#23	0.1540	1	2-1/16	0.1540	470-301540	470-301540B
5/32	0.1563	1	2-1/16	5/32	470-101562	470-101562B
#22	0.1570	1-1/16	2-1/8	0.1570	470-301570	470-301570B
4mm	0.1575	27mm	54mm	4mm	470-401575	470-401575B
#21	0.1590	1-1/16	2-1/8	0.1590	470-301590	470-301590B
#20	0.1610	1-1/16	2-1/8	0.1610	470-301610	470-301610B
#19	0.1660	1-1/16	2-1/8	0.1660	470-301660	470-301660B
#18	0.1695	1-1/16	2-1/8	0.1695	470-301695	470-301695B
11/64	0.1719	1-1/16	2-1/8	11/64	470-101719	470-101719B
#17	0.1730	1-1/8	2-3/16	0.1730	470-301730	470-301730B
#16	0.1770	1-1/8	2-3/16	0.1770	470-301770	470-301770B
4.5mm	0.1772	29mm	56mm	4.5mm	470-401772	470-401772B
#15	0.1800	1-1/8	2-3/16	0.1800	470-301800	470-301800B
#14	0.1820	1-1/8	2-3/16	0.1820	470-301820	470-301820B
#13	0.1850	1-1/8	2-3/16	0.1850	470-301850	470-301850B
3/16	0.1875	1-1/8	2-3/16	3/16	470-101875	470-101875B
#12	0.1890	1-3/16	2-1/4	0.1890	470-301890	470-301890B
#11	0.1910	1-3/16	2-1/4	0.1910	470-301910	470-301910B
#10	0.1935	1-3/16	2-1/4	0.1935	470-301935	470-301935B
#9	0.1960	1-3/16	2-1/4	0.1960	470-301960	470-301960B
5mm	0.1969	30mm	57mm	5mm	470-401969	470-401969B
#8	0.1990	1-3/16	2-1/4	0.1990	470-301990	470-301990B
#7	0.2010	1-3/16	2-1/4	0.2010	470-302010	470-302010B
13/64	0.2031	1-3/16	2-1/4	13/64	470-102031	470-102031B
#6	0.2040	1-1/4	2-3/8	0.2040	470-302040	470-302040B
#5	0.2055	1-1/4	2-3/8	0.2055	470-302055	470-302055B
#4	0.2090	1-1/4	2-3/8	0.2090	470-302090	470-302090B
#3	0.2130	1-1/4	2-3/8	0.2130	470-302130	470-302130B
5.5mm	0.2165	32mm	60mm	5.5mm	470-402165	470-402165B
7/32	0.2188	1-1/4	2-3/8	7/32	470-102188	470-102188B
#2	0.2210	1-5/16	2-7/16	0.2210	470-302210	470-302210B
#1	0.2280	1-5/16	2-7/16	0.2280	470-302280	470-302280B
A	0.2340	1-5/16	2-7/16	0.2340	470-202340	470-202340B
15/64	0.2344	1-5/16	2-7/16	15/64	470-102344	470-102344B
6mm	0.2362	33mm	62mm	6mm	470-402362	470-402362B
B	0.2380	1-3/8	2-1/2	0.2380	470-202380	470-202380B
C	0.2420	1-3/8	2-1/2	0.2420	470-202420	470-202420B
D	0.2460	1-3/8	2-1/2	0.2460	470-202460	470-202460B
1/4	0.2500	1-3/8	2-1/2	1/4	470-102500	470-102500B
E	0.2500	1-3/8	2-1/2	0.2500	470-202500	470-202500B
6.5mm	0.2559	35mm	64mm	6.5mm	470-402559	470-402559B
F	0.2570	1-7/16	2-5/8	0.2570	470-202570	470-202570B
G	0.2610	1-7/16	2-5/8	0.2610	470-202610	470-202610B
17/64	0.2656	1-7/16	2-5/8	17/64	470-102656	470-102656B
H	0.2660	1-1/2	2-11/16	0.2660	470-202660	470-202660B
I	0.2720	1-1/2	2-11/16	0.2720	470-202720	470-202720B
7mm	0.2756	38mm	68mm	7mm	470-402756	470-402756B
J	0.2770	1-1/2	2-11/16	0.2770	470-202770	470-202770B
K	0.2810	1-1/2	2-11/16	0.2810	470-202810	470-202810B
9/32	0.2813	1-1/2	2-11/16	9/32	470-102812	470-102812B
L	0.2900	1-9/16	2-3/4	0.2900	470-202900	470-202900B
M	0.2950	1-9/16	2-3/4	0.2950	470-202950	470-202950B
7.5mm	0.2953	38mm	70mm	7.5mm	470-402953	470-402953B
19/64	0.2969	1-9/16	2-3/4	19/64	470-102969	470-102969B
N	0.3020	1-5/8	2-13/16	0.3020	470-203020	470-203020B
5/16	0.3125	1-5/8	2-13/16	5/16	470-103125	470-103125B
8mm	0.3150	41mm	71mm	8mm	470-403150	470-403150B
O	0.3160	1-11/16	2-15/16	0.3160	470-203160	470-203160B
P	0.3230	1-11/16	2-15/16	0.3230	470-203230	470-203230B
21/64	0.3281	1-11/16	2-15/16	21/64	470-103281	470-103281B
Q	0.3320	1-11/16	3	0.3320	470-203320	470-203320B
8.5mm	0.3346	43mm	76mm	8.5mm	470-403346	470-403346B
R	0.3390	1-11/16	3	0.3390	470-203390	470-203390B
11/32	0.3438	1-11/16	3	11/32	470-103438	470-103438B
S	0.3480	1-3/4	3-1/16	0.3480	470-203480	470-203480B

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide Straight Flute Drill



Series 470 2FL | Straight Flute

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	Bright	AlTiN
Size	Dec.					
9mm	0.3543	45mm	78mm	9mm	470-403543	470-403543B
T	0.3580	1-3/4	3-1/16	0.3580	470-203580	470-203580B
23/64	0.3594	1-3/4	3-1/16	23/64	470-103594	470-103594B
U	0.3680	1-13/16	3-1/8	0.3680	470-203680	470-203680B
9.5mm	0.3740	46mm	79mm	9.5mm	470-403740	470-403740B
3/8	0.3750	1-13/16	3-1/8	3/8	470-103750	470-103750B
V	0.3770	1-7/8	3-1/4	0.3770	470-203770	470-203770B
W	0.3860	1-7/8	3-1/4	0.3860	470-203860	470-203860B
25/64	0.3906	1-7/8	3-1/4	25/64	470-103906	470-103906B
1mm	0.3937	48mm	83mm	1mm	470-403937	470-403937B
X	0.3970	1-15/16	3-5/16	0.3970	470-203970	470-203970B
Y	0.4040	1-15/16	3-5/16	0.4040	470-204040	470-204040B
13/32	0.4063	1-15/16	3-5/16	13/32	470-104062	470-104062B
Z	0.4130	2	3-3/8	0.4130	470-204130	470-204130B
10.5mm	0.4134	51mm	86mm	10.5mm	470-404134	470-404134B
27/64	0.4219	2	3-3/8	27/64	470-104219	470-104219B
11mm	0.4331	51mm	86mm	11mm	470-404331	470-404331B
7/16	0.4375	2-1/16	3-7/16	7/16	470-104375	470-104375B
11.5mm	0.4528	52mm	87mm	11.5mm	470-404528	470-404528B
29/64	0.4531	2-1/8	3-9/16	29/64	470-104531	470-104531B
15/32	0.4688	2-1/8	3-5/8	15/32	470-104688	470-104688B
12mm	0.4724	54mm	92mm	12mm	470-404724	470-404724B
31/64	0.4844	2-3/16	3-11/16	31/64	470-104844	470-104844B
12.5mm	0.4921	56mm	94mm	12.5mm	470-404921	470-404921B
1/2	0.5000	2-1/4	3-3/4	1/2	470-105000	470-105000B
33/64	0.5156	1-1/8	3-1/2	33/64	470-105156	470-105156B
17/32	0.5313	1-1/8	3-1/2	17/32	470-105312	470-105312B
35/64	0.5469	1-1/8	3-1/2	35/64	470-105469	470-105469B
9/16	0.5625	1-1/8	4	9/16	470-105625	470-105625B
5/8	0.6250	1-1/4	4	5/8	470-106250	470-106250B
11/16	0.6875	1-1/2	4	11/16	470-106875	470-106875B
3/4	0.7500	1-1/2	4	3/4	470-107500	470-107500B

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES																																							
3-Flute Drills <ul style="list-style-type: none"> Sub-micrograin carbide substrate for wear resistance Performs well in short-chip materials No preliminary drilling or spotting operations needed Rapid penetration via 3-fluted split point 150° split drill point with corner breaks resists chipping 																																									
<table border="1"> <thead> <tr> <th colspan="3">STEEL</th> <th colspan="2">STAINLESS</th> <th colspan="2">CAST IRON</th> <th colspan="2">NON-FERROUS</th> <th colspan="2">HBSA</th> <th colspan="2">HARDENED STEEL</th> </tr> <tr> <th>P1</th> <th>P2</th> <th>P3</th> <th>M1</th> <th>M2</th> <th>K1</th> <th>K2</th> <th>N1</th> <th>N2</th> <th>S1</th> <th>S2</th> <th>H1</th> <th>H2</th> </tr> </thead> <tbody> <tr> <td>●</td> <td>●</td> <td>○</td> <td></td> <td></td> <td>●</td> <td>●</td> <td>○</td> <td>○</td> <td></td> <td></td> <td>○</td> <td></td> </tr> </tbody> </table>			STEEL			STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL		P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2	●	●	○			●	●	○	○			○	
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL																														
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																													
●	●	○			●	●	○	○			○																														

● Best ○ Good

Series 453 3FL | Twist

Diameter(D ₁) Size Dec.	Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
3mm	0.1181	32mm	57mm	453-401181B
1/8	0.1250	1-1/4	2-1/4	453-101250B
9/64	0.1406	1-3/8	2-1/2	453-101406B
5/32	0.1563	1-3/8	2-1/2	453-101562B
4mm	0.1575	35mm	64mm	453-401575B
11/64	0.1719	1-5/8	2-3/4	453-101719B
3/16	0.1875	1-5/8	2-3/4	453-101875B
5mm	0.1969	45mm	76mm	453-401969B
13/64	0.2031	1-3/4	3	453-102031B
7/32	0.2188	1-3/4	3	453-102188B
15/64	0.2344	2	3-1/4	453-102344B
6mm	0.2362	51mm	83mm	453-402362B
1/4	0.2500	2	3-1/4	453-102500B
17/64	0.2656	2-1/8	3-1/2	453-102656B
7mm	0.2756	54mm	89mm	453-402756B
9/32	0.2813	2-1/8	3-1/2	453-102812B
19/64	0.2969	2-3/8	3-3/4	453-102969B
5/16	0.3125	2-3/8	3-3/4	453-103125B
8mm	0.3150	60mm	95mm	453-403150B
21/64	0.3281	2-1/2	4	453-103281B
11/32	0.3438	2-1/2	4	453-103438B
9mm	0.3543	64mm	102mm	453-403543B
23/64	0.3594	2-3/4	4-1/4	453-103594B
3/8	0.3750	2-3/4	4-1/4	453-103750B
25/64	0.3906	2-7/8	4-1/2	453-103906B
1mm	0.3937	73mm	114mm	453-403937B
13/32	0.4063	2-7/8	4-1/2	453-104062B
27/64	0.4219	2-7/8	4-1/2	453-104219B
11mm	0.4331	73mm	114mm	453-404331B
7/16	0.4375	2-7/8	4-1/2	453-104375B
29/64	0.4531	3	4-3/4	453-104531B
15/32	0.4688	3	4-3/4	453-104688B
12mm	0.4724	76mm	121mm	453-404724B
31/64	0.4844	3	4-3/4	453-104844B
1/2	0.5000	3	4-3/4	453-105000B
17/32	0.5313	3	4-3/4	453-105312B
14mm	0.5512	89mm	146mm	453-405512B
9/16	0.5625	3-1/2	5-3/4	453-105625B
5/8	0.6250	3-1/2	5-3/4	453-106250B
16mm	0.6299	90mm	146mm	453-406299B
3/4	0.7500	4	5-3/4	453-107500B

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide Combination Drill And Countersink



INTRO

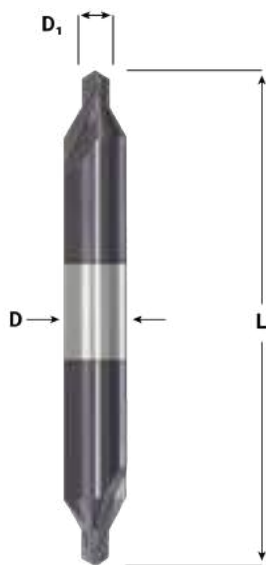
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES																																							
Drill/Countersink <ul style="list-style-type: none"> Sub-micrograin carbide substrate for wear resistance Center drills Multipurpose tool: drill, chamfer, deburr and countersink 																																									
<table border="1"> <thead> <tr> <th colspan="3">STEEL</th> <th colspan="2">STAINLESS</th> <th colspan="2">CAST IRON</th> <th colspan="2">NON-FERROUS</th> <th colspan="2">HRSA</th> <th colspan="2">HARDENED STEEL</th> </tr> <tr> <th>P1</th> <th>P2</th> <th>P3</th> <th>M1</th> <th>M2</th> <th>K1</th> <th>K2</th> <th>N1</th> <th>N2</th> <th>S1</th> <th>S2</th> <th>H1</th> <th>H2</th> </tr> </thead> <tbody> <tr> <td>●</td> <td>●</td> <td>○</td> <td></td> <td></td> <td>●</td> <td>●</td> <td>○</td> <td>○</td> <td></td> <td></td> <td>○</td> <td></td> </tr> </tbody> </table>			STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL		P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2	●	●	○			●	●	○	○			○	
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL																														
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																													
●	●	○			●	●	○	○			○																														

● Best ○ Good

Series 300 2FL | 60°, 82°, 90° | Combo

Pilot(D ₁) Size	OAL(L)	Shank(D)	Incl. Angle	Bright	TiN	AlTiN
00 0.0265	1-1/2	1/8	60°	300-001001	300-001501	300-001001B
0 1/32	1-1/2	1/8		300-001002	300-001502	300-001002B
1 3/64	1-1/2	1/8		300-001003	300-001503	300-001003B
2 5/64	1-7/8	3/16		300-001004	300-001504	300-001004B
3 7/64	2	1/4		300-001005	300-001505	300-001005B
4 1/8	2-1/8	5/16		300-001006	300-001506	300-001006B
5 3/16	2-3/4	7/16		300-001007	300-001507	300-001007B
6 7/32	3	1/2		300-001008	300-001508	300-001008B
7 1/4	3-1/4	5/8		300-001009	300-001509	300-001009B
8 5/16	3-1/2	3/4	300-001010	300-001510	300-001010B	
00 0.0265	1-1/2	1/8	82°	300-002001	-	300-002001B
0 1/32	1-1/2	1/8		300-002002	-	300-002002B
1 3/64	1-1/2	1/8		300-002003	-	300-002003B
2 5/64	1-7/8	3/16		300-002004	-	300-002004B
3 7/64	2	1/4		300-002005	-	300-002005B
4 1/8	2-1/8	5/16		300-002006	-	300-002006B
5 3/16	2-3/4	7/16		300-002007	-	300-002007B
6 7/32	3	1/2		300-002008	-	300-002008B
7 1/4	3-1/4	5/8		300-002009	-	300-002009B
8 5/16	3-1/2	3/4	300-002010	-	300-002010B	
00 0.0265	1-1/2	1/8	90°	300-003001	-	300-003001B
0 1/32	1-1/2	1/8		300-003002	-	300-003002B
1 3/64	1-1/2	1/8		300-003003	-	300-003003B
2 5/64	1-7/8	3/16		300-003004	-	300-003004B
3 7/64	2	1/4		300-003005	-	300-003005B
4 1/8	2-1/8	5/16		300-003006	-	300-003006B
5 3/16	2-3/4	7/16		300-003007	-	300-003007B
6 7/32	3	1/2		300-003008	-	300-003008B
7 1/4	3-1/4	5/8		300-003009	-	300-003009B
8 5/16	3-1/2	3/4	300-003010	-	300-003010B	
1 3/64	4	1/8	60°	300-005001	300-005501	300-005001B
2 5/64	4	3/16		300-005002	300-005502	300-005002B
3 7/64	4	1/4		300-005003	300-005503	300-005003B
4 1/8	4	5/16		300-005004	300-005504	300-005004B
5 3/16	6	7/16		300-005005	300-005505	300-005005B
6 7/32	6	1/2		300-005006	300-005506	300-005006B
7 1/4	6	5/8		300-005007	300-005507	300-005007B
8 5/16	6	3/4		300-005008	300-005508	300-005008B
1 3/64	4	1/8	82°	300-006001	-	300-006001B
2 5/64	4	3/16		300-006002	-	300-006002B
3 7/64	4	1/4		300-006003	-	300-006003B
4 1/8	4	5/16		300-006004	-	300-006004B
5 3/16	6	7/16		300-006005	-	300-006005B
6 7/32	6	1/2		300-006006	-	300-006006B
7 1/4	6	5/8		300-006007	-	300-006007B
8 5/16	6	3/4		300-006008	-	300-006008B

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide Combination Drill And Countersink



Series 300		2FL | 60°, 82°, 90° | Combo				
Pilot(D ₁) Size in	OAL(L)	Shank(D)	Incl. Angle	Bright	TiN	AlTiN
1 3/64	4	1/8	90°	300-007001	-	300-007001B
2 5/64	4	3/16		300-007002	-	300-007002B
3 7/64	4	1/4		300-007003	-	300-007003B
4 1/8	4	5/16		300-007004	-	300-007004B
5 3/16	6	7/16		300-007005	-	300-007005B
6 7/32	6	1/2		300-007006	-	300-007006B
7 1/4	6	5/8		300-007007	-	300-007007B
8 5/16	6	3/4		300-007008	-	300-007008B

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Popular Custom Holemaking Options

- Material-specific point geometry
- Longer flute lengths
- Internal coolant supply
- Proprietary GWS tool coatings

CUSTOM COMES STANDARD

GENERAL PURPOSE

Solid Carbide Straight Flute Chucking Reamer



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Chucking Reamers</p> <ul style="list-style-type: none"> ≤1/4 Diameter Tolerance = +0/+0.0002" >1/4 Diameter Tolerance = +0/+0.0003" Expand an existing hole to a precise size or create a perfect hole finish Reduced neck for through-hole clearance Best suited for through holes Straight flute geometry pushes chips through the hole 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	○	○	○	●	●	○	○	○	○	○	○

● Best ○ Good

Series 500 4 - 6FL | Straight Flute | 45° Chamfer

Diameter(D ₁) Size Dec.	Flute	OAL(L)	Shank(D)	EDP	Diameter(D ₁) Size Dec.	Flute	OAL(L)	Shank(D)	EDP
- 0.0260	1/4	1-1/2	0.0195	500-0000260	- 0.0460	3/8	1-1/2	0.0395	500-0000460
- 0.0265	1/4	1-1/2	0.0200	500-0000265	#56 0.0465	3/8	1-1/2	0.0400	500-003056
- 0.0270	1/4	1-1/2	0.0205	500-0000270	3/64 0.0469	3/8	1-1/2	0.0404	500-001003
- 0.0275	1/4	1-1/2	0.0210	500-0000275	- 0.0470	3/8	1-1/2	0.0405	500-0000470
#70 0.0280	1/4	1-1/2	0.0215	500-003070	- 0.0475	3/8	1-1/2	0.0475	500-0000475
- 0.0285	1/4	1-1/2	0.0220	500-0000285	- 0.0480	3/8	1-1/2	0.0415	500-0000480
- 0.0290	1/4	1-1/2	0.0225	500-0000290	- 0.0485	3/8	1-1/2	0.0420	500-0000485
#69 0.0292	1/4	1-1/2	0.0227	500-003069	- 0.0490	3/8	1-1/2	0.0425	500-0000490
- 0.0295	1/4	1-1/2	0.0230	500-0000295	- 0.0495	3/8	1-1/2	0.0430	500-0000495
- 0.0300	1/4	1-1/2	0.0235	500-0000300	- 0.0500	3/8	1-1/2	0.0435	500-0000500
- 0.0305	1/4	1-1/2	0.0240	500-0000305	- 0.0505	3/8	1-1/2	0.0505	500-0000505
#68 0.0310	1/4	1-1/2	0.0245	500-003068	- 0.0510	3/8	1-1/2	0.0510	500-0000510
1/32 0.0313	1/4	1-1/2	0.0247	500-001002	- 0.0515	3/8	1-1/2	0.0515	500-0000515
- 0.0315	1/4	1-1/2	0.0250	500-0000315	#55 0.0520	3/8	1-1/2	0.0520	500-003055
#67 0.0320	1/4	1-1/2	0.0255	500-003067	- 0.0525	3/8	1-1/2	0.0525	500-0000525
- 0.0325	1/4	1-1/2	0.0260	500-0000325	- 0.0530	3/8	1-1/2	0.0530	500-0000530
- 0.0330	1/4	1-1/2	0.0265	500-0000330	- 0.0535	3/8	1-1/2	0.0535	500-0000535
#66 0.0330	1/4	1-1/2	0.0265	500-003066	- 0.0540	3/8	1-1/2	0.0540	500-0000540
- 0.0335	1/4	1-1/2	0.0270	500-0000335	- 0.0545	3/8	1-1/2	0.0545	500-0000545
- 0.0340	1/4	1-1/2	0.0275	500-0000340	#54 0.0550	3/8	1-1/2	0.0550	500-003054
- 0.0345	1/4	1-1/2	0.0280	500-0000345	- 0.0555	3/8	1-1/2	0.0555	500-0000555
#65 0.0350	1/4	1-1/2	0.0285	500-003065	- 0.0560	3/8	1-1/2	0.0560	500-0000560
- 0.0355	1/4	1-1/2	0.0290	500-0000355	- 0.0565	3/8	1-1/2	0.0565	500-0000565
#64 0.0360	1/4	1-1/2	0.0295	500-003064	- 0.0570	3/8	1-1/2	0.0570	500-0000570
- 0.0365	1/4	1-1/2	0.0300	500-0000365	- 0.0575	3/8	1-1/2	0.0575	500-0000575
#63 0.0370	1/4	1-1/2	0.0305	500-003063	- 0.0580	3/8	1-1/2	0.0580	500-0000580
- 0.0375	1/4	1-1/2	0.0310	500-0000375	- 0.0585	3/8	1-1/2	0.0585	500-0000585
#62 0.0380	1/4	1-1/2	0.0315	500-003062	- 0.0590	3/8	1-1/2	0.0590	500-0000590
- 0.0385	1/4	1-1/2	0.0320	500-0000385	1.5mm 0.0591	10mm	38mm	1.5mm	500-004001.5
#61 0.0390	1/4	1-1/2	0.0325	500-003061	#53 0.0595	3/8	1-1/2	0.0595	500-003053
1mm 0.0394	6mm	38mm	1mm	500-004001	- 0.0600	3/8	1-1/2	0.0600	500-0000600
- 0.0395	1/4	1-1/2	0.0330	500-0000395	- 0.0605	3/8	1-1/2	0.0605	500-0000605
#60 0.0400	1/4	1-1/2	0.0335	500-003060	- 0.0610	3/8	1-1/2	0.0610	500-0000610
- 0.0405	1/4	1-1/2	0.0340	500-0000405	- 0.0615	3/8	1-1/2	0.0615	500-0000615
#59 0.0410	1/4	1-1/2	0.0345	500-003059	- 0.0620	3/8	1-1/2	0.0620	500-0000620
- 0.0415	1/4	1-1/2	0.0350	500-0000415	1/16 0.0625	3/8	1-1/2	1/16	500-001004
#58 0.0420	3/8	1-1/2	0.0355	500-003058	- 0.0630	3/8	1-1/2	0.0630	500-0000630
- 0.0425	3/8	1-1/2	0.0360	500-0000425	#52 0.0635	3/8	1-1/2	0.0635	500-003052
#57 0.0430	3/8	1-1/2	0.0365	500-003057	- 0.0640	3/8	1-1/2	0.0640	500-0000640
- 0.0435	3/8	1-1/2	0.0370	500-0000435	- 0.0645	3/8	1-1/2	0.0645	500-0000645
- 0.0440	3/8	1-1/2	0.0375	500-0000440	- 0.0650	3/8	1-1/2	0.0650	500-0000650
- 0.0445	3/8	1-1/2	0.0380	500-0000445	- 0.0655	1/2	1-3/4	0.0655	500-0000655
- 0.0450	3/8	1-1/2	0.0385	500-0000450	- 0.0660	1/2	1-3/4	0.0660	500-0000660
- 0.0455	3/8	1-1/2	0.0390	500-0000455	- 0.0665	1/2	1-3/4	0.0665	500-0000665

GENERAL PURPOSE

Solid Carbide Straight Flute Chucking Reamer



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Series 500						4 - 6FL | Straight Flute | 45° Chamfer					
Diameter(D ₁)		Flute	OAL(L)	Shank(D)	EDP	Diameter(D ₁)		Flute	OAL(L)	Shank(D)	EDP
Size	Dec.					Size	Dec.				
#51	0.0670	1/2	1-3/4	0.0670	500-003051	-	0.1015	5/8	2-1/4	0.1015	500-0001015
-	0.0675	1/2	1-3/4	0.0675	500-0000675	#38	0.1015	5/8	2-1/4	0.1015	500-003038
-	0.0680	1/2	1-3/4	0.0680	500-0000680	-	0.1020	5/8	2-1/4	0.1020	500-0001020
-	0.0685	1/2	1-3/4	0.0685	500-0000685	-	0.1025	5/8	2-1/4	0.1025	500-0001025
-	0.0690	1/2	1-3/4	0.0690	500-0000690	-	0.1030	5/8	2-1/4	0.1030	500-0001030
-	0.0695	1/2	1-3/4	0.0695	500-0000695	-	0.1035	5/8	2-1/4	0.1035	500-0001035
#50	0.0700	1/2	1-3/4	0.0700	500-003050	#37	0.1040	5/8	2-1/4	0.1040	500-003037
-	0.0705	1/2	1-3/4	0.0705	500-0000705	-	0.1045	5/8	2-1/4	0.1045	500-0001045
-	0.0710	1/2	1-3/4	0.0710	500-0000710	-	0.1050	5/8	2-1/4	0.1050	500-0001050
-	0.0715	1/2	1-3/4	0.0715	500-0000715	-	0.1055	5/8	2-1/4	0.1055	500-0001055
-	0.0720	1/2	1-3/4	0.0720	500-0000720	-	0.1060	5/8	2-1/4	0.1060	500-0001060
-	0.0725	1/2	1-3/4	0.0725	500-0000725	#36	0.1065	5/8	2-1/4	0.1065	500-003036
#49	0.0730	1/2	1-3/4	0.0730	500-003049	-	0.1070	5/8	2-1/4	0.1070	500-0001070
-	0.0735	1/2	1-3/4	0.0735	500-0000735	-	0.1075	5/8	2-1/4	0.1075	500-0001075
-	0.0740	1/2	1-3/4	0.0740	500-0000740	-	0.1080	5/8	2-1/4	0.1080	500-0001080
-	0.0745	1/2	1-3/4	0.0745	500-0000745	-	0.1085	5/8	2-1/4	0.1085	500-0001085
-	0.0750	1/2	1-3/4	0.0750	500-0000750	-	0.1090	5/8	2-1/4	0.1090	500-0001090
-	0.0755	1/2	1-3/4	0.0755	500-0000755	7/64	0.1094	5/8	2-1/4	7/64	500-001007
#48	0.0760	1/2	1-3/4	0.0760	500-003048	-	0.1095	5/8	2-1/4	0.1095	500-0001095
-	0.0765	1/2	1-3/4	0.0765	500-0000765	-	0.1100	5/8	2-1/4	0.1100	500-0001100
-	0.0770	1/2	1-3/4	0.0770	500-0000770	#35	0.1100	5/8	2-1/4	0.1100	500-003035
-	0.0775	1/2	1-3/4	0.0775	500-0000775	-	0.1105	5/8	2-1/4	0.1105	500-0001105
-	0.0780	1/2	1-3/4	0.0780	500-0000780	#34	0.1110	5/8	2-1/4	0.1110	500-003034
5/64	0.0781	1/2	1-3/4	5/64	500-001005	-	0.1115	5/8	2-1/4	0.1115	500-0001115
#47	0.0785	1/2	1-3/4	0.0785	500-003047	-	0.1120	5/8	2-1/4	0.1120	500-0001120
2mm	0.0787	13mm	44mm	2mm	500-004002	-	0.1125	5/8	2-1/4	0.1125	500-0001125
-	0.0790	1/2	1-3/4	0.0790	500-0000790	#33	0.1130	5/8	2-1/4	0.1130	500-003033
-	0.0795	1/2	1-3/4	0.0795	500-0000795	-	0.1135	5/8	2-1/4	0.1135	500-0001135
-	0.0800	1/2	1-3/4	0.0800	500-0000800	-	0.1140	5/8	2-1/4	0.1140	500-0001140
-	0.0805	1/2	1-3/4	0.0805	500-0000805	-	0.1145	5/8	2-1/4	0.1145	500-0001145
#46	0.0810	1/2	1-3/4	0.0810	500-003046	-	0.1150	5/8	2-1/4	0.1150	500-0001150
-	0.0815	1/2	2	0.0815	500-0000815	-	0.1155	5/8	2-1/4	0.1155	500-0001155
#45	0.0820	1/2	2	0.0820	500-003045	#32	0.1160	5/8	2-1/4	0.1160	500-003032
-	0.0825	1/2	2	0.0825	500-0000825	-	0.1165	5/8	2-1/4	0.1165	500-0001165
-	0.0830	1/2	2	0.0830	500-0000830	-	0.1170	5/8	2-1/4	0.1170	500-0001170
-	0.0835	1/2	2	0.0835	500-0000835	-	0.1175	5/8	2-1/4	0.1175	500-0001175
-	0.0840	1/2	2	0.0840	500-0000840	-	0.1180	5/8	2-1/4	0.1180	500-0001180
-	0.0845	1/2	2	0.0845	500-0000845	3mm	0.1181	16mm	57mm	3mm	500-004003
-	0.0850	1/2	2	0.0850	500-0000850	-	0.1185	5/8	2-1/4	0.1185	500-0001185
-	0.0855	1/2	2	0.0855	500-0000855	-	0.1190	5/8	2-1/4	0.1190	500-0001190
#44	0.0860	1/2	2	0.0860	500-003044	-	0.1195	5/8	2-1/4	0.1195	500-0001195
-	0.0865	1/2	2	0.0865	500-0000865	#31	0.1200	5/8	2-1/4	0.1200	500-003031
-	0.0870	1/2	2	0.0870	500-0000870	-	0.1205	5/8	2-1/4	0.1205	500-0001205
-	0.0875	1/2	2	0.0875	500-0000875	-	0.1210	5/8	2-1/4	0.1210	500-0001210
-	0.0880	1/2	2	0.0880	500-0000880	-	0.1215	5/8	2-1/4	0.1215	500-0001215
-	0.0885	1/2	2	0.0885	500-0000885	-	0.1220	5/8	2-1/4	0.1220	500-0001220
#43	0.0890	1/2	2	0.0890	500-003043	-	0.1225	5/8	2-1/4	0.1225	500-0001225
-	0.0895	1/2	2	0.0895	500-0000895	D/P	0.1230	5/8	2-1/4	0.1230	500-0001230
-	0.0900	1/2	2	0.0900	500-0000900	-	0.1235	5/8	2-1/4	0.1235	500-0001235
-	0.0905	1/2	2	0.0905	500-0000905	U/S	0.1240	5/8	2-1/4	0.1240	500-0001240
-	0.0910	1/2	2	0.0910	500-0000910	-	0.1245	5/8	2-1/4	0.1245	500-0001245
-	0.0915	1/2	2	0.0915	500-0000915	D/P	0.1247	5/8	2-1/4	0.1247	500-0001247
-	0.0920	1/2	2	0.0920	500-0000920	1/8	0.1250	5/8	2-1/4	1/8	500-001008
-	0.0925	1/2	2	0.0925	500-0000925	-	0.1255	5/8	2-1/4	0.1255	500-0001255
-	0.0930	1/2	2	0.0930	500-0000930	O/S	0.1260	5/8	2-1/4	0.1260	500-0001260
#42	0.0935	1/2	2	0.0935	500-003042	-	0.1265	5/8	2-1/4	0.1265	500-0001265
3/32	0.0938	1/2	2	3/32	500-001006	-	0.1270	5/8	2-1/4	0.1270	500-0001270
-	0.0940	1/2	2	0.0940	500-0000940	-	0.1275	5/8	2-1/4	0.1275	500-0001275
-	0.0945	1/2	2	0.0945	500-0000945	-	0.1280	5/8	2-1/4	0.1280	500-0001280
-	0.0950	1/2	2	0.0950	500-0000950	#30	0.1285	5/8	2-1/4	0.1285	500-003030
-	0.0955	1/2	2	0.0955	500-0000955	-	0.1290	5/8	2-1/4	0.1290	500-0001290
#41	0.0960	1/2	2	0.0960	500-003041	-	0.1295	5/8	2-1/4	0.1295	500-0001295
-	0.0965	1/2	2	0.0965	500-0000965	-	0.1300	5/8	2-1/4	0.1300	500-0001300
-	0.0970	5/8	2-1/4	0.0970	500-0000970	-	0.1305	3/4	2-1/2	0.1305	500-0001305
-	0.0975	5/8	2-1/4	0.0975	500-0000975	-	0.1310	3/4	2-1/2	0.1310	500-0001310
#40	0.0980	5/8	2-1/4	0.0980	500-003040	-	0.1315	3/4	2-1/2	0.1315	500-0001315
2.5mm	0.0984	16mm	57mm	2.5mm	500-004002.5	-	0.1320	3/4	2-1/2	0.1320	500-0001320
-	0.0985	5/8	2-1/4	0.0985	500-0000985	-	0.1325	3/4	2-1/2	0.1325	500-0001325
-	0.0990	5/8	2-1/4	0.0990	500-0000990	-	0.1330	3/4	2-1/2	0.1330	500-0001330
-	0.0995	5/8	2-1/4	0.0995	500-0000995	-	0.1335	3/4	2-1/2	0.1335	500-0001335
#39	0.0995	5/8	2-1/4	0.0995	500-003039	-	0.1340	3/4	2-1/2	0.1340	500-0001340
-	0.1000	5/8	2-1/4	0.1000	500-0001000	-	0.1345	3/4	2-1/2	0.1345	500-0001345
-	0.1005	5/8	2-1/4	0.1005	500-0001005	-	0.1350	3/4	2-1/2	0.1350	500-0001350
-	0.1010	5/8	2-1/4	0.1010	500-0001010	-	0.1355	3/4	2-1/2	0.1355	500-0001355

GENERAL PURPOSE

Solid Carbide Straight Flute Chucking Reamer



Series 500						4 - 6FL | Straight Flute | 45° Chamfer					
Diameter(D ₁)		Flute	OAL(L)	Shank(D)	EDP	Diameter(D ₁)		Flute	OAL(L)	Shank(D)	EDP
Size	Dec.					Size	Dec.				
#29	0.1360	3/4	2-1/2	0.1360	500-003029	-	0.1705	7/8	2-3/4	0.1705	500-0001705
-	0.1365	3/4	2-1/2	0.1365	500-0001365	-	0.1710	7/8	2-3/4	0.1710	500-0001710
-	0.1370	3/4	2-1/2	0.1370	500-0001370	-	0.1715	7/8	2-3/4	0.1715	500-0001715
-	0.1375	3/4	2-1/2	0.1375	500-0001375	11/64	0.1719	7/8	2-3/4	11/64	500-0010111
3.5mm	0.1378	19mm	64mm	3.5mm	500-004003.5	-	0.1720	7/8	2-3/4	0.1720	500-0001720
-	0.1380	3/4	2-1/2	0.1380	500-0001380	-	0.1725	7/8	2-3/4	0.1725	500-0001725
-	0.1385	3/4	2-1/2	0.1385	500-0001385	#17	0.1730	7/8	2-3/4	0.1730	500-003017
-	0.1390	3/4	2-1/2	0.1390	500-0001390	-	0.1735	7/8	2-3/4	0.1735	500-0001735
-	0.1395	3/4	2-1/2	0.1395	500-0001395	-	0.1740	7/8	2-3/4	0.1740	500-0001740
-	0.1400	3/4	2-1/2	0.1400	500-0001400	-	0.1745	7/8	2-3/4	0.1745	500-0001745
#28	0.1405	3/4	2-1/2	0.1405	500-003028	-	0.1750	7/8	2-3/4	0.1750	500-0001750
9/64	0.1406	3/4	2-1/2	9/64	500-001009	-	0.1755	7/8	2-3/4	0.1755	500-0001755
-	0.1410	3/4	2-1/2	0.1410	500-0001410	-	0.1760	7/8	2-3/4	0.1760	500-0001760
-	0.1415	3/4	2-1/2	0.1415	500-0001415	-	0.1765	7/8	2-3/4	0.1765	500-0001765
-	0.1420	3/4	2-1/2	0.1420	500-0001420	#16	0.1770	7/8	2-3/4	0.1770	500-003016
-	0.1425	3/4	2-1/2	0.1425	500-0001425	4.5mm	0.1772	22mm	70mm	4.5mm	500-004004.5
-	0.1430	3/4	2-1/2	0.1430	500-0001430	-	0.1775	7/8	2-3/4	0.1775	500-0001775
-	0.1435	3/4	2-1/2	0.1435	500-0001435	-	0.1780	7/8	2-3/4	0.1780	500-0001780
#27	0.1440	3/4	2-1/2	0.1440	500-003027	-	0.1785	7/8	2-3/4	0.1785	500-0001785
-	0.1445	3/4	2-1/2	0.1445	500-0001445	-	0.1790	7/8	2-3/4	0.1790	500-0001790
-	0.1450	3/4	2-1/2	0.1450	500-0001450	-	0.1795	7/8	2-3/4	0.1795	500-0001795
-	0.1455	3/4	2-1/2	0.1455	500-0001455	#15	0.1800	7/8	2-3/4	0.1800	500-003015
-	0.1460	3/4	2-1/2	0.1460	500-0001460	-	0.1805	7/8	2-3/4	0.1805	500-0001805
-	0.1465	3/4	2-1/2	0.1465	500-0001465	-	0.1810	7/8	2-3/4	0.1810	500-0001810
#26	0.1470	3/4	2-1/2	0.1470	500-003026	-	0.1815	7/8	2-3/4	0.1815	500-0001815
-	0.1475	3/4	2-1/2	0.1475	500-0001475	#14	0.1820	7/8	2-3/4	0.1820	500-003014
-	0.1480	3/4	2-1/2	0.1480	500-0001480	-	0.1825	7/8	2-3/4	0.1825	500-0001825
-	0.1485	3/4	2-1/2	0.1485	500-0001485	-	0.1830	7/8	2-3/4	0.1830	500-0001830
-	0.1490	3/4	2-1/2	0.1490	500-0001490	-	0.1835	7/8	2-3/4	0.1835	500-0001835
#25	0.1495	3/4	2-1/2	0.1495	500-003025	-	0.1840	7/8	2-3/4	0.1840	500-0001840
-	0.1500	3/4	2-1/2	0.1500	500-0001500	-	0.1845	7/8	2-3/4	0.1845	500-0001845
-	0.1505	3/4	2-1/2	0.1505	500-0001505	#13	0.1850	7/8	2-3/4	0.1850	500-003013
-	0.1510	3/4	2-1/2	0.1510	500-0001510	D/P	0.1855	7/8	2-3/4	0.1855	500-0001855
-	0.1515	3/4	2-1/2	0.1515	500-0001515	-	0.1860	7/8	2-3/4	0.1860	500-0001860
#24	0.1520	3/4	2-1/2	0.1520	500-003024	U/S	0.1865	7/8	2-3/4	0.1865	500-0001865
-	0.1525	3/4	2-1/2	0.1525	500-0001525	-	0.1870	7/8	2-3/4	0.1870	500-0001870
-	0.1530	3/4	2-1/2	0.1530	500-0001530	3/16	0.1875	7/8	2-3/4	3/16	500-001012
-	0.1535	3/4	2-1/2	0.1535	500-0001535	-	0.1880	7/8	2-3/4	0.1880	500-0001880
#23	0.1540	3/4	2-1/2	0.1540	500-003023	O/S	0.1885	7/8	2-3/4	0.1885	500-0001885
-	0.1545	3/4	2-1/2	0.1545	500-0001545	#12	0.1890	7/8	2-3/4	0.1890	500-003012
-	0.1550	3/4	2-1/2	0.1550	500-0001550	-	0.1895	7/8	2-3/4	0.1895	500-0001895
-	0.1555	3/4	2-1/2	0.1555	500-0001555	-	0.1900	7/8	2-3/4	0.1900	500-0001900
-	0.1560	3/4	2-1/2	0.1560	500-0001560	-	0.1905	7/8	2-3/4	0.1905	500-0001905
5/32	0.1563	3/4	2-1/2	5/32	500-001010	#11	0.1910	7/8	2-3/4	0.1910	500-003011
-	0.1565	3/4	2-1/2	0.1565	500-0001565	-	0.1915	7/8	2-3/4	0.1915	500-0001915
#22	0.1570	3/4	2-1/2	0.1570	500-003022	-	0.1920	1	3	0.1920	500-0001920
-	0.1575	3/4	2-1/2	0.1575	500-0001575	-	0.1925	1	3	0.1925	500-0001925
4mm	0.1575	19mm	64mm	4mm	500-004004	-	0.1930	1	3	0.1930	500-0001930
-	0.1580	3/4	2-1/2	0.1580	500-0001580	-	0.1935	1	3	0.1935	500-0001935
-	0.1585	3/4	2-1/2	0.1585	500-0001585	#10	0.1935	1	3	0.1935	500-003010
-	0.1590	3/4	2-1/2	0.1590	500-0001590	-	0.1940	1	3	0.1940	500-0001940
#21	0.1590	3/4	2-1/2	0.1590	500-003021	-	0.1945	1	3	0.1945	500-0001945
-	0.1595	3/4	2-1/2	0.1595	500-0001595	-	0.1950	1	3	0.1950	500-0001950
-	0.1600	3/4	2-1/2	0.1600	500-0001600	-	0.1955	1	3	0.1955	500-0001955
-	0.1605	3/4	2-1/2	0.1605	500-0001605	#9	0.1960	1	3	0.1960	500-003009
#20	0.1610	7/8	2-3/4	0.1610	500-003020	-	0.1965	1	3	0.1965	500-0001965
-	0.1615	7/8	2-3/4	0.1615	500-0001615	5mm	0.1969	25mm	76mm	5mm	500-004005
-	0.1620	7/8	2-3/4	0.1620	500-0001620	-	0.1970	1	3	0.1970	500-0001970
-	0.1625	7/8	2-3/4	0.1625	500-0001625	-	0.1975	1	3	0.1975	500-0001975
-	0.1630	7/8	2-3/4	0.1630	500-0001630	-	0.1980	1	3	0.1980	500-0001980
-	0.1635	7/8	2-3/4	0.1635	500-0001635	-	0.1985	1	3	0.1985	500-0001985
-	0.1640	7/8	2-3/4	0.1640	500-0001640	#8	0.1990	1	3	0.1990	500-003008
-	0.1645	7/8	2-3/4	0.1645	500-0001645	-	0.1995	1	3	0.1995	500-0001995
-	0.1650	7/8	2-3/4	0.1650	500-0001650	-	0.2000	1	3	0.2000	500-0002000
-	0.1655	7/8	2-3/4	0.1655	500-0001655	-	0.2005	1	3	0.2005	500-0002005
#19	0.1660	7/8	2-3/4	0.1660	500-003019	#7	0.2010	1	3	0.2010	500-003007
-	0.1665	7/8	2-3/4	0.1665	500-0001665	-	0.2015	1	3	0.2015	500-0002015
-	0.1670	7/8	2-3/4	0.1670	500-0001670	-	0.2020	1	3	0.2020	500-0002020
-	0.1675	7/8	2-3/4	0.1675	500-0001675	-	0.2025	1	3	0.2025	500-0002025
-	0.1680	7/8	2-3/4	0.1680	500-0001680	-	0.2030	1	3	0.2030	500-0002030
-	0.1685	7/8	2-3/4	0.1685	500-0001685	13/64	0.2031	1	3	13/64	500-001013
-	0.1690	7/8	2-3/4	0.1690	500-0001690	-	0.2035	1	3	0.2035	500-0002035
#18	0.1695	7/8	2-3/4	0.1695	500-003018	#6	0.2040	1	3	0.2040	500-003006
-	0.1700	7/8	2-3/4	0.1700	500-0001700	-	0.2045	1	3	0.2045	500-0002045

INTRO
 MILLING
 SPECIALTY
 HOLEMAKING
 THREADING
 INSERTS

GENERAL PURPOSE

Solid Carbide Straight Flute Chucking Reamer



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Series 500						4 - 6FL | Straight Flute | 45° Chamfer					
Diameter(D ₁)		Flute	OAL(L)	Shank(D)	EDP	Diameter(D ₁)		Flute	OAL(L)	Shank(D)	EDP
Size	Dec.					Size	Dec.				
-	0.2050	1	3	0.2050	500-0002050	-	0.2405	1	3	0.2405	500-0002405
#5	0.2055	1	3	0.2055	500-003005	-	0.2410	1	3	0.2410	500-0002410
-	0.2060	1	3	0.2060	500-0002060	-	0.2415	1	3	0.2415	500-0002415
-	0.2065	1	3	0.2065	500-0002065	C	0.2420	1	3	0.2420	500-002002
-	0.2070	1	3	0.2070	500-0002070	-	0.2425	1	3	0.2425	500-0002425
-	0.2075	1	3	0.2075	500-0002075	-	0.2430	1	3	0.2430	500-0002430
-	0.2080	1	3	0.2080	500-0002080	-	0.2435	1	3	0.2435	500-0002435
-	0.2085	1	3	0.2085	500-0002085	-	0.2440	1	3	0.2440	500-0002440
#4	0.2090	1	3	0.2090	500-003004	-	0.2445	1	3	0.2445	500-0002445
-	0.2095	1	3	0.2095	500-0002095	-	0.2450	1	3	0.2450	500-0002450
-	0.2100	1	3	0.2100	500-0002100	-	0.2455	1	3	0.2455	500-0002455
-	0.2105	1	3	0.2105	500-0002105	D	0.2460	1	3	0.2460	500-002003
-	0.2110	1	3	0.2110	500-0002110	-	0.2465	1	3	0.2465	500-0002465
-	0.2115	1	3	0.2115	500-0002115	-	0.2470	1	3	0.2470	500-0002470
-	0.2120	1	3	0.2120	500-0002120	-	0.2475	1	3	0.2475	500-0002475
-	0.2125	1	3	0.2125	500-0002125	-	0.2480	1	3	0.2480	500-0002480
#3	0.2130	1	3	0.2130	500-003003	-	0.2485	1	3	0.2485	500-0002485
-	0.2135	1	3	0.2135	500-0002135	-	0.2490	1	3	0.2490	500-0002490
-	0.2140	1	3	0.2140	500-0002140	-	0.2495	1	3	0.2495	500-0002495
-	0.2145	1	3	0.2145	500-0002145	-	0.2500	1	3	0.2500	500-0002500
-	0.2150	1	3	0.2150	500-0002150	1/4	0.2500	1	3	1/4	500-001016
-	0.2155	1	3	0.2155	500-0002155	E	0.2500	1	3	0.2500	500-002004
-	0.2160	1	3	0.2160	500-0002160	-	0.2505	1	3	0.2505	500-0002505
5.5mm	0.2165	25mm	76mm	5.5mm	500-004005.5	-	0.2510	1	3	0.2510	500-0002510
-	0.2170	1	3	0.2170	500-0002170	-	0.2515	1	3	0.2515	500-0002515
-	0.2175	1	3	0.2175	500-0002175	-	0.2520	1	3	0.2520	500-0002520
-	0.2180	1	3	0.2180	500-0002180	-	0.2525	1	3	0.2525	500-0002525
-	0.2185	1	3	0.2185	500-0002185	-	0.2530	1	3	0.2530	500-0002530
7/32	0.2188	1	3	7/32	500-001014	-	0.2535	1	3	0.2535	500-0002535
-	0.2190	1	3	0.2190	500-0002190	-	0.2540	1	3	0.2540	500-0002540
-	0.2195	1	3	0.2195	500-0002195	-	0.2545	1	3	0.2545	500-0002545
-	0.2200	1	3	0.2200	500-0002200	-	0.2550	1	3	0.2550	500-0002550
-	0.2205	1	3	0.2205	500-0002205	-	0.2555	1	3	0.2555	500-0002555
#2	0.2210	1	3	0.2210	500-003002	6.5mm	0.2559	29mm	83mm	6.5mm	500-004006.5
-	0.2215	1	3	0.2215	500-0002215	-	0.2560	1-1/8	3-1/4	0.2560	500-0002560
-	0.2220	1	3	0.2220	500-0002220	-	0.2565	1-1/8	3-1/4	0.2565	500-0002565
-	0.2225	1	3	0.2225	500-0002225	F	0.2570	1-1/8	3-1/4	0.2570	500-002005
-	0.2230	1	3	0.2230	500-0002230	-	0.2575	1-1/8	3-1/4	0.2575	500-0002575
-	0.2235	1	3	0.2235	500-0002235	-	0.2580	1-1/8	3-1/4	0.2580	500-0002580
-	0.2240	1	3	0.2240	500-0002240	-	0.2585	1-1/8	3-1/4	0.2585	500-0002585
-	0.2245	1	3	0.2245	500-0002245	-	0.2590	1-1/8	3-1/4	0.2590	500-0002590
-	0.2250	1	3	0.2250	500-0002250	-	0.2595	1-1/8	3-1/4	0.2595	500-0002595
-	0.2255	1	3	0.2255	500-0002255	-	0.2600	1-1/8	3-1/4	0.2600	500-0002600
-	0.2260	1	3	0.2260	500-0002260	-	0.2605	1-1/8	3-1/4	0.2605	500-0002605
-	0.2265	1	3	0.2265	500-0002265	G	0.2610	1-1/8	3-1/4	0.2610	500-002006
-	0.2270	1	3	0.2270	500-0002270	-	0.2615	1-1/8	3-1/4	0.2615	500-0002615
-	0.2275	1	3	0.2275	500-0002275	-	0.2620	1-1/8	3-1/4	0.2620	500-0002620
#1	0.2280	1	3	0.2280	500-003001	-	0.2625	1-1/8	3-1/4	0.2625	500-0002625
-	0.2285	1	3	0.2285	500-0002285	-	0.2630	1-1/8	3-1/4	0.2630	500-0002630
-	0.2290	1	3	0.2290	500-0002290	-	0.2635	1-1/8	3-1/4	0.2635	500-0002635
-	0.2295	1	3	0.2295	500-0002295	-	0.2640	1-1/8	3-1/4	0.2640	500-0002640
-	0.2300	1	3	0.2300	500-0002300	-	0.2645	1-1/8	3-1/4	0.2645	500-0002645
-	0.2305	1	3	0.2305	500-0002305	-	0.2650	1-1/8	3-1/4	0.2650	500-0002650
-	0.2310	1	3	0.2310	500-0002310	-	0.2655	1-1/8	3-1/4	0.2655	500-0002655
-	0.2315	1	3	0.2315	500-0002315	17/64	0.2656	1-1/8	3-1/4	17/64	500-001017
-	0.2320	1	3	0.2320	500-0002320	H	0.2660	1-1/8	3-1/4	0.2660	500-002007
-	0.2325	1	3	0.2325	500-0002325	-	0.2665	1-1/8	3-1/4	0.2665	500-0002665
-	0.2330	1	3	0.2330	500-0002330	-	0.2670	1-1/8	3-1/4	0.2670	500-0002670
-	0.2335	1	3	0.2335	500-0002335	-	0.2675	1-1/8	3-1/4	0.2675	500-0002675
A	0.2340	1	3	0.2340	500-002000	-	0.2680	1-1/8	3-1/4	0.2680	500-0002680
15/64	0.2344	1	3	15/64	500-001015	-	0.2685	1-1/8	3-1/4	0.2685	500-0002685
-	0.2345	1	3	0.2345	500-0002345	-	0.2690	1-1/8	3-1/4	0.2690	500-0002690
-	0.2350	1	3	0.2350	500-0002350	-	0.2695	1-1/8	3-1/4	0.2695	500-0002695
-	0.2355	1	3	0.2355	500-0002355	-	0.2700	1-1/8	3-1/4	0.2700	500-0002700
-	0.2360	1	3	0.2360	500-0002360	-	0.2705	1-1/8	3-1/4	0.2705	500-0002705
6mm	0.2362	25mm	76mm	6mm	500-004006	-	0.2710	1-1/8	3-1/4	0.2710	500-0002710
-	0.2365	1	3	0.2365	500-0002365	-	0.2715	1-1/8	3-1/4	0.2715	500-0002715
-	0.2370	1	3	0.2370	500-0002370	I	0.2720	1-1/8	3-1/4	0.2720	500-002008
-	0.2375	1	3	0.2375	500-0002375	-	0.2725	1-1/8	3-1/4	0.2725	500-0002725
B	0.2380	1	3	0.2380	500-002001	-	0.2730	1-1/8	3-1/4	0.2730	500-0002730
-	0.2385	1	3	0.2385	500-0002385	-	0.2735	1-1/8	3-1/4	0.2735	500-0002735
-	0.2390	1	3	0.2390	500-0002390	-	0.2740	1-1/8	3-1/4	0.2740	500-0002740
-	0.2395	1	3	0.2395	500-0002395	-	0.2745	1-1/8	3-1/4	0.2745	500-0002745
-	0.2400	1	3	0.2400	500-0002400	-	0.2750	1-1/8	3-1/4	0.2750	500-0002750

GENERAL PURPOSE

Solid Carbide Straight Flute Chucking Reamer



Series 500						4 - 6FL | Straight Flute | 45° Chamfer					
Diameter(D ₁)		Flute	OAL(L)	Shank(D)	EDP	Diameter(D ₁)		Flute	OAL(L)	Shank(D)	EDP
Size	Dec.					Size	Dec.				
-	0.2755	1-1/8	3-1/4	0.2755	500-0002755	-	0.3100	1-1/8	3-1/4	0.3100	500-0003100
7mm	0.2756	29mm	83mm	7mm	500-004007	D/P	0.3105	1-1/8	3-1/4	0.3105	500-0003105
-	0.2760	1-1/8	3-1/4	0.2760	500-0002760	-	0.3110	1-1/8	3-1/4	0.3110	500-0003110
-	0.2765	1-1/8	3-1/4	0.2765	500-0002765	-	0.3115	1-1/8	3-1/4	0.3115	500-0003115
-	0.2770	1-1/8	3-1/4	0.2770	500-0002770	-	0.3120	1-1/8	3-1/4	0.3120	500-0003120
J	0.2770	1-1/8	3-1/4	0.2770	500-002009	5/16	0.3125	1-1/8	3-1/4	5/16	500-001020
-	0.2775	1-1/8	3-1/4	0.2775	500-0002775	-	0.3130	1-1/8	3-1/4	0.3130	500-0003130
-	0.2780	1-1/8	3-1/4	0.2780	500-0002780	-	0.3135	1-1/8	3-1/4	0.3135	500-0003135
-	0.2785	1-1/8	3-1/4	0.2785	500-0002785	-	0.3140	1-1/8	3-1/4	0.3140	500-0003140
-	0.2790	1-1/8	3-1/4	0.2790	500-0002790	-	0.3145	1-1/8	3-1/4	0.3145	500-0003145
-	0.2795	1-1/8	3-1/4	0.2795	500-0002795	-	0.3150	1-1/8	3-1/4	0.3150	500-0003150
-	0.2800	1-1/8	3-1/4	0.2800	500-0002800	8mm	0.3150	29mm	83mm	8mm	500-004008
-	0.2805	1-1/8	3-1/4	0.2805	500-0002805	-	0.3155	1-1/8	3-1/4	0.3155	500-0003155
K	0.2810	1-1/8	3-1/4	0.2810	500-002010	O	0.3160	1-1/8	3-1/4	0.3160	500-002014
9/32	0.2813	1-1/8	3-1/4	9/32	500-001018	-	0.3165	1-1/8	3-1/4	0.3165	500-0003165
-	0.2815	1-1/8	3-1/4	0.2815	500-0002815	-	0.3170	1-1/4	3-1/2	0.3170	500-0003170
-	0.2820	1-1/8	3-1/4	0.2820	500-0002820	-	0.3175	1-1/4	3-1/2	0.3175	500-0003175
-	0.2825	1-1/8	3-1/4	0.2825	500-0002825	-	0.3180	1-1/4	3-1/2	0.3180	500-0003180
-	0.2830	1-1/8	3-1/4	0.2830	500-0002830	-	0.3185	1-1/4	3-1/2	0.3185	500-0003185
-	0.2835	1-1/8	3-1/4	0.2835	500-0002835	-	0.3190	1-1/4	3-1/2	0.3190	500-0003190
-	0.2840	1-1/8	3-1/4	0.2840	500-0002840	-	0.3195	1-1/4	3-1/2	0.3195	500-0003195
-	0.2845	1-1/8	3-1/4	0.2845	500-0002845	-	0.3200	1-1/4	3-1/2	0.3200	500-0003200
-	0.2850	1-1/8	3-1/4	0.2850	500-0002850	-	0.3205	1-1/4	3-1/2	0.3205	500-0003205
-	0.2855	1-1/8	3-1/4	0.2855	500-0002855	-	0.3210	1-1/4	3-1/2	0.3210	500-0003210
-	0.2860	1-1/8	3-1/4	0.2860	500-0002860	-	0.3215	1-1/4	3-1/2	0.3215	500-0003215
-	0.2865	1-1/8	3-1/4	0.2865	500-0002865	-	0.3220	1-1/4	3-1/2	0.3220	500-0003220
-	0.2870	1-1/8	3-1/4	0.2870	500-0002870	-	0.3225	1-1/4	3-1/2	0.3225	500-0003225
-	0.2875	1-1/8	3-1/4	0.2875	500-0002875	P	0.3230	1-1/4	3-1/2	0.3230	500-002015
-	0.2880	1-1/8	3-1/4	0.2880	500-0002880	-	0.3235	1-1/4	3-1/2	0.3235	500-0003235
-	0.2885	1-1/8	3-1/4	0.2885	500-0002885	-	0.3240	1-1/4	3-1/2	0.3240	500-0003240
-	0.2890	1-1/8	3-1/4	0.2890	500-0002890	-	0.3245	1-1/4	3-1/2	0.3245	500-0003245
-	0.2895	1-1/8	3-1/4	0.2895	500-0002895	-	0.3250	1-1/4	3-1/2	0.3250	500-0003250
L	0.2900	1-1/8	3-1/4	0.2900	500-002011	-	0.3255	1-1/4	3-1/2	0.3255	500-0003255
-	0.2905	1-1/8	3-1/4	0.2905	500-0002905	-	0.3260	1-1/4	3-1/2	0.3260	500-0003260
-	0.2910	1-1/8	3-1/4	0.2910	500-0002910	-	0.3265	1-1/4	3-1/2	0.3265	500-0003265
-	0.2915	1-1/8	3-1/4	0.2915	500-0002915	-	0.3270	1-1/4	3-1/2	0.3270	500-0003270
-	0.2920	1-1/8	3-1/4	0.2920	500-0002920	-	0.3275	1-1/4	3-1/2	0.3275	500-0003275
-	0.2925	1-1/8	3-1/4	0.2925	500-0002925	-	0.3280	1-1/4	3-1/2	0.3280	500-0003280
-	0.2930	1-1/8	3-1/4	0.2930	500-0002930	21/64	0.3281	1-1/4	3-1/2	21/64	500-001021
-	0.2935	1-1/8	3-1/4	0.2935	500-0002935	-	0.3285	1-1/4	3-1/2	0.3285	500-0003285
-	0.2940	1-1/8	3-1/4	0.2940	500-0002940	-	0.3290	1-1/4	3-1/2	0.3290	500-0003290
-	0.2945	1-1/8	3-1/4	0.2945	500-0002945	-	0.3295	1-1/4	3-1/2	0.3295	500-0003295
M	0.2950	1-1/8	3-1/4	0.2950	500-002012	-	0.3300	1-1/4	3-1/2	0.3300	500-0003300
7.5mm	0.2953	29mm	83mm	7.5mm	500-004007.5	-	0.3305	1-1/4	3-1/2	0.3305	500-0003305
-	0.2955	1-1/8	3-1/4	0.2955	500-0002955	-	0.3310	1-1/4	3-1/2	0.3310	500-0003310
-	0.2960	1-1/8	3-1/4	0.2960	500-0002960	-	0.3315	1-1/4	3-1/2	0.3315	500-0003315
-	0.2965	1-1/8	3-1/4	0.2965	500-0002965	Q	0.3320	1-1/4	3-1/2	0.3320	500-002016
19/64	0.2969	1-1/8	3-1/4	19/64	500-001019	-	0.3325	1-1/4	3-1/2	0.3325	500-0003325
-	0.2970	1-1/8	3-1/4	0.2970	500-0002970	-	0.3330	1-1/4	3-1/2	0.3330	500-0003330
-	0.2975	1-1/8	3-1/4	0.2975	500-0002975	-	0.3335	1-1/4	3-1/2	0.3335	500-0003335
-	0.2980	1-1/8	3-1/4	0.2980	500-0002980	-	0.3340	1-1/4	3-1/2	0.3340	500-0003340
-	0.2985	1-1/8	3-1/4	0.2985	500-0002985	-	0.3345	1-1/4	3-1/2	0.3345	500-0003345
-	0.2990	1-1/8	3-1/4	0.2990	500-0002990	8.5mm	0.3346	32mm	89mm	8.5mm	500-004008.5
-	0.2995	1-1/8	3-1/4	0.2995	500-0002995	-	0.3350	1-1/4	3-1/2	0.3350	500-0003350
-	0.3000	1-1/8	3-1/4	0.3000	500-0003000	-	0.3355	1-1/4	3-1/2	0.3355	500-0003355
-	0.3005	1-1/8	3-1/4	0.3005	500-0003005	-	0.3360	1-1/4	3-1/2	0.3360	500-0003360
-	0.3010	1-1/8	3-1/4	0.3010	500-0003010	-	0.3365	1-1/4	3-1/2	0.3365	500-0003365
-	0.3015	1-1/8	3-1/4	0.3015	500-0003015	-	0.3370	1-1/4	3-1/2	0.3370	500-0003370
N	0.3020	1-1/8	3-1/4	0.3020	500-002013	-	0.3375	1-1/4	3-1/2	0.3375	500-0003375
-	0.3025	1-1/8	3-1/4	0.3025	500-0003025	-	0.3380	1-1/4	3-1/2	0.3380	500-0003380
-	0.3030	1-1/8	3-1/4	0.3030	500-0003030	-	0.3385	1-1/4	3-1/2	0.3385	500-0003385
-	0.3035	1-1/8	3-1/4	0.3035	500-0003035	R	0.3390	1-1/4	3-1/2	0.3390	500-002017
-	0.3040	1-1/8	3-1/4	0.3040	500-0003040	-	0.3395	1-1/4	3-1/2	0.3395	500-0003395
-	0.3045	1-1/8	3-1/4	0.3045	500-0003045	-	0.3400	1-1/4	3-1/2	0.3400	500-0003400
-	0.3050	1-1/8	3-1/4	0.3050	500-0003050	-	0.3405	1-1/4	3-1/2	0.3405	500-0003405
-	0.3055	1-1/8	3-1/4	0.3055	500-0003055	-	0.3410	1-1/4	3-1/2	0.3410	500-0003410
-	0.3060	1-1/8	3-1/4	0.3060	500-0003060	-	0.3415	1-1/4	3-1/2	0.3415	500-0003415
-	0.3065	1-1/8	3-1/4	0.3065	500-0003065	-	0.3420	1-1/4	3-1/2	0.3420	500-0003420
-	0.3070	1-1/8	3-1/4	0.3070	500-0003070	-	0.3425	1-1/4	3-1/2	0.3425	500-0003425
-	0.3075	1-1/8	3-1/4	0.3075	500-0003075	-	0.3430	1-1/4	3-1/2	0.3430	500-0003430
-	0.3080	1-1/8	3-1/4	0.3080	500-0003080	-	0.3435	1-1/4	3-1/2	0.3435	500-0003435
-	0.3085	1-1/8	3-1/4	0.3085	500-0003085	11/32	0.3438	1-1/4	3-1/2	11/32	500-001022
-	0.3090	1-1/8	3-1/4	0.3090	500-0003090	-	0.3440	1-1/4	3-1/2	0.3440	500-0003440
-	0.3095	1-1/8	3-1/4	0.3095	500-0003095	-	0.3445	1-1/4	3-1/2	0.3445	500-0003445

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GENERAL PURPOSE

Solid Carbide Straight Flute Chucking Reamer



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Series 500						4 - 6FL Straight Flute 45° Chamfer					
Diameter(D ₁)		Flute	OAL(L)	Shank(D)	EDP	Diameter(D ₁)		Flute	OAL(L)	Shank(D)	EDP
Size	Dec.					Size	Dec.				
-	0.3450	1-1/4	3-1/2	0.3450	500-0003450	-	0.3805	1-1/4	3-1/2	0.3805	500-0003805
-	0.3455	1-1/4	3-1/2	0.3455	500-0003455	-	0.3810	1-1/4	3-1/2	0.3810	500-0003810
-	0.3460	1-1/4	3-1/2	0.3460	500-0003460	-	0.3815	1-1/4	3-1/2	0.3815	500-0003815
-	0.3465	1-1/4	3-1/2	0.3465	500-0003465	-	0.3820	1-1/4	3-1/2	0.3820	500-0003820
-	0.3470	1-1/4	3-1/2	0.3470	500-0003470	-	0.3825	1-1/4	3-1/2	0.3825	500-0003825
-	0.3475	1-1/4	3-1/2	0.3475	500-0003475	-	0.3830	1-1/4	3-1/2	0.3830	500-0003830
S	0.3480	1-1/4	3-1/2	0.3480	500-002018	-	0.3835	1-1/4	3-1/2	0.3835	500-0003835
-	0.3485	1-1/4	3-1/2	0.3485	500-0003485	-	0.3840	1-1/4	3-1/2	0.3840	500-0003840
-	0.3490	1-1/4	3-1/2	0.3490	500-0003490	-	0.3845	1-1/4	3-1/2	0.3845	500-0003845
-	0.3495	1-1/4	3-1/2	0.3495	500-0003495	-	0.3850	1-1/4	3-1/2	0.3850	500-0003850
-	0.3500	1-1/4	3-1/2	0.3500	500-0003500	-	0.3855	1-1/4	3-1/2	0.3855	500-0003855
-	0.3505	1-1/4	3-1/2	0.3505	500-0003505	W	0.3860	1-1/4	3-1/2	0.3860	500-002022
-	0.3510	1-1/4	3-1/2	0.3510	500-0003510	-	0.3865	1-1/4	3-1/2	0.3865	500-0003865
-	0.3515	1-1/4	3-1/2	0.3515	500-0003515	-	0.3870	1-1/4	3-1/2	0.3870	500-0003870
-	0.3520	1-1/4	3-1/2	0.3520	500-0003520	-	0.3875	1-1/4	3-1/2	0.3875	500-0003875
-	0.3525	1-1/4	3-1/2	0.3525	500-0003525	-	0.3880	1-1/4	3-1/2	0.3880	500-0003880
-	0.3530	1-1/4	3-1/2	0.3530	500-0003530	-	0.3885	1-1/4	3-1/2	0.3885	500-0003885
-	0.3535	1-1/4	3-1/2	0.3535	500-0003535	-	0.3890	1-1/4	3-1/2	0.3890	500-0003890
-	0.3540	1-1/4	3-1/2	0.3540	500-0003540	-	0.3895	1-1/4	3-1/2	0.3895	500-0003895
9mm	0.3543	32mm	89mm	9mm	500-004009	-	0.3900	1-1/4	3-1/2	0.3900	500-0003900
-	0.3545	1-1/4	3-1/2	0.3545	500-0003545	-	0.3905	1-1/4	3-1/2	0.3905	500-0003905
-	0.3550	1-1/4	3-1/2	0.3550	500-0003550	25/64	0.3906	1-1/4	3-1/2	25/64	500-001025
-	0.3555	1-1/4	3-1/2	0.3555	500-0003555	-	0.3910	1-1/4	3-1/2	0.3910	500-0003910
-	0.3560	1-1/4	3-1/2	0.3560	500-0003560	-	0.3915	1-1/4	3-1/2	0.3915	500-0003915
-	0.3565	1-1/4	3-1/2	0.3565	500-0003565	-	0.3920	1-1/4	3-1/2	0.3920	500-0003920
-	0.3570	1-1/4	3-1/2	0.3570	500-0003570	-	0.3925	1-1/4	3-1/2	0.3925	500-0003925
-	0.3575	1-1/4	3-1/2	0.3575	500-0003575	-	0.3930	1-1/4	3-1/2	0.3930	500-0003930
T	0.3580	1-1/4	3-1/2	0.3580	500-002019	-	0.3935	1-1/4	3-1/2	0.3935	500-0003935
-	0.3585	1-1/4	3-1/2	0.3585	500-0003585	1mm	0.3937	32mm	89mm	10mm	500-004010
-	0.3590	1-1/4	3-1/2	0.3590	500-0003590	-	0.3940	1-1/4	3-1/2	0.3940	500-0003940
23/64	0.3594	1-1/4	3-1/2	23/64	500-001023	-	0.3945	1-1/4	3-1/2	0.3945	500-0003945
-	0.3595	1-1/4	3-1/2	0.3595	500-0003595	-	0.3950	1-1/4	3-1/2	0.3950	500-0003950
-	0.3600	1-1/4	3-1/2	0.3600	500-0003600	-	0.3955	1-1/4	3-1/2	0.3955	500-0003955
-	0.3605	1-1/4	3-1/2	0.3605	500-0003605	-	0.3960	1-1/4	3-1/2	0.3960	500-0003960
-	0.3610	1-1/4	3-1/2	0.3610	500-0003610	-	0.3965	1-1/4	3-1/2	0.3965	500-0003965
-	0.3615	1-1/4	3-1/2	0.3615	500-0003615	X	0.3970	1-1/4	3-1/2	0.3970	500-002023
-	0.3620	1-1/4	3-1/2	0.3620	500-0003620	-	0.3975	1-1/4	3-1/2	0.3975	500-0003975
-	0.3625	1-1/4	3-1/2	0.3625	500-0003625	-	0.3980	1-1/4	3-1/2	0.3980	500-0003980
-	0.3630	1-1/4	3-1/2	0.3630	500-0003630	-	0.3985	1-1/4	3-1/2	0.3985	500-0003985
-	0.3635	1-1/4	3-1/2	0.3635	500-0003635	-	0.3990	1-1/4	3-1/2	0.3990	500-0003990
-	0.3640	1-1/4	3-1/2	0.3640	500-0003640	-	0.3995	1-1/4	3-1/2	0.3995	500-0003995
-	0.3645	1-1/4	3-1/2	0.3645	500-0003645	-	0.4000	1-1/4	3-1/2	0.4000	500-0004000
-	0.3650	1-1/4	3-1/2	0.3650	500-0003650	-	0.4005	1-1/4	3-1/2	0.4005	500-0004005
-	0.3655	1-1/4	3-1/2	0.3655	500-0003655	-	0.4010	1-1/4	3-1/2	0.4010	500-0004010
-	0.3660	1-1/4	3-1/2	0.3660	500-0003660	-	0.4015	1-1/4	3-1/2	0.4015	500-0004015
-	0.3665	1-1/4	3-1/2	0.3665	500-0003665	-	0.4020	1-1/4	3-1/2	0.4020	500-0004020
-	0.3670	1-1/4	3-1/2	0.3670	500-0003670	-	0.4025	1-1/4	3-1/2	0.4025	500-0004025
-	0.3675	1-1/4	3-1/2	0.3675	500-0003675	-	0.4030	1-1/4	3-1/2	0.4030	500-0004030
U	0.3680	1-1/4	3-1/2	0.3680	500-002020	-	0.4035	1-1/4	3-1/2	0.4035	500-0004035
-	0.3685	1-1/4	3-1/2	0.3685	500-0003685	Y	0.4040	1-1/4	3-1/2	0.4040	500-002024
-	0.3690	1-1/4	3-1/2	0.3690	500-0003690	-	0.4045	1-1/4	3-1/2	0.4045	500-0004045
-	0.3695	1-1/4	3-1/2	0.3695	500-0003695	-	0.4050	1-1/4	3-1/2	0.4050	500-0004050
-	0.3700	1-1/4	3-1/2	0.3700	500-0003700	-	0.4055	1-1/4	3-1/2	0.4055	500-0004055
-	0.3705	1-1/4	3-1/2	0.3705	500-0003705	-	0.4060	1-1/4	3-1/2	0.4060	500-0004060
-	0.3710	1-1/4	3-1/2	0.3710	500-0003710	13/32	0.4063	1-1/4	3-1/2	13/32	500-001026
-	0.3715	1-1/4	3-1/2	0.3715	500-0003715	-	0.4065	1-1/4	3-1/2	0.4065	500-0004065
-	0.3720	1-1/4	3-1/2	0.3720	500-0003720	-	0.4070	1-1/4	3-1/2	0.4070	500-0004070
-	0.3725	1-1/4	3-1/2	0.3725	500-0003725	-	0.4075	1-1/4	3-1/2	0.4075	500-0004075
D/P	0.3730	1-1/4	3-1/2	0.3730	500-0003730	-	0.4080	1-1/4	3-1/2	0.4080	500-0004080
-	0.3735	1-1/4	3-1/2	0.3735	500-0003735	-	0.4085	1-1/4	3-1/2	0.4085	500-0004085
U/S	0.3740	1-1/4	3-1/2	0.3740	500-0003740	-	0.4090	1-1/4	3-1/2	0.4090	500-0004090
9.5mm	0.3740	32mm	89mm	9.5mm	500-004009.5	-	0.4095	1-1/4	3-1/2	0.4095	500-0004095
D/P	0.3745	1-1/4	3-1/2	0.3745	500-0003745	-	0.4100	1-1/4	3-1/2	0.4100	500-0004100
3/8	0.3750	1-1/4	3-1/2	3/8	500-001024	-	0.4105	1-1/4	3-1/2	0.4105	500-0004105
-	0.3755	1-1/4	3-1/2	0.3755	500-0003755	-	0.4110	1-1/4	3-1/2	0.4110	500-0004110
O/S	0.3760	1-1/4	3-1/2	0.3760	500-0003760	-	0.4115	1-1/4	3-1/2	0.4115	500-0004115
-	0.3765	1-1/4	3-1/2	0.3765	500-0003765	-	0.4120	1-1/4	3-1/2	0.4120	500-0004120
V	0.3770	1-1/4	3-1/2	0.3770	500-002021	-	0.4125	1-1/4	3-1/2	0.4125	500-0004125
-	0.3775	1-1/4	3-1/2	0.3775	500-0003775	Z	0.4130	1-1/4	3-1/2	0.4130	500-002025
-	0.3780	1-1/4	3-1/2	0.3780	500-0003780	10.5mm	0.4134	32mm	89mm	10.5mm	500-004010.5
-	0.3785	1-1/4	3-1/2	0.3785	500-0003785	-	0.4135	1-1/4	3-1/2	0.4135	500-0004135
-	0.3790	1-1/4	3-1/2	0.3790	500-0003790	-	0.4140	1-1/4	3-1/2	0.4140	500-0004140
-	0.3795	1-1/4	3-1/2	0.3795	500-0003795	-	0.4145	1-1/4	3-1/2	0.4145	500-0004145
-	0.3800	1-1/4	3-1/2	0.3800	500-0003800	-	0.4150	1-1/4	3-1/2	0.4150	500-0004150

GENERAL PURPOSE

Solid Carbide Straight Flute Chucking Reamer



Series 500						4 - 6FL | Straight Flute | 45° Chamfer					
Diameter(D ₁)		Flute	OAL(L)	Shank(D)	EDP	Diameter(D ₁)		Flute	OAL(L)	Shank(D)	EDP
Size	Dec.					Size	Dec.				
-	0.4155	1-1/4	3-1/2	0.4155	500-0004155	-	0.4515	1-3/8	4	0.4515	500-0004515
-	0.4160	1-1/4	3-1/2	0.4160	500-0004160	-	0.4520	1-3/8	4	0.4520	500-0004520
-	0.4165	1-3/8	4	0.4165	500-0004165	-	0.4525	1-3/8	4	0.4525	500-0004525
-	0.4170	1-3/8	4	0.4170	500-0004170	11.5mm	0.4528	35mm	102mm	0.4528	500-004011.5
-	0.4175	1-3/8	4	0.4175	500-0004175	-	0.4530	1-3/8	4	0.4530	500-0004530
-	0.4180	1-3/8	4	0.4180	500-0004180	29/64	0.4531	1-3/8	4	29/64	500-001029
-	0.4185	1-3/8	4	0.4185	500-0004185	-	0.4535	1-3/8	4	0.4535	500-0004535
-	0.4190	1-3/8	4	0.4190	500-0004190	-	0.4540	1-3/8	4	0.4540	500-0004540
-	0.4195	1-3/8	4	0.4195	500-0004195	-	0.4545	1-3/8	4	0.4545	500-0004545
-	0.4200	1-3/8	4	0.4200	500-0004200	-	0.4550	1-3/8	4	0.4550	500-0004550
-	0.4205	1-3/8	4	0.4205	500-0004205	-	0.4555	1-3/8	4	0.4555	500-0004555
-	0.4210	1-3/8	4	0.4210	500-0004210	-	0.4560	1-3/8	4	0.4560	500-0004560
-	0.4215	1-3/8	4	0.4215	500-0004215	-	0.4565	1-3/8	4	0.4565	500-0004565
27/64	0.4219	1-3/8	4	27/64	500-001027	-	0.4570	1-3/8	4	0.4570	500-0004570
-	0.4220	1-3/8	4	0.4220	500-0004220	-	0.4575	1-3/8	4	0.4575	500-0004575
-	0.4225	1-3/8	4	0.4225	500-0004225	-	0.4580	1-3/8	4	0.4580	500-0004580
-	0.4230	1-3/8	4	0.4230	500-0004230	-	0.4585	1-3/8	4	0.4585	500-0004585
-	0.4235	1-3/8	4	0.4235	500-0004235	-	0.4590	1-3/8	4	0.4590	500-0004590
-	0.4240	1-3/8	4	0.4240	500-0004240	-	0.4595	1-3/8	4	0.4595	500-0004595
-	0.4245	1-3/8	4	0.4245	500-0004245	-	0.4600	1-3/8	4	0.4600	500-0004600
-	0.4250	1-3/8	4	0.4250	500-0004250	-	0.4605	1-3/8	4	0.4605	500-0004605
-	0.4255	1-3/8	4	0.4255	500-0004255	-	0.4610	1-3/8	4	0.4610	500-0004610
-	0.4260	1-3/8	4	0.4260	500-0004260	-	0.4615	1-3/8	4	0.4615	500-0004615
-	0.4265	1-3/8	4	0.4265	500-0004265	-	0.4620	1-3/8	4	0.4620	500-0004620
-	0.4270	1-3/8	4	0.4270	500-0004270	-	0.4625	1-3/8	4	0.4625	500-0004625
-	0.4275	1-3/8	4	0.4275	500-0004275	-	0.4630	1-3/8	4	0.4630	500-0004630
-	0.4280	1-3/8	4	0.4280	500-0004280	-	0.4635	1-3/8	4	0.4635	500-0004635
-	0.4285	1-3/8	4	0.4285	500-0004285	-	0.4640	1-3/8	4	0.4640	500-0004640
-	0.4290	1-3/8	4	0.4290	500-0004290	-	0.4645	1-3/8	4	0.4645	500-0004645
-	0.4295	1-3/8	4	0.4295	500-0004295	-	0.4650	1-3/8	4	0.4650	500-0004650
-	0.4300	1-3/8	4	0.4300	500-0004300	-	0.4655	1-3/8	4	0.4655	500-0004655
-	0.4305	1-3/8	4	0.4305	500-0004305	-	0.4660	1-3/8	4	0.4660	500-0004660
-	0.4310	1-3/8	4	0.4310	500-0004310	-	0.4665	1-3/8	4	0.4665	500-0004665
-	0.4315	1-3/8	4	0.4315	500-0004315	-	0.4670	1-3/8	4	0.4670	500-0004670
-	0.4320	1-3/8	4	0.4320	500-0004320	-	0.4675	1-3/8	4	0.4675	500-0004675
-	0.4325	1-3/8	4	0.4325	500-0004325	-	0.4680	1-3/8	4	0.4680	500-0004680
-	0.4330	1-3/8	4	0.4330	500-0004330	-	0.4685	1-3/8	4	0.4685	500-0004685
11mm	0.4331	35mm	102mm	11mm	500-004011	15/32	0.4688	1-3/8	4	15/32	500-001030
-	0.4335	1-3/8	4	0.4335	500-0004335	-	0.4690	1-3/8	4	0.4690	500-0004690
-	0.4340	1-3/8	4	0.4340	500-0004340	-	0.4695	1-3/8	4	0.4695	500-0004695
-	0.4345	1-3/8	4	0.4345	500-0004345	-	0.4700	1-3/8	4	0.4700	500-0004700
-	0.4350	1-3/8	4	0.4350	500-0004350	-	0.4705	1-3/8	4	0.4705	500-0004705
D/P	0.4355	1-3/8	4	0.4355	500-0004355	-	0.4710	1-3/8	4	0.4710	500-0004710
-	0.4360	1-3/8	4	0.4360	500-0004360	-	0.4715	1-3/8	4	0.4715	500-0004715
U/S	0.4365	1-3/8	4	0.4365	500-0004365	-	0.4720	1-3/8	4	0.4720	500-0004720
-	0.4370	1-3/8	4	0.4370	500-0004370	12mm	0.4724	35mm	102mm	0.4724	500-004012
7/16	0.4375	1-3/8	4	7/16	500-001028	-	0.4725	1-3/8	4	0.4725	500-0004725
-	0.4380	1-3/8	4	0.4380	500-0004380	-	0.4730	1-3/8	4	0.4730	500-0004730
-	0.4385	1-3/8	4	0.4385	500-0004385	-	0.4735	1-3/8	4	0.4735	500-0004735
-	0.4390	1-3/8	4	0.4390	500-0004390	-	0.4740	1-3/8	4	0.4740	500-0004740
-	0.4395	1-3/8	4	0.4395	500-0004395	-	0.4745	1-3/8	4	0.4745	500-0004745
-	0.4400	1-3/8	4	0.4400	500-0004400	-	0.4750	1-3/8	4	0.4750	500-0004750
-	0.4405	1-3/8	4	0.4405	500-0004405	-	0.4755	1-3/8	4	0.4755	500-0004755
-	0.4410	1-3/8	4	0.4410	500-0004410	-	0.4760	1-3/8	4	0.4760	500-0004760
-	0.4415	1-3/8	4	0.4415	500-0004415	-	0.4765	1-3/8	4	0.4765	500-0004765
-	0.4420	1-3/8	4	0.4420	500-0004420	-	0.4770	1-3/8	4	0.4770	500-0004770
-	0.4425	1-3/8	4	0.4425	500-0004425	-	0.4775	1-3/8	4	0.4775	500-0004775
-	0.4430	1-3/8	4	0.4430	500-0004430	-	0.4780	1-3/8	4	0.4780	500-0004780
-	0.4435	1-3/8	4	0.4435	500-0004435	-	0.4785	1-1/2	4	0.4785	500-0004785
-	0.4440	1-3/8	4	0.4440	500-0004440	-	0.4790	1-1/2	4	0.4790	500-0004790
-	0.4445	1-3/8	4	0.4445	500-0004445	-	0.4795	1-1/2	4	0.4795	500-0004795
-	0.4450	1-3/8	4	0.4450	500-0004450	-	0.4800	1-1/2	4	0.4800	500-0004800
-	0.4455	1-3/8	4	0.4455	500-0004455	-	0.4805	1-1/2	4	0.4805	500-0004805
-	0.4460	1-3/8	4	0.4460	500-0004460	-	0.4810	1-1/2	4	0.4810	500-0004810
-	0.4465	1-3/8	4	0.4465	500-0004465	-	0.4815	1-1/2	4	0.4815	500-0004815
-	0.4470	1-3/8	4	0.4470	500-0004470	-	0.4820	1-1/2	4	0.4820	500-0004820
-	0.4475	1-3/8	4	0.4475	500-0004475	-	0.4825	1-1/2	4	0.4825	500-0004825
-	0.4480	1-3/8	4	0.4480	500-0004480	-	0.4830	1-1/2	4	0.4830	500-0004830
-	0.4485	1-3/8	4	0.4485	500-0004485	-	0.4835	1-1/2	4	0.4835	500-0004835
-	0.4490	1-3/8	4	0.4490	500-0004490	-	0.4840	1-1/2	4	0.4840	500-0004840
-	0.4495	1-3/8	4	0.4495	500-0004495	31/64	0.4844	1-1/2	4	31/64	500-001031
-	0.4500	1-3/8	4	0.4500	500-0004500	-	0.4845	1-1/2	4	0.4845	500-0004845
-	0.4505	1-3/8	4	0.4505	500-0004505	-	0.4850	1-1/2	4	0.4850	500-0004850
-	0.4510	1-3/8	4	0.4510	500-0004510	-	0.4855	1-1/2	4	0.4855	500-0004855

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Solid Carbide Straight Flute Chucking Reamer



Series 500		4 - 6FL | Straight Flute | 45° Chamfer									
Diameter(D ₁)		Flute	OAL(L)	Shank(D)	EDP	Diameter(D ₁)		Flute	OAL(L)	Shank(D)	EDP
Size	Dec.					Size	Dec.				
-	0.4860	1-1/2	4	0.4860	500-0004860	-	0.6255	1-3/4	4	0.6255	500-0006255
-	0.4865	1-1/2	4	0.4865	500-0004865	-	0.6260	1-3/4	4	0.6260	500-0006260
-	0.4870	1-1/2	4	0.4870	500-0004870	-	0.6265	1-3/4	4	0.6265	500-0006265
-	0.4875	1-1/2	4	0.4875	500-0004875	-	0.6270	1-3/4	4	0.6270	500-0006270
-	0.4880	1-1/2	4	0.4880	500-0004880	-	0.6275	1-3/4	4	0.6275	500-0006275
-	0.4885	1-1/2	4	0.4885	500-0004885	-	0.6280	1-3/4	4	0.6280	500-0006280
-	0.4890	1-1/2	4	0.4890	500-0004890	-	0.6285	1-3/4	4	0.6285	500-0006285
-	0.4895	1-1/2	4	0.4895	500-0004895	-	0.6290	1-3/4	4	0.6290	500-0006290
-	0.4900	1-1/2	4	0.4900	500-0004900	-	0.6295	1-3/4	4	0.6295	500-0006295
-	0.4905	1-1/2	4	0.4905	500-0004905	16mm	0.6299	44mm	102mm	16mm	500-004016
-	0.4910	1-1/2	4	0.4910	500-0004910	-	0.6300	1-3/4	4	0.6300	500-0006300
-	0.4915	1-1/2	4	0.4915	500-0004915	-	0.6305	1-3/4	4	0.6305	500-0006305
-	0.4920	1-1/2	4	0.4920	500-0004920	-	0.6310	1-3/4	4	0.6310	500-0006310
12.5mm	0.4921	38mm	102mm	0.4921	500-004012.5	-	0.7470	1-3/4	4	0.7470	500-0007470
-	0.4925	1-1/2	4	0.4925	500-0004925	-	0.7475	1-3/4	4	0.7475	500-0007475
-	0.4930	1-1/2	4	0.4930	500-0004930	-	0.7480	1-3/4	4	0.7480	500-0007480
-	0.4935	1-1/2	4	0.4935	500-0004935	-	0.7485	1-3/4	4	0.7485	500-0007485
-	0.4940	1-1/2	4	0.4940	500-0004940	-	0.7490	1-3/4	4	0.7490	500-0007490
-	0.4945	1-1/2	4	0.4945	500-0004945	-	0.7495	1-3/4	4	0.7495	500-0007495
-	0.4950	1-1/2	4	0.4950	500-0004950	3/4	0.7500	1-3/4	4	3/4	500-001048
-	0.4955	1-1/2	4	0.4955	500-0004955	-	0.7505	1-3/4	4	0.7505	500-0007505
-	0.4960	1-1/2	4	0.4960	500-0004960	-	0.7510	1-3/4	4	0.7510	500-0007510
-	0.4965	1-1/2	4	0.4965	500-0004965						
-	0.4970	1-1/2	4	0.4970	500-0004970						
-	0.4975	1-1/2	4	0.4975	500-0004975						
D/P	0.4980	1-1/2	4	0.4980	500-0004980						
-	0.4985	1-1/2	4	0.4985	500-0004985						
U/S	0.4990	1-1/2	4	0.4990	500-0004990						
D/P	0.4995	1-1/2	4	0.4995	500-0004995						
1/2	0.5000	1-1/2	4	1/2	500-001032						
-	0.5005	1-1/2	4	0.5005	500-0005005						
O/S	0.5010	1-1/2	4	0.5010	500-0005010						
-	0.5015	1-1/2	4	0.5015	500-0005015						
-	0.5020	1-1/2	4	0.5020	500-0005020						
-	0.5025	1-1/2	4	0.5025	500-0005025						
-	0.5030	1-1/2	4	0.5030	500-0005030						
-	0.5035	1-1/2	4	0.5035	500-0005035						
-	0.5040	1-1/2	4	0.5040	500-0005040						
-	0.5045	1-1/2	4	0.5045	500-0005045						
-	0.5050	1-1/2	4	0.5050	500-0005050						
-	0.5090	1-1/2	4	0.5090	500-0005090						
-	0.5095	1-1/2	4	0.5095	500-0005095						
-	0.5100	1-1/2	4	0.5100	500-0005100						
-	0.5105	1-1/2	4	0.5105	500-0005105						
-	0.5110	1-1/2	4	0.5110	500-0005110						
-	0.5115	1-1/2	4	0.5115	500-0005115						
13mm	0.5118	38mm	102mm	13mm	500-004013						
-	0.5120	1-1/2	4	0.5120	500-0005120						
-	0.5495	1-1/2	4	0.5495	500-0005495						
-	0.5500	1-1/2	4	0.5500	500-0005500						
-	0.5505	1-1/2	4	0.5505	500-0005505						
-	0.5510	1-1/2	4	0.5510	500-0005510						
14mm	0.5512	38mm	102mm	14mm	500-004014						
-	0.5515	1-1/2	4	0.5515	500-0005515						
-	0.5600	1-1/2	4	0.5600	500-0005600						
-	0.5605	1-1/2	4	0.5605	500-0005605						
-	0.5610	1-1/2	4	0.5610	500-0005610						
-	0.5615	1-1/2	4	0.5615	500-0005615						
-	0.5620	1-1/2	4	0.5620	500-0005620						
9/16	0.5625	1-1/2	4	9/16	500-001036						
-	0.5885	1-3/4	4	0.5885	500-0005885						
-	0.5890	1-3/4	4	0.5890	500-0005890						
-	0.5895	1-3/4	4	0.5895	500-0005895						
-	0.5900	1-3/4	4	0.5900	500-0005900						
15mm	0.5906	44mm	102mm	15mm	500-004015						
-	0.6210	1-3/4	4	0.6210	500-0006210						
-	0.6215	1-3/4	4	0.6215	500-0006215						
-	0.6220	1-3/4	4	0.6220	500-0006220						
-	0.6225	1-3/4	4	0.6225	500-0006225						
-	0.6230	1-3/4	4	0.6230	500-0006230						
-	0.6235	1-3/4	4	0.6235	500-0006235						
-	0.6240	1-3/4	4	0.6240	500-0006240						
-	0.6245	1-3/4	4	0.6245	500-0006245						
5/8	0.6250	1-3/4	4	5/8	500-001040						

INTRO

MILLING

SPECIALTY

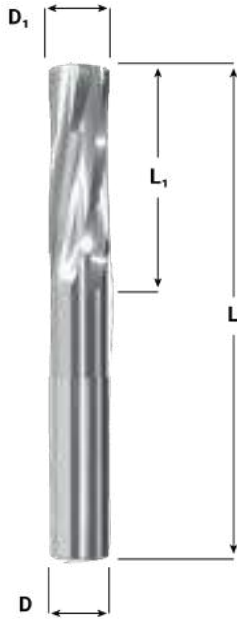
HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Solid Carbide Spiral Flute Chucking Reamer



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Helical Reamers</p> <ul style="list-style-type: none"> • ≤1/4 Diameter Tolerance = +0/+0.0002" • >1/4 Diameter Tolerance = +0/+0.0003" • Expand an existing hole to a precise size or create a perfect hole finish • Reduced neck for through-hole clearance • Best suited for blind holes • Helical flute geometry pulls chips out of the hole 		<ul style="list-style-type: none"> CARBIDE 10° 15° CHF 4FL 6FL P376 Bright

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	○	○	○	●	●	○	○	○	○	○	○

● Best ○ Good

Series 550 | 4 - 6FL | Slow Spiral | 45° Chamfer

Diameter(D ₁) Size	Dec.	Flute Length(L ₁)	OAL(L)	Shank(D)	Flutes	Helix	EDP
3/64	0.0468	3/8	1-1/2	3/64	4	15	550-001003
1/16	0.0625	3/8	1-1/2	1/16	4	15	550-001004
5/64	0.0781	1/4	1-3/4	5/64	4	15	550-001005
3/32	0.0937	1/2	2	3/32	4	15	550-001006
7/64	0.1093	5/8	2-1/4	7/64	4	15	550-001007
1/8	0.1250	5/8	2-1/4	1/8	4	15	550-001008
9/64	0.1406	3/4	2-1/2	9/64	4	10	550-001009
5/32	0.1562	3/4	2-1/2	5/32	4	10	550-001010
11/64	0.1718	7/8	2-3/4	11/64	4	10	550-001011
3/16	0.1875	7/8	2-3/4	3/16	4	10	550-001012
9/32	0.2031	1	3	9/32	4	10	550-001013
7/32	0.2187	1	3	7/32	4	10	550-001014
15/64	0.2343	1	3	15/64	4	10	550-001015
1/4	0.2500	1	3	1/4	4	10	550-001016
17/64	0.2656	1-1/8	3-1/4	17/64	6	10	550-001017
9/32	0.2812	1-1/8	3-1/4	9/32	6	10	550-001018
5/16	0.3125	1-1/8	3-1/4	5/16	6	10	550-001020
3/8	0.3750	1-1/4	3-1/2	3/8	6	10	550-001024
13/32	0.4062	1-1/4	3-1/2	13/32	6	10	550-001026
7/16	0.4375	1-3/8	4	7/16	6	10	550-001028
1/2	0.5000	1-1/2	4	1/2	6	10	550-001032

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Countersinks</p> <ul style="list-style-type: none"> Sub-micrograin carbide substrate for wear resistance General purpose countersinking operations Single end and double end 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	○			●	●	○	○			○	

● Best ○ Good

Series 331 | 1FL | 60°-120° | Single & Double End

Diameter(D ₁)	Shank(D)	Incl. Angle	Single End	Double End
1/8	1/8	60°	331-001050	331-201050
3/16	3/16		331-002050	331-202050
1/4	1/4		331-003050	331-203050
5/16	1/4		331-004050	331-204050
3/8	1/4		331-005050	331-205050
1/2	1/4		331-006050	331-206050
1/2	3/8		331-006550	331-207050
5/8	1/4		331-007050	331-208050
5/8	3/8		331-007550	-
3/4	3/8		331-008050	-
3/4	1/2		331-008550	-
1	1/2		331-010050	-
1-1/4	3/4		331-011050	-
1-1/2	3/4		331-012050	-
1/8	1/8	82°	331-001060	331-201060
3/16	3/16		331-002060	331-202060
1/4	1/4		331-003060	331-203060
5/16	5/16		-	331-204060
3/8	1/4		331-005060	331-205060
1/2	1/4		331-006060	331-206060
1/2	3/8		331-006560	331-207060
5/8	1/4		331-007060	331-208060
5/8	3/8		331-007560	-
3/4	3/8		331-008060	-
3/4	1/2		331-008560	-
1	1/2		331-010060	-
1-1/4	3/4		331-011060	-
1-1/2	3/4		331-012060	-
1/8	1/8	90°	331-001070	331-201070
3/16	3/16		331-002070	331-202070
1/4	1/4		331-003070	331-203070
5/16	5/16		-	331-204070
3/8	1/4		331-005070	331-205070
1/2	1/4		331-006070	331-206070
1/2	3/8		331-006570	331-207070
5/8	1/4		331-007070	331-208070
5/8	3/8		331-007570	-
3/4	3/8		331-008070	-
3/4	1/2		331-008570	-
1	1/2		331-010070	-
1-1/4	3/4		331-011070	-
1-1/2	3/4		331-012070	-
1/8	1/8	100°	331-001080	331-201080
3/16	3/16		331-002080	331-202080
1/4	1/4		331-003080	331-203080

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide Countersink



Series 331 | 1FL | 60°-120° | Single & Double End

Diameter(D ₁)	Shank(D)	Incl. Angle	Single End	Double End
5/16	1/4	100°	331-004080	331-204080
3/8	1/4		331-005080	331-205080
1/2	1/4		331-006080	331-206080
1/2	3/8		331-006580	331-207080
5/8	1/4		331-007080	331-208080
5/8	3/8		331-007580	-
3/4	3/8		331-008080	-
3/4	1/2		331-008580	-
1	1/2		331-010080	-
1-1/4	3/4		331-011080	-
1-1/2	3/4	331-012080	-	
5/16	5/16	110°	-	331-204090
5/8	5/8		-	331-207090
1/8	1/8		331-001090	331-201090
1/8	1/8		-	331-201100
3/16	3/16		331-002090	331-202090
3/16	3/16		-	331-202200
1/4	1/4		331-003090	331-203090
1/4	1/4		-	331-203100
5/16	5/16		-	331-204100
3/8	1/4		331-005090	331-205090
3/8	3/8	-	331-205100	
1/2	1/4	331-006090	331-206090	
1/2	1/2	-	331-206100	
5/8	1/4	331-007090	331-208090	
5/8	5/8	-	331-207100	
3/4	3/8	331-008090	-	
3/4	3/4	-	331-208100	
1	1/2	331-010090	-	
1-1/4	3/4	331-011090	-	
1-1/2	3/4	331-012090	-	

*bold numbers are EDPs for ordering

Popular Custom Holemaking Options

Material-specific point geometry

Longer flute lengths

Internal coolant supply

Proprietary GWS tool coatings

CUSTOM COMES STANDARD

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Solid Carbide 3-Flute Countersink



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Countersinks</p> <ul style="list-style-type: none"> Sub-micrograin carbide substrate for wear resistance General purpose countersinking operations 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	○			●	●	○	○			○	

● Best ○ Good

Series 333 3FL | 60°-120°

Diameter(D ₁)	OAL(L)	Shank(D)	Incl. Angle	EDP	
1/8	1-1/2	1/8	60°	333-001050	
3/16	2	3/16		333-002050	
1/4	2	1/4		333-003050	
5/16	2-9/16	1/4		333-004050	
3/8	2-1/2	1/4		333-005050	
1/2	2-1/2	1/4		333-006050	
1/2	2-7/8	3/8		333-006550	
5/8	2-3/4	3/8		333-007050	
3/4	3	3/8		333-008050	
3/4	3	1/2		333-008550	
7/8	3-1/8	1/2		333-009050	
1	3	1/2		333-010050	
1-1/4	3-1/2	3/4		333-011050	
1-1/2	3-1/2	3/4		333-012050	
1/8	1-1/2	1/8		82°	333-001060
3/16	2	3/16			333-002060
1/4	2	1/4	333-003060		
5/16	2-7/8	1/4	333-004060		
3/8	2-1/2	1/4	333-005060		
1/2	2-1/2	1/4	333-006060		
1/2	2-3/4	3/8	333-006560		
5/8	2-3/4	3/8	333-007060		
3/4	3	3/8	333-008060		
3/4	2-7/8	1/2	333-008560		
7/8	2-15/16	1/2	333-009060		
1	3	1/2	333-010060		
1-1/4	3-1/2	3/4	333-011060		
1-1/2	3-1/2	3/4	333-012060		
1/8	1-1/2	1/8	90°		333-001070
3/16	2	3/16			333-002070
1/4	2	1/4		333-003070	
5/16	2-7/8	1/4		333-004070	
3/8	2-1/2	1/4		333-005070	
1/2	2-1/2	1/4		333-006070	
1/2	2-3/4	3/8		333-006570	
5/8	2-3/4	3/8		333-007070	
3/4	3	3/8		333-008070	
3/4	2-3/4	1/2		333-008570	
7/8	3	1/2		333-009070	
1	3	1/2		333-010070	
1-1/4	3-1/2	3/4		333-011070	
1-1/2	3-1/2	3/4		333-012070	
1/8	1-1/2	1/8		100°	333-001080
3/16	2	3/16			333-002080
1/4	2	1/4	333-003080		

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide 3-Flute Countersink



Series 333 3FL | 60°-120°

Diameter(D ₁)	OAL(L)	Shank(D)	Incl. Angle	EDP
3/8	2-1/2	1/4	100°	333-005080
1/2	2-1/2	1/4		333-006080
5/8	2-3/4	3/8		333-007080
3/4	3	3/8		333-008080
1	3	1/2		333-010080
1-1/4	3-1/2	3/4		333-011080
1-1/2	3-1/2	3/4		333-012080
1/8	1-1/2	1/8	120°	333-001090
3/16	2	3/16		333-002090
1/4	2	1/4		333-003090
3/8	2-1/2	1/4		333-005090
1/2	2-1/2	1/4		333-006090
5/8	2-3/4	3/8		333-007090
3/4	3	3/8		333-008090
1	3	1/2		333-010090
1-1/4	3-1/2	3/4		333-011090
1-1/2	3-1/2	3/4		333-012090

*bold numbers are EDPs for ordering

Popular Custom Holemaking Options

- Material-specific point geometry
- Longer flute lengths
- Internal coolant supply
- Proprietary GWS tool coatings

**CUSTOM
COMES
STANDARD**

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Countersinks</p> <ul style="list-style-type: none"> Sub-micrograin carbide substrate for wear resistance General purpose countersinking operations Single end and double end 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	○			●	●	○	○			○	

● Best ○ Good

Series 334 | 4FL | 60°-120° | Single & Double End

Diameter(D ₁)	OAL(L)	Shank(D)	Drill Point	Incl. Angle	Single End	Double End
1/8	1-1/2	1/8	Yes	60°	-	334-301050
1/8	1-1/2	1/8	No		334-001050	334-201050
3/16	2	3/16	Yes		-	334-302050
1/4	2	1/4	Yes		-	334-303050
1/4	2	1/4	No		334-003050	334-202050
5/16	2-1/8	5/16	Yes		-	334-304050
3/8	2-1/2	3/8	Yes		-	334-305050
3/8	2-1/2	1/4	No		334-005050	334-203050
1/2	3	1/2	Yes		-	334-306050
1/2	2-1/2	3/8	No		334-006050	334-204050
5/8	3-1/4	5/8	Yes		-	334-307050
5/8	2-1/2	3/8	No		334-007050	334-205050
3/4	3-1/2	3/4	Yes	-	334-308050	
3/4	3	1/2	No	334-008050	334-206050	
1	3	1/2	No	334-010050	334-207050	
1/8	1-1/2	1/8	Yes	82°	-	334-301060
1/8	1-1/2	1/8	No		334-001060	334-201060
3/16	2	3/16	Yes		-	334-302060
1/4	2	1/4	Yes		-	334-303060
1/4	2	1/4	No		334-003060	334-202060
5/16	2-1/8	5/16	Yes		-	334-304060
3/8	2-1/2	3/8	Yes		-	334-305060
3/8	2-1/2	1/4	No		334-005060	334-203060
1/2	3	1/2	Yes		-	334-306060
1/2	2-1/2	3/8	No		334-006060	334-204060
5/8	3-1/4	5/8	Yes		-	334-307060
5/8	2-1/2	3/8	No		334-007060	334-205060
3/4	3-1/2	3/4	Yes	-	334-308060	
3/4	3	1/2	No	334-008060	334-206060	
1	3	1/2	No	334-010060	334-207060	
1/8	1-1/2	1/8	Yes	90°	-	334-301070
1/8	1-1/2	1/8	No		334-001070	334-201070
3/16	2	3/16	Yes		-	334-302070
1/4	2	1/4	Yes		-	334-303070
1/4	2	1/4	No		334-003070	334-202070
5/16	2-1/8	5/16	Yes		-	334-304070
3/8	2-1/2	3/8	Yes		-	334-305070
3/8	2-1/2	1/4	No		334-005070	334-203070
1/2	3	1/2	Yes		-	334-306070
1/2	2-1/2	3/8	No		334-006070	334-204070
5/8	3-1/4	5/8	Yes		-	334-307070
5/8	2-1/2	3/8	No		334-007070	334-205070
3/4	3-1/2	3/4	Yes	-	334-308070	
3/4	3	1/2	No	334-008070	334-206070	
1	3	1/2	No	334-010070	334-207070	

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide 4-Flute Countersink



Series 334 4FL | 60°-120° | Single & Double End

Diameter(D ₁)	OAL(L)	Shank(D)	Drill Point	Incl. Angle	Single End	Double End
1/8	1-1/2	1/8	Yes	100°	-	334-301080
1/8	1-1/2	1/8	No		334-001080	334-201080
3/16	2	3/16	Yes		-	334-302080
1/4	2	1/4	Yes		-	334-303080
1/4	2	1/4	No		334-003080	334-202080
5/16	2-1/8	5/16	Yes		-	334-304080
3/8	2-1/2	3/8	Yes		-	334-305080
3/8	2-1/2	1/4	No		334-005080	334-203080
1/2	3	1/2	Yes		-	334-306080
1/2	2-1/2	3/8	No		334-006080	334-204080
5/8	3-1/4	5/8	Yes		-	334-307080
5/8	2-1/2	3/8	No		334-007080	334-205080
3/4	3-1/2	3/4	Yes		-	334-308080
3/4	3	1/2	No		334-008080	334-206080
1	3	1/2	No		334-010080	334-207080
1/8	1-1/2	1/8	Yes		110°	-
3/16	2	3/16	Yes	-		334-302090
1/4	2	1/4	Yes	-		334-303090
5/16	2-1/8	5/16	Yes	-		334-304090
3/8	2-1/2	3/8	Yes	-		334-305090
1/2	3	1/2	Yes	-		334-306090
5/8	3-1/4	5/8	Yes	-		334-307090
3/4	3-1/2	3/4	Yes	-		334-308090
1/8	1-1/2	1/8	No	120°	-	334-201100
1/8	1-1/2	1/8	Yes		-	334-301100
1/8	1-1/2	1/8	No		334-001090	334-201090
3/16	2	3/16	No		-	334-202100
3/16	2	3/16	Yes		-	334-302100
1/4	2	1/4	No		-	334-203100
1/4	2	1/4	Yes		-	334-303100
1/4	2	1/4	No		334-003090	334-202090
5/16	2-1/8	5/16	No		-	334-204100
5/16	2-1/8	5/16	Yes		-	334-304100
3/8	2-1/2	3/8	No		-	334-205100
3/8	2-1/2	3/8	Yes		-	334-305100
3/8	2-1/2	1/4	No		334-005090	334-203090
1/2	3	1/2	No		-	334-206100
1/2	3	1/2	Yes		-	334-306100
1/2	2-1/2	3/8	No		334-006090	334-204090
5/8	3-1/4	5/8	No		-	334-207100
5/8	3-1/4	5/8	Yes		-	334-307100
5/8	2-1/2	3/8	No		334-007090	334-205090
3/4	3-1/2	3/4	No		-	334-208100
3/4	3-1/2	3/4	Yes	-	334-308100	
3/4	3	1/2	No	334-008090	334-206090	
1	3	1/2	No	334-010090	334-207090	

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Countersinks</p> <ul style="list-style-type: none"> Sub-micrograin carbide substrate for wear resistance General purpose countersinking operations Single end and double end 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	○			●	●	○	○			○	

● Best ○ Good

Series 336 | 6FL | 60°-120° | Single & Double End

Diameter(D ₁)	OAL(L)	Shank(D)	Incl. Angle	Single End	Double End
1/8	1-1/2	1/8	60°	336-001050	336-201050
1/8	1-1/2	1/8	82°	336-001060	336-201060
1/8	1-1/2	1/8	90°	336-001070	336-201070
1/8	1-1/2	1/8	100°	336-001080	-
1/8	1-1/2	1/8	120°	336-001090	-
3/16	2	3/16	60°	336-002050	336-202050
3/16	2	3/16	82°	336-002060	336-202060
3/16	2	3/16	90°	336-002070	336-202070
3/16	2	3/16	100°	336-002080	-
3/16	2	3/16	120°	336-002090	-
1/4	2	1/4	60°	336-003050	336-203050
1/4	2	1/4	82°	336-003060	336-203060
1/4	2	1/4	90°	336-003070	336-203070
1/4	2	1/4	100°	336-003080	-
1/4	2	1/4	120°	336-003090	-
5/16	2	1/4	60°	336-004050	336-204050
5/16	2	1/4	82°	336-004060	336-204060
5/16	2	1/4	90°	336-004070	336-204070
5/16	2	1/4	100°	336-004080	-
5/16	2	1/4	120°	336-004090	-
3/8	2-1/2	1/4	60°	336-005050	336-205050
3/8	2-1/2	1/4	82°	336-005060	336-205060
3/8	2-1/2	1/4	90°	336-005070	336-205070
3/8	2-1/2	1/4	100°	336-005080	-
3/8	2-1/2	1/4	120°	336-005090	-
1/2	2-1/2	1/4	60°	336-006050	336-206050
1/2	2-1/2	1/4	82°	336-006060	336-206060
1/2	2-1/2	1/4	90°	336-006070	336-206070
1/2	2-1/2	1/4	100°	336-006080	-
1/2	2-1/2	1/4	120°	336-006090	-
1/2	2-7/8	3/8	60°	336-006550	336-207050
1/2	2-3/4	3/8	82°	336-006560	336-207060
1/2	2-3/4	3/8	90°	336-006570	336-207070
1/2	2-3/4	3/8	100°	336-006580	-
1/2	2-3/4	3/8	120°	336-006590	-
5/8	2-3/4	3/8	60°	336-007050	336-208050
5/8	2-3/4	3/8	82°	336-007060	336-208060
5/8	2-3/4	3/8	90°	336-007070	336-208070
5/8	2-3/4	3/8	100°	336-007080	-
5/8	2-3/4	3/8	120°	336-007090	-
3/4	3	3/8	60°	336-008050	-
3/4	3	3/8	82°	336-008060	-
3/4	3	3/8	90°	336-008070	-
3/4	3	3/8	100°	336-008080	-
3/4	3	3/8	120°	336-008090	-

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide 6-Flute Countersink



Series 336 6FL | 60°-120° | Single & Double End

Diameter(D ₁)	OAL(L)	Shank(D)	Incl. Angle	Single End	Double End
3/4	2-7/8	1/2	60°	336-008550	-
3/4	2-3/4	1/2	82°	336-008560	-
3/4	2-3/4	1/2	90°	336-008570	-
3/4	2-3/4	1/2	100°	336-008580	-
3/4	2-3/4	1/2	120°	336-008590	-
7/8	3	1/2	60°	336-009050	-
7/8	3	1/2	82°	336-009060	-
7/8	3	1/2	90°	336-009070	-
7/8	3	1/2	100°	336-009080	-
7/8	3	1/2	120°	336-009090	-
1	3	1/2	60°	336-010050	-
1	3	1/2	82°	336-010060	-
1	3	1/2	90°	336-010070	-
1	3	1/2	100°	336-010080	-
1	3	1/2	120°	336-010090	-
1-1/4	3-1/2	3/4	60°	336-011050	-
1-1/4	3-1/2	3/4	82°	336-011060	-
1-1/4	3-1/2	3/4	90°	336-011070	-
1-1/4	3-1/2	3/4	100°	336-011080	-
1-1/4	3-1/2	3/4	120°	336-011090	-
1-1/2	3-1/2	3/4	60°	336-012050	-
1-1/2	3-1/2	3/4	82°	336-012060	-
1-1/2	3-1/2	3/4	90°	336-012070	-
1-1/2	3-1/2	3/4	100°	336-012080	-
1-1/2	3-1/2	3/4	120°	336-012090	-

*bold numbers are EDPs for ordering

Popular Custom Holemaking Options

Material-specific point geometry
 Longer flute lengths
 Internal coolant supply
 Proprietary GWS tool coatings

CUSTOM COMES STANDARD

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Solid Carbide Boring Bar



INTRO

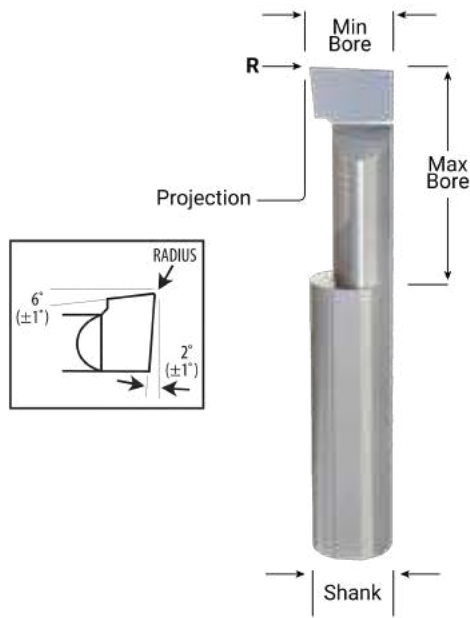
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Boring Bar</p> <ul style="list-style-type: none"> Sub-micrograin carbide substrate for wear resistance Lock-down flat automatically locates the tool on center World-class finishes for horizontal drilling applications Shank Diameter Tolerance: +0/-0.0005" 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	○	○	○	●	●	○	○	○	○	○	○

● Best ○ Good

Series 601 Lock-Down Flat | Radius

Minimum Bore	Maximum Bore	Projection	Shank(D)	Radius(R)	EDP
0.050	0.150	0.013	1/8	0.004	601-050150
0.050	0.200	0.013	1/8	0.004	601-050200
0.050	0.300	0.013	1/8	0.004	601-050300
0.050	0.400	0.013	1/8	0.004	601-050400
0.060	0.150	0.015	1/8	0.004	601-060150
0.060	0.200	0.015	1/8	0.004	601-060200
0.060	0.300	0.015	1/8	0.004	601-060300
0.060	0.400	0.015	1/8	0.004	601-060400
0.060	0.500	0.015	1/8	0.004	601-060500
0.080	0.150	0.020	1/8	0.004	601-080150
0.080	0.200	0.020	1/8	0.004	601-080200
0.080	0.300	0.020	1/8	0.004	601-080300
0.080	0.400	0.020	1/8	0.004	601-080400
0.080	0.500	0.020	1/8	0.004	601-080500
0.080	0.600	0.020	1/8	0.004	601-080600
0.100	0.150	0.025	1/8	0.004	601-100150
0.100	0.200	0.025	1/8	0.004	601-100200
0.100	0.300	0.025	1/8	0.004	601-100300
0.100	0.400	0.025	1/8	0.004	601-100400
0.100	0.500	0.025	1/8	0.004	601-100500
0.100	0.600	0.025	1/8	0.004	601-100600
0.100	0.700	0.025	1/8	0.004	601-100700
0.110	0.150	0.028	1/8	0.004	601-110150
0.110	0.200	0.028	1/8	0.004	601-110200
0.110	0.300	0.028	1/8	0.004	601-110300
0.110	0.400	0.028	1/8	0.004	601-110400
0.110	0.500	0.028	1/8	0.004	601-110500
0.110	0.600	0.028	1/8	0.004	601-110600
0.110	0.700	0.028	1/8	0.004	601-110700
0.120	0.250	0.030	3/16	0.006	601-120250
0.120	0.350	0.030	3/16	0.006	601-120350
0.120	0.500	0.030	3/16	0.006	601-120500
0.120	0.600	0.030	3/16	0.006	601-120600
0.120	0.700	0.030	3/16	0.006	601-120700
0.120	0.800	0.030	3/16	0.006	601-120800
0.140	0.250	0.035	3/16	0.006	601-140250
0.140	0.400	0.035	3/16	0.006	601-140400
0.140	0.500	0.035	3/16	0.006	601-140500
0.140	0.600	0.035	3/16	0.006	601-140600
0.140	0.700	0.035	3/16	0.006	601-140700
0.140	0.750	0.035	3/16	0.006	601-140750
0.140	0.800	0.035	3/16	0.006	601-140800
0.160	1.000	0.040	3/16	0.006	601-1601000
0.160	0.250	0.040	3/16	0.006	601-160250
0.160	0.400	0.040	3/16	0.006	601-160400

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Solid Carbide Boring Bar



Series 601

Lock-Down Flat | Radius

Minimum Bore	Maximum Bore	Projection	Shank(D)	Radius(R)	EDP
0.160	0.500	0.040	3/16	0.006	601-160500
0.160	0.600	0.040	3/16	0.006	601-160600
0.160	0.750	0.040	3/16	0.006	601-160750
0.160	0.900	0.040	3/16	0.006	601-160900
0.180	1.000	0.045	1/4	0.006	601-1801000
0.180	1.100	0.045	1/4	0.006	601-1801100
0.180	1.250	0.045	1/4	0.006	601-1801250
0.180	1.500	0.045	1/4	0.006	601-1801500
0.180	0.350	0.045	1/4	0.006	601-180350
0.180	0.500	0.045	1/4	0.006	601-180500
0.180	0.600	0.045	1/4	0.006	601-180600
0.180	0.750	0.045	1/4	0.006	601-180750
0.180	0.900	0.045	1/4	0.006	601-180900
0.200	1.000	0.050	1/4	0.006	601-2001000
0.200	1.100	0.050	1/4	0.006	601-2001100
0.200	1.200	0.050	1/4	0.006	601-2001200
0.200	1.300	0.050	1/4	0.006	601-2001300
0.200	0.400	0.050	1/4	0.006	601-200400
0.200	0.500	0.050	1/4	0.006	601-200500
0.200	0.600	0.050	1/4	0.006	601-200600
0.200	0.700	0.050	1/4	0.006	601-200700
0.200	0.800	0.050	1/4	0.006	601-200800
0.200	0.900	0.050	1/4	0.006	601-200900
0.230	1.000	0.058	5/16	0.006	601-2301000
0.230	1.100	0.058	5/16	0.006	601-2301100
0.230	1.150	0.058	5/16	0.006	601-2301150
0.230	1.200	0.058	5/16	0.006	601-2301200
0.230	1.250	0.058	5/16	0.006	601-2301250
0.230	1.400	0.058	5/16	0.006	601-2301400
0.230	1.500	0.058	5/16	0.006	601-2301500
0.230	1.600	0.058	5/16	0.006	601-2301600
0.230	0.400	0.058	5/16	0.006	601-230400
0.230	0.500	0.058	5/16	0.006	601-230500
0.230	0.600	0.058	5/16	0.006	601-230600
0.230	0.700	0.058	5/16	0.006	601-230700
0.230	0.800	0.058	5/16	0.006	601-230800
0.230	0.900	0.058	5/16	0.006	601-230900
0.290	1.000	0.073	5/16	0.006	601-2901000
0.290	1.100	0.073	5/16	0.006	601-2901100
0.290	1.250	0.073	5/16	0.006	601-2901250
0.290	1.350	0.073	5/16	0.006	601-2901350
0.290	1.500	0.073	5/16	0.006	601-2901500
0.290	1.600	0.073	5/16	0.006	601-2901600
0.290	1.750	0.073	5/16	0.006	601-2901750
0.290	0.500	0.073	5/16	0.006	601-290500
0.290	0.600	0.073	5/16	0.006	601-290600
0.290	0.750	0.073	5/16	0.006	601-290750
0.290	0.900	0.073	5/16	0.006	601-290900
0.320	1.000	0.080	3/8	0.006	601-3201000
0.320	1.100	0.080	3/8	0.006	601-3201100
0.320	1.250	0.080	3/8	0.006	601-3201250
0.320	1.500	0.080	3/8	0.006	601-3201500
0.320	1.600	0.080	3/8	0.006	601-3201600
0.320	1.800	0.080	3/8	0.006	601-3201800
0.320	2.000	0.080	3/8	0.006	601-3202000
0.320	2.500	0.080	3/8	0.006	601-3202500
0.320	3.000	0.080	3/8	0.006	601-3203000
0.320	0.500	0.080	3/8	0.006	601-320500
0.320	0.600	0.080	3/8	0.006	601-320600
0.320	0.750	0.080	3/8	0.006	601-320750
0.320	0.900	0.080	3/8	0.006	601-320900
0.360	1.000	0.090	3/8	0.006	601-3601000
0.360	1.150	0.090	3/8	0.006	601-3601150
0.360	1.250	0.090	3/8	0.006	601-3601250
0.360	1.500	0.090	3/8	0.006	601-3601500
0.360	1.600	0.090	3/8	0.006	601-3601600
0.360	1.800	0.090	3/8	0.006	601-3601800
0.360	2.000	0.090	3/8	0.006	601-3602000
0.360	2.500	0.090	3/8	0.006	601-3602500
0.360	3.000	0.090	3/8	0.006	601-3603000
0.360	0.500	0.090	3/8	0.006	601-360500
0.360	0.600	0.090	3/8	0.006	601-360600
0.360	0.750	0.090	3/8	0.006	601-360750
0.360	0.900	0.090	3/8	0.006	601-360900
0.490	1.000	0.123	1/2	0.006	601-4901000
0.490	1.250	0.123	1/2	0.006	601-4901250

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Solid Carbide Boring Bar



Series 601 Lock-Down Flat | Radius

Minimum Bore	Maximum Bore	Projection	Shank(D)	Radius(R)	EDP
0.490	1.500	0.123	1/2	0.006	601-4901500
0.490	2.000	0.123	1/2	0.006	601-4902000
0.490	2.500	0.123	1/2	0.006	601-4902500
0.490	2.600	0.123	1/2	0.006	601-4902600
0.490	2.750	0.123	1/2	0.006	601-4902750
0.490	3.000	0.123	1/2	0.006	601-4903000
0.490	3.500	0.123	1/2	0.006	601-4903500
0.490	4.000	0.123	1/2	0.006	601-4904000
0.490	4.500	0.123	1/2	0.006	601-4904500
0.490	0.750	0.123	1/2	0.006	601-490750

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

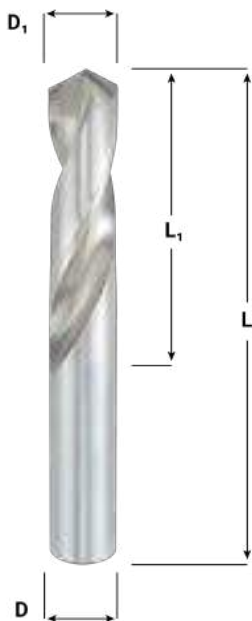
HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Carbide-Tip Screw Machine Drill



FEATURES/DESCRIPTION		APPLICATION	FEATURES																																								
Carbide-Tip Drill <ul style="list-style-type: none"> Carbide tipped wear resistance and HSS body for toughness General purpose drill for cutting cast iron, ductile iron, bronze, cast aluminum, fiberglass, and plastics Not suited for continuous chip low carbon steels or alloy aluminums 118° general purpose cam relief point for maximum edge strength 																																											
<table border="1"> <thead> <tr> <th colspan="3">STEEL</th> <th colspan="2">STAINLESS</th> <th colspan="2">CAST IRON</th> <th colspan="2">NON-FERROUS</th> <th colspan="2">HSSA</th> <th colspan="2">HARDENED STEEL</th> </tr> <tr> <th>P1</th> <th>P2</th> <th>P3</th> <th>M1</th> <th>M2</th> <th>K1</th> <th>K2</th> <th>N1</th> <th>N2</th> <th>S1</th> <th>S2</th> <th>H1</th> <th>H2</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td>●</td> <td>●</td> <td></td> <td>○</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>					STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL		P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2						●	●		○				
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL																																
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																															
					●	●		○																																			

● Best ○ Good

Series 110 | 2FL | Carbide-Tip | 118° | Screw Machine Length

Diameter(D ₁) Size Dec.	Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
1/8	0.1250	7/8	1/8	11001250
3.5mm	0.1378	1	2-1/16	11001378
9/64	0.1406	1	2-1/16	11001406
5/32	0.1562	1	2-1/16	11001562
4mm	0.1575	25mm	52mm	11001575
11/64	0.1719	1-1/8	2-3/16	11001719
4.5mm	0.1772	1-1/8	2-3/16	11001772
3/16	0.1875	1-1/8	2-3/16	11001875
5mm	0.1969	32mm	60mm	11001969
#7	0.2010	1-1/4	2-3/8	11002010
13/64	0.2031	1-1/4	2-3/8	11002031
#3	0.2130	1-1/4	2-3/8	11002130
5.5mm	0.2165	1-1/4	2-3/8	11002165
7/32	0.2188	1-1/4	2-3/8	11002188
#1	0.2280	1-3/8	2-1/2	11002280
15/64	0.2344	1-3/8	2-1/2	11002344
6mm	0.2362	35mm	64mm	11002362
D	0.2460	1-3/8	2-1/2	11002460
1/4	0.2500	1-3/8	2-1/2	11002500
6.5mm	0.2559	1-1/2	2-11/16	11002559
F	0.2570	1-1/2	2-11/16	11002570
G	0.2610	1-1/2	2-11/16	11002610
17/64	0.2656	1-1/2	2-11/16	11002656
H	0.2660	1-1/2	2-11/16	11002660
I	0.2720	1-1/2	2-11/16	11002720
7mm	0.2756	38mm	68mm	11002756
9/32	0.2812	1-1/2	2-11/16	11002812
7.5mm	0.2953	1-5/8	2-13/16	11002953
19/64	0.2969	1-5/8	2-13/16	11002969
5/16	0.3125	1-5/8	2-13/16	11003125
8mm	0.3150	41mm	71mm	11003150
O	0.3160	1-5/8	2-13/16	11003160
21/64	0.3281	1-11/16	3	11003281
Q	0.3320	1-11/16	3	11003320
8.5mm	0.3346	1-11/16	3	11003346
R	0.3390	1-11/16	3	11003390
11/32	0.3438	1-11/16	3	11003438
9mm	0.3543	43mm	79mm	11003543
23/64	0.3594	1-11/16	3	11003594
U	0.3680	1-13/16	3-1/8	11003680
9.5mm	0.3740	1-13/16	3-1/8	11003740
3/8	0.3750	1-13/16	3-1/8	11003750
W	0.3860	1-15/16	3-5/16	11003860
25/64	0.3906	1-15/16	3-5/16	11003906
10mm	0.3937	49mm	84mm	11003937

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Series 110 | 2FL | Carbide-Tip | 118° | Screw Machine Length

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
X	0.3970	1-15/16	3-5/16	0.3970	11003970
13/32	0.4062	1-15/16	3-5/16	13/32	11004062
10.5mm	0.4134	2-1/16	3-7/16	0.4134	11004134
27/64	0.4219	2-1/16	3-7/16	27/64	11004219
11mm	0.4331	52mm	87mm	11mm	11004331
7/16	0.4375	2-1/16	3-7/16	7/16	11004375
11.5mm	0.4528	2-1/8	3-5/8	29/64	11004528
29/64	0.4531	2-1/8	3-5/8	29/64	11004531
15/32	0.4688	2-1/8	3-5/8	15/32	11004688
12mm	0.4724	54mm	92mm	12mm	11004724
31/64	0.4844	2-1/4	3-3/4	31/64	11004844
12.5mm	0.4921	2-1/4	3-3/4	0.4921	11004921
1/2	0.5000	2-1/4	3-3/4	1/2	11005000
13mm	0.5118	60mm	98mm	13mm	11005118
17/32	0.5312	2-3/8	3-7/8	17/32	11005312
13.5mm	0.5315	2-3/8	3-7/8	17/32	11005315
14mm	0.5512	64mm	102mm	14mm	11005512
9/16	0.5625	2-1/2	4	9/16	11005625
19/32	0.5938	2-5/8	4-1/8	19/32	11005938
5/8	0.6250	2-3/4	4-1/4	5/8	11006250
21/32	0.6562	2-7/8	4-1/2	21/32	11006562
11/16	0.6875	2-7/8	4-5/8	11/16	11006875
23/32	0.7188	3	4-3/4	23/32	11007188
3/4	0.7500	3-1/8	5	3/4	11007500
25/32	0.7812	3-1/4	5-1/8	25/32	11007812
13/16	0.8125	3-3/8	5-1/4	13/16	11008125
27/32	0.8438	3-1/2	5-3/8	27/32	11008438
7/8	0.8750	3-1/2	5-1/2	7/8	11008750
29/32	0.9062	3-5/8	5-5/8	29/32	11009062
15/16	0.9375	3-3/4	5-3/4	15/16	11009375
31/32	0.9688	3-7/8	5-7/8	31/32	11009688
1*	1.0000	4	6	1	11010000
1-1/16*	1.0625	4	6-1/4	1	11010625
1-1/8*	1.1250	4	6-3/8	1	11011250
1-3/16*	1.1875	4-1/4	6-5/8	1	11011875
1-1/4*	1.2500	4-3/8	6-3/4	1	11012500

*bold numbers are EDPs for ordering

Popular Custom Holemaking Options

- Material-specific point geometry
- Longer flute lengths
- Internal coolant supply
- Proprietary GWS tool coatings

CUSTOM COMES STANDARD

GENERAL PURPOSE

135° Carbide-Tip Drill Screw Machine Drill



FEATURES/DESCRIPTION		APPLICATION	FEATURES	
<p>Carbide-Tip Drill</p> <ul style="list-style-type: none"> Carbide tipped wear resistance and HSS body for toughness Performance drill for cutting cast iron, ductile iron, bronze, cast aluminum, fiberglass, and plastics Not suited for continuous chip low carbon steels or alloy aluminums 135° four facet split point for best center cutting action and lowest thrust Stub length ideal for use as starting drill for deep hole drills 				

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
					○	○		○		●		

● Best ○ Good

Series 115 | 2FL | Carbide-Tip | 135° | Screw Machine Length

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
1/8	0.1250	7/8	1-7/8	1/8	11501250
3.5mm	0.1378	1	2-1/16	0.1378	11501378
9/64	0.1406	1	2-1/16	9/64	11501406
5/32	0.1562	1	2-1/16	5/32	11501562
4mm	0.1575	25mm	52mm	4mm	11501575
11/64	0.1719	1-1/8	2-3/16	11/64	11501719
4.5mm	0.1772	1-1/8	2-3/16	0.1772	11501772
3/16	0.1875	1-1/8	2-3/16	3/16	11501875
5mm	0.1969	32mm	60mm	5mm	11501969
#7	0.2010	1-1/4	2-3/8	0.2010	11502010
13/64	0.2031	1-1/4	2-3/8	13/64	11502031
#3	0.2130	1-1/4	2-3/8	0.2130	11502130
5.5mm	0.2165	1-1/4	2-3/8	0.2165	11502165
7/32	0.2188	1-1/4	2-3/8	7/32	11502188
15/64	0.2344	1-3/8	2-1/2	15/64	11502344
6mm	0.2362	35mm	64mm	6mm	11502362
D	0.2460	1-3/8	2-1/2	0.2460	11502460
1/4	0.2500	1-3/8	2-1/2	1/4	11502500
6.5mm	0.2559	1-1/2	2-11/16	0.2559	11502559
F	0.2570	1-1/2	2-11/16	0.2570	11502570
G	0.2610	1-1/2	2-11/16	0.2610	11502610
17/64	0.2656	1-1/2	2-11/16	17/64	11502656
I	0.2720	1-1/2	2-11/16	0.2720	11502720
7mm	0.2756	38mm	68mm	7mm	11502756
9/32	0.2812	1-1/2	2-11/16	9/32	11502812
7.5mm	0.2953	1-5/8	2-13/16	0.2953	11502953
19/64	0.2969	1-5/8	2-13/16	19/64	11502969
5/16	0.3125	1-5/8	2-13/16	5/16	11503125
8mm	0.3150	41mm	71mm	8mm	11503150
O	0.3160	1-5/8	2-13/16	0.3160	11503160
21/64	0.3281	1-11/16	3	21/64	11503281
Q	0.3320	1-11/16	3	0.3320	11503320
8.5mm	0.3346	1-11/16	3	0.3346	11503346
R	0.3390	1-11/16	3	0.3390	11503390
11/32	0.3438	1-11/16	3	11/32	11503438
9mm	0.3543	46mm	79mm	9mm	11503543
23/64	0.3594	1-13/16	3-1/8	23/64	11503594
U	0.3680	1-13/16	3-1/8	0.3680	11503680
9.5mm	0.3740	1-13/16	3-1/8	3/8	11503740
3/8	0.3750	1-13/16	3-1/8	3/8	11503750
W	0.3860	1-15/16	3-5/16	0.3860	11503860
25/64	0.3906	1-15/16	3-5/16	25/64	11503906
10mm	0.3937	49mm	84mm	10mm	11503937
13/32	0.4062	1-15/16	3-5/16	13/32	11504062
10.5mm	0.4134	2-1/16	3-7/16	0.4134	11504134

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

135° Carbide-Tip Drill Screw Machine Drill



Series 115 | 2FL | Carbide-Tip | 135° | Screw Machine Length

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
27/64	0.4219	2-1/16	3-7/16	27/64	11504219
11mm	0.4331	52mm	87mm	11mm	11504331
7/16	0.4375	2-1/16	3-7/16	7/16	11504375
11.5mm	0.4528	2-1/8	3-5/8	29/64	11504528
29/64	0.4531	2-1/8	3-5/8	29/64	11504531
15/32	0.4688	2-1/8	3-5/8	15/32	11504688
12mm	0.4724	54mm	92mm	12mm	11504724
31/64	0.4844	2-1/4	3-3/4	31/64	11504844
12.5mm	0.4921	2-1/4	3-3/4	0.4921	11504921
1/2	0.5000	2-1/4	3-3/4	1/2	11505000
13mm	0.5118	60mm	98mm	13mm	11505118
17/32	0.5312	2-3/8	3-7/8	17/32	11505312
13.5mm	0.5315	2-3/8	3-7/8	17/32	11505315
14mm	0.5512	64mm	102mm	14mm	11505512
9/16	0.5625	2-1/2	4	9/16	11505625
19/32	0.5938	2-5/8	4-1/8	19/32	11505938
5/8	0.6250	2-3/4	4-1/4	5/8	11506250
21/32	0.6562	2-7/8	4-1/2	21/32	11506562
11/16	0.6875	2-7/8	4-5/8	11/16	11506875
23/32	0.7188	3	4-3/4	23/32	11507188
3/4	0.7500	3-1/8	5	3/4	11507500
25/32	0.7812	3-1/4	5-1/8	25/32	11507812
13/16	0.8125	3-3/8	5-1/4	13/16	11508125
27/32	0.8438	3-1/2	5-3/8	27/32	11508438
7/8	0.8750	3-1/2	5-1/2	7/8	11508750
29/32	0.9062	3-5/8	5-5/8	29/32	11509062
15/16	0.9375	3-3/4	5-3/4	15/16	11509375
31/32	0.9688	3-7/8	5-7/8	31/32	11509688
1*	1.0000	4	6	1	11510000
1-1/16*	1.0625	4	6-1/4	1	11510625
1-1/8*	1.1250	4	6-3/8	1	11511250
1-3/16*	1.1875	4-1/4	6-5/8	1	11511875
1-1/4*	1.2500	4-3/8	6-3/4	1	11512500

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Popular Custom Holemaking Options

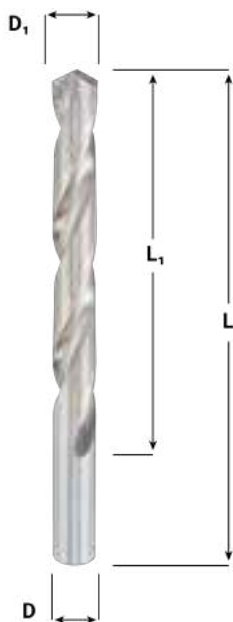
- Material-specific point geometry
- Longer flute lengths
- Internal coolant supply
- Proprietary GWS tool coatings

**CUSTOM
COMES
STANDARD**



GENERAL PURPOSE

Carbide-Tip Jobber Length Drill



FEATURES/DESCRIPTION				APPLICATION		FEATURES						
Carbide-Tip Drill <ul style="list-style-type: none"> Carbide tipped wear resistance and HSS body for toughness General purpose drill for cutting cast iron, ductile iron, bronze, cast aluminum, fiberglass, and plastics Not suited for continuous chip low carbon steels or alloy aluminums 118° general purpose cam relief point for maximum edge strength 												
STEEL		STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL		
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
					●	●		○				

● Best ○ Good

Series 120 2FL | Carbide-Tip | 118° | Jobber Length

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
#40	0.0980	1-5/8	2-3/4	0.0980	12000980
#39	0.0995	1-5/8	2-3/4	0.0995	12000995
#38	0.1015	1-5/8	2-3/4	0.1015	12001015
#37	0.1040	1-5/8	2-3/4	0.1040	12001040
#36	0.1065	1-5/8	2-3/4	0.1065	12001065
7/64	0.1094	1-5/8	2-3/4	7/64	12001094
#35	0.1100	1-5/8	2-3/4	7/64	12001100
#34	0.1110	1-5/8	2-3/4	0.1110	12001110
#33	0.1130	1-5/8	2-3/4	0.1130	12001130
#32	0.1160	1-5/8	2-3/4	0.1160	12001160
3mm	0.1181	41mm	70mm	3mm	12001181
#31	0.1200	1-5/8	2-3/4	0.1200	12001200
3.1mm	0.1220	1-5/8	2-3/4	0.1220	12001220
1/8	0.1250	1-5/8	2-3/4	1/8	12001250
3.2mm	0.1260	1-5/8	2-3/4	1/8	12001260
#30	0.1285	1-5/8	2-3/4	0.1285	12001285
3.3mm	0.1299	2	3-1/8	0.1299	12001299
3.4mm	0.1339	2	3-1/8	0.1339	12001339
#29	0.1360	2	3-1/8	0.1360	12001360
3.5mm	0.1378	2	3-1/8	0.1378	12001378
#28	0.1405	2	3-1/8	9/64	12001405
9/64	0.1406	2	3-1/8	9/64	12001406
3.6mm	0.1417	2	3-1/8	9/64	12001417
#27	0.1440	2	3-1/8	0.1440	12001440
3.7mm	0.1457	2	3-1/8	0.1457	12001457
#26	0.1470	2	3-1/8	0.1470	12001470
#25	0.1495	2	3-1/8	0.1495	12001495
3.8mm	0.1496	2	3-1/8	0.1496	12001496
#24	0.1520	2	3-1/8	0.1520	12001520
3.9mm	0.1535	2	3-1/8	0.1535	12001535
#23	0.1540	2	3-1/8	0.1540	12001540
5/32	0.1562	2	3-1/8	5/32	12001562
#22	0.1570	2	3-1/8	5/32	12001570
4mm	0.1575	51mm	79mm	4mm	12001575
#21	0.1590	2	3-1/8	0.1590	12001590
#20	0.1610	2-5/16	3-1/2	0.1610	12001610
4.1mm	0.1614	2-5/16	3-1/2	0.1614	12001614
4.2mm	0.1654	2-5/16	3-1/2	0.1654	12001654
#19	0.1660	2-5/16	3-1/2	0.1660	12001660
4.3mm	0.1693	2-5/16	3-1/2	0.1693	12001693
#18	0.1695	2-5/16	3-1/2	0.1695	12001695
11/64	0.1719	2-5/16	3-1/2	11/64	12001719
#17	0.1730	2-5/16	3-1/2	11/64	12001730
4.4mm	0.1732	2-5/16	3-1/2	11/64	12001732
#16	0.1770	2-5/16	3-1/2	0.1770	12001770

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Carbide-Tip Jobber Length Drill



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Series 120 | 2FL | Carbide-Tip | 118° | Jobber Length

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
4.5mm	0.1772	2-5/16	3-1/2	0.1772	12001772
#15	0.1800	2-5/16	3-1/2	0.1800	12001800
4.6mm	0.1811	2-5/16	3-1/2	0.1811	12001811
#14	0.1820	2-5/16	3-1/2	0.1820	12001820
#13	0.1850	2-5/16	3-1/2	0.1850	12001850
3/16	0.1875	2-5/16	3-1/2	3/16	12001875
#12	0.1890	2-5/16	3-1/2	3/16	12001890
#11	0.1910	2-5/16	3-1/2	0.1910	12001910
4.9mm	0.1929	2-1/2	3-3/4	0.1929	12001929
#10	0.1935	2-1/2	3-3/4	0.1935	12001935
#9	0.1960	2-1/2	3-3/4	0.1960	12001960
5mm	0.1969	64mm	95mm	5mm	12001969
#8	0.1990	2-1/2	3-3/4	0.1990	12001990
5.1mm	0.2008	2-1/2	3-3/4	0.2008	12002008
#7	0.2010	2-1/2	3-3/4	0.2010	12002010
13/64	0.2031	2-1/2	3-3/4	13/64	12002031
#6	0.2040	2-1/2	3-3/4	13/64	12002040
5.2mm	0.2047	2-1/2	3-3/4	0.2047	12002047
#5	0.2055	2-1/2	3-3/4	0.2055	12002055
5.3mm	0.2087	2-1/2	3-3/4	0.2087	12002087
#4	0.2090	2-1/2	3-3/4	0.2090	12002090
5.4mm	0.2126	2-1/2	3-3/4	0.2126	12002126
#3	0.2130	2-1/2	3-3/4	0.2130	12002130
5.5mm	0.2165	2-1/2	3-3/4	0.2165	12002165
7/32	0.2188	2-1/2	3-3/4	7/32	12002188
5.6mm	0.2205	2-1/2	3-3/4	0.2205	12002205
#2	0.2210	2-1/2	3-3/4	0.2210	12002210
5.7mm	0.2244	2-3/4	4	0.2244	12002244
#1	0.2280	2-3/4	4	0.2280	12002280
5.8mm	0.2283	2-3/4	4	0.2283	12002283
5.9mm	0.2323	2-3/4	4	0.2323	12002323
A	0.2340	2-3/4	4	15/64	12002340
15/64	0.2344	2-3/4	4	15/64	12002344
6mm	0.2362	70mm	102mm	6mm	12002362
B	0.2380	2-3/4	4	0.2380	12002380
6.1mm	0.2402	2-3/4	4	0.2402	12002402
C	0.2420	2-3/4	4	0.2420	12002420
6.2mm	0.2441	2-3/4	4	0.2441	12002441
D	0.2460	2-3/4	4	0.2460	12002460
6.3mm	0.2480	2-3/4	4	0.2480	12002480
1/4	0.2500	2-3/4	4	1/4	12002500
6.4mm	0.2520	2-3/4	4	0.2520	12002520
6.5mm	0.2559	2-15/16	4-1/4	0.2559	12002559
F	0.2570	2-15/16	4-1/4	0.2570	12002570
6.6mm	0.2598	2-15/16	4-1/4	0.2598	12002598
G	0.2610	2-15/16	4-1/4	0.2610	12002610
6.7mm	0.2638	2-15/16	4-1/4	0.2638	12002638
17/64	0.2656	2-15/16	4-1/4	17/64	12002656
H	0.2660	2-15/16	4-1/4	17/64	12002660
6.8mm	0.2677	2-15/16	4-1/4	0.2677	12002677
6.9mm	0.2717	2-15/16	4-1/4	0.2717	12002717
I	0.2720	2-15/16	4-1/4	0.2720	12002720
7mm	0.2756	75mm	108mm	7mm	12002756
J	0.2770	2-15/16	4-1/4	0.2770	12002770
7.1mm	0.2795	2-15/16	4-1/4	0.2795	12002795
K	0.2810	2-15/16	4-1/4	9/32	12002810
9/32	0.2812	2-15/16	4-1/4	9/32	12002812
7.2mm	0.2835	2-15/16	4-1/4	0.2835	12002835
7.3mm	0.2874	3-3/16	4-1/2	0.2874	12002874
L	0.2900	3-3/16	4-1/2	0.2900	12002900
7.4mm	0.2913	3-3/16	4-1/2	0.2913	12002913
M	0.2950	3-3/16	4-1/2	0.2950	12002950
7.5mm	0.2953	3-3/16	4-1/2	0.2953	12002953
19/64	0.2969	3-3/16	4-1/2	19/64	12002969
7.6mm	0.2992	3-3/16	4-1/2	0.2992	12002992
N	0.3020	3-3/16	4-1/2	0.3020	12003020
7.7mm	0.3031	3-3/16	4-1/2	0.3031	12003031
7.8mm	0.3071	3-3/16	4-1/2	0.3071	12003071
7.9mm	0.3110	3-3/16	4-1/2	5/16	12003110
5/16	0.3125	3-3/16	4-1/2	5/16	12003125
8mm	0.3150	81mm	114mm	8mm	12003150
O	0.3160	3-3/16	4-1/2	0.3160	12003160

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Carbide-Tip Jobber Length Drill



Series 120 2FL | Carbide-Tip | 118° | Jobber Length

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
8.1mm	0.3189	3-7/16	4-3/4	0.3189	12003189
8.2mm	0.3228	3-7/16	4-3/4	0.3228	12003228
P	0.3230	3-7/16	4-3/4	0.3230	12003230
8.3mm	0.3268	3-7/16	4-3/4	21/64	12003268
21/64	0.3281	3-7/16	4-3/4	21/64	12003281
8.4mm	0.3307	3-7/16	4-3/4	0.3307	12003307
Q	0.3320	3-7/16	4-3/4	0.3320	12003320
8.5mm	0.3346	3-7/16	4-3/4	0.3346	12003346
8.6mm	0.3386	3-7/16	4-3/4	0.3386	12003386
R	0.3390	3-7/16	4-3/4	0.3390	12003390
8.7mm	0.3425	3-7/16	4-3/4	11/32	12003425
11/32	0.3438	3-7/16	4-3/4	11/32	12003438
8.8mm	0.3465	3-7/16	4-3/4	0.3465	12003465
S	0.3480	3-5/8	5	0.3480	12003480
8.9mm	0.3504	3-5/8	5	0.3504	12003504
9mm	0.3543	92mm	127mm	9mm	12003543
T	0.3580	3-5/8	5	23/64	12003580
9.1mm	0.3583	3-5/8	5	23/64	12003583
23/64	0.3594	3-5/8	5	23/64	12003594
9.2mm	0.3622	3-5/8	5	0.3622	12003622
9.3mm	0.3661	3-5/8	5	0.3661	12003661
U	0.3680	3-5/8	5	0.3680	12003680
9.4mm	0.3701	3-5/8	5	0.3701	12003701
9.5mm	0.3740	3-5/8	5	3/8	12003740
3/8	0.3750	3-5/8	5	3/8	12003750
V	0.3770	3-5/8	5	0.3770	12003770
9.6mm	0.3780	3-5/8	5	0.3780	12003780
9.7mm	0.3819	3-7/8	5-1/4	0.3819	12003819
9.8mm	0.3858	3-7/8	5-1/4	0.3858	12003858
W	0.3860	3-7/8	5-1/4	0.3860	12003860
9.9mm	0.3898	3-7/8	5-1/4	25/64	12003898
25/64	0.3906	3-7/8	5-1/4	25/64	12003906
10mm	0.3937	98mm	133mm	10mm	12003937
X	0.3970	3-7/8	5-1/4	0.3970	12003970
10.1mm	0.3976	3-7/8	5-1/4	0.3976	12003976
10.2mm	0.4016	3-7/8	5-1/4	0.4016	12004016
Y	0.4040	3-7/8	5-1/4	0.4040	12004040
10.3mm	0.4055	3-7/8	5-1/4	13/32	12004055
13/32	0.4062	3-7/8	5-1/4	13/32	12004062
10.4mm	0.4094	3-7/8	5-1/4	0.4094	12004094
Z	0.4130	4-1/16	5-1/2	0.4130	12004130
10.5mm	0.4134	4-1/16	5-1/2	0.4134	12004134
10.6mm	0.4173	4-1/16	5-1/2	0.4173	12004173
10.7mm	0.4213	4-1/16	5-1/2	27/64	12004213
27/64	0.4219	4-1/16	5-1/2	27/64	12004219
10.8mm	0.4252	4-1/16	5-1/2	0.4252	12004252
10.9mm	0.4291	4-1/16	5-1/2	0.4291	12004291
11mm	0.4331	103mm	140mm	11mm	12004331
11.1mm	0.4370	4-1/16	5-1/2	7/16	12004370
7/16	0.4375	4-1/16	5-1/2	7/16	12004375
11.2mm	0.4409	4-1/16	5-1/2	0.4409	12004409
11.3mm	0.4449	4-5/16	5-3/4	0.4449	12004449
11.4mm	0.4488	4-5/16	5-3/4	0.4488	12004488
11.5mm	0.4528	4-5/16	5-3/4	29/64	12004528
29/64	0.4531	4-5/16	5-3/4	29/64	12004531
11.6mm	0.4567	4-5/16	5-3/4	0.4567	12004567
11.7mm	0.4606	4-5/16	5-3/4	0.4606	12004606
11.8mm	0.4646	4-5/16	5-3/4	0.4646	12004646
11.9mm	0.4685	4-5/16	5-3/4	15/32	12004685
15/32	0.4688	4-5/16	5-3/4	15/32	12004688
12mm	0.4724	110mm	146mm	12mm	12004724
12.1mm	0.4764	4-1/2	6	0.4764	12004764
12.2mm	0.4803	4-1/2	6	0.4803	12004803
12.3mm	0.4843	4-1/2	6	31/64	12004843
31/64	0.4844	4-1/2	6	31/64	12004844
12.4mm	0.4882	4-1/2	6	0.4882	12004882
12.5mm	0.4921	4-1/2	6	0.4921	12004921
12.6mm	0.4961	4-1/2	6	0.4961	12004961
1/2	0.5000	4-1/2	6	1/2	12005000
12.8mm	0.5039	4-1/2	6	0.5039	12005039
12.9mm	0.5079	4-13/16	6-5/8	0.5079	12005079
13mm	0.5118	122mm	168mm	13mm	12005118

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Carbide-Tip Jobber Length Drill



Series 120 | 2FL | Carbide-Tip | 118° | Jobber Length

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
33/64	0.5156	4-13/16	6-5/8	33/64	12005156
17/32	0.5312	4-13/16	6-5/8	17/32	12005312
35/64	0.5469	4-13/16	6-5/8	35/64	12005469
9/16	0.5625	4-13/16	6-5/8	9/16	12005625
37/64	0.5781	5-3/16	6-5/8	37/64	12005781
19/32	0.5938	5-3/16	7-1/8	19/32	12005938
39/64	0.6094	5-3/16	7-1/8	39/64	12006094
5/8	0.6250	5-3/16	7-1/8	5/8	12006250
41/64	0.6406	5-3/16	7-1/8	41/64	12006406
21/32	0.6562	5-3/16	7-1/8	21/32	12006562
43/64	0.6719	5-5/8	7-5/8	43/64	12006719
11/16	0.6875	5-5/8	7-5/8	11/16	12006875

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

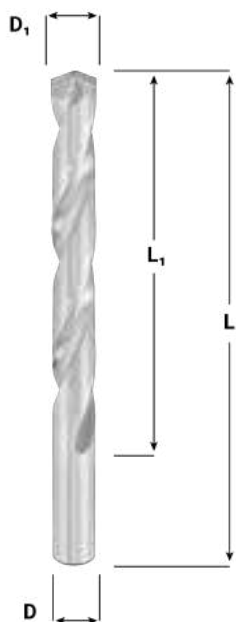
THREADING

INSERTS

Popular Custom Holemaking Options

GENERAL PURPOSE

135° Carbide-Tip Jobber Length Drill



FEATURES/DESCRIPTION				APPLICATION	FEATURES							
Carbide-Tip Drill <ul style="list-style-type: none"> Carbide tipped wear resistance and HSS body for toughness Performance drill for cutting cast iron, ductile iron, bronze, cast aluminum, fiberglass, and plastics Not suited for continuous chip low carbon steels or alloy aluminums 135° four facet split point for best center cutting action and lowest thrust Low thrust point can be used on hand and power feed aircraft drilling 												
STEEL		STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL		
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
					○	○		○		●		

● Best ○ Good

Series 125 | 2FL | Carbide-Tip | 135° | Jobber Length

Size	Diameter(D ₁) Dec.	Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
#32	0.1160	1-5/8	2-3/4	0.1160	12501160
#31	0.1200	1-5/8	2-3/4	0.1200	12501200
1/8	0.1250	1-5/8	2-3/4	1/8	12501250
#30	0.1285	1-5/8	2-3/4	0.1285	12501285
#29	0.1360	2	3-1/8	0.1360	12501360
#28	0.1405	2	3-1/8	9/64	12501405
9/64	0.1406	2	3-1/8	9/64	12501406
#27	0.1440	2	3-1/8	0.1440	12501440
#26	0.1470	2	3-1/8	0.1470	12501470
#25	0.1495	2	3-1/8	0.1495	12501495
#24	0.1520	2	3-1/8	0.1520	12501520
#23	0.1540	2	3-1/8	0.1540	12501540
5/32	0.1562	2	3-1/8	5/32	12501562
#22	0.1570	2	3-1/8	5/32	12501570
#21	0.1590	2	3-1/8	0.1590	12501590
#20	0.1610	2-5/16	3-1/2	0.1610	12501610
#19	0.1660	2-5/16	3-1/2	0.1660	12501660
#18	0.1695	2-5/16	3-1/2	0.1695	12501695
11/64	0.1719	2-5/16	3-1/2	11/64	12501719
#17	0.1730	2-5/16	3-1/2	11/64	12501730
#16	0.1770	2-5/16	3-1/2	0.1770	12501770
#15	0.1800	2-5/16	3-1/2	0.1800	12501800
#14	0.1820	2-5/16	3-1/2	0.1820	12501820
#13	0.1850	2-5/16	3-1/2	0.1850	12501850
3/16	0.1875	2-5/16	3-1/2	3/16	12501875
#12	0.1890	2-5/16	3-1/2	3/16	12501890
#11	0.1910	2-5/16	3-1/2	0.1910	12501910
#10	0.1935	2-1/2	3-3/4	0.1935	12501935
#9	0.1960	2-1/2	3-3/4	0.1960	12501960
#8	0.1990	2-1/2	3-3/4	0.1990	12501990
#7	0.2010	2-1/2	3-3/4	0.2010	12502010
13/64	0.2031	2-1/2	3-3/4	13/64	12502031
#6	0.2040	2-1/2	3-3/4	13/64	12502040
#5	0.2055	2-1/2	3-3/4	0.2055	12502055
#4	0.2090	2-1/2	3-3/4	0.2090	12502090
#3	0.2130	2-1/2	3-3/4	0.2130	12502130
7/32	0.2188	2-1/2	3-3/4	7/32	12502188
#2	0.2210	2-1/2	3-3/4	0.2210	12502210
#1	0.2280	2-3/4	4	0.2280	12502280
A	0.2340	2-3/4	4	15/64	12502340
15/64	0.2344	2-3/4	4	15/64	12502344
B	0.2380	2-3/4	4	0.2380	12502380
C	0.2420	2-3/4	4	0.2420	12502420
D	0.2460	2-3/4	4	0.2460	12502460
1/4	0.2500	2-3/4	4	1/4	12502500

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

135° Carbide-Tip Jobber Length Drill



Series 125 | 2FL | Carbide-Tip | 135° | Jobber Length

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
F	0.2570	2-15/16	4-1/4	0.2570	12502570
G	0.2610	2-15/16	4-1/4	0.2610	12502610
17/64	0.2656	2-15/16	4-1/4	17/64	12502656
H	0.2660	2-15/16	4-1/4	17/64	12502660
I	0.2720	2-15/16	4-1/4	0.2720	12502720
J	0.2770	2-15/16	4-1/4	0.2770	12502770
K	0.2810	2-15/16	4-1/4	9/32	12502810
9/32	0.2812	2-15/16	4-1/4	9/32	12502812
L	0.2900	3-3/16	4-1/2	0.2900	12502900
M	0.2950	3-3/16	4-1/2	0.2950	12502950
19/64	0.2969	3-3/16	4-1/2	19/64	12502969
N	0.3020	3-3/16	4-1/2	0.3020	12503020
5/16	0.3125	3-3/16	4-1/2	5/16	12503125
O	0.3160	3-3/16	4-1/2	0.3160	12503160
P	0.3230	3-7/16	4-3/4	0.3230	12503230
21/64	0.3281	3-7/16	4-3/4	21/64	12503281
Q	0.3320	3-7/16	4-3/4	0.3320	12503320
R	0.3390	3-7/16	4-3/4	0.3390	12503390
11/32	0.3438	3-7/16	4-3/4	11/32	12503438
S	0.3480	3-5/8	5	0.3480	12503480
T	0.3580	3-5/8	5	23/64	12503580
23/64	0.3594	3-5/8	5	23/64	12503594
U	0.3680	3-5/8	5	0.3680	12503680
3/8	0.3750	3-5/8	5	3/8	12503750
V	0.3770	3-5/8	5	0.3770	12503770
W	0.3860	3-7/8	5-1/4	0.3860	12503860
25/64	0.3906	3-7/8	5-1/4	25/64	12503906
X	0.3970	3-7/8	5-1/4	0.3970	12503970
Y	0.4040	3-7/8	5-1/4	0.4040	12504040
13/32	0.4062	3-7/8	5-1/4	13/32	12504062
Z	0.4130	4-1/16	5-1/2	0.4130	12504130
27/64	0.4219	4-1/16	5-1/2	27/64	12504219
7/16	0.4375	4-1/16	5-1/2	7/16	12504375
29/64	0.4531	4-5/16	5-3/4	29/64	12504531
15/32	0.4688	4-5/16	5-3/4	15/32	12504688
31/64	0.4844	4-1/2	6	31/64	12504844
1/2	0.5000	4-1/2	6	1/2	12505000
33/64	0.5156	4-13/16	6-5/8	33/64	12505156
17/32	0.5312	4-13/16	6-5/8	17/32	12505312
35/64	0.5469	4-13/16	6-5/8	35/64	12505469
9/16	0.5625	4-13/16	6-5/8	9/16	12505625
37/64	0.5781	5-3/16	6-5/8	37/64	12505781
19/32	0.5938	5-3/16	7-1/8	19/32	12505938
39/64	0.6094	5-3/16	7-1/8	39/64	12506094
5/8	0.6250	5-3/16	7-1/8	5/8	12506250
41/64	0.6406	5-3/16	7-1/8	41/64	12506406
21/32	0.6562	5-3/16	7-1/8	21/32	12506562
43/64	0.6719	5-5/8	7-5/8	43/64	12506719
11/16	0.6875	5-5/8	7-5/8	11/16	12506875

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

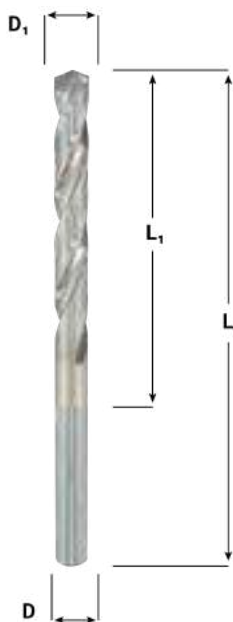
HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Aerospace 135° NAS907 Carbide-Tip Extension Drill



FEATURES/DESCRIPTION				APPLICATION	FEATURES																																												
Carbide-Tip Drill <ul style="list-style-type: none"> Carbide tipped wear resistance and HSS body for toughness General purpose drill for cutting cast iron, ductile iron, bronze, cast aluminum, fiberglass, plastics, and titanium stacks 135° NAS 907 split point for aggressive center cutting action and low thrust Aircraft extension drills can be used on hand and power feed drilling in airframe drilling 																																																	
<table border="1"> <thead> <tr> <th colspan="3">STEEL</th> <th colspan="2">STAINLESS</th> <th colspan="2">CAST IRON</th> <th colspan="2">NON-FERROUS</th> <th colspan="2">HSSA</th> <th colspan="2">HARDENED STEEL</th> </tr> <tr> <th>P1</th> <th>P2</th> <th>P3</th> <th>M1</th> <th>M2</th> <th>K1</th> <th>K2</th> <th>N1</th> <th>N2</th> <th>S1</th> <th>S2</th> <th>H1</th> <th>H2</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td>○</td> <td>○</td> <td></td> <td>○</td> <td></td> <td>●</td> <td></td> <td></td> </tr> </tbody> </table>					STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL		P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2						○	○		○		●								
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL																																						
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																																					
					○	○		○		●																																							

● Best ○ Good

Series 129 | 2FL | Carbide-Tip | 135° | 12" OAL

Size	Diameter(D ₁) Dec.	Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
#32	0.1160	1-5/8	12	0.1160	12901160
#31	0.1200	1-5/8	12	0.1200	12901200
1/8	0.1250	1-5/8	12	1/8	12901250
#30	0.1285	1-5/8	12	0.1285	12901285
#29	0.1360	2	12	0.1360	12901360
#28	0.1405	2	12	9/64	12901405
9/64	0.1406	2	12	9/64	12901406
#27	0.1440	2	12	0.1440	12901440
#26	0.1470	2	12	0.1470	12901470
#25	0.1495	2	12	0.1495	12901495
#24	0.1520	2	12	0.1520	12901520
#23	0.1540	2	12	0.1540	12901540
5/32	0.1562	2	12	5/32	12901562
#22	0.1570	2	12	5/32	12901570
#21	0.1590	2	12	0.1590	12901590
#20	0.1610	2-5/16	12	0.1610	12901610
#19	0.1660	2-5/16	12	0.1660	12901660
#18	0.1695	2-5/16	12	0.1695	12901695
11/64	0.1719	2-5/16	12	11/64	12901719
#17	0.1730	2-5/16	12	11/64	12901730
#16	0.1770	2-5/16	12	0.1770	12901770
#15	0.1800	2-5/16	12	0.1800	12901800
#14	0.1820	2-5/16	12	0.1820	12901820
#13	0.1850	2-5/16	12	0.1850	12901850
3/16	0.1875	2-5/16	12	3/16	12901875
#12	0.1890	2-5/16	12	3/16	12901890
#11	0.1910	2-5/16	12	0.1910	12901910
#10	0.1935	2-1/2	12	0.1935	12901935
#9	0.1960	2-1/2	12	0.1960	12901960
#8	0.1990	2-1/2	12	0.1990	12901990
#7	0.2010	2-1/2	12	0.2010	12902010
13/64	0.2031	2-1/2	12	13/64	12902031
#6	0.2040	2-1/2	12	13/64	12902040
#5	0.2055	2-1/2	12	0.2055	12902055
#4	0.2090	2-1/2	12	0.2090	12902090
#3	0.2130	2-1/2	12	0.2130	12902130
7/32	0.2188	2-1/2	12	7/32	12902188
#2	0.2210	2-1/2	12	0.2210	12902210
#1	0.2280	2-3/4	12	0.2280	12902280
A	0.2340	2-3/4	12	15/64	12902340
15/64	0.2344	2-3/4	12	15/64	12902344
B	0.2380	2-3/4	12	0.2380	12902380
C	0.2420	2-3/4	12	0.2420	12902420
D	0.2460	2-3/4	12	0.2460	12902460
1/4	0.2500	2-3/4	12	1/4	12902500

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Aerospace 135° NAS907 Carbide-Tip Extension Drill



Series 129 2FL | Carbide-Tip | 135° | 12" OAL

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
F	0.2570	2-15/16	12	0.2570	12902570
G	0.2610	2-15/16	12	0.2610	12902610
17/64	0.2656	2-15/16	12	17/64	12902656
H	0.2660	2-15/16	12	17/64	12902660
I	0.2720	2-15/16	12	0.2720	12902720
J	0.2770	2-15/16	12	0.2770	12902770
K	0.2810	2-15/16	12	9/32	12902810
9/32	0.2812	2-15/16	12	9/32	12902812
L	0.2900	3-3/16	12	0.2900	12902900
M	0.2950	3-3/16	12	0.2950	12902950
19/64	0.2969	3-3/16	12	19/64	12902969
N	0.3020	3-3/16	12	0.3020	12903020
5/16	0.3125	3-3/16	12	5/16	12903125
O	0.3160	3-3/16	12	0.3160	12903160
P	0.3230	3-7/16	12	0.3230	12903230
21/64	0.3281	3-7/16	12	21/64	12903281
Q	0.3320	3-7/16	12	0.3320	12903320
R	0.3390	3-7/16	12	0.3390	12903390
11/32	0.3438	3-7/16	12	11/32	12903438
S	0.3480	3-5/8	12	0.3480	12903480
T	0.3580	3-5/8	12	23/64	12903580
23/64	0.3594	3-5/8	12	23/64	12903594
U	0.3680	3-5/8	12	0.3680	12903680
3/8	0.3750	3-5/8	12	3/8	12903750
V	0.3770	3-5/8	12	0.3770	12903770
W	0.3860	3-7/8	12	0.3860	12903860
25/64	0.3906	3-7/8	12	25/64	12903906
X	0.3970	3-7/8	12	0.3970	12903970
Y	0.4040	3-7/8	12	0.4040	12904040
13/32	0.4062	3-7/8	12	13/32	12904062
Z	0.4130	3-7/8	12	0.4130	12904130
27/64	0.4219	4-1/16	12	27/64	12904219
7/16	0.4375	4-1/16	12	7/16	12904375
29/64	0.4531	4-5/16	12	29/64	12904531
15/32	0.4688	4-5/16	12	15/32	12904688
31/64	0.4844	4-1/2	12	31/64	12904844
1/2	0.5000	4-1/2	12	1/2	12905000

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Carbide-Tip Taper Length Drill



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION				APPLICATION	FEATURES							
Carbide-Tip Drill <ul style="list-style-type: none"> Carbide tipped wear resistance and HSS body for toughness General purpose drill for cutting cast iron, ductile iron, bronze, cast aluminum, fiberglass, and plastics Not suited for continuous chip low carbon steels or alloy aluminums 118° general purpose cam relief point for maximum edge strength Tanged shank provides positive drive 												
STEEL		STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL		
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
					●	●		○				

● Best ○ Good

Series 130 | 2FL | Carbide-Tip | 118° | Taper Length | Tang

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
1/8	0.1250	2-3/4	5-1/8	1/8	13001250
9/64	0.1406	3	5-3/8	9/64	13001406
5/32	0.1562	3	5-3/8	5/32	13001562
11/64	0.1719	3-3/8	5-3/4	11/64	13001719
3/16	0.1875	3-3/8	5-3/4	3/16	13001875
5mm	0.1969	92mm	152mm	5mm	13001969
13/64	0.2031	3-5/8	6	13/64	13002031
5.5mm	0.2165	3-5/8	6	0.2165	13002165
7/32	0.2188	3-5/8	6	7/32	13002188
15/64	0.2344	3-3/4	6-1/8	15/64	13002344
6mm	0.2362	95mm	156mm	6mm	13002362
1/4	0.2500	3-3/4	6-1/8	1/4	13002500
6.5mm	0.2559	3-7/8	6-1/4	0.2559	13002559
17/64	0.2656	3-7/8	6-1/4	17/64	13002656
7mm	0.2756	98mm	159mm	7mm	13002756
9/32	0.2812	3-7/8	6-1/4	9/32	13002812
7.5mm	0.2953	4	6-3/8	0.2953	13002953
19/64	0.2969	4	6-3/8	19/64	13002969
5/16	0.3125	4	6-3/8	5/16	13003125
8mm	0.3150	102mm	162mm	8mm	13003150
21/64	0.3281	4-1/8	6-1/2	21/64	13003281
8.5mm	0.3346	4-1/8	6-1/2	0.3346	13003346
11/32	0.3438	4-1/8	6-1/2	11/32	13003438
9mm	0.3543	108mm	171mm	9mm	13003543
23/64	0.3594	4-1/4	6-3/4	23/64	13003594
9.5mm	0.3740	4-1/4	6-3/4	3/8	13003740
3/8	0.3750	4-1/4	6-3/4	3/8	13003750
25/64	0.3906	4-3/8	7	25/64	13003906
10mm	0.3937	111mm	178mm	10mm	13003937
13/32	0.4062	4-3/8	7	13/32	13004062
10.5mm	0.4134	4-5/8	7-1/4	0.4134	13004134
27/64	0.4219	4-5/8	7-1/4	27/64	13004219
11mm	0.4331	117mm	184mm	11mm	13004331
7/16	0.4375	4-5/8	7-1/4	7/16	13004375
11.5mm	0.4528	4-3/4	7-1/2	29/64	13004528
29/64	0.4531	4-3/4	7-1/2	29/64	13004531
15/32	0.4688	4-3/4	7-1/2	15/32	13004688
12mm	0.4724	121mm	191mm	12mm	13004724
31/64	0.4844	4-3/4	7-3/4	31/64	13004844
12.5mm	0.4921	4-3/4	7-3/4	0.4921	13004921
1/2	0.5000	4-3/4	7-3/4	1/2	13005000
13mm	0.5118	121mm	203mm	13mm	13005118
33/64	0.5156	4-3/4	8	33/64	13005156
17/32	0.5312	4-3/4	8	17/32	13005312
13.5mm	0.5315	4-3/4	8	17/32	13005315

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Carbide-Tip Taper Length Drill



Series 130 | 2FL | Carbide-Tip | 118° | Taper Length | Tang

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
35/64	0.5469	4-7/8	8-1/4	35/64	13005469
14mm	0.5512	124mm	210mm	14mm	13005512
9/16	0.5625	4-7/8	8-1/4	9/16	13005625
14.5mm	0.5709	4-7/8	8-3/4	0.5709	13005709
37/64	0.5781	4-7/8	8-3/4	37/64	13005781
15mm	0.5906	124mm	222mm	15mm	13005906
19/32	0.5938	4-7/8	8-3/4	19/32	13005938
39/64	0.6094	4-7/8	8-3/4	39/64	13006094
15.5mm	0.6102	4-7/8	8-3/4	39/64	13006102
5/8	0.6250	4-7/8	8-3/4	5/8	13006250
16mm	0.6299	130mm	229mm	16mm	13006299
41/64	0.6406	5-1/8	9	41/64	13006406
16.5mm	0.6496	5-1/8	9	0.6496	13006496
21/32	0.6562	5-1/8	9	21/32	13006562
17mm	0.6693	137mm	235mm	17mm	13006693
43/64	0.6719	5-3/8	9-1/4	43/64	13006719
11/16	0.6875	5-3/8	9-1/4	11/16	13006875
17.5mm	0.6890	5-3/8	9-1/4	11/16	13006890
45/64	0.7031	5-5/8	9-1/2	45/64	13007031
18mm	0.7087	143mm	241mm	18mm	13007087
23/32	0.7188	5-5/8	9-1/2	23/32	13007188
18.5mm	0.7283	5-7/8	9-3/4	0.7283	13007283
47/64	0.7344	5-7/8	9-3/4	47/64	13007344
19mm	0.7480	149mm	248mm	19mm	13007480
3/4	0.7500	5-7/8	9-3/4	3/4	13007500
13/16	0.8125	6-1/8	10	13/16	13008125
7/8	0.8750	6-1/8	10	7/8	13008750
15/16	0.9375	6-1/8	10-3/4	15/16	13009375
#1	1.0000	6-3/8	11	1	13010000

*bold numbers are EDPs for ordering

Popular Custom Holemaking Options

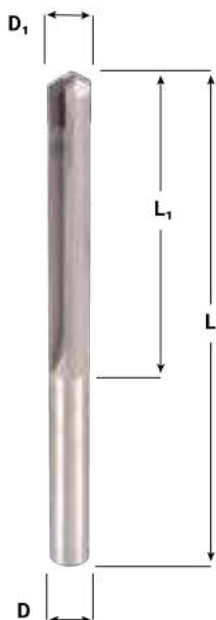
- Material-specific point geometry
- Longer flute lengths
- Internal coolant supply
- Proprietary GWS tool coatings

**CUSTOM
COMES
STANDARD**



GENERAL PURPOSE

Carbide-Tip Drill For Hardened Steel



FEATURES/DESCRIPTION		APPLICATION	FEATURES	
<p>Carbide-Tip Drill</p> <ul style="list-style-type: none"> Carbide tipped wear resistance and HSS body for toughness High temperature braze, extra thick tip and heavy land construction withstand the heavy feed pressure when drilling steels between 38 to 55 Rc Utility repairs are common use for these die drills 118° cam relief notch thin point for maximum edge strength 				

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
											●	●

● Best ○ Good

Series 150 | 2FL | Carbide-Tip | 118° | Regular Length | Straight Flute

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
11/64	0.1719	1-1/2	3-1/2	5/32	15001719
3/16	0.1875	1-1/2	3-1/2	11/64	15001875
5mm	0.1969	44mm	95mm	4.5mm	15001969
13/64	0.2031	1-3/4	3-3/4	3/16	15002031
5.5mm	0.2165	1-3/4	3-3/4	0.2165	15002165
7/32	0.2188	1-3/4	3-3/4	13/64	15002188
15/64	0.2344	2	4	7/32	15002344
6mm	0.2362	51mm	102mm	5.5mm	15002362
1/4	0.2500	2	4	15/64	15002500
6.5mm	0.2559	2-1/4	4-1/4	0.2559	15002559
17/64	0.2656	2-1/4	4-1/4	1/4	15002656
7mm	0.2756	57mm	108mm	6.5mm	15002756
9/32	0.2812	2-1/4	4-1/4	17/64	15002812
7.5mm	0.2953	2-1/2	4-1/2	0.2953	15002953
19/64	0.2969	2-1/2	4-1/2	9/32	15002969
5/16	0.3125	2-1/2	4-1/2	19/64	15003125
8mm	0.3150	64mm	114mm	7.5mm	15003150
21/64	0.3281	2-3/4	4-3/4	5/16	15003281
8.5mm	0.3346	2-3/4	4-3/4	0.3346	15003346
11/32	0.3438	2-3/4	4-3/4	21/64	15003438
9mm	0.3543	76mm	127mm	8.5mm	15003543
23/64	0.3594	3	5	11/32	15003594
9.5mm	0.3740	3	5	3/8	15003740
3/8	0.3750	3	5	23/64	15003750
25/64	0.3906	3	5-1/4	3/8	15003906
10mm	0.3937	76mm	133mm	9.5mm	15003937
13/32	0.4062	3	5-1/4	25/64	15004062
10.5mm	0.4134	3	5-1/2	0.4134	15004134
27/64	0.4219	3	5-1/2	13/32	15004219
11mm	0.4331	76mm	140mm	10.5mm	15004331
7/16	0.4375	3	5-1/2	27/64	15004375
11.5mm	0.4528	3-1/4	5-3/4	29/64	15004528
29/64	0.4531	3-1/4	5-3/4	7/16	15004531
15/32	0.4688	3-1/4	5-3/4	29/64	15004688
12mm	0.4724	83mm	146mm	11.5mm	15004724
31/64	0.4844	3-1/2	6	15/32	15004844
12.5mm	0.4921	3-1/2	6	0.4921	15004921
1/2	0.5000	3-1/2	6	1/2	15005000
13mm	0.5118	89mm	152mm	12.5mm	15005118
17/32	0.5312	3-1/2	6	1/2	15005312
13.5mm	0.5315	3-1/2	6	17/32	15005315
14mm	0.5512	89mm	152mm	13mm	15005512
9/16	0.5625	3-1/2	6	17/32	15005625
15mm	0.5906	102mm	178mm	14mm	15005906
19/32	0.5938	4	7	9/16	15005938

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Carbide-Tip Drill For Hardened Steel



Series 150 | 2FL | Carbide-Tip | 118° | Regular Length | Straight Flute

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
5/8	0.6250	4	7	19/32	15006250
16mm	0.6299	102mm	178mm	15mm	15006299
21/32	0.6562	4-1/2	7-1/2	5/8	15006562
17mm	0.6693	114mm	191mm	16.5mm	15006693
11/16	0.6875	4-1/2	7-1/2	21/32	15006875
18mm	0.7087	121mm	203mm	17.5mm	15007087
23/32	0.7188	4-3/4	8	11/16	15007188
19mm	0.7480	121mm	203mm	18mm	15007480
3/4	0.7500	4-3/4	8	23/32	15007500
2mm	0.7874	121mm	203mm	19.5mm	15007874
13/16	0.8125	4-3/4	8	25/32	15008125
21mm	0.8268	121mm	203mm	20.5mm	15008268
22mm	0.8661	121mm	203mm	21.5mm	15008661
7/8	0.8750	4-3/4	8	27/32	15008750
23mm	0.9055	121mm	203mm	22.5mm	15009055
15/16	0.9375	4-3/4	8	29/32	15009375
24mm	0.9449	121mm	203mm	23.5mm	15009449
25mm	0.9843	121mm	203mm	24.5mm	15009843
#1	1.0000	4-3/4	8	1	15010000

*bold numbers are EDPs for ordering

Popular Custom Holemaking Options

Material-specific point geometry

Longer flute lengths

Internal coolant supply

Proprietary GWS tool coatings

CUSTOM COMES STANDARD

GENERAL PURPOSE

Precision Carbide-Tip Drill For Glass And Tile Ceramics



FEATURES/DESCRIPTION				APPLICATION	FEATURES				
Carbide-Tip Drill For Glass/Ceramics <ul style="list-style-type: none"> Carbide-tip drill for glass and ceramics To be used with reduced cutting pressure to avoid cracking Recommended 30 SFM with heavy coolant or submerged 									

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2

● Best ○ Good

Series 162 | 2FL | Carbide-Tip | Regular Length | Spherical Point					
Diameter(D ₁)	Flute Length(L ₁)	OAL(L)	Shank(D)	EDP	
1/8	7/64	2-1/2	7/64	16201250	
3/16	5/32	2-1/2	5/32	16201875	
1/4	13/64	2-1/2	13/64	16202500	
5/16	1/4	3	1/4	16203125	
3/8	1/4	3-1/2	1/4	16203750	
7/16	1	3.3333	1/4	16204375	
1/2	1/4	3-5/8	1/4	16205000	
9/16	3/8	4	3/8	16205625	
5/8	1	4	3/8	16206250	

*bold numbers are EDPs for ordering

Popular Custom Holemaking Options

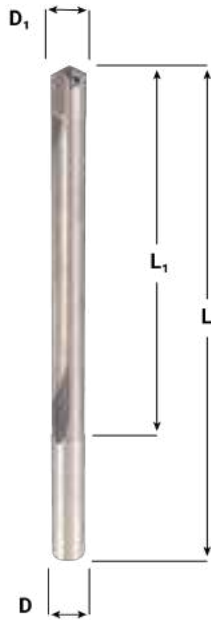
- Material-specific point geometry
- Longer flute lengths
- Internal coolant supply
- Proprietary GWS tool coatings

CUSTOM COMES STANDARD

INTRO
 MILLING
 SPECIALTY
 HOLEMAKING
 THREADING
 INSERTS

GENERAL PURPOSE

Carbide-Tip Coolant-Through 4-Facet Drill



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Carbide-Tip Drill</p> <ul style="list-style-type: none"> Carbide tipped wear resistance and HSS body for toughness Extra length tip for increased regrinds Coolant-through design produces straightest holes to reamer like finish Not suited for continuous chip low carbon steels or alloy aluminums Solid steel body allows 2 to 3 times the penetration rate of gun drills on conventional machinery 125° four facet point is a self-centering point with notch thinning for ease in chisel penetration Requires on size starting hole with greater point angle 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
	○				●	●		●		○		

● Best ○ Good

Series 170 | 2FL | Carbide-Tip | 125° | Long Length | Coolant-Through | Straight Flute

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
3/16	0.1875	3-3/4	5-3/4	3/16	17001875
5mm	0.1969	95mm	146mm	5mm	17001969
5.5mm	0.2165	4-1/8	6-1/8	0.2165	17002165
7/32	0.2188	4-1/8	6-1/8	7/32	17002188
15/64	0.2344	4-5/8	6-1/8	15/64	17002344
6mm	0.2362	117mm	156mm	6mm	17002362
1/4	0.2500	4-5/8	6-1/8	1/4	17002500
6.5mm	0.2559	4-5/8	6-1/8	0.2559	17002559
17/64	0.2656	4-3/4	6-1/4	17/64	17002656
7mm	0.2756	121mm	159mm	7mm	17002756
9/32	0.2812	4-3/4	6-1/4	9/32	17002812
7.5mm	0.2953	4-7/8	6-3/8	0.2953	17002953
19/64	0.2969	4-7/8	6-3/8	19/64	17002969
5/16	0.3125	4-7/8	6-3/8	5/16	17003125
8mm	0.3150	124mm	162mm	8mm	17003150
21/64	0.3281	5	6-1/2	21/64	17003281
8.5mm	0.3346	5	6-1/2	0.3346	17003346
11/32	0.3438	5	6-1/2	11/32	17003438
9mm	0.3543	133mm	171mm	9mm	17003543
23/64	0.3594	5-1/4	6-3/4	23/64	17003594
9.5mm	0.3740	5-1/4	6-3/4	3/8	17003740
3/8	0.3750	5-1/4	6-3/4	3/8	17003750
25/64	0.3906	5-1/2	7	25/64	17003906
10mm	0.3937	140mm	178mm	10mm	17003937
13/32	0.4062	5-1/2	7	13/32	17004062
10.5mm	0.4134	5-3/4	7-1/4	0.4134	17004134
27/64	0.4219	5-3/4	7-1/4	27/64	17004219
11mm	0.4331	146mm	184mm	11mm	17004331
7/16	0.4375	5-3/4	7-1/4	7/16	17004375
11.5mm	0.4528	5-3/4	7-1/2	29/64	17004528
29/64	0.4531	5-3/4	7-1/2	29/64	17004531
15/32	0.4688	5-3/4	7-1/2	15/32	17004688
12mm	0.4724	146mm	191mm	12mm	17004724
31/64	0.4844	5-3/4	7-3/4	31/64	17004844
12.5mm	0.4921	5-3/4	7-3/4	0.4921	17004921
1/2	0.5000	5-3/4	7-3/4	1/2	17005000
13mm	0.5118	152mm	203mm	13mm	17005118
33/64	0.5156	6	8	33/64	17005156
17/32	0.5312	6	8	17/32	17005312
13.5mm	0.5315	6	8	17/32	17005315
14mm	0.5512	159mm	210mm	14mm	17005512
9/16	0.5625	6-1/4	8-1/4	9/16	17005625
14.5mm	0.5709	6-3/4	8-3/4	0.5709	17005709
15mm	0.5906	171mm	222mm	15mm	17005906
19/32	0.5938	6-3/4	8-3/4	19/32	17005938

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Carbide-Tip Coolant-Through 4-Facet Drill



Series 170 | 2FL | Carbide-Tip | 125° | Long Length | Coolant-Through | Straight Flute

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
15.5mm	0.6102	6-3/4	8-3/4	39/64	17006102
5/8	0.6250	6-3/4	8-3/4	5/8	17006250
16mm	0.6299	178mm	229mm	16mm	17006299
16.5mm	0.6496	7	9	0.6496	17006496
21/32	0.6562	7	9	21/32	17006562
17mm	0.6693	184mm	235mm	17mm	17006693
11/16	0.6875	7-1/4	9-1/4	11/16	17006875
17.5mm	0.6890	7-1/4	9-1/4	11/16	17006890
18mm	0.7087	191mm	241mm	18mm	17007087
23/32	0.7188	7-1/2	9-1/2	23/32	17007188
18.5mm	0.7283	7-3/4	9-3/4	0.7283	17007283
19mm	0.7480	197mm	248mm	19mm	17007480
3/4	0.7500	7-3/4	9-3/4	3/4	17007500
49/64	0.7656	7-7/8	9-7/8	49/64	17007656
19.5mm	0.7677	7-7/8	9-7/8	0.7677	17007677
25/32	0.7812	7-7/8	9-7/8	25/32	17007812
2mm	0.7874	203mm	254mm	20mm	17007874
20.5mm	0.8071	8	10	0.8071	17008071
13/16	0.8125	8	10	13/16	17008125
21mm	0.8268	203mm	254mm	21mm	17008268
27/32	0.8438	8	10	27/32	17008438
21.5mm	0.8465	8	10	0.8465	17008465
22mm	0.8661	203mm	254mm	22mm	17008661
7/8	0.8750	8	10	7/8	17008750
22.5mm	0.8858	8	10	0.8858	17008858
23mm	0.9055	203mm	254mm	23mm	17009055
29/32	0.9062	8	10	29/32	17009062
23.5mm	0.9252	8-3/4	10-3/4	0.9252	17009252
15/16	0.9375	8-3/4	10-3/4	15/16	17009375
24mm	0.9449	229mm	279mm	24mm	17009449
24.5mm	0.9646	9	11	0.9646	17009646
31/32	0.9688	9	11	31/32	17009688
25mm	0.9843	229mm	279mm	25mm	17009843
#1	1.0000	9	11	1	17010000

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

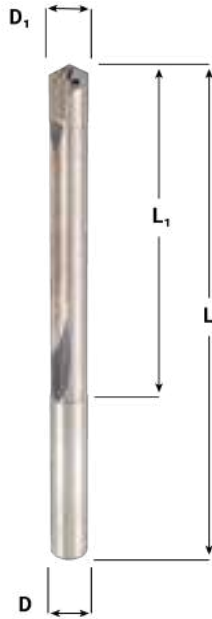
HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Carbide-Tip Coolant-Through 4-Facet Drill



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Carbide-Tip Drill</p> <ul style="list-style-type: none"> Carbide tipped wear resistance and HSS body for toughness Extra length tip for increased regrinds Coolant-through design produces straightest holes to reamer like finish Not suited for continuous chip low carbon steels or alloy aluminums Solid steel body allows 2 to 3 times the penetration rate of gun drills on conventional machinery 125° four facet point is a self-centering point with notch thinning for ease in chisel penetration Requires on size starting hole with greater point angle 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
	○				●	●		●		○		

● Best ○ Good

Series 171 | 2FL | Carbide-Tip | 125° | Jobber Length | Coolant-Through | Straight Flute

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
3/16	0.1875	2	4	3/16	17101875
5mm	0.1969	51mm	102mm	5mm	17101969
5.5mm	0.2165	2-1/4	4-1/4	0.2165	17102165
7/32	0.2188	2-1/4	4-1/4	7/32	17102188
15/64	0.2344	2-1/2	4-29/32	15/64	17102344
6mm	0.2362	64mm	125mm	6mm	17102362
1/4	0.2500	2-1/2	4-29/32	1/4	17102500
6.5mm	0.2559	2-1/2	4-29/32	0.2559	17102559
17/64	0.2656	2-3/4	5-5/32	17/64	17102656
7mm	0.2756	70mm	131mm	7mm	17102756
9/32	0.2812	2-3/4	5-5/32	9/32	17102812
7.5mm	0.2953	3-3/16	5-19/32	0.2953	17102953
19/64	0.2969	3-3/16	5-19/32	19/64	17102969
5/16	0.3125	3-3/16	5-19/32	5/16	17103125
8mm	0.3150	81mm	142mm	8mm	17103150
21/64	0.3281	3-7/16	5-27/32	21/64	17103281
8.5mm	0.3346	3-7/16	5-27/32	0.3346	17103346
11/32	0.3438	3-7/16	5-27/32	11/32	17103438
9mm	0.3543	92mm	154mm	9mm	17103543
23/64	0.3594	3-5/8	6-1/32	23/64	17103594
9.5mm	0.3740	3-5/8	6-1/32	3/8	17103740
3/8	0.3750	3-5/8	6-1/32	3/8	17103750
25/64	0.3906	3-7/8	6-9/32	25/64	17103906
10mm	0.3937	98mm	159mm	10mm	17103937
13/32	0.4062	3-7/8	6-9/32	13/32	17104062
10.5mm	0.4134	4-1/16	6-15/32	0.4134	17104134
27/64	0.4219	4-1/16	6-15/32	27/64	17104219
11mm	0.4331	103mm	164mm	11mm	17104331
7/16	0.4375	4-1/16	6-15/32	7/16	17104375
11.5mm	0.4528	4-5/16	6-23/32	29/64	17104528
29/64	0.4531	4-5/16	6-23/32	29/64	17104531
15/32	0.4688	4-5/16	6-23/32	15/32	17104688
12mm	0.4724	109mm	171mm	12mm	17104724
31/64	0.4844	4-1/2	6-29/32	31/64	17104844
12.5mm	0.4921	4-1/2	6-29/32	0.4921	17104921
1/2	0.5000	4-1/2	6-29/32	1/2	17105000
13mm	0.5118	122mm	183mm	13mm	17105118
17/32	0.5312	4-13/16	7-7/32	17/32	17105312
13.5mm	0.5315	4-13/16	7-7/32	17/32	17105315
14mm	0.5512	122mm	183mm	14mm	17105512
9/16	0.5625	4-13/16	7-7/32	9/16	17105625
14.5mm	0.5709	5-3/16	7-19/32	0.5709	17105709
15mm	0.5906	131mm	193mm	15mm	17105906
19/32	0.5938	5-3/16	7-19/32	19/32	17105938
15.5mm	0.6102	5-3/16	7-19/32	39/64	17106102

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Carbide-Tip Coolant-Through 4-Facet Drill



Series 171 | 2FL | Carbide-Tip | 125° | Jobber Length | Coolant-Through | Straight Flute

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
5/8	0.6250	5-3/16	7-19/32	5/8	17106250
16mm	0.6299	131mm	193mm	16mm	17106299
41/64	0.6406	5-3/16	7-19/32	41/64	17106406
16.5mm	0.6496	5-3/16	7-19/32	0.6496	17106496
21/32	0.6562	5-3/16	7-19/32	21/32	17106562
17mm	0.6693	143mm	204mm	17mm	17106693
43/64	0.6719	5-5/8	8-1/32	43/64	17106719
11/16	0.6875	5-5/8	8-1/32	11/16	17106875
17.5mm	0.6890	5-5/8	8-1/32	11/16	17106890
45/64	0.7031	5-5/8	8-1/32	45/64	17107031
18mm	0.7087	143mm	204mm	18mm	17107087
23/32	0.7188	5-5/8	8-1/32	23/32	17107188
18.5mm	0.7283	6-1/16	8-15/32	0.7283	17107283
47/64	0.7344	6-1/16	8-15/32	47/64	17107344
19mm	0.7480	154mm	215mm	19mm	17107480
3/4	0.7500	6-1/16	8-15/32	3/4	17107500
19.5mm	0.7677	6-1/16	8-9/16	0.7677	17107677
25/32	0.7812	6-1/16	8-9/16	25/32	17107812
2mm	0.7874	154mm	217mm	20mm	17107874
20.5mm	0.8071	6-1/16	8-9/16	0.8071	17108071
13/16	0.8125	6-1/16	8-9/16	13/16	17108125
21mm	0.8268	165mm	229mm	21mm	17108268
27/32	0.8438	6-1/2	9	27/32	17108438
21.5mm	0.8465	6-1/2	9	0.8465	17108465
22mm	0.8661	165mm	229mm	22mm	17108661
7/8	0.8750	6-1/2	9	7/8	17108750
22.5mm	0.8858	6-15/16	9-7/16	0.8858	17108858
23mm	0.9055	176mm	240mm	23mm	17109055
29/32	0.9062	6-15/16	9-7/16	29/32	17109062
23.5mm	0.9252	6-15/16	9-7/16	0.9252	17109252
15/16	0.9375	6-15/16	9-7/16	15/16	17109375
24mm	0.9449	176mm	240mm	24mm	17109449
24.5mm	0.9646	6-15/16	9-7/16	0.9646	17109646
31/32	0.9688	6-15/16	9-7/16	31/32	17109688
25mm	0.9843	187mm	251mm	25mm	17109843
#1	1.0000	7-3/8	9-7/8	1	17110000

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

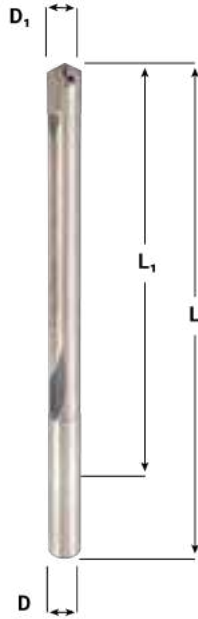
HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Carbide-Tip Coolant-Through 4-Facet Drill



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Carbide-Tip Drill</p> <ul style="list-style-type: none"> Carbide tipped wear resistance and HSS body for toughness Extra length tip for increased regrinds Coolant-through design produces straightest holes to reamer like finish Not suited for continuous chip low carbon steels or alloy aluminums Solid steel body allows 2 to 3 times the penetration rate of gun drills on conventional machinery 125° four facet point is a self-centering point with notch thinning for ease in chisel penetration Requires on size starting hole with greater point angle 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
	○				●	●		●		○		

● Best ○ Good

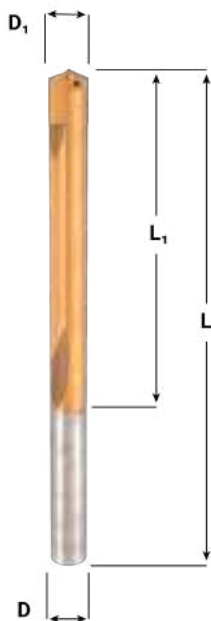
Series 172 | 2FL | Carbide-Tip | 125° | X-Long Length | Coolant-Through | Straight Flute

Diameter(D ₁)	Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
1/4	8	10	1/4	17202500
9/32	8	10	9/32	17202812
5/16	8	10	5/16	17203125
11/32	8	10	11/32	17203438
3/8	9	11	3/8	17203750
13/32	9	11	13/32	17204062
7/16	9	11	7/16	17204375
15/32	9-3/4	12	15/32	17204688
1/2	9-3/4	12	1/2	17205000
17/32	9-3/4	12	17/32	17205312
9/16	10-3/4	13	9/16	17205625
5/8	10-3/4	13	5/8	17206250
3/4	11-3/4	14	3/4	17207500
7/8	12-3/4	15	7/8	17208750
1	13-3/4	16	1	17210000

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Carbide-Tip Coolant-Through Drill



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Carbide-Tip Drill</p> <ul style="list-style-type: none"> Carbide tipped wear resistance and HSS body for toughness Coolant-through design produces straightest holes to reamer like finish Not suited for continuous chip low carbon steels or alloy aluminums Solid steel body allows 2 to 3 times the penetration rate of gun drills on conventional machinery 130° helical point eases chisel pressure and improves life in several materials Requires on size starting hole with greater point angle 		<ul style="list-style-type: none"> CARBIDE TIP 2FL 0° 130° JOBBER COOLANT THROUGH P364 REDUCED SWAMP TIN

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
	●	○			●	●		○				

● Best ○ Good

Series 176 | 2FL | Carbide-Tip | 130° | Jobber Length | Coolant-Through | Straight Flute

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
3/16	0.1875	2	4	3/16	17601875
#7	0.2010	2	4	3/16	17602010
#3	0.2130	2-1/4	4-1/4	13/64	17602130
7/32	0.2188	2-1/4	4-1/4	7/32	17602188
1/4	0.2500	2-1/2	4-29/32	15/64	17602500
9/32	0.2812	2-3/4	5-5/32	17/64	17602812
5/16	0.3125	3-3/16	5-19/32	19/64	17603125
11/32	0.3438	3-7/16	5-27/32	21/64	17603438
3/8	0.3750	3-5/8	6-1/32	23/64	17603750
13/32	0.4062	3-7/8	6-9/32	25/64	17604062
7/16	0.4375	4-1/16	6-15/32	27/64	17604375
15/32	0.4688	4-5/16	6-23/32	29/64	17604688
1/2	0.5000	4-1/2	6-29/32	31/64	17605000
17/32	0.5312	4-13/16	7-7/32	33/64	17605312
9/16	0.5625	4-13/16	7-7/32	35/64	17605625
19/32	0.5938	5-3/16	7-19/32	37/64	17605938
5/8	0.6250	5-3/16	7-19/32	39/64	17606250
21/32	0.6562	5-3/16	7-19/32	41/64	17606562
11/16	0.6875	5-5/8	8-1/32	43/64	17606875
23/32	0.7188	5-5/8	8-1/32	45/64	17607188
3/4	0.7500	6-1/16	8-15/32	47/64	17607500
25/32	0.7812	6-1/16	8-9/16	49/64	17607812
13/16	0.8125	6-1/16	8-9/16	51/64	17608125
27/32	0.8438	6-1/2	9	53/64	17608438
7/8	0.8750	6-1/2	9	55/64	17608750
29/32	0.9062	6-15/16	9-7/16	57/64	17609062
15/16	0.9375	6-15/16	9-7/16	59/64	17609375
31/32	0.9688	6-15/16	9-7/16	61/64	17609688
#1	1.0000	7-3/8	9-7/8	1	17610000

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Heavy Duty Carbide-Tip Coolant-Through Drill



INTRO

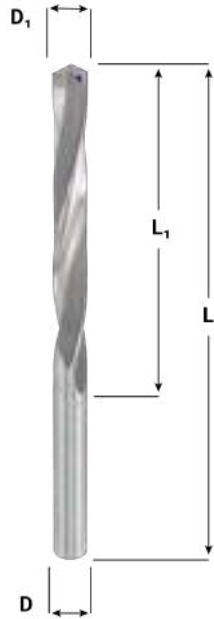
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Carbide-Tip Drill</p> <ul style="list-style-type: none"> Carbide tipped wear resistance and HSS body for toughness Coolant-through design has a positive rake, heavy web and slow helix for increased rigidity Not suited for continuous chip low carbon steels or alloy aluminums Faster penetration rates than straight flute carbide tipped designs 125° four facet point and pre-thinned tip web provide low power drilling characteristics 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
			○		○			○		●		

● Best ○ Good

Series 290 | 2FL | Carbide-Tip | 125° | Long Length | Coolant-Through

Diameter(D ₁)	Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
1/4	3-3/4	6-1/8	1/4	29002500
9/32	3-7/8	6-1/4	9/32	29002812
5/16	4	6-3/8	5/16	29003125
11/32	4-1/8	6-1/2	11/32	29003438
3/8	4-1/4	6-3/4	3/8	29003750
13/32	4-3/8	7	13/32	29004062
7/16	4-5/8	7-1/4	7/16	29004375
15/32	4-7/8	7-1/2	15/32	29004688
1/2	5	7-3/4	1/2	29005000
17/32	5-1/4	8	17/32	29005312
9/16	5-3/8	8-1/4	9/16	29005625
19/32	5-5/8	8-1/2	19/32	29005938
5/8	5-3/4	8-3/4	5/8	29006250
21/32	5-7/8	9	21/32	29006562
11/16	6	9-1/4	11/16	29006875
23/32	6-3/16	9-1/2	23/32	29007188
3/4	6-3/8	9-3/4	3/4	29007500

*bold numbers are EDPs for ordering

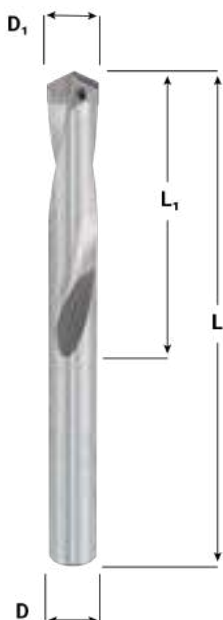
Popular Custom Holemaking Options

- Material-specific point geometry
- Longer flute lengths
- Internal coolant supply
- Proprietary GWS tool coatings

**CUSTOM
COMES
STANDARD**

GENERAL PURPOSE

Heavy Duty Carbide-Tip Coolant-Through Drill



FEATURES/DESCRIPTION				APPLICATION	FEATURES							
Carbide-Tip Drill <ul style="list-style-type: none"> Carbide tipped wear resistance and HSS body for toughness Coolant-through design has a positive rake, heavy web and slow helix for increased rigidity when cutting short depth holes Not suited for continuous chip low carbon steels or alloy aluminums Faster penetration rates than straight flute carbide tipped designs 125° four facet point and pre-thinned tip web provide low power drilling characteristics 												
STEEL		STAINLESS		CAST IRON	NON-FERROUS	HRSA		HARDENED STEEL				
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
			○		○		○		●			

● Best ○ Good

Series 295 | 2FL | Carbide-Tip | 125° | Short Length | Coolant-Through | Reduced Shank

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
1/4	0.2500	1-17/32	3-15/16	15/64	29502500
6.5mm	0.2559	1-17/32	3-15/16	6mm	29502559
17/64	0.2656	1-19/32	4	1/4	29502656
7mm	0.2756	40mm	102mm	6.5mm	29502756
9/32	0.2812	1-19/32	4	17/64	29502812
7.5mm	0.2953	1-19/32	4	7mm	29502953
19/64	0.2969	1-3/4	4-5/32	9/32	29502969
5/16	0.3125	1-3/4	4-5/32	19/64	29503125
8mm	0.3150	44mm	106mm	7.5mm	29503150
21/64	0.3281	1-15/16	4-11/32	5/16	29503281
8.5mm	0.3346	1-15/16	4-11/32	8mm	29503346
11/32	0.3438	1-15/16	4-11/32	21/64	29503438
9mm	0.3543	49mm	110mm	8.5mm	29503543
23/64	0.3594	2-1/8	4-17/32	11/32	29503594
9.5mm	0.3740	2-1/8	4-17/32	9mm	29503740
3/8	0.3750	2-1/8	4-17/32	23/64	29503750
25/64	0.3906	2-9/32	4-11/16	3/8	29503906
10mm	0.3937	58mm	119mm	9.5mm	29503937
13/32	0.4062	2-9/32	4-11/16	25/64	29504062
10.5mm	0.4134	2-9/32	4-11/16	10mm	29504134
27/64	0.4219	2-1/2	4-29/32	13/32	29504219
11mm	0.4331	64mm	125mm	10.5mm	29504331
7/16	0.4375	2-1/2	4-29/32	27/64	29504375
11.5mm	0.4528	2-21/32	5-1/16	11mm	29504528
29/64	0.4531	2-21/32	5-1/16	7/16	29504531
15/32	0.4688	2-21/32	5-1/16	29/64	29504688
12mm	0.4724	67mm	129mm	11.5mm	29504724
31/64	0.4844	2-13/16	5-7/32	15/32	29504844
12.5mm	0.4921	2-13/16	5-7/32	12mm	29504921
1/2	0.5000	2-13/16	5-7/32	31/64	29505000
13mm	0.5118	76mm	137mm	12.5mm	29505118
33/64	0.5156	3	5-13/32	1/2	29505156
17/32	0.5312	3	5-13/32	33/64	29505312
13.5mm	0.5315	3	5-13/32	13mm	29505315
35/64	0.5469	3-1/8	5-17/32	17/32	29505469
14mm	0.5512	79mm	140mm	13.5mm	29505512
9/16	0.5625	3-1/8	5-17/32	35/64	29505625
14.5mm	0.5709	3-9/32	5-11/16	14mm	29505709
37/64	0.5781	3-9/32	5-11/16	9/16	29505781
15mm	0.5906	83mm	144mm	14.5mm	29505906
19/32	0.5938	3-9/32	5-11/16	37/64	29505938
39/64	0.6094	3-7/16	5-27/32	19/32	29506094
15.5mm	0.6102	3-7/16	5-27/32	15mm	29506102
5/8	0.6250	3-7/16	5-27/32	39/64	29506250
16mm	0.6299	87mm	148mm	15.5mm	29506299

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Heavy Duty Carbide-Tip Coolant-Through Drill



Series 295 | 2FL | Carbide-Tip | 125° | Short Length | Coolant-Through | Reduced Shank

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
41/64	0.6406	3-21/32	6-1/16	5/8	29506406
16.5mm	0.6496	3-21/32	6-1/16	16mm	29506496
21/32	0.6562	3-21/32	6-1/16	41/64	29506562
17mm	0.6693	93mm	154mm	16.5mm	29506693
43/64	0.6719	3-13/16	6-7/32	21/32	29506719
11/16	0.6875	3-13/16	6-7/32	43/64	29506875
17.5mm	0.6890	3-13/16	6-7/32	17mm	29506890
45/64	0.7031	3-15/16	6-11/32	11/16	29507031
18mm	0.7087	100mm	161mm	17.5mm	29507087
23/32	0.7188	3-15/16	6-11/32	45/64	29507188
18.5mm	0.7283	3-15/16	6-11/32	18mm	29507283
47/64	0.7344	4-1/8	6-17/32	23/32	29507344
19mm	0.7480	105mm	166mm	18.5mm	29507480
3/4	0.7500	4-1/8	6-17/32	47/64	29507500
49/64	0.7656	4-9/32	6-25/32	3/4	29507656
19.5mm	0.7677	4-9/32	6-25/32	19mm	29507677
25/32	0.7812	4-9/32	6-25/32	49/64	29507812
2mm	0.7874	109mm	172mm	19.5mm	29507874
51/64	0.7969	4-7/16	6-15/16	25/32	29507969
20.5mm	0.8071	4-7/16	6-15/16	20mm	29508071
13/16	0.8125	4-7/16	6-15/16	51/64	29508125
21mm	0.8268	117mm	180mm	20.5mm	29508268
53/64	0.8281	4-19/32	7-3/32	13/16	29508281
27/32	0.8438	4-19/32	7-3/32	53/64	29508438
21.5mm	0.8465	4-19/32	7-3/32	21mm	29508465
55/64	0.8594	4-11/16	7-3/16	27/32	29508594
22mm	0.8661	119mm	183mm	21.5mm	29508661
7/8	0.8750	4-11/16	7-3/16	55/64	29508750
22.5mm	0.8858	4-7/8	7-3/8	22mm	29508858
57/64	0.8906	4-7/8	7-3/8	7/8	29508906
23mm	0.9055	124mm	187mm	22.5mm	29509055
29/32	0.9062	4-7/8	7-3/8	57/64	29509062
59/64	0.9219	5-1/32	7-17/32	29/32	29509219
23.5mm	0.9252	5-1/32	7-17/32	23mm	29509252
15/16	0.9375	5-1/32	7-17/32	59/64	29509375
24mm	0.9449	132mm	195mm	23.5mm	29509449
61/64	0.9531	5-3/16	7-11/16	15/16	29509531
24.5mm	0.9646	5-3/16	7-11/16	24mm	29509646
31/32	0.9688	5-3/16	7-11/16	61/64	29509688
25mm	0.9843	135mm	198mm	24.5mm	29509843
63/64	0.9844	5-5/16	7-13/16	31/32	29509844
#1	1.0000	5-5/16	7-13/16	63/64	29510000
26mm	1.0236	144mm	208mm	25mm	29510236
1-1/32	1.0312	5-11/16	8-3/16	1	29510312
1-1/16	1.0625	5-11/16	8-3/16	1	29510625
1-3/32	1.0938	5-11/16	8-3/16	1	29510938
1-1/8	1.1250	5-11/16	8-3/16	1	29511250

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

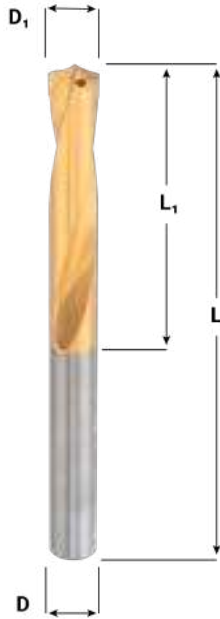
HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Carbide-Tip Coolant-Through Drill



FEATURES/DESCRIPTION	APPLICATION	FEATURES																																							
<p>Carbide-Tip Drill</p> <ul style="list-style-type: none"> Carbide tipped wear resistance and HSS body for toughness Coolant-through design has a positive rake, heavy web and slow helix for increased rigidity when cutting short depth holes Not suited for continuous chip low carbon steels or alloy aluminums Faster penetration rates than straight flute carbide tipped designs Stub length allows penetration into machined surfaces without a starting hole 130° helical point eases chisel pressure and improves life in several materials 		<ul style="list-style-type: none"> CARBIDE TIP 2FL 15° 135° SHORT COOLANT THROUGH STUB REDUCED SHANK P364 TIN 																																							
<table border="1"> <thead> <tr> <th colspan="3">STEEL</th> <th colspan="2">STAINLESS</th> <th colspan="2">CAST IRON</th> <th colspan="2">NON-FERROUS</th> <th colspan="2">HRSA</th> <th colspan="2">HARDENED STEEL</th> </tr> <tr> <th>P1</th> <th>P2</th> <th>P3</th> <th>M1</th> <th>M2</th> <th>K1</th> <th>K2</th> <th>N1</th> <th>N2</th> <th>S1</th> <th>S2</th> <th>H1</th> <th>H2</th> </tr> </thead> <tbody> <tr> <td></td> <td>●</td> <td>●</td> <td></td> <td></td> <td>●</td> <td>●</td> <td></td> <td>○</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>			STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL		P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2		●	●			●	●		○				
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL																														
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																													
	●	●			●	●		○																																	

● Best ○ Good

Series 296 | 2FL | Carbide-Tip | 135° | Stub Length | Coolant-Through | Reduced Shank

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
D	0.2460	1-17/32	3-15/16	15/64	29602460
1/4	0.2500	1-17/32	3-15/16	15/64	29602500
6.5mm	0.2559	1-17/32	3-15/16	6mm	29602559
F	0.2570	1-17/32	3-15/16	1/4	29602570
G	0.2610	1-17/32	3-15/16	1/4	29602610
17/64	0.2656	1-19/32	4	1/4	29602656
I	0.2720	1-19/32	4	17/64	29602720
7mm	0.2756	40mm	102mm	6.5mm	29602756
9/32	0.2812	1-19/32	4	17/64	29602812
7.5mm	0.2953	1-19/32	4	7mm	29602953
19/64	0.2969	1-3/4	4-5/32	9/32	29602969
5/16	0.3125	1-3/4	4-5/32	19/64	29603125
8mm	0.3150	44mm	106mm	7.5mm	29603150
O	0.3160	1-3/4	4-5/32	19/64	29603160
21/64	0.3281	1-15/16	4-11/32	5/16	29603281
Q	0.3320	1-15/16	4-11/32	5/16	29603320
8.5mm	0.3346	1-15/16	4-11/32	8mm	29603346
R	0.3390	1-15/16	4-11/32	21/64	29603390
11/32	0.3438	1-15/16	4-11/32	21/64	29603438
9mm	0.3543	49mm	110mm	8.5mm	29603543
23/64	0.3594	2-1/8	4-17/32	11/32	29603594
U	0.3680	2-1/8	4-17/32	23/64	29603680
9.5mm	0.3740	2-1/8	4-17/32	9mm	29603740
3/8	0.3750	2-1/8	4-17/32	23/64	29603750
W	0.3860	2-9/32	4-11/16	3/8	29603860
25/64	0.3906	2-9/32	4-11/16	mm	29603906
10mm	0.3937	58mm	119mm	9.5mm	29603937
13/32	0.4062	2-9/32	4-11/16	25/64	29604062
10.5mm	0.4134	2-9/32	4-11/16	10mm	29604134
27/64	0.4219	2-1/2	4-29/32	13/32	29604219
11mm	0.4331	64mm	125mm	10.5mm	29604331
7/16	0.4375	2-1/2	4-29/32	27/64	29604375
11.5mm	0.4528	2-21/32	5-1/16	11mm	29604528
29/64	0.4531	2-21/32	5-1/16	7/16	29604531
15/32	0.4688	2-21/32	5-1/16	29/64	29604688
12mm	0.4724	67mm	129mm	11.5mm	29604724
31/64	0.4844	2-13/16	5-7/32	15/32	29604844
12.5mm	0.4921	2-13/16	5-7/32	12mm	29604921
1/2	0.5000	2-13/16	5-7/32	31/64	29605000
13mm	0.5118	76mm	137mm	12.5mm	29605118
33/64	0.5156	3	5-13/32	1/2	29605156
17/32	0.5312	3	5-13/32	33/64	29605312
13.5mm	0.5315	3	5-13/32	13mm	29605315
35/64	0.5469	3-1/8	5-17/32	17/32	29605469
14mm	0.5512	79mm	140mm	13.5mm	29605512

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Carbide-Tip Coolant-Through Drill



Series 296

2FL | Carbide-Tip | 135° | Stub Length | Coolant-Through | Reduced Shank

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
9/16	0.5625	3-1/8	5-17/32	35/64	29605625
14.5mm	0.5709	3-9/32	5-11/16	14mm	29605709
37/64	0.5781	3-9/32	5-11/16	9/16	29605781
15mm	0.5906	83mm	144mm	14.5mm	29605906
19/32	0.5938	3-9/32	5-11/16	37/64	29605938
39/64	0.6094	3-7/16	5-27/32	19/32	29606094
15.5mm	0.6102	3-7/16	5-27/32	15mm	29606102
5/8	0.6250	3-7/16	5-27/32	39/64	29606250
16mm	0.6299	87mm	148mm	15.5mm	29606299
41/64	0.6406	3-21/32	6-1/16	5/8	29606406
16.5mm	0.6496	3-21/32	6-1/16	16mm	29606496
21/32	0.6562	3-21/32	6-1/16	41/64	29606562
17mm	0.6693	93mm	154mm	16.5mm	29606693
43/64	0.6719	3-13/16	6-7/32	21/32	29606719
11/16	0.6875	3-13/16	6-7/32	43/64	29606875
17.5mm	0.6890	3-13/16	6-7/32	17mm	29606890
45/64	0.7031	3-15/16	6-11/32	11/16	29607031
18mm	0.7087	100mm	161mm	17.5mm	29607087
23/32	0.7188	3-15/16	6-11/32	45/64	29607188
18.5mm	0.7283	3-15/16	6-11/32	18mm	29607283
47/64	0.7344	4-1/8	6-17/32	23/32	29607344
19mm	0.7480	105mm	166mm	18.5mm	29607480
3/4	0.7500	4-1/8	6-17/32	47/64	29607500
49/64	0.7656	4-9/32	6-25/32	3/4	29607656
19.5mm	0.7677	4-9/32	6-25/32	19mm	29607677
25/32	0.7812	4-9/32	6-25/32	49/64	29607812
2mm	0.7874	109mm	172mm	19.5mm	29607874
51/64	0.7969	4-7/16	6-15/16	25/32	29607969
20.5mm	0.8071	4-7/16	6-15/16	20mm	29608071
13/16	0.8125	4-7/16	6-15/16	51/64	29608125
21mm	0.8268	117mm	180mm	20.5mm	29608268
53/64	0.8281	4-19/32	7-3/32	13/16	29608281
27/32	0.8438	4-19/32	7-3/32	53/64	29608438
21.5mm	0.8465	4-19/32	7-3/32	21mm	29608465
55/64	0.8594	4-11/16	7-3/16	27/32	29608594
22mm	0.8661	119mm	183mm	21.5mm	29608661
7/8	0.8750	4-11/16	7-3/16	55/64	29608750
22.5mm	0.8858	4-7/8	7-3/8	22mm	29608858
57/64	0.8906	4-7/8	7-3/8	7/8	29608906
23mm	0.9055	124mm	187mm	22.5mm	29609055
29/32	0.9062	4-7/8	7-3/8	57/64	29609062
59/64	0.9219	5-1/32	7-17/32	29/32	29609219
23.5mm	0.9252	5-1/32	7-17/32	23mm	29609252
15/16	0.9375	5-1/32	7-17/32	59/64	29609375
24mm	0.9449	132mm	195mm	23.5mm	29609449
61/64	0.9531	5-3/16	7-11/16	15/16	29609531
24.5mm	0.9646	5-3/16	7-11/16	24mm	29609646
31/32	0.9688	5-3/16	7-11/16	61/64	29609688
25mm	0.9843	135mm	198mm	24.5mm	29609843
63/64	0.9844	5-5/16	7-13/16	31/32	29609844
#1	1.0000	5-5/16	7-13/16	63/64	29610000
26mm	1.0236	144mm	208mm	25mm	29610236
1-1/32	1.0312	5-11/16	8-3/16	1	29610312
1-1/16	1.0625	5-11/16	8-3/16	1	29610625
1-3/32	1.0938	5-11/16	8-3/16	1	29610938
1-1/8	1.1250	5-11/16	8-3/16	1	29611250

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

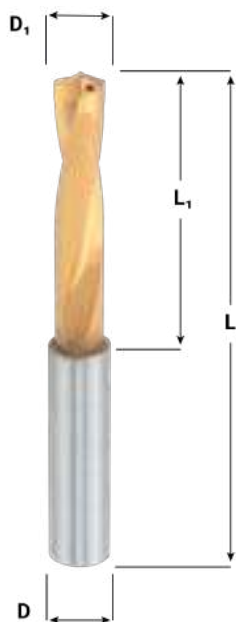
HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Carbide-Tip Coolant-Through Drill



FEATURES/DESCRIPTION	APPLICATION	FEATURES																																							
<p>Carbide-Tip Drill</p> <ul style="list-style-type: none"> Carbide tipped wear resistance and HSS body for toughness Coolant-through design has a positive rake, heavy web and slow helix for increased rigidity when cutting short depth holes Not suited for continuous chip low carbon steels or alloy aluminums Faster penetration rates than straight flute carbide tipped designs 130° Helical point eases chisel pressure and improves life in several materials Common shank sizes 		<ul style="list-style-type: none"> CARBIDE TIP 2FL 15° 135° SHORT COOLANT THROUGH STUB h6 P364 TIN 																																							
<table border="1"> <thead> <tr> <th colspan="3">STEEL</th> <th colspan="2">STAINLESS</th> <th colspan="2">CAST IRON</th> <th colspan="2">NON-FERROUS</th> <th colspan="2">HSSA</th> <th colspan="2">HARDENED STEEL</th> </tr> <tr> <th>P1</th> <th>P2</th> <th>P3</th> <th>M1</th> <th>M2</th> <th>K1</th> <th>K2</th> <th>N1</th> <th>N2</th> <th>S1</th> <th>S2</th> <th>H1</th> <th>H2</th> </tr> </thead> <tbody> <tr> <td></td> <td>●</td> <td>●</td> <td></td> <td></td> <td>●</td> <td>●</td> <td></td> <td>○</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>			STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL		P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2		●	●			●	●		○				
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL																														
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																													
	●	●			●	●		○																																	

● Best ○ Good

Series 297 | 2FL | Carbide-Tip | 135° | Stub Length | Coolant-Through | Common Shank

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
1/4	0.2500	1-17/32	3-15/16	5/8	29702500
6.5mm	0.2559	1-17/32	3-15/16	16mm	29702559
17/64	0.2656	1-19/32	4	5/8	29702656
7mm	0.2756	40mm	102mm	16mm	29702756
9/32	0.2812	1-19/32	4	5/8	29702812
7.5mm	0.2953	1-19/32	4	16mm	29702953
19/64	0.2969	1-3/4	4-5/32	5/8	29702969
5/16	0.3125	1-3/4	4-5/32	5/8	29703125
8mm	0.3150	44mm	106mm	16mm	29703150
21/64	0.3281	1-15/16	4-11/32	5/8	29703281
8.5mm	0.3346	1-15/16	4-11/32	16mm	29703346
11/32	0.3438	1-15/16	4-11/32	5/8	29703438
9mm	0.3543	49mm	110mm	16mm	29703543
23/64	0.3594	2-1/8	4-17/32	5/8	29703594
9.5mm	0.3740	2-1/8	4-17/32	16mm	29703740
3/8	0.3750	2-1/8	4-17/32	5/8	29703750
25/64	0.3906	2-9/32	4-11/16	5/8	29703906
10mm	0.3937	58mm	119mm	16mm	29703937
13/32	0.4062	2-9/32	4-11/16	5/8	29704062
10.5mm	0.4134	2-9/32	4-11/16	16mm	29704134
27/64	0.4219	2-1/2	4-29/32	5/8	29704219
11mm	0.4331	64mm	125mm	16mm	29704331
7/16	0.4375	2-1/2	4-29/32	5/8	29704375
11.5mm	0.4528	2-21/32	5-1/16	16mm	29704528
29/64	0.4531	2-21/32	5-1/16	5/8	29704531
15/32	0.4688	2-21/32	5-1/16	5/8	29704688
12mm	0.4724	67mm	129mm	16mm	29704724
31/64	0.4844	2-13/16	5-7/32	5/8	29704844
12.5mm	0.4921	2-13/16	5-7/32	16mm	29704921
1/2	0.5000	2-13/16	5-7/32	5/8	29705000
13mm	0.5118	76mm	137mm	16mm	29705118
33/64	0.5156	3	5-13/32	5/8	29705156
17/32	0.5312	3	5-13/32	5/8	29705312
13.5mm	0.5315	3	5-13/32	16mm	29705315
35/64	0.5469	3-1/8	5-17/32	5/8	29705469
14mm	0.5512	79mm	140mm	16mm	29705512
9/16	0.5625	3-1/8	5-17/32	5/8	29705625
14.5mm	0.5709	3-9/32	5-11/16	20mm	29705709
37/64	0.5781	3-9/32	5-11/16	3/4	29705781
15mm	0.5906	83mm	144mm	20mm	29705906
19/32	0.5938	3-9/32	5-11/16	3/4	29705938
39/64	0.6094	3-7/16	5-27/32	3/4	29706094
15.5mm	0.6102	3-7/16	5-27/32	20mm	29706102
5/8	0.6250	3-7/16	5-27/32	3/4	29706250
16mm	0.6299	87mm	148mm	20mm	29706299

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Carbide-Tip Coolant-Through Drill



Series 297 | 2FL | Carbide-Tip | 135° | Stub Length | Coolant-Through | Common Shank

Diameter(D ₁)		Flute Length(L ₁)	OAL(L)	Shank(D)	EDP
Size	Dec.				
41/64	0.6406	3-21/32	6-1/16	3/4	29706406
16.5mm	0.6496	3-21/32	6-1/16	20mm	29706496
21/32	0.6562	3-21/32	6-1/16	3/4	29706562
17mm	0.6693	93mm	154mm	20mm	29706693
43/64	0.6719	3-13/16	6-7/32	3/4	29706719
11/16	0.6875	3-13/16	6-7/32	3/4	29706875
17.5mm	0.6890	3-13/16	6-7/32	20mm	29706890
45/64	0.7031	3-15/16	6-11/32	3/4	29707031
18mm	0.7087	100mm	161mm	20mm	29707087
23/32	0.7188	3-15/16	6-11/32	3/4	29707188
18.5mm	0.7283	3-15/16	6-11/32	20mm	29707283
47/64	0.7344	4-1/8	6-17/32	1	29707344
19mm	0.7480	105mm	166mm	25mm	29707480
3/4	0.7500	4-1/8	6-17/32	1	29707500
19.3mm	0.7590	4-9/32	6-25/32	25mm	29707590
49/64	0.7656	4-9/32	6-25/32	1	29707656
19.5mm	0.7677	4-9/32	6-25/32	25mm	29707677
25/32	0.7812	4-9/32	6-25/32	1	29707812
2mm	0.7874	109mm	172mm	25mm	29707874
51/64	0.7969	4-7/16	6-15/16	1	29707969
20.5mm	0.8071	4-7/16	6-15/16	25mm	29708071
13/16	0.8125	4-7/16	6-15/16	1	29708125
21mm	0.8268	117mm	180mm	25mm	29708268
53/64	0.8281	4-19/32	7-3/32	1	29708281
27/32	0.8438	4-19/32	7-3/32	1	29708438
21.5mm	0.8465	4-19/32	7-3/32	25mm	29708465
55/64	0.8594	4-11/16	7-3/16	1	29708594
22mm	0.8661	119mm	183mm	25mm	29708661
7/8	0.8750	4-11/16	7-3/16	1	29708750
22.5mm	0.8858	4-7/8	7-3/8	25mm	29708858
57/64	0.8906	4-7/8	7-3/8	1	29708906
23mm	0.9055	124mm	187mm	25mm	29709055
29/32	0.9062	4-7/8	7-3/8	1	29709062
59/64	0.9219	5-1/32	7-17/32	1	29709219
23.5mm	0.9252	5-1/32	7-17/32	25mm	29709252
15/16	0.9375	5-1/32	7-17/32	1	29709375
24mm	0.9449	132mm	195mm	25mm	29709449
61/64	0.9531	5-3/16	7-11/16	1	29709531
24.5mm	0.9646	5-3/16	7-11/16	25mm	29709646
31/32	0.9688	5-3/16	7-11/16	1	29709688
25mm	0.9843	135mm	198mm	25mm	29709843
63/64	0.9844	5-5/16	7-13/16	1	29709844
#1	1.0000	5-5/16	7-13/16	1	29710000
25.7mm	1.0110	5-11/16	8-3/16	1	29710110
26mm	1.0236	144mm	208mm	25mm	29710236
1-1/32	1.0312	5-11/16	8-3/16	1	29710312
1-1/16	1.0625	5-11/16	8-3/16	1	29710625
1-3/32	1.0938	5-11/16	8-3/16	1	29710938
1-1/8	1.1250	5-11/16	8-3/16	1	29711250

*bold numbers are EDPs for ordering

Popular Custom Holemaking Options

- Material-specific point geometry
- Longer flute lengths
- Internal coolant supply
- Proprietary GWS tool coatings

**CUSTOM
COMES
STANDARD**

TECHNICAL DATA

HOLEMAKING

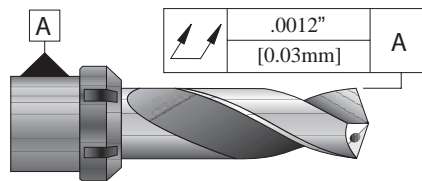


Tool Material	Self Start	
	Entry	Feed Rate
	Up to 100%	Reduce 30 to 50%
Carbide	5.5 x Ø	8.5 x Ø
Carbide Tip	4 x Ø	6 x Ø
HSS, Cobalt	4 x Ø	6 x Ø

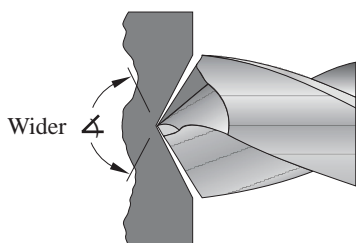
Drill Depth	
For greater drill depths or better positioning use other starting methods shown.	

To properly self start a drill use the following:

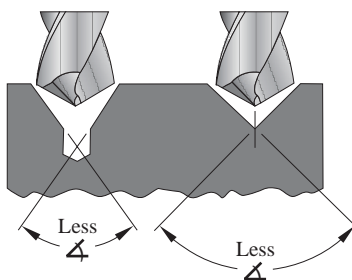
- Shortened projection
- Rigid part fixturing
- Enter machined surface



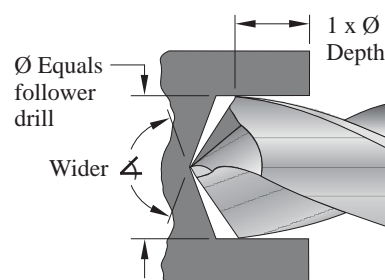
Spot for carbide



Spot for H.S.S.

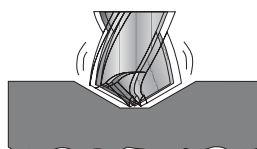


Starting hole** for carbide



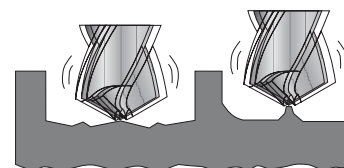
Tool Groups	Spot/Starting Hole Versus Follower Drill		
	Wider Δ +5° to +10°	Same Δ	Less Δ
HPS Carbide (A, B, M)	●	●	◐
Carbide Standard	●	◐	○*
Carbide Tipped	●	◐	○*
HSS, Cobalt t	◐	◐	●
	● Most Appropriate	◐ Occasionally Appropriate	○ Don't Use

* If you can not drill first and chamfer the hole afterwards, reducing RPM (up to 60%) and Feed/Rev. (up to 40%) while machining out the difference in point angles may help protect the carbide drill.



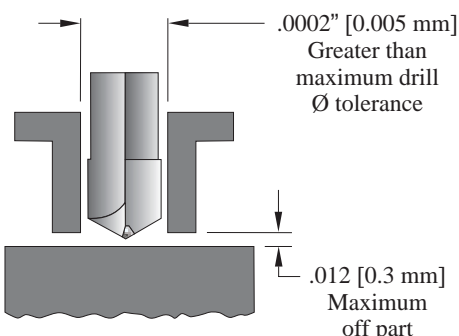
Avoid using a spot drill with a chisel flat. Use Styles 114, 113 and 115 for spotting.

** Accurate position & size control to within .002" (0.05 mm) oversized on the start hole can yield hole accuracy comparable to most bushing starts. DO NOT rotate long tools i.e. #172 & #175 outside starting hole at high RPM or whip-out will occur. Ease the long tool into the starting hole at 200 RPM and .025" (.635 mm) / Rev.

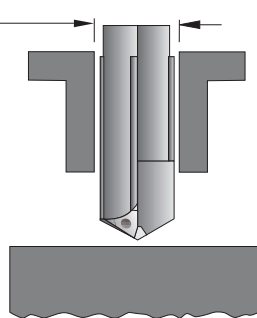


Avoid convex spots from indexable drills or non-center cut tools.

Bushing against



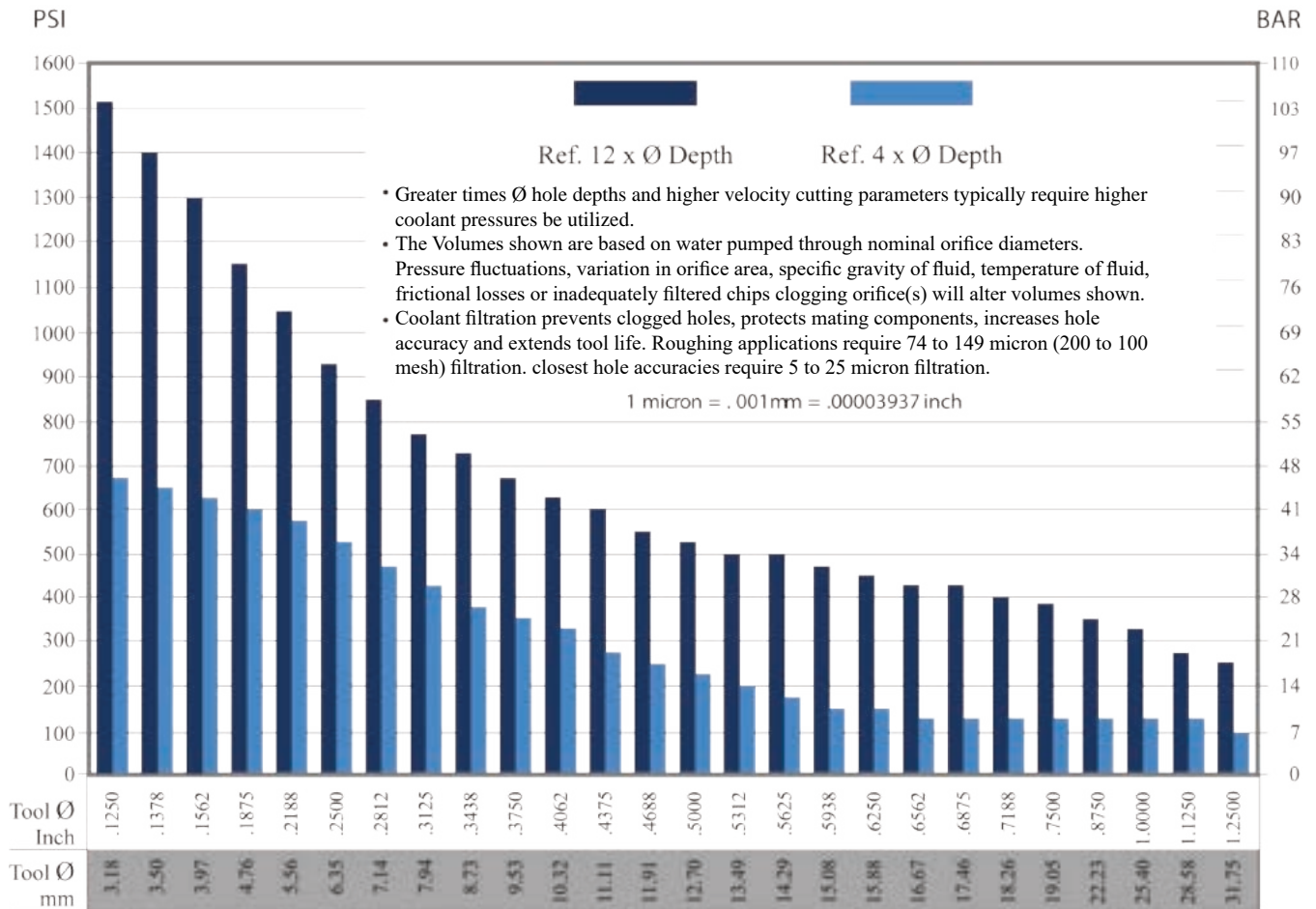
Bushing away



Tool Group Letter(s)	Bushing		
	Against	Away	
A, B, E, M, P, T	◐	○	● Most Appropriate
D, G, J, Q, R	●	◐	◐ Occasionally Appropriate
F, N	●	●	○ Don't Use

Special double margin drills can be made to optimize performance in bushing starts and angular entry/exit applications.

Correct coolant pressure helps ensure sufficient lubrication and cooling at the cutting zone.



Lack of proper holder seal decreases coolant velocity and chip evacuation.

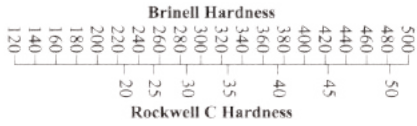


Use of a sealed collet or other coolant sealing system is necessary for optimal tool performance and chip evacuation.

1 US Gallon = 3.785 Liters = 8.337 lbs. Water
2.2046 lbs. = 1 Kg.

Drill Style	Cutting Diameter Range (inches)	Oil Hole Flow Capacities in GPM at listed pressures 50psi - 1500psi											
		50 psi	100 psi	200 psi	300 psi	400 psi	500 psi	600 psi	700 psi	800 psi	1000 psi	1200 psi	1500 psi
174 175	.125 - .158	0.19	0.27	0.38	0.47	0.54	0.61	0.67	0.72	0.77	0.86	0.94	1.05
	.172 - .219	0.30	0.43	0.61	0.75	0.86	0.96	1.06	1.14	1.22	1.36	1.49	1.67
	.234 - .250	0.61	0.86	1.22	1.49	1.72	1.92	2.10	2.27	2.43	2.72	2.98	3.33
292 293 294	.156 - .177	0.19	0.27	0.38	0.47	0.54	0.61	0.67	0.72	0.77	0.86	0.94	1.05
	.188 - .221	0.27	0.38	0.54	0.66	0.76	0.85	0.94	1.01	1.08	1.21	1.32	1.48
	.234 - .339	0.53	0.76	1.07	1.31	1.51	1.69	1.85	2.00	2.14	2.39	2.62	2.93
	.344 - .472	0.98	1.39	1.96	2.40	2.78	3.10	3.40	3.67	3.93	4.39	4.81	5.37
	.484 - .689	1.56	2.21	3.13	3.83	4.42	4.94	5.42	5.85	6.25	6.99	7.66	8.56
	.703 - .350	2.00	2.84	4.01	4.91	5.67	6.34	6.94	7.50	8.02	8.97	9.82	10.98
260	.250 - .266	0.58	0.82	1.17	1.43	1.65	1.84	2.02	2.18	2.33	2.61	2.85	3.19
	.281 - .297	0.74	1.05	1.48	1.81	2.10	2.34	2.57	2.77	2.96	3.31	3.63	4.06
	.313 - .328	0.92	1.30	1.84	2.25	2.60	2.90	3.18	3.43	3.67	4.11	4.50	5.03
	.344 - .375	1.15	1.62	2.30	2.81	3.25	3.63	3.98	4.30	4.60	5.14	5.63	6.29
	.391 - .500	1.48	2.10	2.97	3.63	4.20	4.69	5.14	5.55	5.93	6.63	7.27	8.13
	.563	1.63	2.31	3.26	4.00	4.62	5.16	5.65	6.11	6.53	7.30	8.00	8.94
	.625	2.08	2.94	4.16	5.10	5.89	6.58	7.21	7.79	8.33	9.31	10.20	11.40
170 171 172 176 290 295 296 297	.188 - .201	0.25	0.36	0.51	0.62	0.72	0.80	0.88	0.95	1.01	1.13	1.24	1.39
	.213 - .219	0.33	0.47	0.66	0.81	0.94	1.05	1.15	1.24	1.33	1.49	1.63	1.82
	.234 - .261	0.44	0.63	0.89	1.09	1.25	1.40	1.54	1.66	1.77	1.98	2.17	2.43
	.266 - .281	0.58	0.82	1.17	1.43	1.65	1.84	2.02	2.18	2.33	2.61	2.85	3.19
	.295 - .316	0.71	1.01	1.43	1.75	2.02	2.26	2.47	2.67	2.85	3.19	3.49	3.91
	.328 - .344	0.80	1.13	1.60	1.95	2.26	2.52	2.76	2.98	3.19	3.57	3.91	4.37
	.354 - .375	0.92	1.30	1.84	2.25	2.60	2.90	3.18	3.43	3.67	4.11	4.50	5.03
	.386 - .406	1.18	1.67	2.37	2.90	3.35	3.74	4.10	4.43	4.74	5.29	5.80	6.48
	.413 - .438	1.33	1.88	2.66	3.26	3.76	4.20	4.61	4.97	5.32	5.95	6.51	7.28
	.453 - .472	1.48	2.10	2.97	3.63	4.20	4.69	5.14	5.55	5.93	6.63	7.27	8.13
	.484 - .500	1.63	2.31	3.26	4.00	4.62	5.16	5.65	6.11	6.53	7.30	8.00	8.94
	.519 - .532	1.93	2.73	3.86	4.72	5.45	6.10	6.68	7.22	7.71	8.62	9.45	10.56
	.547 - .563	2.04	2.89	4.09	5.00	5.78	6.46	7.08	7.64	8.17	9.14	10.01	11.19
170 171 172 176	.571 - .594	2.20	3.11	4.40	5.39	6.22	6.95	7.62	8.23	8.80	9.83	10.77	12.04
	.610 - .625	2.36	3.33	4.72	5.78	6.67	7.46	8.17	8.82	9.43	10.54	11.55	12.91
	.630 - .656	2.52	3.56	5.04	6.17	7.13	7.97	8.73	9.43	10.08	11.27	12.34	13.80
170 171 172 176	At listed pressures 50psi - 700psi												
		50 psi	100 psi	200 psi	250 psi	300 psi	350 psi	400 psi	450 psi	500 psi	550 psi	600 psi	700 psi
	.669 - .689	2.85	4.03	5.69	6.36	6.97	7.53	8.05	8.54	9.00	9.44	9.86	10.65
	.703 - .750	3.21	4.54	6.42	7.18	7.87	8.50	9.08	9.63	10.15	10.65	11.12	12.01
	.767 - .813	3.49	4.93	6.98	7.80	8.54	9.23	9.87	10.46	11.03	11.57	12.08	13.05
	.827 - .875	3.94	5.57	7.88	8.81	9.65	10.42	11.14	11.82	12.46	13.07	13.65	14.74
	.886 - .938	4.30	6.08	8.60	9.61	10.53	11.37	12.16	12.89	13.59	14.26	14.89	16.08
	.945 - 1.000	4.80	6.78	9.59	10.73	11.75	12.69	13.57	14.39	15.17	15.91	16.62	17.95
	1.125	5.41	7.65	10.82	12.10	13.26	14.32	15.31	16.24	17.12	17.95	18.75	20.25
	1.25	6.00	8.49	12.00	13.42	14.70	15.88	16.97	18.00	18.97	19.90	20.79	22.45
290 295 296 297	.571 - .688	2.10	2.98	4.21	4.71	5.15	5.57	5.95	6.31	6.65	6.98	7.29	7.87
	.703 - .781	2.48	3.51	4.97	5.56	6.09	6.57	7.03	7.45	7.86	8.24	8.61	9.30
	.797 - .844	3.13	4.42	6.25	6.99	7.66	8.27	8.84	9.38	9.89	10.37	10.83	11.70
	.859 - .938	3.85	5.44	7.70	8.61	9.43	10.18	10.89	11.55	12.17	12.77	13.33	14.40
	.953 - 1.000	4.15	5.87	8.30	9.28	10.16	10.98	11.74	12.45	13.12	13.76	14.37	15.52
	1.125	4.45	6.29	8.89	9.94	10.89	11.76	12.58	13.34	14.06	14.75	15.40	16.64

Series Koolcarb, Kooltwist, Durapoint, Carbide-Tipped
2 FL | Carbide | Carbide-Tip | Drills



Material Group No.	Material / Workpiece	Chip Class	Tool Group							
			SOLID CARBIDE NON-COOLANT FED						CARBIDE TIP NON-COOLANT FED	
			High Penetration Spiral Flute 	High Penetration Spiral Flute 	Standard Helix	3 Flute High Helix	Str. Flute Heavy Duty	Bore Drill Straight Flute	Standard Helix	Str. Flute Heavy Duty
A	B	D	C	E	F	G	J			
1	Aluminum Alloys [<5% Si] 2011 6061 2014 7075 2024	()	(12) 250-450	○	(6-7) a 150-350	(8-9) 200-400	○	○	○	○
2	Aluminum [>5% Si] AZ61A 356 319 380 355 390	()	(12) 350-600	○	(6-7) 200-400	(8-9) 300-500	○	(6-7) 200-400	(6-7) 150-350	○
3	Copper - Zinc (Brass) 268-Yellow 464-Naval 380-Free Cut 836-Red	()	(9) 200-400	○	(5-6) a 150-300	(7-8) 175-350	(4-5) 150-300	(4-5) 150-300	(5-6) 150-300	(4-5) 150-300
4	Copper Alloys (Bronze) 510-Phos. Bronze 614-Alum. Bronze 905-Tin Bronze	()	(9) 200-400	○	(5-6) 150-250	(6-7) 200-300	(4-5) 150-250	(4-5) 150-300	(5-6) 150-300	(4-5) 150-200
5	Cast (Grey) Iron G3000 G4500 G4000 G5500	()	(9-10) 150-350	○	(5-7) 150-300	(6-8) 175-325	○	(5-6) 200-350	(5-7) 150-225	○
6	Ductile (Nodular) Iron Powder Metal D4018 80-55-06 60-40-18 100-70-03 65-45-12	()	(9) 150-300	(9) 150-300	(4-6) 150-250	(6-8) 150-250	○	(3-5) 150-250	(4-6) 125-275	○
7	Carbon Steels [<35C] 1018 5120 4118 1035 5134 4130 1117 8620 516-70 1215 9310 4620	()	(8) 150-250	(10-11) 200-350	○	○	○	○	○	○
8	Medium Carbon Steels [>35 to 50C] P20 1541 1045 4140 1050 4150 1141 4340 1144 6150	()	(6-8) 150-250	(6-8) 130-220	○	○	○	○	○	○
9	High Carbon and Tool Steels [>50C] A-2 M-2 D-2 O-1 H-13 S-7	()	(5-7) 80-140	(5-7) 65-120	○	○	(1-2) 60-125	○	○	(1-2) 60-125
10	Hardened Steels (48 to 65Rc)	()	(1-2) 40-80	○	○	○	(1) 25-60	○	○	(1) 25-60
11	Free Machining Stainless Steel 303 440F	()	(5-6) 100-200	○	(3-5) 80-180	(4-6) 80-180	(2-3) 80-180	○	(3-4) 80-160	○
12	Stainless Steel 15-5PH 316 410 17-4PH 440	()	(5-6) 90-150	(5-6) 90-150	(3-5) 60-140	(4-6) 60-140	(2-3) 60-140	○	○	○
13	High Nickel Stainless Steel Nitronic 50 304 321 13-8	()	(5-6) 30-70	(5-6) 30-70	○	○	○	○	○	○
14	Titanium 6AL4V Commercially Pure = Type B Tool	()	(5-6) 60-120	(5-7) 55-110	(3-5) 50-90	(3-5) 50-90	(2-3) 50-100	○	(2-3) 40-80	○
15	Moderate Temperature Alloys Inconel 718	()	(2-3) 50-100	○	○	○	(1-2) 50-100	○	○	○
16	High Temperature Alloys Rene Hastelloy L605	()	(2-3) 25-80	○	○	○	(1-2) 25-80	○	○	(1-2) 25-80
17	Hard Plastics, Resin Fiberglass, Graphite and Carbon	()	○	○	(3-5) 100-200	(4-6) 125-225	○	○	(3-5) 100-200	○

(Feed Curve) Notes

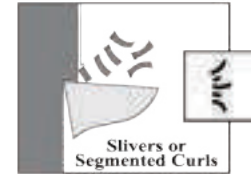


 Most Appropriate Occasionally Appropriate Do Not Use



Material Group No.	Chip Class	Tool Group					
		SOLID CARBIDE COOLANT FED		CARBIDE TIP COOLANT FED			OTHER COOLANT FED
		High Penetration Spiral Flute	Straight Flute	High Performance Spiral Flute	Spiral Flute Heavy Duty	Straight Flute	PM Cobalt
		M	N	P	Q	R	T
1	()	(11-12) 500-650	(6) 200-400	(8-9) a 250-425	(6-7) a 200-400	(6-7) 200-400	○
2	()	(11-12) 500-650	(6-7) 350-550	(8-9) 300-500	(6-7) 200-400	(6-7) 300-500	○
3	()	(9-11) 400-550	(4-5) 225-300	(5-7) 250-450	(5-7) 225-425	(4-5) 200-400	○
4	()	(9-11) 500-650	(4-5) 175-250	(5-7) 200-400	(5-7) 200-300	(4-5) 200-300	○
5	()	(9-10) 300-400	(4-6) 200-300	(6-8) 225-325	(6-8) 200-260	(5-7) 225-300	(7-9) 75-110
6	()	(9) 275-350	(4-6) 150-250	(6-7) a 225-275	(6-7) a 200-260	(4-6) 190-250	(7-9) 60-100
7	()	(8-10) 290-390	○	(5-7) a 180-250	○	○	(7-9) 100-130
8	()	(6-8) 150-250	(2-3) 110-150	(4-6) 150-200	(3-4) 100-150	(2-3) 100-150	(6-8) 60-100
9	()	(5-7) 120-225	(2-3) 80-135	(4-6) 135-185	(1-2) 70-100	(2-3) 100-150	(5-7) 50-90
10	()	(1-2) 50-100	○	(1-2) b 45-90	(1-2) b 60-90	○	○
11	()	(4-6) 130-200	(2-3) 120-180	(2-3) 120-170	(2-3) 100-160	(2-3) 70-125	(4-5) 60-90
12	()	(4-6) 100-150	(1-2) 80-120	(2-3) a 80-120	(2-3) a 60-100	○	(4-5) 50-85
13	()	(4-6) 90-150	○	(1-2) a 40-60	○	○	○
14	()	(4-6) 90-150	(1-2) 60-100	(2-3) 50-110	(2-3) 50-100	(1-2) 60-120	○
15	()	(2-3) 70-130	○	(2) 60-90	(2) 60-90	○	(2-3) 30-75
16	()	(2-3) 40-80	○	(1-2) 40-80	(1-2) b 40-80	○	(2) 25-60
17	()	○	(4-5) 150-225	○	○	(4-5) 125-200	○

Most Appropriate Occasionally Appropriate Do Not Use



SFM = Surface Feet per Minute

$$RPM = \frac{SFM \times 3.82}{Tool \text{ } \varnothing \text{ Decimal (Inch)}}$$

$$IPR = FM* \times Tool \varnothing$$

Use 4 place inch decimal diameter

$$IPM = \text{Inch per Minute Penetration}$$

$$IPM = RPM \times IPR$$

(Feed Curve)	FM*
(1)	0.004
(2)	0.006
(3)	0.008
(4)	0.010
(5)	0.012
(6)	0.014
(7)	0.016
(8)	0.018
(9)	0.020
(10)	0.024
(11)	0.028
(12)	0.035
(13)	0.045

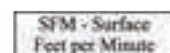
*FM is the proportionate Feed Multiplier

ie.: $\frac{.0040 \text{ IPR}}{.3346'' \varnothing} = \frac{.012 \text{ IPR}}{1.000'' \varnothing} = \frac{.012 \text{ FM}^*}{1.000'' \varnothing}$

Notes

- a. 1 to 2 x \varnothing deep holes only.
- b. Use more aggressive points.

(Feed Curve) Notes



Series Koolcarb, Kooltwist, Durapoint, Carbide-Tipped
2 FL | Carbide | Carbide-Tip | Drills

Feed Curve	1	2	3	4	5	6	7	8	9	10	11	12	13	
Feed Multiplier	0.004	0.006	0.008	0.010	0.012	0.014	0.016	0.018	0.020	0.024	0.028	0.035	0.045	
Surface Feet per Minute (SFM)	20	.31	.46	.61	.76	.92	1.07	1.22	1.38	1.53	1.83	2.14	2.67	3.44
	40	.61	.92	1.22	1.53	1.83	2.14	2.44	2.75	3.06	3.67	4.28	5.35	6.88
	60	.92	1.38	1.83	2.29	2.75	3.21	3.67	4.13	4.58	5.50	6.42	8.02	10.31
	80	1.22	1.83	2.44	3.06	3.67	4.28	4.89	5.50	6.11	7.33	8.56	10.70	13.75
	100	1.53	2.29	3.06	3.82	4.58	5.35	6.11	6.88	7.64	9.17	10.70	13.37	17.19
	125	1.91	2.87	3.82	4.78	5.73	6.69	7.64	8.60	9.55	11.46	13.37	16.71	21.49
	150	2.29	3.44	4.58	5.73	6.88	8.02	9.17	10.31	11.46	13.75	16.04	20.06	25.79
	175	2.67	4.01	5.35	6.69	8.02	9.36	10.70	12.03	13.37	16.04	18.72	23.40	30.08
	200	3.06	4.58	6.11	7.64	9.17	10.70	12.22	13.75	15.28	18.34	21.39	26.74	34.38
	225	3.44	5.16	6.88	8.60	10.31	12.03	13.75	15.47	17.19	20.63	24.07	30.08	38.68
	250	3.82	5.73	7.64	9.55	11.46	13.37	15.28	17.19	19.10	22.92	26.74	33.43	42.98
	275	4.20	6.30	8.40	10.51	12.61	14.71	16.81	18.91	21.01	25.21	29.41	36.77	47.27
	300	4.58	6.88	9.17	11.46	13.75	16.04	18.34	20.63	22.92	27.50	32.09	40.11	51.57
	350	5.35	8.02	10.70	13.37	16.04	18.72	21.39	24.07	26.74	32.09	37.44	46.80	60.17
	400	6.11	9.17	12.22	15.28	18.34	21.39	24.45	27.50	30.56	36.67	42.78	53.48	68.76
	450	6.88	10.31	13.75	17.19	20.63	24.07	27.50	30.94	34.38	41.26	48.13	60.17	77.36
500	7.64	11.46	15.28	19.10	22.92	26.74	30.56	34.38	38.20	45.84	53.48	66.85	85.95	
550	8.40	12.61	16.81	21.01	25.21	29.41	33.62	37.82	42.02	50.42	58.83	73.54	94.55	
600	9.17	13.75	18.34	22.92	27.50	32.09	36.67	41.26	45.84	55.01	64.18	80.22	103.14	

*(Surface Feet per Minute) SFM x .3048 = Surface Meters per Minute

INTRO

MILLING

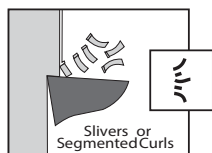
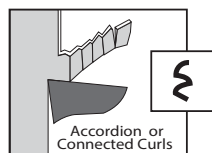
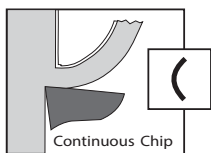
SPECIALTY

HOLEMAKING

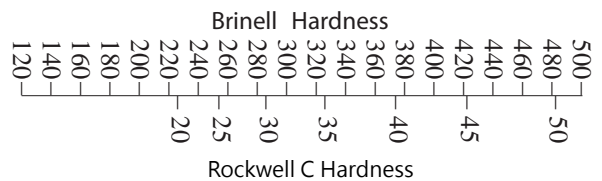
THREADING

INSERTS

	Chip Class	USA	Germany	United Kingdom	France	Japan
Group 1 Aluminum Alloys up to 5% Silicon	(	2011	AlCuBiPb	FC1	A-U5PbBi	A2011
		2014	AlCuSiMn	L102	A-U4SG	A2014
		2024	AlCuSiMg2	L109	A-U4G1	A2024
		6061	AlMgSiCu	L117	A-GSUC	A6061
		7075	AlMgSiCu1.5	2L88	A-Z5GU	A7075
Group 2 Aluminum Alloys over 5% Silicon and Magnesium	) ) )	AZ61A	MgAl6Zn	3373	G-A6Z1	H4202
		319.0				AC2B
		355.0		LM16	A-S4UG	H2117
		356.0	AlSi7Mg	2L99	A-S7G	H5202
		380.0	AlSi8Cu3	LM24	A-S9U3	H5302
		390.0				
Group 3 Copper - Zinc Alloys (Brass)	) ) )	268 (Yellow)	CuZn36	CZ107	UZ33	C2680
		360 (Free Cut)	CuZn36Pb3	CZ124	UZ36Pb3	C3601
		464 (Naval)	CuZn39Sn	CZ112		
		836 (Red)	CuSn5ZnPb		U-E5Pb5Z5	BCIn6
Group 4 Copper Alloys (Bronze)	) ) )	510 (Phosphur)		PB102	UE5P	C5101
		614 (Aluminum)	CuAl8Fe	c		
		905 (Tin)	CuSn10Zn			BC3C
Group 5 Cast (Grey) Iron	) ) )	G3000	GG20	1452 Gr. 220	Ft20D	FC20
		G4000	GG25	1452 Gr. 260	Ft25D	FC25
		G4500	GG30	1452 Gr. 300	Ft30D	FC30
		G5500	GG35	1452 Gr. 350	Ft35D	FC35
Group 6 Ductile (Nodular) Iron and Powder Metal A lloys	) ) )	D4018	GGG 40	420/12	FGS 370-17	FCD 40 FCD
		60-40-18	GGG 40	420/12	FGS 370-17	40
		65-45-12	GGG 50	500/7	FGS 400-12	FCD 50 FCD
		80-55-06	GGG 60	600/3	FGS 600-3	60
		100-70-03	GGG 70	700/2	FGS 700-2	FCD 70
Group 7 Low Carbon Steels up to . 35% Carbon	(	A-36 (Boiler Plate)	13Mn6	150M12	E35-4	S17C
		1018	C16.8	080A17	AF42	S18C
		1035	Ck35	060A35	AF55	S35C
		1117		210A15		SUM31
		1215	9 5Mn 36	240M07	S300	SUM23
		4118	20CrMo5	708H20	18CD4	SCM418H
		4130	30CrMo4	708A30	30CD4	SCM2
		4620		665A19	2ND8	
		5120	76Mn3	080A72	XC75	SCr420H
		5134				
		516-70	C16.8	080A17	AF42	
		8620	21NiCrMoS2	805A20	19NCDB2	SNM220H
9310	14NiCrMo134	832H13	16NCD13			



Chip Classifications



	Chip Class	USA	Germany	United Kingdom	France	Japan
Group 8 Medium Carbon Steels (.35 - .50% Carbon)		P20	40CrMnMo7	4659		
		1045	Ck45	080M46	XC45	S45C
		1050	QSt32-2	045A10	XC12	S50C
		1141		216A42	45MF4	SUM42
		1144	45S20	226M44	45MF6	SUM43
		1541	45SiMn5	150M40	40M6	SMn2
		4140	42CrMo4	708H42	42CD4	SCM4
		4150	50CrMo4		50SCD6	
		4340	40NiCrMo6	2S.119		SNCM8
	6150	50CrV4	735A50	50CV4	SUP10	
Group 9 High Carbon and Tool Steels		A-2	X100CrMoV5.1	BA2	Z100CDV5	SKD12
		D-2	X165CrVMo12.1	BD2	Z160CDV12	SKD11
		H-13	X40CrMoV5.1	BH13	Z40CDV5	SKD61
		M-1	S2-9-1	BM1	Z85DCWV08-04-02-01	
		M-2	S6-5-2Si	BM2	Z85WDCV06-05-04	
		M3-2	S6-5-3		Z120WDCV06-05-04-03	SKH51
		M-7	S2-9-2		Z100DCWV09-04-02-02	SKH58
		M35	X85WMoCo6.5.5		Z90WDCKCV06-05-05-04-02	SKH55
		O-1	100MnCrW4	BO1	90MWCV5	SKS21
		S-7	X79WCo18.5	BT4	Z80WKVC18-05-04	SKH3
		T15	X133WCo12.5	BT15	Z160WKVC12-05-05-04	SKH10
	52100	100CrMn6	970535A99	A35-552100C6		
Group 10 Hardened Steels (48-65 Rc)						
Group 11 Stainless Steel(Free Machining)		303	X12CrNiS18.8	303S21	Z10CNF18.09	SUS303
		440C	X105CrMo17		Z80CSN20.02	SUS440C
Group 12 Stainless Steel		Nitronic50				
		15-5PH		15Cr5Ni		
		17-4PH	X5CrNiCuNb17.4	17Cr4Ni	Z6CNU17.04	SCS24
		304	X6CrNi189	970S15	Z5CN18.09	SCS13
		316	X5CrNiMo1812	316S25	Z6CND17.11	SCS14
		321	X8CRNiTi18.10	S-520	Z6CNT18.12	SUSY321
		410	X15Cr13		Z12CN13M	SCS1
440A	X65CrMo14		Z70CD14	SUS440A		
Group 13 Titanium		6AL4V				
Group 14 Soft High Temperature Alloys		Inconel718				
Group 15 Hard High Temperature Alloys		Rene				
		Hastelloy				
		L605				
		A286	X5NiCrTi26.15	HR650	Z6NCTDV25.15B	SUH660
Group 16 Hard Plastics,Resin Fiberglass,Graphite & Carbon		PVC				
		SMC				
		Acrylic				

Series 4060

Carbide Step Drill for "Torx" Style Bone Screws

Work Material		M	S2
		316L, X2CrNiMo	Ti6Al4V, ASTM B348
m/min		25 - 35	20 - 30
Torx type	Diameter (mm)	mm/rev	mm/rev
T4	0.9	0.02 - 0.03	0.01 - 0.015
T5	1.0	0.02 - 0.03	0.01 - 0.015
T6	1.2	0.03 - 0.04	0.015 - 0.02
T7	1.4	0.03 - 0.04	0.015 - 0.02
T8	1.6	0.03 - 0.04	0.015 - 0.02
T10	1.9	0.05 - 0.06	0.02 - 0.03
T15	2.3	0.05 - 0.06	0.02 - 0.03
T20	2.7	0.06 - 0.07	0.03 - 0.04
T25	3.1	0.07 - 0.08	0.03 - 0.04
T30	3.8	0.07 - 0.08	0.03 - 0.04

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Series 4050

PAC Reamers | 1 FL | Inch & Metric | Solid

Work Material	P						M				K				N	
	Carbon Steel		Alloy Steel		Tool Steel		300 & 400 SS		PH SS		Gray		Ductile		> 10% Si	
SFM	220 - 350		210 - 315		205 - 295		130 - 200		120 - 190		300 - 455		170 - 300		330 - 385	
Drill Dia.	RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR
	mm	inch														
1/8	7334	0.0013	6723	0.0013	6418	0.0013	4890	0.0013	4584	0.0013	8404	0.0013	7182	0.0013	10085	0.0013
4	5822	0.0016	5337	0.0016	5094	0.0016	3881	0.0016	3639	0.0016	6671	0.0016	5700	0.0016	8005	0.0016
3/16	4890	0.0019	4482	0.0019	4278	0.0019	3260	0.0019	3056	0.0019	5603	0.0019	4788	0.0019	6723	0.0019
6	3881	0.0024	3558	0.0024	3396	0.0024	2587	0.0024	2426	0.0024	4447	0.0024	3800	0.0024	5337	0.0024
1/4	3667	0.0025	3362	0.0025	3209	0.0025	2445	0.0025	2292	0.0025	4202	0.0025	3591	0.0025	5042	0.0025
8	2911	0.0031	2668	0.0031	2547	0.0031	1941	0.0031	1819	0.0031	3335	0.0031	2850	0.0031	4002	0.0031
3/8	2445	0.0038	2241	0.0038	2139	0.0038	1630	0.0038	1528	0.0038	2801	0.0038	2394	0.0038	3362	0.0038
10	2329	0.0039	2135	0.0039	2038	0.0039	1552	0.0039	1455	0.0039	2668	0.0039	2280	0.0039	3202	0.0039
7/16	2096	0.0044	1921	0.0044	1834	0.0044	1397	0.0044	1310	0.0044	2401	0.0044	2052	0.0044	2881	0.0044
12	1941	0.0047	1779	0.0047	1698	0.0047	1294	0.0047	1213	0.0047	2224	0.0047	1900	0.0047	2668	0.0047
1/2	1834	0.0050	1681	0.0050	1604	0.0050	1222	0.0050	1146	0.0050	2101	0.0050	1795	0.0050	2521	0.0050
14	1663	0.0055	1525	0.0055	1455	0.0055	1109	0.0055	1040	0.0055	1906	0.0055	1629	0.0055	2287	0.0055
5/8	1467	0.0063	1345	0.0063	1284	0.0063	978	0.0063	917	0.0063	1681	0.0063	1436	0.0063	2017	0.0063

Series 4005

PAC Drill | 2 FL | 5xD | Solid | Inch & Metric

Work Material	P						M				K				N			
	Carbon Steel		Alloy Steel		Tool Steel		300 & 400 SS		PH SS		Gray		Ductile		6061, 7075		> 10% Si	
SFM	220 - 350		210 - 315		205 - 295		130 - 200		120 - 190		235-390		170 - 300		300 - 460		330 - 385	
Drill Dia. mm inch	RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR
	1	23287	0.0008	21346	0.0008	20376	0.0008	15524	0.0006	14554	0.0006	26683	0.0008	22802	0.0008	33960	0.0014	32019	0.0014
1/16	14669	0.0013	13446	0.0013	12835	0.0013	9779	0.0009	9168	0.0009	16808	0.0013	14363	0.0013	21392	0.0022	20170	0.0022
2	11643	0.0016	10673	0.0016	10188	0.0016	7762	0.0012	7277	0.0012	13341	0.0016	11401	0.0016	16980	0.0028	16010	0.0028
3/32	9779	0.0019	8964	0.0019	8557	0.0019	6519	0.0014	6112	0.0014	11205	0.0019	9575	0.0019	14261	0.0033	13446	0.0033
3	7762	0.0024	7115	0.0024	6792	0.0024	5175	0.0018	4851	0.0018	8894	0.0024	7601	0.0024	11320	0.0041	10673	0.0041
1/8	7334	0.0025	6723	0.0025	6418	0.0025	4890	0.0019	4584	0.0019	8404	0.0025	7182	0.0025	10696	0.0044	10085	0.0044
4	5822	0.0031	5337	0.0031	5094	0.0031	3881	0.0024	3639	0.0024	6671	0.0031	5700	0.0031	8490	0.0055	8005	0.0055
3/16	4890	0.0038	4482	0.0038	4278	0.0038	3260	0.0028	3056	0.0028	5603	0.0038	4788	0.0038	7131	0.0066	6723	0.0066
6	3881	0.0047	3558	0.0047	3396	0.0047	2587	0.0035	2426	0.0035	4447	0.0047	3800	0.0047	5660	0.0083	5337	0.0083
1/4	3667	0.0050	3362	0.0050	3209	0.0050	2445	0.0038	2292	0.0038	4202	0.0050	3591	0.0050	5348	0.0088	5042	0.0088
8	2911	0.0063	2668	0.0063	2547	0.0063	1941	0.0047	1819	0.0047	3335	0.0063	2850	0.0063	4245	0.0110	4002	0.0110
3/8	2445	0.0075	2241	0.0075	2139	0.0075	1630	0.0056	1528	0.0056	2801	0.0075	2394	0.0075	3565	0.0131	3362	0.0131
10	2329	0.0079	2135	0.0079	2038	0.0079	1552	0.0059	1455	0.0059	2668	0.0079	2280	0.0079	3396	0.0138	3202	0.0138
7/16	2096	0.0088	1921	0.0088	1834	0.0088	1397	0.0066	1310	0.0066	2401	0.0088	2052	0.0088	3056	0.0153	2881	0.0153
12	1941	0.0094	1779	0.0094	1698	0.0094	1294	0.0071	1213	0.0071	2224	0.0094	1900	0.0094	2830	0.0165	2668	0.0165
1/2	1834	0.0100	1681	0.0100	1604	0.0100	1222	0.0075	1146	0.0075	2101	0.0100	1795	0.0100	2674	0.0175	2521	0.0175
14	1663	0.0110	1525	0.0110	1455	0.0110	1109	0.0083	1040	0.0083	1906	0.0110	1629	0.0110	2426	0.0193	2287	0.0193
5/8	1467	0.0125	1345	0.0125	1284	0.0125	978	0.0094	917	0.0094	1681	0.0125	1436	0.0125	2139	0.0219	2017	0.0219
18	1294	0.0142	1186	0.0142	1132	0.0142	862	0.0106	809	0.0106	1482	0.0142	1267	0.0142	1887	0.0248	1779	0.0248

Series 4105

PAC Drill | 2 FL | 5xD | Coolant-Through | Inch & Metric

Work Material	P						M				K				N			
	Carbon Steel		Alloy Steel		Tool Steel		300 & 400 SS		PH SS		Gray		Ductile		6061, 7075		> 10% Si	
SFM	220 - 350		210 - 315		205 - 295		130 - 200		120 - 190		235-390		170 - 300		300 - 460		330 - 385	
Drill Dia.	RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR	RPM	IPR
	mm	inch																
1	26780	0.0008	24548	0.0008	23432	0.0008	17853	0.0006	16737	0.0006	30685	0.0008	26222	0.0008	39054	0.0014	36822	0.0014
1/16	16869	0.0013	15463	0.0013	14760	0.0013	11246	0.0009	10543	0.0009	19329	0.0013	16518	0.0013	24601	0.0022	23195	0.0022
2	13390	0.0016	12274	0.0016	11716	0.0016	8927	0.0012	8369	0.0012	15343	0.0016	13111	0.0016	19527	0.0028	18411	0.0028
3/32	11246	0.0019	10309	0.0019	9840	0.0019	7497	0.0014	7029	0.0014	12886	0.0019	11012	0.0019	16401	0.0033	15463	0.0033
3	8927	0.0024	8183	0.0024	7811	0.0024	5951	0.0018	5579	0.0018	10228	0.0024	8741	0.0024	13018	0.0041	12274	0.0041
1/8	8435	0.0025	7732	0.0025	7380	0.0025	5623	0.0019	5272	0.0019	9665	0.0025	8259	0.0025	12300	0.0044	11598	0.0044
4	6695	0.0031	6137	0.0031	5858	0.0031	4463	0.0024	4184	0.0024	7671	0.0031	6555	0.0031	9763	0.0055	9206	0.0055
3/16	5623	0.0038	5154	0.0038	4920	0.0038	3749	0.0028	3514	0.0028	6443	0.0038	5506	0.0038	8200	0.0066	7732	0.0066
6	4463	0.0047	4091	0.0047	3905	0.0047	2976	0.0035	2790	0.0035	5114	0.0047	4370	0.0047	6509	0.0083	6137	0.0083
1/4	4217	0.0050	3866	0.0050	3690	0.0050	2812	0.0038	2636	0.0038	4832	0.0050	4129	0.0050	6150	0.0088	5799	0.0088
8	3347	0.0063	3069	0.0063	2929	0.0063	2232	0.0047	2092	0.0047	3836	0.0063	3278	0.0063	4882	0.0110	4603	0.0110
3/8	2812	0.0075	2577	0.0075	2460	0.0075	1874	0.0056	1757	0.0056	3222	0.0075	2753	0.0075	4100	0.0131	3866	0.0131
10	2678	0.0079	2455	0.0079	2343	0.0079	1785	0.0059	1674	0.0059	3069	0.0079	2622	0.0079	3905	0.0138	3682	0.0138
7/16	2410	0.0088	2209	0.0088	2109	0.0088	1607	0.0066	1506	0.0066	2761	0.0088	2360	0.0088	3514	0.0153	3314	0.0153
12	2232	0.0094	2046	0.0094	1953	0.0094	1488	0.0071	1395	0.0071	2557	0.0094	2185	0.0094	3254	0.0165	3069	0.0165
1/2	2109	0.0100	1933	0.0100	1845	0.0100	1406	0.0075	1318	0.0075	2416	0.0100	2065	0.0100	3075	0.0175	2899	0.0175
14	1913	0.0110	1753	0.0110	1674	0.0110	1275	0.0083	1196	0.0083	2192	0.0110	1873	0.0110	2790	0.0193	2630	0.0193
5/8	1687	0.0125	1546	0.0125	1476	0.0125	1125	0.0094	1054	0.0094	1933	0.0125	1652	0.0125	2460	0.0219	2320	0.0219
18	1488	0.0142	1364	0.0142	1302	0.0142	992	0.0106	930	0.0106	1705	0.0142	1457	0.0142	2170	0.0248	2046	0.0248

Series 4001

Aperture | 4D | 2 FL | Solid

Material			Hardness	Inches Per Tooth (IPT)												
				Cutting Diameter												
				3/64	1/16	1/8	5/32	3/16	1/4	5/16	3/8	1/2	9/16	5/8	3/4	
P	Steel	Free Machining & Low Carbon: 10XX, 11XX, 12XX, A36	≤ 28 Rc	SFM	405	400	390	380	370	360	350	340	320	300	275	265
				IPR	.001-.002	.002-.003	.003-.005	.004-.006	.005-.007	.0055-.0080	.006-.009	.007-.010	.008-.011	.009-.014	.010-.014	.011-.015
	Steel	Medium/High Carbon Steels, Alloy Steels: 13XX, 41XX, 43XX, 86XX	28-38 Rc	SFM	350	340	330	320	310	300	290	280	270	265	260	260
				IPR	.001-.002	.002-.003	.003-.005	.004-.006	.005-.007	.0055-.0080	.006-.009	.007-.010	.008-.011	.009-.014	.010-.014	.011-.015
	Die Steels	A2, H13, L6, P20, S7	28-44 Rc	SFM	210	200	200	190	190	185	185	180	180	175	175	170
				IPR	.0004-.0008	.0008-.0012	.0014-.0030	.0024-.0040	.003-.005	.0035-.0060	.006-.009	.007-.010	.008-.011	.009-.014	.010-.014	.011-.015
M	Stainless Steels	Easy to Machine, 430F, 301, 303, 410, 416 Annealed, 420F, 430, 430F	≤ 28 Rc	SFM	360	355	350	340	330	320	310	300	275	250	225	200
				IPR	.001-.002	.002-.003	.003-.005	.004-.006	.005-.007	.0055-.0080	.006-.009	.007-.010	.008-.011	.009-.014	.010-.014	.011-.015
	Stainless Steels	Moderately Difficult to Machine, Nitronic 50, Nitronic 60, 301, 303 304, 304L Incoloy 27-7Mo, 316 316L, 321, 347	≤ 28 Rc	SFM	150	145	140	135	130	125	120	115	110	105	100	95
				IPR	.001-.002	.002-.003	.003-.005	.004-.006	.005-.007	.0055-.0080	.006-.009	.007-.010	.008-.011	.009-.014	.010-.014	.011-.015
	Stainless Steels	Difficult to Machine, 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321, PH13-8Mo, Nitronics	> 28 Rc	SFM	160	150	140	130	120	110	110	105	105	100	100	95
				IPR	.0004-.0012	.001-.002	.0020-.0033	.0024-.0035	.0030-.0043	.0031-.0050	.003-.006	.005-.009	.007-.009	.008-.010	.009-.011	.009-.013
S	Super Alloys	High Temp, Nimonics, Inconel, Monel, Hastelloy	≤ 42 Rc	SFM	100	90	85	80	75	70	65	60	55	50	45	40
				IPR	.0004-.0012	.001-.002	.0014-.0033	.0016-.0035	.002-.004	.0023-.0043	.003-.005	.004-.006	.005-.007	.005-.007	.006-.008	.006-.009	.009-.0140
S	Super Alloys	Titanium: Ti 3Al-2.5V, Ti 6Al-4V Ti 10V-2Fe-3Al	≤ 42 Rc	SFM	150	140	130	125	120	115	110	105	100	100	90	90
				IPR	.0004-.0012	.001-.002	.003-.004	.004-.006	.005-.007	.0055-.0080	.006-.009	.007-.010	.008-.011	.008-.010	.010-.014	.011-.015
K	Cast Iron	Gray: SAE J431, ASTM A48	160-200 HB	SFM	500	490	480	470	460	430	410	400	390	370	360	350
				IPR	.001-.002	.002-.003	.003-.005	.004-.006	.005-.007	.0055-.0080	.006-.009	.007-.010	.008-.011	.009-.014	.010-.014	.011-.015
	Cast Iron	Ductile & Malleable, ASTM A536, ASTM 897, ASTM A47, ASTM A220	200-250 HB	SFM	300	290	280	270	260	250	240	230	220	210	200	190
				IPR	.001-.002	.002-.003	.003-.005	.004-.006	.005-.007	.0055-.0080	.006-.009	.007-.010	.008-.011	.009-.014	.010-.014	.011-.015

Series 300, 400, 402

2 FL | Spot Drill | Spade Drill | Combination Drill

Material				(IPR) Cutting Tool Diameter						
				1/32	1/16	1/8	1/4	3/8	1/2	
P	Steel	Free Machining & Low Carbon: 10XX, 11XX, 12XX, A36	≤ 28 Rc	175						
	Steel	Medium/High Carbon Steels, Alloy Steels: 13XX, 41XX, 43XX, 86XX	28-38 Rc	165						
	Die Steels	A2, H13, L6, P20, S7	28-44 Rc	150						
M	Stainless Steels	Easy to Machine, 430F, 301, 303, 410, 416 Annealed, 420F, 430, 430F	≤ 28 Rc	125						
	Stainless Steels	Moderately Difficult to Machine, Nitronic 50, 301, 303, 304, 304L, 316, 316L, 321, 347	≤ 28 Rc	60	0.0005	0.0010	0.0015	0.0030	0.0040	0.0050
S	Super Alloys	High Temp, Nimonics, Inconel, Monel, Hastelloy	≤ 42 Rc	40						
	Super Alloys	Titanium: Ti 3Al-2.5V, Ti 6Al-4V Ti 10V-2Fe-3Al	≤ 42 Rc	80						
H	Hardened Steels	-	35-45 Rc	50						
K	Cast Iron	Gray: SAE J431, ASTM A48	160-200 HB	275						
	Cast Iron	Ductile & Malleable, ASTM A536, ASTM 897, ASTM A47, ASTM A220	200-250 HB	175						

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Series 450, 453, 460, 470

General Purpose Drills | 2 & 3 FL | Twist | Straight

Material		Hardness	SFM	(IPR) Cutting Tool Diameter								
				1/32	1/16	1/8	1/4	3/8	1/2	5/8	3/4	
P	Steel	Free Machining & Low Carbon: 10XX, 11XX, 12XX, A36	≤ 28 Rc	175								
	Steel	Medium/High Carbon Steels, Alloy Steels: 13XX, 41XX, 43XX, 86XX	28-38 Rc	165	0.0010	0.0020	0.0030	0.0060	0.0080	0.0100	0.0110	0.0120
	Die Steels	A2, H13, L6, P20, S7	28-44 Rc	150								
M	Stainless Steels	Easy to Machine, 430F, 301, 303, 410, 416 Annealed, 420F, 430, 430F	≤ 28 Rc	140	0.0010	0.0020	0.0030	0.0060	0.0080	0.0100	0.0110	0.0120
	Stainless Steels	Moderately Difficult to Machine, Nitronic 50, 301, 303, 304, 304L, 316, 316L, 321, 347	≤ 28 Rc	60	0.0003	0.0005	0.0020	0.0040	0.0050	0.0060	0.0080	0.0100
S	Super Alloys	High Temp, Nimonic, Inconel, Monel, Hastelloy	≤ 42 Rc	60	0.0003	0.0005	0.0020	0.0040	0.0050	0.0060	0.0080	0.0100
	Super Alloys	Titanium: Ti 3Al-2.5V, Ti 6Al-4V Ti 10V-2Fe-3Al	≤ 42 Rc	80								
H	Hardened Steels	4140H, P20, H13	35-45 Rc	50	0.0003	0.0010	0.0010	0.0010	0.0020	0.0020	0.0020	0.0030
K	Cast Iron	Gray: SAE J431, ASTM A48	160-200 HB	175								
	Cast Iron	Ductile & Malleable, ASTM A536, ASTM 897, ASTM A47, ASTM A220	200-250 HB	175	0.0010	0.0020	0.0030	0.0060	0.0080	0.0100	0.0110	0.0120
N	Non-Ferrous	Aluminum, Brass, Bronze, Copper, Plastics	-	300								
	Non-Ferrous	Kevlar/Graphite	-	375	0.0003	0.0005	0.0020	0.0040	0.0050	0.0060	0.0080	0.0100

Series 500, 550

Chucking Reamers | 4 - 6 FL | Straight | Helical

				Inches Per Revolution (IPR)					
				Cutting Diameter					
Material		Hardness	SFM	0.0280-0.0625"	0.0626-0.1250"	0.1251-0.2500"	0.2501-0.5000"	0.5001-0.7500"	
P	Steel	Free Machining & Low Carbon: 10XX, 11XX, 12XX, A36	≤ 28 Rc	200-300	0.0005 - 0.0030	0.0020 - 0.0060	0.0040 - 0.0100	0.0060 - 0.0150	0.0100 - 0.0300
	Steel	Medium/High Carbon, 1030, 4140, 5115	28-38 Rc	125-200	0.0005 - 0.0020	0.0020 - 0.0040	0.0040 - 0.0060	0.0060 - 0.0100	0.0100 - 0.0200
	Die Steels	A2, H13, L6, P20, S7	28-44 Rc	50-125	0.0002 - 0.0010	0.0010 - 0.0020	0.0020 - 0.0040	0.0040 - 0.0060	0.0060 - 0.0100
M	Stainless Steels	Easy to Machine, 430F, 301, 303, 410, 416 Annealed, 420F, 430, 430F	≤ 28 Rc	120-190	0.0005 - 0.0020	0.0020 - 0.0040	0.0040 - 0.0060	0.0060 - 0.0100	0.0100 - 0.0200
	Stainless Steels	Moderately Difficult to Machine, Nitronic 50, 301, 303, 304, 304L, 316, 316L, 321, 347	≤ 28 Rc	80-120	0.0005 - 0.0020	0.0020 - 0.0040	0.0040 - 0.0060	0.0060 - 0.0100	0.0100 - 0.0200
	Stainless Steels	Difficult to Machine, 302B, 304B, 309, 310, 316, 316Ti, PH13-8Mo	> 28 Rc	60-100	0.0002 - 0.0020	0.0010 - 0.0040	0.0020 - 0.0060	0.0040 - 0.0100	0.0060 - 0.0100
S	Super Alloys	Inconel	<40 Rc	40-70	0.0002 - 0.0010	0.0010 - 0.0020	0.0020 - 0.0040	0.0040 - 0.0060	0.0060 - 0.0100
	Super Alloys	High Temp, Nimonic, Inconel, Monel, Hastelloy	<40 Rc	30-45	0.0002 - 0.0010	0.0010 - 0.0020	0.0020 - 0.0040	0.0040 - 0.0060	0.0060 - 0.0200
	Super Alloys	Titanium: Ti 3Al-2.5V, Ti 6Al-4V Ti 10V-2Fe-3Al	<40 Rc	35-50	0.0002 - 0.0020	0.0010 - 0.0040	0.0020 - 0.0060	0.0040 - 0.0100	0.0060 - 0.0200
H	Hardened Steels	Die Steel, Alloy Steels 23-32 Rc	23-32 Rc	125-200	0.0002 - 0.0020	0.0010 - 0.0040	0.0020 - 0.0060	0.0040 - 0.0100	0.0060 - 0.0200
	Hardened Steels	Die Steel, Alloy Steels 32-43 Rc	32-43 Rc	50-125	0.0005 - 0.0020	0.0020 - 0.0040	0.0040 - 0.0060	0.0060 - 0.0100	0.0100 - 0.0200
	Hardened Steels	Die Steel, Alloy Steels 43-52 Rc	43-52 Rc	35-50	0.0002 - 0.0010	0.0010 - 0.0020	0.0020 - 0.0040	0.0040 - 0.0060	0.0060 - 0.0100
	Hardened Steels	Die Steels, Tool Steel	> 50 Rc	15-35	5 0.0005 - 0.0030	0.0020 - 0.0060	0.0040 - 0.0100	0.0060 - 0.0150	0.0100 - 0.0300
K	Cast Iron	Gray: SAE J431, ASTM A48	≤ 240 HB	150-250	0.0005 - 0.0020	0.0020 - 0.0040	0.0040 - 0.0060	0.0060 - 0.0100	0.0100 - 0.0200
	Cast Iron	Ductile & Malleable, ASTM A536, ASTM 897, ASTM A47, ASTM A220	> 240 HB	125-200	0.0005 - 0.0020	0.0020 - 0.0040	0.0040 - 0.0060	0.0060 - 0.0100	0.0100 - 0.0200
	Cast Iron	Martensitic (Hard)	> 240 HB	50-75	5 0.0002 - 0.0010	0.0010 - 0.0020	0.0020 - 0.0040	0.0040 - 0.0060	0.0060 - 0.0100
N	Non-Ferrous	Aluminum, Aluminum Alloys	> 240 HB	500-1000	0.0005 - 0.0020	0.0020 - 0.0060	0.0040 - 0.0100	0.0060 - 0.0150	0.0100 - 0.0300
	Non-Ferrous	Brass, Bronze (Free Machining)	> 240 HB	250-400	0.0005 - 0.0020	0.0020 - 0.0040	0.0040 - 0.0060	0.0060 - 0.0100	0.0100 - 0.0200
	Non-Ferrous	Brass, Bronze (Soft)	> 240 HB	150-250	0.0002 - 0.0010	0.0010 - 0.0020	0.0020 - 0.0040	0.0040 - 0.0060	0.0060 - 0.0100
	Non-Ferrous	Copper, Bronze (Hard)	> 240 HB	100-150	0.0002 - 0.0010	0.0010 - 0.0020	0.0020 - 0.0040	0.0040 - 0.0060	0.0060 - 0.0100
	Non-Ferrous	Magnesium, Magnesium Alloys, Plastics	> 240 HB	500-1000	0.0002 - 0.0010	0.0010 - 0.0020	0.0020 - 0.0040	0.0040 - 0.0060	0.0060 - 0.0100

INTRO
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Series 500, 550

Chuking Reamers | 4 - 6 FL | Straight | Helical

Hole Size Parameters			Drill Diameter								
			0.30135	0.0290/0.0280	0.0550/0.0520	0.1130	0.2380	0.3594	0.4844	0.6094	0.7344
			Reamer Diameter								
Material			TOTAL STOCK ALLOWANCE								
P	Steel	Free Machining & Low Carbon: 10XX, 11XX, 12XX, A36	0.0012	0.0025	0.0049	0.0089	0.0100	0.0120	0.0130	0.0150	0.0170
	Steel	Medium/High Carbon Steels, Alloy Steels: 13XX, 41XX, 43XX, 86XX	0.0013	0.0028	0.0055	0.0099	0.0110	0.0130	0.0140	0.0160	
	Die Steels	A2, H13, L6, P20, S7	0.0012	0.0025	0.0049	0.0089	0.0100	0.0120	0.0130	0.0150	
M	Stainless Steels	Easy to Machine, 430F, 301, 303, 410, 416 Annealed, 420F, 430, 430F	0.0012	0.0025	0.0049	0.0089	0.0100	0.0120	0.0130	0.0150	0.0160
S	Super Alloys	Soft	0.0012	0.0025	0.0049	0.0089	0.0100	0.0110	0.0130	0.0140	0.0160
	Super Alloys	Hard	0.0010	0.0023	0.0044	0.0081	0.0090	0.0100	0.0120	0.0130	0.0140
	Super Alloys	Titanium: Ti 3Al-2.5V, Ti 6Al-4V Ti 10V-2Fe-3Al	0.0013	0.0028	0.0055	0.0099	0.0110	0.0130	0.0140	0.0160	0.0170
H	Hardened Steels	-	0.0009	0.0020	0.0040	0.0072	0.0080	0.0100	0.0110	0.0130	0.0140
K	Cast Iron	Cast	0.0013	0.0028	0.0055	0.0099	0.0110	0.0130	0.0140	0.0160	0.0180
	Cast Iron	Ductile								0.0150	0.0170
N	Non-Ferrous	Magnesium	0.0014	0.0030	0.0060	0.0110	0.0120	0.0150	0.0160	0.0180	0.0200
	Non-Ferrous	Aluminum ≥ 5% Si						0.0130	0.0150	0.0160	0.0180
	Non-Ferrous	Aluminum ≤ 5% Si									
	Non-Ferrous	Brass									
	Non-Ferrous	Bronze, Copper										0.0140	0.0150	0.0170	0.0190

Series 331 - 336

Countersinks | 1 - 6 FL | 60 - 120°

Material		SFM
P	Carbon Steel - 10XX, 12XX	120-170
	Alloy Steel - 4140, 8620	80-150
	Tool Steel - A2, D2, H11, H13	50-80
	Alloys (300 - 400 Brinnell)	30-50
M	Stainless - 300, 400	80-125
	PH Stainless - 17-4, 15-5	50-75
S	HRSA - Inco718	23-35
	HRSA - Nimonics, Monel, Hastelloy	50-75
	Titanium - Ti 3Al-2.5V, Ti 6Al-4V Ti	60-90
H	Hardened Steel - (35 - 40 Rc)	40-60
	Hardened Steel - (40 - 45 Rc)	35-55
	Hardened Steel - (45 - 50 Rc)	25-40
	Hardened Steel - (50 - 55 Rc)	15-20
K	Gray - SAE J431, ASTM A48	125-225
	Ductile & Malleable - ASTM A536, ASTM 897, ASTM A47	100-175
	Hard Chilled	20-35
N	Aluminum / Aluminum Alloys	300-500
	Brass / Bronze	150-250
	Magnesium / Magnesium Alloys & Plastics	250-400

Series 601

Boring Bars | Radius | Lock-Down Flat

Material			SFM	Inches Per Tooth (IPT)
P	Steels	Carbon Steel	78-800	0.0005-0.0150
		High-Strength	75-600	0.0005-0.0150
		Heat Treated Alloys	75-250	0.0005-0.0150
		Powdered Metals	75-250	0.0005-0.0150
P	Die Steels	A2, H13, L6, P20, S7	75-500	0.0005-0.0150
M	Stainless Steels	3XX, 4XX, PH	75-500	0.0005-0.0150
S	Super Alloys	Ni Alloys, Ti Alloys	75-300	0.0003-0.0100
H	Hardened Steels	<55 Rc	60-150	0.0001-0.0050
K	Cast-Iron	-	100-850	0.0005-0.0250
N	Non-Ferrous	Aluminum, Brass, Bronze	200-2000	0.0005-0.0300
		Copper	130-400	0.0005-0.0300
		Zinc	150-350	0.0005-0.0300
		Acrylics, Fiberglass, Graphites, Nylons, Phenolics, Plastics	200-1000	0.0005-0.0300

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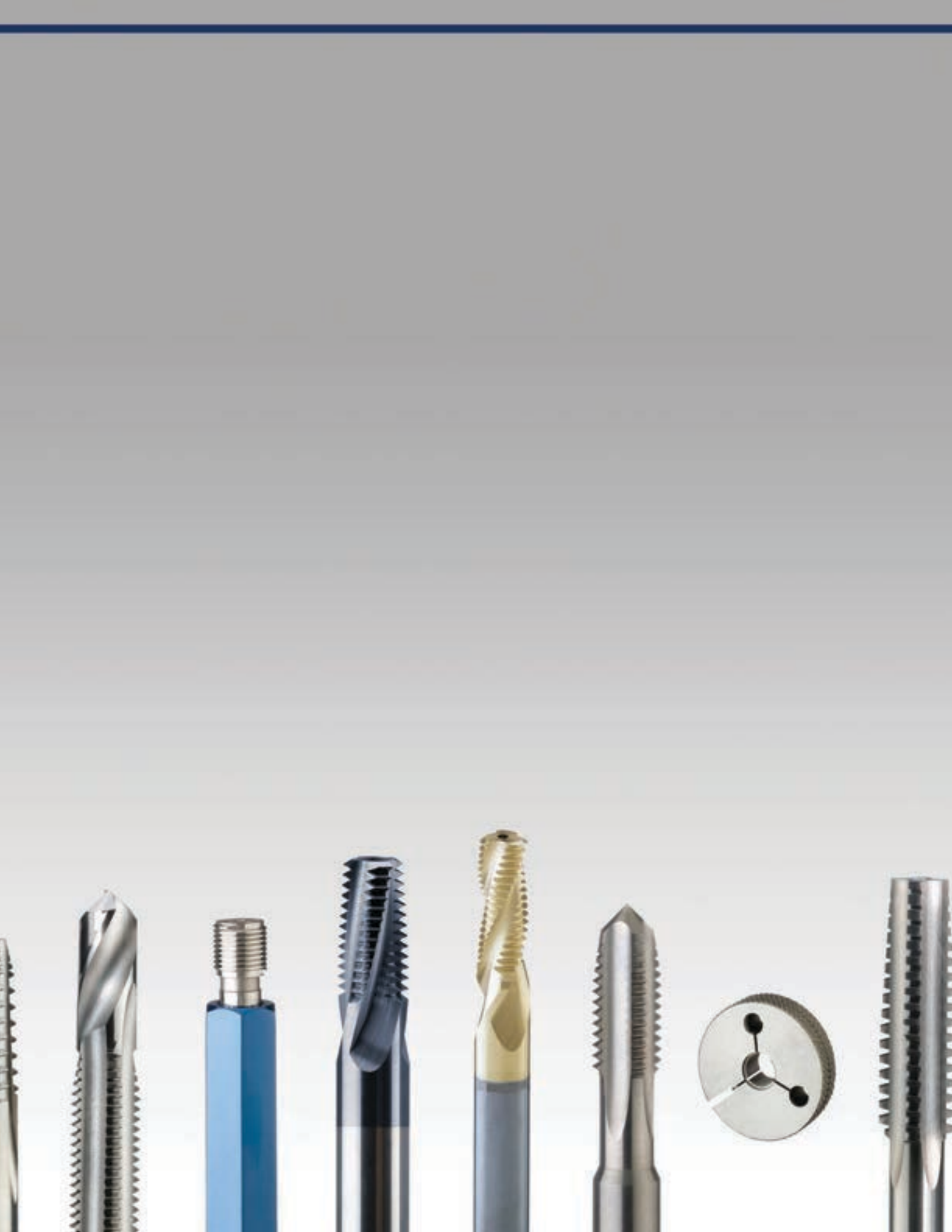
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T H R E A D I N G

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ADVANCED PERFORMANCE

Carbide Thread Mills For Ferrous And Non-Ferrous Materials



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FEATURES/DESCRIPTION	APPLICATION	FEATURES
Thread Mills <ul style="list-style-type: none"> Micrograin carbide substrate for wear resistance Suitable for wide range of materials up to 2xD Helical flute for smooth chatter-free cutting 	 	

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	●	○	○	●	●	○	○	○	○	○	○

● Best ○ Good

Series 180 **TM | Helical | 2xD**

Thread Size	Cutter Dia.(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Flutes	Bright	TiAlN
6-32 NC	0.100	0.297	2.0	3/16	3	14300	14300-TIALN
8-32 NC	0.120	0.328	2.0	3/16	3	14301	14301-TIALN
10-24 NC	0.140	0.396	2.5	3/16	3	14302	14302-TIALN
10-32 NF	0.140	0.391	2.5	3/16	3	14303	14303-TIALN
1/4-20 NC	0.180	0.525	2.5	3/16	3	14304	14304-TIALN
1/4-28 NF	0.180	0.518	2.5	3/16	3	14305	14305-TIALN
5/16-18 NC	0.235	0.639	2.5	1/4	3	14306	14306-TIALN
5/16-24 NF	0.235	0.646	2.5	1/4	3	14307	14307-TIALN
3/8-16 NC	0.300	0.781	3.0	5/16	4	14308	14308-TIALN
3/8-24 NF	0.300	0.771	3.0	5/16	4	14309	14309-TIALN
7/16-14 NC	0.345	0.893	3.5	3/8	4	14310	14310-TIALN
7/16-20 NF	0.345	0.875	3.5	3/8	4	14311	14311-TIALN
1/2-13 NC	0.370	1.038	3.5	3/8	4	14312	14312-TIALN
1/2-20 NF	0.370	1.025	3.5	3/8	4	14313	14313-TIALN
9/16-12 NC	0.450	1.125	3.5	1/2	4	14314	14314-TIALN
9/16-18 NF	0.450	1.139	3.5	1/2	4	14315	14315-TIALN
5/8-11 NC	0.490	1.318	3.5	1/2	4	14316	14316-TIALN
5/8-16 NS	0.490	1.281	3.5	1/2	4	14317	14317-TIALN
5/8-18 NF	0.490	1.250	3.5	1/2	4	14318	14318-TIALN
3/4-10 NC	0.585	1.550	4.0	5/8	4	14319	14319-TIALN
3/4-16 NF	0.585	1.531	4.0	5/8	4	14320	14320-TIALN
7/8-9 NC	0.620	1.833	4.0	5/8	4	14321	14321-TIALN
7/8-14 NF	0.620	1.750	4.0	5/8	4	14322	14322-TIALN
1-8 NC	0.740	2.063	5.0	3/4	4	14323	14323-TIALN
1-12 NF	0.740	2.042	5.0	3/4	4	14324	14324-TIALN

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Carbide Thread Mills For Ferrous And Non-Ferrous Materials



INTRO

MILLING

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THREADING

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FEATURES/DESCRIPTION	APPLICATION	FEATURES
Thread Mills <ul style="list-style-type: none"> Micrograin carbide substrate for wear resistance Suitable for wide range of materials up to 2xD Coolant-through improves tool life and performance 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	○	○	●	●	●	○	○	○	○	○	○

● Best ○ Good

Series 181 TMO | Helical | 2xD | Coolant-Through

Thread Size	Cutter Dia.(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Flutes	Bright	TiAlN
10-24 NC	0.140	0.396	2.5	3/16	3	14350	14350-TIALN
10-32 NF	0.140	0.391	2.5	3/16	3	14351	14351-TIALN
1/4-20 NC	0.180	0.525	2.5	3/16	3	14352	14352-TIALN
1/4-28 NF	0.180	0.518	2.5	3/16	3	14353	14353-TIALN
5/16-18 NC	0.235	0.639	2.5	1/4	3	14354	14354-TIALN
5/16-24 NF	0.235	0.646	2.5	1/4	3	14355	14355-TIALN
3/8-16 NC	0.300	0.781	3.0	5/16	4	14356	14356-TIALN
3/8-24 NF	0.300	0.771	3.0	5/16	4	14357	14357-TIALN
7/16-14 NC	0.345	0.893	3.5	3/8	4	14358	14358-TIALN
7/16-20 NF	0.345	0.875	3.5	3/8	4	14359	14359-TIALN
1/2-13 NC	0.370	1.038	3.5	3/8	4	14360	14360-TIALN
9/16-18 NF	0.450	1.139	3.5	1/2	4	14361	14361-TIALN
5/8-11 NC	0.490	1.318	3.5	1/2	4	14362	14362-TIALN
3/4-10 NC	0.585	1.550	4.0	5/8	4	14363	14363-TIALN
3/4-16 NF	0.585	1.531	4.0	5/8	4	14364	14364-TIALN

*bold numbers are EDPs for ordering

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- Custom thread forms
- Tailored dimensions and chamfers
- Variety of enhanced PVD tool coatings

CUSTOM COMES STANDARD

ADVANCED PERFORMANCE

Carbide Thread Mills For Ferrous And Non-Ferrous Materials



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Thread Mills</p> <ul style="list-style-type: none"> Micrograin carbide substrate for wear resistance Suitable for wide range of materials up to 2xD Helical flute for smooth chatter-free cutting 	 	

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	○	○	○	●	●	○	○	○	○	○	○

● Best ○ Good

Series 180M **TM-M | Helical | 2xD | Metric**

Thread Size	Cutter Dia.(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Flutes	Bright	TiAlN
M4X0.7	0.115	0.317	2.0	3/16	3	14375	14375-TIALN
M5X0.8	0.145	0.394	2.5	3/16	3	14376	14376-TIALN
M6X0.75	0.170	0.487	2.5	3/16	3	14377	14377-TIALN
M6X1	0.170	0.492	2.5	3/16	3	14378	14378-TIALN
M8X1	0.235	0.650	2.5	1/4	3	14379	14379-TIALN
M8X1.25	0.235	0.664	2.5	1/4	3	14380	14380-TIALN
M10X1	0.300	0.807	3.0	5/16	4	14381	14381-TIALN
M10X1.5	0.300	0.797	3.0	5/16	4	14382	14382-TIALN
M12X1	0.370	0.965	3.5	3/8	4	14383	14383-TIALN
M12X1.5	0.370	0.974	3.5	3/8	4	14384	14384-TIALN
M12X1.75	0.370	0.999	3.5	3/8	4	14385	14385-TIALN
M14X1.5	0.420	1.152	3.5	1/2	4	14386	14386-TIALN
M14X2	0.420	1.142	3.5	1/2	4	14387	14387-TIALN
M16X1.5	0.490	1.270	3.5	1/2	4	14388	14388-TIALN
M16X2	0.490	1.299	3.5	1/2	4	14389	14389-TIALN

*bold numbers are EDPs for ordering

INTRO

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ADVANCED PERFORMANCE

Carbide Thread Mills For Ferrous And Non-Ferrous Materials



FEATURES/DESCRIPTION		APPLICATION	FEATURES																																								
Thread Mills <ul style="list-style-type: none"> Micrograin carbide substrate for wear resistance Suitable for wide range of materials up to 2xD Coolant-through improves tool life and performance 		 	 																																								
<table border="1"> <thead> <tr> <th colspan="3">STEEL</th> <th colspan="2">STAINLESS</th> <th colspan="2">CAST IRON</th> <th colspan="2">NON-FERROUS</th> <th colspan="2">HRSA</th> <th colspan="2">HARDENED STEEL</th> </tr> <tr> <th>P1</th> <th>P2</th> <th>P3</th> <th>M1</th> <th>M2</th> <th>K1</th> <th>K2</th> <th>N1</th> <th>N2</th> <th>S1</th> <th>S2</th> <th>H1</th> <th>H2</th> </tr> </thead> <tbody> <tr> <td>●</td> <td>●</td> <td>○</td> <td>○</td> <td>●</td> <td>●</td> <td>●</td> <td>○</td> <td>○</td> <td>○</td> <td>○</td> <td>○</td> <td>○</td> </tr> </tbody> </table> <p style="text-align: right;">● Best ○ Good</p>					STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL		P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2	●	●	○	○	●	●	●	○	○	○	○	○	○
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL																																
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																															
●	●	○	○	●	●	●	○	○	○	○	○	○																															

Series 181M | TMO-M | Helical | 2xD | Coolant-Through | Metric

Thread Size	Cutter Dia. (D ₁)	LOC (L ₁)	OAL (L)	Shank (D)	Flutes	Bright	TiAlN
M5X0.8	0.145	0.394	2.5	3/16	3	14400	14400-TIALN
M6X0.75	0.170	0.487	2.5	3/16	3	14401	14401-TIALN
M6X1	0.170	0.492	2.5	3/16	3	14402	14402-TIALN
M8X1	0.235	0.650	2.5	1/4	3	14403	14403-TIALN
M8X1.25	0.235	0.664	2.5	1/4	3	14404	14404-TIALN
M10X1	0.300	0.807	3.0	5/16	4	14405	14405-TIALN
M10X1.5	0.300	0.797	3.0	5/16	4	14406	14406-TIALN
M12X1	0.370	0.965	3.5	3/8	4	14407	14407-TIALN
M12X1.5	0.370	0.974	3.5	3/8	4	14408	14408-TIALN
M12X1.75	0.370	0.999	3.5	3/8	4	14409	14409-TIALN
M14X1.5	0.420	1.152	3.5	1/2	4	14410	14410-TIALN
M14X2	0.420	1.142	3.5	1/2	4	14411	14411-TIALN
M16X1.5	0.490	1.270	3.5	1/2	4	14412	14412-TIALN
M16X2	0.490	1.299	3.5	1/2	4	14413	14413-TIALN

*bold numbers are EDPs for ordering

Popular Custom Threading Options

- Special Pitch Diameter limits
- Custom thread forms
- Tailored dimensions and chamfers
- Variety of enhanced PVD tool coatings

CUSTOM
COMES
STANDARD

ADVANCED PERFORMANCE

Carbide Thread Mills For Ferrous And Non-Ferrous Materials



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Thread Mills - Pipe</p> <ul style="list-style-type: none"> Micrograin carbide substrate for wear resistance Suitable for wide range of materials For NPT and NPTF threads Helical flute for smooth chatter-free cutting 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
●	●	○	○	○	●	●	○	○	○	○	○	○

● Best ○ Good

Series 182 | TM-PT | Helical | NPT/NPTF

Thread Size	Standard	Cutter Dia.(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Flutes	Bright	TiAlN
1/16-27	NPT	0.245	0.481	2.5	1/4	3	14500	14500-TIALN
1/8-27	NPT	0.300	0.592	3.0	5/16	4	14501	14501-TIALN
1/4-18	NPT	0.360	0.611	3.5	3/8	4	14502	14502-TIALN
3/8-18	NPT	0.427	0.722	3.5	1/2	4	14503	14503-TIALN
1/2-14	NPT	0.490	1.000	3.5	1/2	4	14504	14504-TIALN
1-11-1/2	NPT	0.620	1.130	4.0	5/8	4	14505	14505-TIALN
2 1/2-8	NPT	0.740	1.500	5.0	3/4	4	14506	14506-TIALN
1/16-27	NPTF	0.245	0.481	2.5	1/4	3	14510	14510-TIALN
1/8-27	NPTF	0.300	0.592	3.0	5/16	4	14511	14511-TIALN
1/4-18	NPTF	0.360	0.611	3.5	3/8	4	14512	14512-TIALN
1/2-14	NPTF	0.490	1.000	3.5	1/2	4	14513	14513-TIALN
1-11-1/2	NPTF	0.620	1.130	4.0	5/8	4	14514	14514-TIALN
2 1/2-8	NPTF	0.740	1.500	5.0	3/4	4	14515	14515-TIALN

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

ADVANCED PERFORMANCE

Carbide Thread Mills For Difficult-To-Machine Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES																																							
<p>Thread Mills - Pipe</p> <ul style="list-style-type: none"> • Micrograin carbide substrate for wear resistance • Ideal for exotic materials like stainless steel and HRSA • For NPT and NPTF threads • Helical flute for smooth chatter-free cutting 																																									
<table border="1"> <thead> <tr> <th colspan="3">STEEL</th> <th colspan="2">STAINLESS</th> <th colspan="2">CAST IRON</th> <th colspan="2">NON-FERROUS</th> <th colspan="2">HRSA</th> <th colspan="2">HARDENED STEEL</th> </tr> <tr> <th>P1</th> <th>P2</th> <th>P3</th> <th>M1</th> <th>M2</th> <th>K1</th> <th>K2</th> <th>N1</th> <th>N2</th> <th>S1</th> <th>S2</th> <th>H1</th> <th>H2</th> </tr> </thead> <tbody> <tr> <td>○</td> <td>○</td> <td>○</td> <td>●</td> <td>●</td> <td>○</td> <td>○</td> <td>○</td> <td>○</td> <td>●</td> <td>●</td> <td>○</td> <td>○</td> </tr> </tbody> </table> <p>● Best ○ Good</p>			STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL		P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2	○	○	○	●	●	○	○	○	○	●	●	○	○
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL																														
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																													
○	○	○	●	●	○	○	○	○	●	●	○	○																													

Series 184 | TM-PT-X | Helical | NPT/NPTF | Exotics

Thread Size	Standard	Cutter Dia. (D ₁)	LOC (L ₁)	OAL (L)	Shank (D)	Flutes	EDP
1/16-27	NPT	0.245	0.481	2.5	1/4	3	14520-ALCRN
1/8-27	NPT	0.300	0.592	3.0	5/16	4	14521-ALCRN
1/4-18	NPT	0.360	0.611	3.5	3/8	4	14522-ALCRN
3/8-18	NPT	0.427	0.722	3.5	1/2	4	14523-ALCRN
1/2-14	NPT	0.490	1.000	3.5	1/2	4	14524-ALCRN
1-11-1/2	NPT	0.620	1.130	4.0	5/8	4	14525-ALCRN
2-1/2-8	NPT	0.740	1.500	5.0	3/4	4	14526-ALCRN
1/16-27	NPTF	0.245	0.481	2.5	1/4	4	14530-ALCRN
1/8-27	NPTF	0.300	0.592	3.0	5/16	4	14531-ALCRN
1/4-18	NPTF	0.360	0.611	3.5	3/8	4	14532-ALCRN
1/2-14	NPTF	0.490	1.000	3.5	1/2	4	14533-ALCRN
1-11-1/2	NPTF	0.620	1.130	4.0	5/8	4	14534-ALCRN
2-1/2-8	NPTF	0.740	1.500	5.0	3/4	4	14535-ALCRN

*bold numbers are EDPs for ordering

Popular Custom Threading Options

- Special Pitch Diameter limits
- Custom thread forms
- Tailored dimensions and chamfers
- Variety of enhanced PVD tool coatings

**CUSTOM
COMES
STANDARD**

ADVANCED PERFORMANCE

Carbide Thread Mills For Aluminum Alloys



FEATURES/DESCRIPTION	APPLICATION	FEATURES																																							
<p>Thread Mills - Pipe</p> <ul style="list-style-type: none"> Micrograin carbide substrate for wear resistance NF1 coating for Aluminum Alloys Helical flute for smooth chatter-free cutting 																																									
<table border="1"> <thead> <tr> <th colspan="3">STEEL</th> <th colspan="2">STAINLESS</th> <th colspan="2">CAST IRON</th> <th colspan="2">NON-FERROUS</th> <th colspan="2">HRSA</th> <th colspan="2">HARDENED STEEL</th> </tr> <tr> <th>P1</th> <th>P2</th> <th>P3</th> <th>M1</th> <th>M2</th> <th>K1</th> <th>K2</th> <th>N1</th> <th>N2</th> <th>S1</th> <th>S2</th> <th>H1</th> <th>H2</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>●</td> <td>●</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>			STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL		P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2								●	●				
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL																														
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																													
							●	●																																	

● Best ○ Good

Series 185 | TM-PT-AL | Helical | NPT/NPTF | Aluminum

Thread Size	Standard	Cutter Dia.(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	Flutes	EDP
1/16-27	NPT	0.245	0.481	2.5	1/4	3	14520-ZRN
1/8-27	NPT	0.300	0.592	3.0	5/16	4	14521-ZRN
1/4-18	NPT	0.360	0.611	3.5	3/8	4	14522-ZRN
3/8-18	NPT	0.427	0.722	3.5	1/2	4	14523-ZRN
1/2-14	NPT	0.490	1.000	3.5	1/2	4	14524-ZRN
1-11-1/2	NPT	0.620	1.130	4.0	5/8	4	14525-ZRN
2 1/2-8	NPT	0.740	1.500	5.0	3/4	4	14526-ZRN
1/16-27	NPTF	0.245	0.481	2.5	1/4	4	14530-ZRN
1/8-27	NPTF	0.300	0.592	3.0	5/16	4	14531-ZRN
1/4-18	NPTF	0.360	0.611	3.5	3/8	4	14532-ZRN
1/2-14	NPTF	0.490	1.000	3.5	1/2	4	14533-ZRN
1-11-1/2	NPTF	0.620	1.130	4.0	5/8	4	14534-ZRN
2 1/2-8	NPTF	0.740	1.500	5.0	3/4	4	14535-ZRN

*bold numbers are EDPs for ordering

INTRO

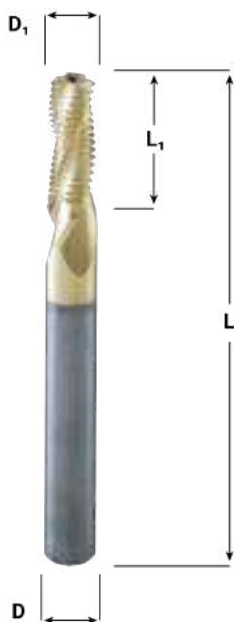
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES																																							
Thread Mills - Aluminum <ul style="list-style-type: none"> Micrograin carbide substrate for wear resistance NF1 coating for Aluminum Alloys Coolant-through improves tool life and performance Helical flute for smooth chatter-free cutting 																																									
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STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL																														
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																													
							●	●																																	

Series 186 | TM-O-AL | Helical | 2xD | Coolant-Through | AL

Thread Size	Cutter Dia.(D ₁)	LOC(L ₁)	OAL(L)	Shank(D)	EDP
10-24 NC	0.140	0.396	2.5	3/16	14425-ZRN
10-32 NF	0.140	0.391	2.5	3/16	14426-ZRN
1/4-20 NC	0.180	0.525	2.5	3/16	14427-ZRN
1/4-28 NF	0.180	0.518	2.5	3/16	14428-ZRN
5/16-18 NC	0.235	0.639	2.5	1/4	14429-ZRN
5/16-24 NF	0.235	0.646	2.5	1/4	14430-ZRN
3/8-16 NC	0.300	0.781	3.0	5/16	14431-ZRN
3/8-24 NF	0.300	0.771	3.0	5/16	14432-ZRN
7/16-14 NC	0.345	0.893	3.5	3/8	14433-ZRN
7/16-20 NF	0.345	0.875	3.5	3/8	14434-ZRN
1/2-13 NC	0.370	1.038	3.5	3/8	14435-ZRN
9/16-18 NF	0.450	1.139	3.5	1/2	14436-ZRN
5/8-11 NC	0.490	1.318	3.5	1/2	14437-ZRN
3/4-10 NC	0.585	1.550	4.0	5/8	14438-ZRN
3/4-16 NF	0.585	1.531	4.0	5/8	14439-ZRN

*bold numbers are EDPs for ordering

Popular Custom Threading Options

<ul style="list-style-type: none"> Special Pitch Diameter limits Custom thread forms Tailored dimensions and chamfers Variety of enhanced PVD tool coatings 	<p>CUSTOM COMES STANDARD</p>
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ADVANCED PERFORMANCE

Carbide Thread Mills For Aluminum Alloys



FEATURES/DESCRIPTION	APPLICATION	FEATURES
Thread Mills - Aluminum <ul style="list-style-type: none"> • Micrograin carbide substrate for wear resistance • NF1 coating for Aluminum Alloys • Coolant-through improves tool life and performance • Helical flute for smooth chatter-free cutting 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HBSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
							●	●				

● Best ○ Good

Series 186M | TM-O-AL | Helical | 2xD | Coolant-Through | AL | Metric

Thread Size	Cutter Dia. (D ₁)	LOC (L ₁)	OAL (L)	Shank (D)	EDP
M5X0.8	0.145	0.394	2.5	3/16	14440-ZRN
M6X0.75	0.170	0.487	2.5	3/16	14441-ZRN
M6X1	0.170	0.492	2.5	3/16	14442-ZRN
M8X1	0.235	0.650	2.5	1/4	14443-ZRN
M8X1.25	0.235	0.664	2.5	1/4	14444-ZRN
M10X1	0.300	0.807	3.0	5/16	14445-ZRN
M10X1.5	0.300	0.797	3.0	5/16	14446-ZRN
M12X1	0.370	0.965	3.5	3/8	14447-ZRN
M12X1.5	0.370	0.974	3.5	3/8	14448-ZRN
M12X1.75	0.370	0.999	3.5	3/8	14449-ZRN
M14X1.5	0.420	1.152	3.5	1/2	14450-ZRN
M14X2	0.420	1.142	3.5	1/2	14451-ZRN
M16X1.5	0.490	1.270	3.5	1/2	14452-ZRN
M16X2	0.490	1.299	3.5	1/2	14453-ZRN

*bold numbers are EDPs for ordering

INTRO

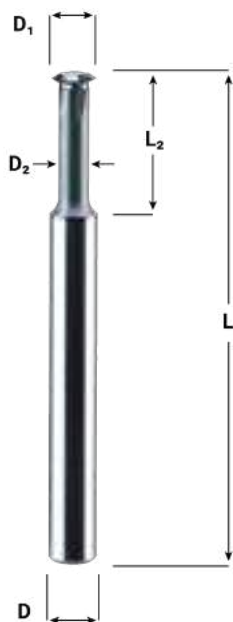
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES																																							
<p>Thread Mills - Single Point</p> <ul style="list-style-type: none"> Micrograin carbide substrate for wear resistance Single point design to create any desired TPI needed Greater versatility to create multiple thread profiles with one tool Perfect Save-the-Day tool TPI Range: Indicates thread pitch range the thread mill can achieve 																																									
<table border="1"> <thead> <tr> <th colspan="3">STEEL</th> <th colspan="2">STAINLESS</th> <th colspan="2">CAST IRON</th> <th colspan="2">NON-FERROUS</th> <th colspan="2">HRSA</th> <th colspan="2">HARDENED STEEL</th> </tr> <tr> <th>P1</th> <th>P2</th> <th>P3</th> <th>M1</th> <th>M2</th> <th>K1</th> <th>K2</th> <th>N1</th> <th>N2</th> <th>S1</th> <th>S2</th> <th>H1</th> <th>H2</th> </tr> </thead> <tbody> <tr> <td>●</td> <td>●</td> <td>○</td> <td>○</td> <td>○</td> <td>●</td> <td>●</td> <td></td> <td></td> <td></td> <td></td> <td>○</td> <td></td> </tr> </tbody> </table> <p style="text-align: right;">● Best ○ Good</p>			STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL		P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2	●	●	○	○	○	●	●					○	
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL																														
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																													
●	●	○	○	○	●	●					○																														

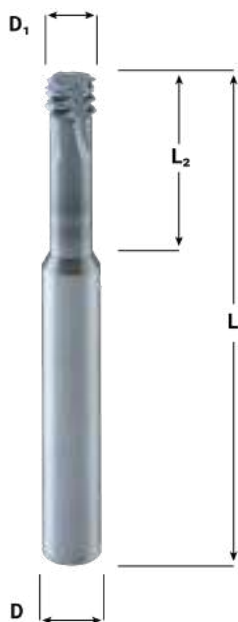
Series 187 | **TM-SP | Single Point**

TPI Range	Cutter Dia.(D ₁)	Neck Len.(L ₂)	Neck Dia.(D ₂)	OAL(L)	Shank(D)	Flutes	Bright	TiAlN
2-56 -80	0.060	0.180	0.034	2.5	3/16	3	14550	14550-TIALN
2-56 -80	0.060	0.275	0.034	2.5	3/16	3	14551	14551-TIALN
3-48 -72	0.072	0.200	0.040	2.5	3/16	3	14552	14552-TIALN
3-48 -72	0.072	0.320	0.040	2.5	3/16	3	14553	14553-TIALN
4-40 -64	0.080	0.225	0.045	2.5	3/16	3	14554	14554-TIALN
4-40 -64	0.080	0.360	0.045	2.5	3/16	3	14555	14555-TIALN
6-32 -64	0.098	0.280	0.049	2.5	3/16	3	14556	14556-TIALN
6-32 -64	0.098	0.445	0.049	2.5	3/16	3	14557	14557-TIALN
8-32 -56	0.120	0.330	0.070	2.5	3/16	3	14558	14558-TIALN
8-32 -56	0.120	0.525	0.070	2.5	3/16	3	14559	14559-TIALN
10-24 -56	0.135	0.380	0.070	2.5	3/16	3	14560	14560-TIALN
10-24 -56	0.135	0.610	0.070	2.5	3/16	3	14561	14561-TIALN
1/4-20 -56	0.180	0.500	0.105	2.5	1/4	4	14562	14562-TIALN
1/4-20 -56	0.180	0.775	0.105	2.5	1/4	4	14563	14563-TIALN
5/16-18 -48	0.240	0.625	0.160	2.5	1/4	4	14564	14564-TIALN
5/16-18 -48	0.240	0.965	0.160	2.5	1/4	4	14565	14565-TIALN
3/8-14 -40	0.290	0.875	0.190	3.0	1/4	4	14566	14566-TIALN
3/8-14 -40	0.290	1.160	0.190	3.0	1/4	4	14567	14567-TIALN
1/2-12 -32	0.372	1.125	0.240	3.0	1/4	4	14568	14568-TIALN
1/2-12 -32	0.372	1.560	0.240	3.0	1/4	4	14569	14569-TIALN
5/8-11 -32	0.490	1.375	0.350	3.5	3/8	5	14570	14570-TIALN
5/8-12 -32	0.490	1.940	0.350	3.5	3/8	5	14571	14571-TIALN
3/4-10 -32	0.595	1.625	0.420	4.0	5/8	6	14572	14572-TIALN
3/4-11 -32	0.595	2.310	0.420	4.0	5/8	6	14573	14573-TIALN
7/8-8 -24	0.695	1.750	0.490	5.0	3/4	6	14574	14574-TIALN
1-6 -32	0.740	2.000	0.490	5.0	3/4	6	14575	14575-TIALN

*bold numbers are EDPs for ordering

ADVANCED PERFORMANCE

Carbide Thread Mills For Difficult-To-Machine Materials



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Thread Mills - LHC/LHS</p> <ul style="list-style-type: none"> Micrograin carbide substrate for wear resistance Ideal for exotic materials like stainless steel and HRSA LHC/LHS for top down milling to maintain climb milling and create a right hand thread 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○	●	●	○	○			●	●	○	○

● Best ○ Good

Series 189 | TM-LHC | LHC/LHS | Top/Down | Exotics

Thread Size	Cutter Dia. (D ₁)	Neck Len. (L ₂)	Neck Dia. (D ₂)	OAL (L)	Shank (D)	Flutes	EDP
2-56 NC	0.065	0.170	0.170	2.5	1/4	3	14600-ALCRN
3-48 NC	0.075	0.200	0.200	2.5	1/4	3	14601-ALCRN
4-40 NC	0.085	0.250	0.250	2.5	1/4	3	14602-ALCRN
6-32 NC	0.100	0.280	0.280	2.5	1/4	3	14603-ALCRN
8-32 NC	0.120	0.370	0.370	2.5	1/4	3	14604-ALCRN
10-24 NC	0.140	0.420	0.420	2.5	1/4	3	14605-ALCRN
10-32 NF	0.140	0.420	0.420	2.5	1/4	3	14606-ALCRN
1/4-20 NC	0.180	0.550	0.550	2.5	1/4	3	14607-ALCRN
1/4-28 NF	0.180	0.550	0.550	2.5	1/4	3	14608-ALCRN
5/16-18 NC	0.235	0.680	0.680	2.5	1/4	3	14609-ALCRN
5/16-24 NF	0.235	0.680	0.680	2.5	1/4	3	14610-ALCRN
3/8-16 NC	0.300	0.840	0.840	3.0	3/8	4	14611-ALCRN
3/8-24 NF	0.300	0.840	0.840	3.0	3/8	4	14612-ALCRN
7/16-14 NC	0.345	0.980	0.980	3.0	3/8	4	14613-ALCRN
7/16-20 NF	0.345	0.980	0.980	3.0	3/8	4	14614-ALCRN
1/2-13 NC	0.370	1.080	1.080	3.0	3/8	4	14615-ALCRN
9/16-18 NF	0.450	1.240	1.240	3.5	1/2	4	14616-ALCRN
5/8-11 NC	0.490	1.360	1.360	3.5	1/2	4	14617-ALCRN
3/4-10 NC	0.585	1.630	1.630	4.0	5/8	4	14618-ALCRN
3/4-16 NF	0.585	1.630	1.630	4.0	5/8	4	14619-ALCRN

*bold numbers are EDPs for ordering

Popular Custom Threading Options

- Special Pitch Diameter limits
- Custom thread forms
- Tailored dimensions and chamfers
- Variety of enhanced PVD tool coatings

**CUSTOM
COMES
STANDARD**

INTRO
 MILLING
 SPECIALTY
 HOLEMAKING
 THREADING
 INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES																																							
<p>Thread Mills - LHC/LHS</p> <ul style="list-style-type: none"> Micrograin carbide substrate for wear resistance Ideal for exotic materials like stainless steel and HRSA LHC/LHS for top down milling to maintain climb milling and create a right hand thread 																																									
<table border="1"> <thead> <tr> <th colspan="3">STEEL</th> <th colspan="2">STAINLESS</th> <th colspan="2">CAST IRON</th> <th colspan="2">NON-FERROUS</th> <th colspan="2">HRSA</th> <th colspan="2">HARDENED STEEL</th> </tr> <tr> <th>P1</th> <th>P2</th> <th>P3</th> <th>M1</th> <th>M2</th> <th>K1</th> <th>K2</th> <th>N1</th> <th>N2</th> <th>S1</th> <th>S2</th> <th>H1</th> <th>H2</th> </tr> </thead> <tbody> <tr> <td>○</td> <td>○</td> <td>○</td> <td>●</td> <td>●</td> <td>○</td> <td>○</td> <td></td> <td></td> <td>●</td> <td>●</td> <td>○</td> <td>○</td> </tr> </tbody> </table> <p>● Best ○ Good</p>			STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL		P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2	○	○	○	●	●	○	○			●	●	○	○
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL																														
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																													
○	○	○	●	●	○	○			●	●	○	○																													

Series 189M | TM-LHC-M | LHC/LHS | Top/Down | Exotics

Thread Size	Cutter Dia.(D ₁)	Neck Len.(L ₂)	OAL(L)	Shank(φ)	Flutes	EDP
M2X0.4	0.060	0.180	2.5	1/4	3	14620-ALCRN
M2.5X0.45	0.076	0.220	2.5	1/4	3	14621-ALCRN
M3X0.5	0.092	0.260	2.5	1/4	3	14622-ALCRN
M3.5X0.6	0.108	0.300	2.5	1/4	3	14623-ALCRN
M4X0.7	0.122	0.350	2.5	1/4	3	14624-ALCRN
M5X0.8	0.150	0.440	2.5	1/4	3	14625-ALCRN
M6X0.75	0.182	0.530	2.5	1/4	3	14626-ALCRN
M6X1	0.182	0.530	2.5	1/4	3	14627-ALCRN
M8X1	0.245	0.700	2.5	1/4	3	14628-ALCRN
M8X1.25	0.245	0.700	2.5	1/4	3	14629-ALCRN
M10X1	0.308	0.880	3.0	3/8	4	14630-ALCRN
M10X1.5	0.308	0.880	3.0	3/8	4	14631-ALCRN
M12X1	0.370	1.000	3.0	3/8	4	14632-ALCRN
M12X1.5	0.370	1.000	3.0	3/8	4	14633-ALCRN
M12X1.75	0.370	1.000	3.0	3/8	4	14634-ALCRN
M14X1.5	0.440	1.180	3.5	1/2	4	14635-ALCRN
M14X2	0.440	1.180	3.5	1/2	4	14636-ALCRN
M16X1.5	0.490	1.360	3.5	1/2	4	14637-ALCRN
M16X2	0.490	1.360	3.5	1/2	4	14638-ALCRN

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Carbide Taps For Cast Iron And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION		APPLICATION	FEATURES																																							
<p>Carbide Taps - Straight Flute</p> <ul style="list-style-type: none"> • Popular Specials • Micrograin carbide substrate for wear resistance • Stocked Bright finish • ANSI Tap - Refer to USCTI Table 302A for dimensions • Custom carbide taps as 3-6 days pending blank availability 																																										
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STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL																															
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																														
○	○	○			○	○	○	○			○																															

● Best ○ Good

Series 126 Hand Tap | Carbide | Plug & Bottom

Thread Size	Thread Limit	Flutes	Plug	Bottom
0-80 NF	H2	2	41579	41580
2-56 NC	H2	2	41536	41537
4-40 NC	H2	2	41007	41008
4-48 NF	H2	2	41017	41018
5-40 NC	H2	3	41034	41035
6-32 NC	H3	3	41074	41075
6-40 NF	H2	3	41092	41093
8-32 NC	H3	4	41125	41126
8-36 NF	H2	4	41147	41148
10-24 NC	H3	4	41180	41181
10-32 NF	H3	4	41213	41214
12-24 NC	H3	4	41246	41247
12-28 NF	H3	4	41279	41280
1/4-20 NC	H3	4	41312	41313
1/4-28 NF	H3	4	41345	41346
5/16-18 NC	H3	4	41378	41379
5/16-24 NF	H3	4	41411	41412
3/8-16 NC	H3	4	41444	41445
3/8-24 NF	H3	4	41476	41477
7/16-14 NC	H3	4	41520	41521
7/16-20 NF	H3	4	41524	41525
1/2-13 NC	H3	4	41528	41529
1/2-20 NF	H3	4	41532	41533
9/16-12 NC	H3	4	47201	47202
9/16-18 NF	H3	4	47204	47205
5/8-11 NC	H3	4	47207	47208
5/8-18 NF	H3	4	47210	47211
3/4-10 NC	H3	4	47213	47214
3/4-16 NF	H3	4	47216	47217
3/4-10 NC	H5	4	47228	47229
3/4-16 NF	H5	4	47231	47232

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Carbide Taps For Cast Iron And Non-Ferrous Materials



INTRO

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FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Carbide Taps - Straight Flute</p> <ul style="list-style-type: none"> • Popular Specials • Micrograin carbide substrate for wear resistance • Stocked Bright finish • ANSI Tap - Refer to USCTI Table 302A for dimensions • Custom carbide taps as 3-6 days pending blank availability 	 	

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

● Best ○ Good

Series 126M Hand Tap | Carbide | Metric | Plug & Bottom

Thread Size	Thread Limit	Flutes	Plug	Bottom
M3 X 0.5	D3	3	43001	43002
M3.5 X 0.6	D4	3	43005	43006
M4 X 0.7	D4	4	43009	43010
M4.5 X 0.75	D4	4	43013	43014
M5 X 0.8	D4	4	43017	43018
M6 X 1.0	D5	4	43021	43022
M7 X 1.0	D5	4	43025	43026
M8 X 1.25	D5	4	43029	43030
M8 X 1.0	D5	4	43033	43034
M10 X 1.5	D6	4	43037	43038
M10 X 1.25	D5	4	43041	43042
M12 X 1.75	D6	4	43045	43046

*bold numbers are EDPs for ordering

Popular Custom Threading Options

- Special Pitch Diameter limits
- Custom thread forms
- Tailored dimensions and chamfers
- Variety of enhanced PVD tool coatings

**CUSTOM
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GENERAL PURPOSE

Carbide Taps For Cast Iron And Non-Ferrous Materials



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FEATURES/DESCRIPTION				APPLICATION		FEATURES						
<p>Carbide Taps - Spiral Point</p> <ul style="list-style-type: none"> • Popular Specials • Micrograin carbide substrate for wear resistance • Stocked Bright finish • ANSI Tap - Refer to USCTI Table 302A for dimensions • Custom carbide taps as 3-6 days pending blank availability 												
STEEL		STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL		
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 128 | Spiral Point Tap | Carbide | Plug

Thread Size	Thread Limit	Flutes	EDP
2-56 NC	H3	2	41538
4-40 NC	H2	2	41009
4-48 NF	H2	2	41019
5-40 NC	H2	2	41032
6-32 NC	H3	2	41072
8-32 NC	H3	2	41120
10-24 NC	H3	2	41175
10-32 NF	H3	2	41208
12-24 NC	H3	2	41241
12-28 NF	H3	2	41274
1/4-20 NC	H3	2	41307
1/4-28 NF	H3	2	41340
5/16-18 NC	H3	2	41373
5/16-24 NF	H3	2	41406
3/8-16 NC	H3	3	41442
3/8-24 NF	H1	3	41001
7/16-14 NC	H3	3	41522
7/16-20 NF	H3	3	41526
1/2-13 NC	H3	3	41530
1/2-20 NF	H3	3	41534

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Carbide Taps For Cast Iron And Non-Ferrous Materials



INTRO

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FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Carbide Taps - Spiral Point</p> <ul style="list-style-type: none"> • Popular Specials • Micrograin carbide substrate for wear resistance • Stocked Bright finish • ANSI Tap - Refer to USCTI Table 302A for dimensions • Custom carbide taps as 3-6 days pending blank availability 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 128M | Spiral Point Tap | Carbide | Metric | Plug

Thread Size	Thread Limit	Flutes	EDP
M3 X 0.5	D3	2	43003
M3.5 X 0.6	D4	2	43007
M4 X 0.7	D4	2	43011
M4.5 X 0.75	D4	2	43015
M5 X 0.8	D4	2	43019
M6 X 1.0	D5	2	43023
M7 X 1.0	D5	2	43027
M8 X 1.25	D5	2	43031
M10 X 1.5	D6	3	43039
M10 X 1.25	D5	3	43043
M12 X 1.75	D6	3	43047

*bold numbers are EDPs for ordering

Popular Custom Threading Options

- Special Pitch Diameter limits
- Custom thread forms
- Tailored dimensions and chamfers
- Variety of enhanced PVD tool coatings

**CUSTOM
COMES
STANDARD**



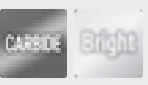
GENERAL PURPOSE

Carbide Taps For Cast Iron And Non-Ferrous Materials



INTRO
 MILLING
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FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Carbide Tap - Pipe - NPT/F</p> <ul style="list-style-type: none"> • Popular Specials • Micrograin carbide substrate for wear resistance • Stocked Bright finish • > 1/4" are CARB-I-SERT brazed style • ANSI Tap - Refer to USCTI Table 311 for dimensions • Custom carbide taps as 3-6 days pending blank availability 	 	

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 127 Pipe Tap | Carbide | Plug | NPT/F

Thread Size	Flutes	EDP
1/16-27	4	41800
1/8-27	4	41801
1/4-18	4	41802
3/8-18	4	41808
1/2-14	4	41809
3/4-14	4	41810
1-11-1/2	6	41811

*bold numbers are EDPs for ordering

GENERAL PURPOSE

HSS Taps For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES																																							
<p>Hand Tap</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Hand tap • Stocked Bright finish • ANSI Tap - Refer to USCTI Table 302/303 for dimensions • Custom taps as fast as 24hrs 																																									
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STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL																														
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																													
○	○	○			○	○	○	○			○																														

● Best ○ Good

Series 101 Hand Tap | Taper, Plug, Bottom

Thread Size	Thread Limit	Flutes	Taper	Plug	Bottom
2-56 NC	H4	2	17762	17763	17764
4-36 NS	H2	3	-	17946	17947
6-32 NC	H5	3	15121	15122	15123
6-32 NC	H7	3	15127	15128	15129
6-32 NC	H11	3	15133	15134	15135
6-48 NS	H2	3	15157	15158	15159
8-24 NS	H3	4	15163	15164	15165
8-32 NC	H5	4	15181	15182	15183
8-32 NC	H7	4	15187	15188	15189
8-32 NC	H11	4	15193	15194	15195
8-40 NS	H2	4	15217	15218	15219
10-24 NC	H5	4	15235	15236	15237
10-24 NC	H7	4	15241	15242	15243
10-24 NC	H11	4	15247	15248	15249
10-28 NS	H3	4	15265	15266	15267
10-30 NS	H3	4	15271	15272	15273
10-32 NF	H4	4	-	17898	17899
10-32 NF	H5	4	15289	15290	15291
10-32 NF	H7	4	15295	15296	15297
10-32 NF	H11	4	15301	15302	15303
10-36 NS	H2	4	15319	15320	15321
10-40 NS	H2	4	15325	15326	15327
10-48 NS	H2	4	15331	15332	15333
10-56 NS	H2	4	15337	15338	15339
10-64 NS	H2	4	15343	15344	15345
12-32 NEF	H3	4	15385	15386	15387
12-36 NS	H2	4	15391	15392	15393
14-20 NS	H3	4	15397	15398	15399
14-24 NS	H3	4	15403	15404	15405
5/32-32	H3	4	17559	17560	17561
3/16-24 NS	H3	4	15442	15443	15444
3/16-32 NC	H3	4	15448	15449	15450
7/32-32	H3	4	17564	17565	17566
.210-36 NS	H3	4	17645	17646	17647
.210-36 NS	H4	4	-	17901	17902
1/4-20 NC	H7	4	15493	15494	15495
1/4-20 NC	H11	4	15499	15500	15501
1/4-20 NC	H21	4	15505	15506	15507
1/4-24 NS	H3	4	15535	15536	15537
1/4-27 NS	H3	4	15541	15542	15543
1/4-28 NF	H5	4	15553	15554	15555
1/4-28 NF	H7	4	15559	15560	15561
1/4-28 NF	H11	4	15565	15566	15567
1/4-32 NEF	H3	4	15583	15584	15585
1/4-32 NEF	H5	4	15589	15590	15591

*bold numbers are EDPs for ordering

GENERAL PURPOSE

HSS Taps For Ferrous And Non-Ferrous Materials



Series 101 Hand Tap | Taper, Plug, Bottom

Thread Size	Thread Limit	Flutes	Taper	Plug	Bottom
1/4-36 NS	H2	4	15595	15596	15597
1/4-36 NS	H3	4	17758	17759	17760
1/4-40 NS	H2	4	15601	15602	15603
1/4-48 NS	H2	4	15613	15614	15615
1/4-56 NS	H2	4	15619	15620	15621
1/4-80 NS	H2	4	15637	15638	15639
1/4-40 NS	H3	4	15607	15608	15609
9/32-32 NS	H3	4	17588	17589	17590
5/16-18 NC	H7	4	15649	15650	15651
5/16-18 NC	H11	4	15655	15656	15657
5/16-18 NC	H21	4	15661	15662	15663
5/16-20 NS	H3	4	15683	15684	15685
5/16-24 NF	H5	4	17649	17650	17651
5/16-24 NF	H6	4	17706	17707	17708
5/16-24 NF	H11	4	15707	15708	15709
5/16-27 NS	H3	4	15718	15719	15720
5/16-28 NS	H3	4	15724	15725	15726
5/16-32 NEF	H3	4	15729	15730	15731
5/16-32 NEF	H5	4	15734	15735	15736
5/16-40 NS	H2	4	15739	15740	15741
11/32-32 NS	H3	4	15749	15750	15751
3/8-16 NC	H7	4	15765	15766	15767
3/8-16 NC	H11	4	15770	15771	15772
3/8-16 NC	H21	4	15775	15776	15777
3/8-18 NS	H3	4	15805	15806	15807
3/8-20 NS	H3	4	15837	15838	15839
3/8-24 NF	H5	4	15847	15848	15849
3/8-24 NF	H7	4	15852	15853	15854
3/8-24 NF	H8	4	-	17915	17916
3/8-24 NF	H11	4	15857	15858	15859
3/8-27 NS	H3	4	15867	15868	15869
3/8-28 NS	H3	4	15872	15873	15874
3/8-32 NEF	H3	4	15877	15878	15879
3/8-32 NEF	H5	4	15882	15883	15884
3/8-40 NS	H2	4	15887	15888	15889
3/8-40 NS	H3	4	17614	17615	17616
3/8-48 NS	H2	4	15892	15893	15894
13/32-32 NS	H3	4	15897	15898	15899
7/16-14 NC	H11	4	15907	15908	15909
7/16-16 NS	H3	4	15937	15938	15939
7/16-18 NS	H3	4	15942	15943	15944
7/16-20 NF	H6	4	17740	17741	17742
7/16-20 NF	H11	4	15962	15963	15964
7/16-24 NS	H3	4	15977	15978	15979
7/16-24 NS	H5	4	15982	15983	15984
7/16-27 NS	H3	4	15987	15988	15989
7/16-28 NEF	H3	4	15992	15993	15994
7/16-28 NEF	H5	4	15997	15998	15999
7/16-32 NS	H3	4	16002	16003	16004
7/16-40 NS	H2	4	16007	16008	16009
15/32-32 NS	H3	6	16012	16013	16014
1/2-12 NS	H3	4	16027	16028	16029
1/2-13 NC	H7	4	16042	16043	16044
1/2-13 NC	H11	4	16047	16048	16049
1/2-13 NC	H21	4	16052	16053	16054
1/2-14 NS	H3	4	16114	16115	16116
1/2-16 NS	H3	4	16119	16120	16121
1/2-18 NS	H3	4	16124	16125	16126
1/2-20 NF	H5	4	-	-	17634
1/2-20 NF	H7	4	16134	16135	16136
1/2-20 NF	H11	4	16139	16140	16141
1/2-24 NS	H3	4	16154	16155	16156
1/2-27 NS	H3	4	16159	16160	16161
1/2-28 NEF	H3	4	16164	16165	16166
1/2-28 NEF	H5	4	16169	16170	16171
1/2-32 NS	H3	6	16174	16175	16176
1/2-40 NS	H2	6	16179	16180	16181
33/64-13 NS	H3	4	16184	16185	16186
9/16-16 NS	H3	4	16199	16200	16201
9/16-18 NF	H5	4	-	18375	17769
9/16-18 NF	H11	4	16214	16215	16216
9/16-20 NS	H3	4	16224	16225	16226
9/16-24 NEF	H3	4	16229	16230	16231
9/16-24 NEF	H5	4	16234	16235	16236
9/16-27 NS	H3	6	16239	16240	16241
9/16-32 NC	H3	6	16244	16245	16246

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

HSS Taps For Ferrous And Non-Ferrous Materials



Series 101 | Hand Tap | Taper, Plug, Bottom

Thread Size	Thread Limit	Flutes	Taper	Plug	Bottom
5/8-11 NC	H11	4	16274	16275	16276
5/8-11 NC	H21	4	16279	16280	16281
5/8-12 NS	H3	4	16319	16320	16321
5/8-16 NS	H3	4	16324	16325	16326
5/8-18 NF	H7	4	17680	17681	17682
5/8-18 NF	H8	4	-	17904	17905
5/8-18 NF	H11	4	16334	16335	16336
5/8-20 NS	H3	4	16348	16349	16350
5/8-24 NEF	H3	6	16353	16354	16355
5/8-24 NEF	H5	6	16358	16359	16360
5/8-27 NS	H3	6	16363	16364	16365
5/8-28 NS	H3	6	16368	16369	16370
5/8-32 NS	H3	6	16373	16374	16375
41/64-11 NS	H4	4	16378	16379	16380
11/16-18 NS	H3	4	16393	16394	16395
11/16-20 NS	H3	6	16398	16399	16400
11/16-24 NEF	H3	6	16403	16404	16405
11/16-24 NEF	H5	6	16408	16409	16410
11/16-28 NS	H3	6	16418	16419	16420
11/16-32 NS	H3	6	16423	16424	16425
3/4-10 NC	H11	4	16453	16454	16455
3/4-10 NC	H21	4	16458	16459	16460
3/4-11 NH	H9	6	16496	16497	16498
3/4-12 NS	H4	4	16501	16502	16503
3/4-16 NF	H7	4	17636	17637	17638
3/4-16 NF	H8	4	17744	17745	17746
3/4-16 NF	H11	4	16538	16539	16540
3/4-18 NS	H3	4	16547	16548	16549
3/4-20 NEF	H3	6	16552	16553	16554
3/4-20 NEF	H5	6	16557	16558	16559
3/4-24 NS	H3	6	16562	16563	16564
3/4-27 NS	H3	6	16567	16568	16569
3/4-32 NS	H3	6	16572	16573	16574
3/4-40 NS	H3	6	16577	16578	16579
49/64-10 NS	H4	4	16582	16583	16584
13/16-10 NS	H4	4	16596	16597	16598
13/16-12 NS	H4	4	16601	16602	16603
13/16-16 NS	H3	4	16606	16607	16608
13/16-18 NS	H3	4	16611	16612	16613
13/16-20 NEF	H3	6	16616	16617	16618
13/16-20 NEF	H5	6	16621	16622	16623
13/16-24 NS	H3	6	16626	16627	16628
7/8-9 NC	H11	4	16651	16652	16653
7/8-10 NS	H4	4	16660	16661	16662
7/8-12 NS	H4	4	16665	16666	16667
7/8-14 NF	H5	4	17748	17749	17750
7/8-14 NF	H6	4	17685	17686	17687
7/8-14 NF	H11	4	16675	16676	16677
7/8-16 NS	H3	4	16680	16681	16682
7/8-18 NS	H3	4	16685	16686	16687
7/8-20 NEF	H3	6	16690	16691	16692
7/8-20 NEF	H5	6	16695	16696	16697
7/8-24 NS	H3	6	16700	16701	16702
7/8-27 NS	H3	6	16705	16706	16707
7/8-32 NS	H3	6	16710	16711	16712
15/16-12 NS	H4	4	16715	16716	16717
15/16-14 NS	H4	4	16720	16721	16722
15/16-16 NS	H3	6	16725	16726	16727
15/16-18 NC	H3	6	16730	16731	16732
15/16-20 NS	H3	6	16735	16736	16737
15/16-20 NS	H5	6	16740	16741	16742
15/16-32 NEF	H3	6	16755	16756	16757
1-8 NC	H6	4	-	17918	17919
1-8 NC	H11	4	16784	16785	16786
1-8 NC	H21	4	17731	17732	17733
1-10	H4	4	16808	16809	16810
1-12 NF	H6	4	16833	16834	16835
1-12 NF	H11	4	16838	16839	16840
1-14 NS	H6	4	16848	16849	16850
1-14 NS	H11	4	16853	16854	16855
1-16 NS	H3	6	16858	16859	16860
1-18 NS	H3	6	16863	16864	16865
1-20 NEF	H3	6	16868	16869	16870
1-20 NEF	H5	6	16873	16874	16875
1-24 NS	H3	6	16878	16879	16880
1-27 NS	H3	6	16883	16884	16885

*bold numbers are EDPs for ordering

GENERAL PURPOSE

HSS Taps For Ferrous And Non-Ferrous Materials



Series 101 Hand Tap | Taper, Plug, Bottom

Thread Size	Thread Limit	Flutes	Taper	Plug	Bottom
1-32 NS	H3	6	16888	16889	16890
1 1/16-12 NS	H4	4	17713	17714	17715
1 1/16-12 NS	H5	4	16892	16893	16894
1 1/16-12 NS	H7	4	16896	16897	16898
1 1/16-14 NS	H5	6	16900	16901	16902
1 1/16-16 NS	H4	6	16904	16905	16906
1 1/16-16 NS	H6	6	16908	16909	16910
1 1/16-18 NEF	H4	6	16912	16913	16914
1 1/16-18 NEF	H6	6	16916	16917	16918
1 1/16-20 NS	H4	6	16920	16921	16922
1 1/16-24 NS	H4	6	16924	16925	16926
1-1/8-8 NS	H5	4	16942	16943	16944
1-1/8-10 NS	H5	4	16946	16947	16948
1-1/8-12 NF	H6	4	16954	16955	16956
1-1/8-12 NF	H11	4	17775	17776	17777
1-1/8-14 NS	H5	6	16958	16959	16960
1-1/8-16 NS	H4	6	16962	16963	16964
1-1/8-18 NEF	H4	6	16966	16967	16968
1-1/8-18 NEF	H6	6	16970	16971	16972
1-1/8-20 NS	H4	6	16974	16975	16976
1-1/8-24 NS	H4	6	16978	16979	16980
1-1/8-28	H4	6	-	18114	18115
1-1/8-32 NS	H4	8	16986	16987	16988
1 3/16-12 NS	H5	6	16990	16991	16992
1 3/16-14 NS	H5	6	16994	16995	16996
1 3/16-16 NS	H4	6	16998	16999	17000
1 3/16-16 NS	H6	6	17002	17003	17004
1 3/16-18 NEF	H4	6	17006	17007	17008
1 3/16-18 NEF	H6	6	17010	17011	17012
1 3/16-20 NS	H4	6	17014	17015	17016
1-1/4-7 NC	H8	4	17032	17033	17034
1-1/4-7 NC	H11	4	17752	17753	17754
1-1/4-8 NS	H5	4	17044	17045	17046
1-1/4-10 NS	H5	4	17056	17057	17058
1-1/4-12 NS	H6	6	17079	17080	17081
1-1/4-14 NS	H5	6	17083	17084	17085
1-1/4-16 NS	H4	6	17087	17088	17089
1-1/4-18 NEF	H4	6	17091	17092	17093
1-1/4-18 NEF	H6	6	17095	17096	17097
1-1/4-20 NC	H4	6	17099	17100	17101
1-1/4-24 NS	H4	8	17103	17104	17105
1-1/4-32 NEF	H4	10	17107	17108	17109
1 5/16-12 NS	H5	6	17111	17112	17113
1 5/16-12 NS	H8	6	17115	17116	17117
1 5/16-16 NS	H4	6	17123	17124	17125
1 5/16-16 NS	H6	6	17127	17128	17129
1 5/16-18 NC	H4	6	17131	17132	17133
1 5/16-18 NC	H6	6	17135	17136	17137
1 5/16-20 NS	H4	6	17139	17140	17141
1 3/8-8 NS	H5	4	17157	17158	17159
1 3/8-16 NC	H4	6	17169	17170	17171
1 3/8-18 NS	H4	6	17173	17174	17175
1 3/8-18 NS	H6	6	17177	17178	17179
1 3/8-20 NS	H4	6	17181	17182	17183
1 7/16-18 NS	H4	6	17185	17186	17187
1 7/16-18 NS	H6	6	17189	17190	17191
1-1/2-8 NS	H5	6	17215	17216	17217
1-1/2-10 NS	H5	6	17227	17228	17229
1-1/2-12 NS	H6	6	17247	17248	17249
1-1/2-16 NS	H4	6	17251	17252	17253
1-1/2-18 NS	H4	6	17255	17256	17257
1-1/2-18 NS	H6	6	17259	17260	17261
1-1/2-20 NF	H4	6	17263	17264	17265
1-1/2-24 NS	H4	8	17267	17268	17269
1-9/16-16 NS	H5	6	17271	17272	17273
1-9/16-18 NF	H5	6	17275	17276	17277
1-5/8-5 1/2	H7	6	17279	17280	17281
1-5/8-8 NS	H6	6	17283	17284	17285
1-5/8-12	H4	6	-	17908	17909
1-5/8-12 NS	H6	6	17287	17288	17289
1-5/8-16 NS	H5	6	17291	17292	17293
1-5/8-18 NF	H5	6	17295	17296	17297
1-3/4-5 NC	H7	6	17299	17300	17301
1-3/4-8 NS	H6	6	17303	17304	17305
1-3/4-10 NC	H6	6	17307	17308	17309
1-3/4-12 NS	H6	6	17311	17312	17313

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

HSS Taps For Ferrous And Non-Ferrous Materials



Series 101 | Hand Tap | Taper, Plug, Bottom

Thread Size	Thread Limit	Flutes	Taper	Plug	Bottom
1-3/4-12 NS	H8	6	17315	17316	17317
1-3/4-16 NF	H5	6	17319	17320	17321
1-3/4-16 NF	H7	6	17323	17324	17325
1-3/4-18 NS	H5	6	17327	17328	17329
1-7/8-5 NS	H7	6	17331	17332	17333
1-7/8-8 NS	H6	6	17335	17336	17337
1-7/8-12 NS	H6	6	17339	17340	17341
1-7/8-12 NS	H8	6	17343	17344	17345
1-7/8-16 NS	H5	6	17347	17348	17349
2-4 1/2	H7	6	17353	17354	17355
2-8 NS	H6	6	17357	17358	17359
2-12	H6	6	17373	17374	17375
2-12	H8	6	17377	17378	17379
2-16 NS	H5	6	17381	17382	17383
2-20 NS	H5	8	17385	17386	17387
2 1/8-8 NS	H6	6	17389	17390	17391
2 1/8-12 NS	H6	6	17393	17394	17395
2 1/8-16 NS	H5	6	17397	17398	17399
2 1/4-4 NC 1/2	H7	6	17401	17402	17403
2 1/4-8 NS	H6	6	17405	17406	17407
2 1/4-12 NS	H6	6	17409	17410	17411
2 1/4-16 NS	H5	6	17413	17414	17415
2 3/8-8 NS	H6	6	17417	17418	17419
2 3/8-12 NS	H6	6	17421	17422	17423
2 3/8-16 NC	H5	6	17425	17426	17427
2 1/2-4 NC	H7	6	17429	17430	17431
2 1/2-8 NS	H6	6	17433	17434	17435
2 1/2-12 NS	H6	6	17443	17444	17445
2 1/2-16 NS	H5	6	17447	17448	17449
2 3/4-12 NS	H7	6	17459	17460	17461
3-4 NC	H9	6	17467	17468	17469
3-8 NS	H8	6	17471	17472	17473
3-12 NS	H7	8	17481	17482	17483
3-16 NS	H7	8	17485	17486	17487
3 1/8-12 NS	H7	8	17489	17490	17491
3 1/4-8 NS	H8	6	17498	17499	17500
3 1/4-12 NS	H7	8	17502	17503	17504
3 1/2-4 NC	H9	6	17506	17507	17508
3 1/2-8 NS	H8	6	17510	17511	17512
3 1/2-12 NS	H7	8	17520	17521	17522
3 3/4-4 NC	H9	6	17524	17525	17526
3 3/4-8 NS	H8	10	17528	17529	17530
3 3/4-12 NS	H7	10	17532	17533	17534
4-4 NC	H9	10	17536	17537	17538
4-8 NS	H8	10	17540	17541	17542
4-12 NS	H7	10	17550	17551	17552

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

HSS Taps For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION		APPLICATION	FEATURES																																							
Hand Tap - Double Lead <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Double-lead hand tap • Stocked Bright finish • ANSI Tap - Refer to USCTI Table 302/303 for dimensions • Custom taps as fast as 24hrs 		 	 																																							
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STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL																															
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																														
○	○	○			○	○	○	○			○																															

● Best ○ Good

Series 103 Hand Tap | Dbl Lead | Taper, Plug, Bottom

Thread Size	Thread Limit	Taper	Plug	Bottom
10-24 NC	H3	15253	15254	15255
1/4-20 NC	H3	15511	15512	15513
1/4-28 NF	H3	15571	15572	15573
5/16-18 NC	H3	15667	15668	15669
3/8-16 NC	H3	15760	15761	15762
3/8-16 NC	H3	15780	15781	15782
1/2-13 NC	H3	16057	16058	16059

*bold numbers are EDPs for ordering

Popular Custom Threading Options

- Special Pitch Diameter limits
- Custom thread forms
- Tailored dimensions and chamfers
- Variety of enhanced PVD tool coatings

CUSTOM
COMES
STANDARD

GENERAL PURPOSE

HSS Taps For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION		APPLICATION	FEATURES																																								
<p>Hand Tap - Metric</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Stocked Bright finish • Hand tap • ANSI Tap - Refer to USCTI Table 302/303 for dimensions • Custom taps as fast as 24hrs 		 	 																																								
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STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL																																
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																															
○	○	○			○	○	○	○			○																																

● Best ○ Good

Series 101M Hand Tap | Metric | Taper, Plug, Bottom

Thread Size	Thread Limit	Flutes	Taper	Plug	Bottom
M1.6 X 0.35	D3	2	20009	20010	20011
M1.8 X 0.35	D3	2	20021	20022	20023
M2 X 0.4	D3	3	20033	20034	20035
M2.2 X 0.45	D3	3	20045	20046	20047
M2.5 X 0.45	D1	3	20051	20052	20053
M2.5 X 0.45	D3	3	20057	20058	20059
M2.6X0.45	D3	3	-	21179	21180
M3 X 0.5	D1	3	20063	20064	20065
M3 X 0.5	D3	3	20069	20070	20071
M3.5 X 0.6	D1	3	20084	20085	20086
M3.5 X 0.6	D11	3	20111	20112	20113
M3.5 X 0.6	D4	3	20090	20091	20092
M4 X 0.7	D2	4	20123	20124	20125
M4 X 0.7	D4	4	20129	20130	20131
M4 X 0.7	D11	4	20150	20151	20152
M4 X 0.75	D4	4	21176	21035	21036
M4.5 X 0.75	D2	4	20162	20163	20164
M4.5 X 0.75	D4	4	20168	20169	20170
M4.5 X 0.75	D11	4	20189	20190	20191
M5 X 0.50	D3	4	20909	20910	20911
M5 X 0.8	D2	4	20201	20202	20203
M5 X 0.8	D4	4	20207	20208	20209
M5 X 0.8	D11	4	20228	20229	20230
M5X0.9	D3	4	-	21184	21185
M5.5X0.9	D3	4	-	21189	21190
M6 X 0.50	D3	4	20975	20976	20977
M6 X 0.75	D3	4	20279	20280	20281
M6 X 1.0	D3	4	20240	20241	20242
M6 X 1.0	D5	4	20246	20247	20248
M6 X 1.0	D11	4	20267	20268	20269
M7 X 1.0	D5	4	20289	20290	20291
M7 X 1.0	D11	4	20308	20309	20310
M8 X 0.75	D5	4	20940	20941	20942
M8 X 1.0	D3	4	20352	20353	20354
M8 X 1.0	D5	4	20357	20358	20359
M8 X 1.0	D11	4	20375	20376	20377
M8 X 1.25	D3	4	20318	20319	20320
M8 X 1.25	D5	4	20323	20324	20325
M8 X 1.25	D11	4	20342	20343	20344
M8X0.5	D4	4	-	21024	21025
M9 X 1.0	D5	4	21141	21041	21042
M9 X 1.25	D5	4	21143	21038	21039
M10 X 1.0	D3	4	20447	20448	20449
M10 X 1.0	D5	4	20944	20945	20946
M10 X 1.25	D3	4	20419	20420	20421

*bold numbers are EDPs for ordering

GENERAL PURPOSE

HSS Taps For Ferrous And Non-Ferrous Materials



Series 101M Hand Tap | Metric | Taper, Plug, Bottom

Thread Size	Thread Limit	Flutes	Taper	Plug	Bottom
M10 X 1.25	D5	4	20424	20425	20426
M10 X 1.25	D11	4	20442	20443	20444
M10 X 1.5	D3	4	20385	20386	20387
M10 X 1.5	D6	4	20390	20391	20392
M10 X 1.5	D11	4	20410	20411	20409
M11 X 1.0	D5	4	20984	20985	20986
M11 X 1.5	D6	4	20452	20453	20454
M12 X 1.0	D5	4	20889	20890	20891
M12 X 1.25	D3	4	20491	20492	20493
M12 X 1.25	D5	4	20496	20497	20498
M12 X 1.25	D11	4	20514	20515	20516
M12 X 1.50	D6	4	20905	20906	20907
M12 X 1.75	D3	4	20457	20458	20459
M12 X 1.75	D6	4	20462	20463	20464
M12 X 1.75	D11	4	20481	20482	20483
M14 X 1.00	D5	4	20901	20902	20903
M14 X 1.25	D4	4	20555	20556	20557
M14 X 1.5	D3	4	20539	20540	20541
M14 X 1.5	D6	4	20544	20546	20547
M14 X 2	D3	4	20524	20525	20526
M14 X 2	D7	4	20529	20530	20531
M15 X 1.0	D5	4	20988	20989	20990
M16 X 1.0	D5	4	21159	21045	21046
M16 X 1.5	D3	4	20580	20581	20582
M16 X 1.5	D6	4	20585	20586	20587
M16 X 2	D4	4	20560	20561	20562
M16 X 2	D7	4	20565	20566	20567
M16 X 2	D11	4	20575	20576	20577
M18 X 1.0	D5	4	20893	20894	20895
M18 X 1.5	D3	4	20610	20611	20612
M18 X 1.5	D4	4	20615	20616	20617
M18 X 1.5	D6	4	20620	20621	20622
M18 X 2.5	D7	4	20600	20601	20602
M20 X 1.0	D6	4	-	21048	21049
M20 X 1.5	D3	4	20650	20651	20652
M20 X 1.5	D6	4	20655	20656	20657
M20 X 1.5	D11	4	20665	20666	20667
M20 X 2.5	D4	4	20630	20631	20632
M20 X 2.5	D7	4	20635	20636	20637
M20 X 2.5	D11	4	20645	20646	20647
M22 X 1.5	D3	4	20685	20686	20687
M22 X 1.5	D6	4	20690	20691	20692
M22 X 1.5	D11	4	20700	20701	20702
M22 X 2.5	D4	4	20670	20671	20672
M22 X 2.5	D7	4	20675	20676	20677
M24 X 1.5	D6	4	20916	20917	20918
M24 X 2	D4	4	20725	20726	20727
M24 X 2	D7	4	20730	20731	20732
M24 X 3	D4	4	20705	20706	20707
M24 X 3	D8	4	20710	20711	20712
M24 X 3	D11	4	20720	20721	20722
M25X1.5	D6	4	-	21031	21032
M26 X 1.5	D6	6	20980	20981	20982
M27 X 1.5	D6	6	-	21057	21058
M27 X 2	D5	4	20755	20756	20757
M27 X 2	D7	4	20760	20761	20762
M27 X 3	D5	4	20740	20741	20742
M27 X 3	D8	4	20745	20746	20747
M30 X 1.50	D6	6	20897	20898	20899
M30 X 2	D5	4	20785	20786	20787
M30 X 2	D7	4	20790	20791	20792
M30 X 3.5	D5	4	20770	20771	20772
M30 X 3.5	D9	4	20775	20776	20777
M32 X 1.5	D6	6	21200	21060	21061
M32 X 2.0	D7	6	20816	20817	21199
M33 X 2	D5	4	20815	20816	20817
M33 X 2	D7	4	20820	20821	20822
M33 X 3.5	D5	4	20800	20801	20802
M33 X 3.5	D9	4	20805	20806	20807
M35 X 1.5	D6	6	20956	20957	20958
M36 X 1.5	D6	6	20960	20961	20962
M36 X 2.0	D7	6	20920	20921	20922
M36 X 3	D5	4	20845	20846	20847
M36 X 3	D8	4	20850	20851	20852
M36 X 4	D5	4	20830	20831	20832
M36 X 4	D9	4	20835	20836	20837

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

HSS Taps For Ferrous And Non-Ferrous Materials



Series 101M Hand Tap | Metric | Taper, Plug, Bottom

Thread Size	Thread Limit	Flutes	Taper	Plug	Bottom
M39 X 3	D6	6	20875	20876	20877
M39 X 3	D8	6	20880	20881	20882
M39 X 4	D6	6	20860	20861	20862
M39 X 4	D9	6	20865	20866	20867
M40 X 1.5	D6	6	20971	20972	20973
M42 X 1.5	D6	6	-	21063	21064
M42 X 4.5	D10	6	20964	20965	20966

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Popular Custom Threading Options

- Special Pitch Diameter limits
- Custom thread forms
- Tailored dimensions and chamfers
- Variety of enhanced PVD tool coatings

CUSTOM COMES STANDARD

GENERAL PURPOSE

HSS Taps For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES																																							
<p>Spiral Flute Tap</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Stocked Bright finish • Spiral flute tap for blind holes • ANSI Tap - Refer to USCTI Table 302/303 for dimensions • Custom taps as fast as 24hrs 																																									
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STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL																														
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																													
○	○	○			○	○	○	○			○																														

● Best ○ Good

Series 107 | Spiral Flute Tap | Plug & Bottom

Thread Size	Thread Limit	Flutes	Helix	Plug	Bottom
4-40 NC	H3	2	52	17672	17673
5-40 NC	H5	2	52	-	18900
5-40 NC	H7	2	52	-	18901
5-40 NC	H11	2	52	-	18902
6-32 NC	H5	2	52	-	18903
6-32 NC	H7	2	52	-	18904
6-32 NC	H11	2	52	-	18905
6-40 NF	H3	2	52	-	18906
6-48 NS	H2	2	52	-	18907
8-32 NC	H5	2	52	-	18908
8-32 NC	H7	2	52	-	18909
8-32 NC	H11	2	52	-	18910
8-40 NS	H2	2	52	-	18911
10-24 NC	H5	2	52	-	18912
10-24 NC	H7	2	52	-	18913
10-24 NC	H11	2	52	-	18914
10-32 NF	H4	2	52	-	18915
10-32 NF	H5	2	52	-	18916
10-32 NF	H7	2	52	-	18917
10-32 NF	H11	2	52	-	18918
10-40 NS	H2	2	52	-	18919
12-32 NEF	H3	2	52	-	18920
1/4-20 NC	H5	3	52	17766	17767
1/4-24 NS	H3	2	52	-	18921
1/4-28 NF	H5	2	52	-	18922
1/4-28 NF	H7	2	52	-	18923
1/4-28 NF	H11	2	52	-	18924
1/4-32 NEF	H3	2	52	-	18925
1/4-36 NS	H2	2	52	-	18926
1/4-36 NS	H3	2	52	-	18927
1/4-40 NS	H2	3	52	-	18928
5/16-18 NC	H7	2	52	-	18929
5/16-18 NC	H11	2	52	-	18930
5/16-24 NF	H5	2	52	-	18931
5/16-24 NF	H11	2	52	-	18932
5/16-32 NEF	H3	2	52	-	18933
3/8-16 NC	H5	3	30	17912	17913
3/8-24 NF	H5	3	30	17724	17725
7/16-14 NC	H11	3	30	-	18934
7/16-20 NF	H11	3	30	-	18935
15/32-32 NS	H3	3	30	-	18936
1/2-13 NC	H11	3	30	-	18937
1/2-20 NF	H11	3	30	-	18938
1/2-28 NEF	H3	3	30	-	18939
5/8-11 NC	H3	4	30	16284	16285

*bold numbers are EDPs for ordering

GENERAL PURPOSE

HSS Taps For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Series 107 Spiral Flute Tap | Plug & Bottom

Thread Size	Thread Limit	Flutes	Helix	Plug	Bottom
5/8-18 NF	H3	4	30	16339	16340
5/8-11 NC	H3	4	52	17717	17718
5/8-18 NF	H3	4	52	17727	17728
3/4-10 NC	H3	4	30	16463	16464
3/4-16 NF	H3	4	30	16543	16544
7/8-9 NC	H4	4	30	16656	16657
1-8 NC	H4	4	52	17791	17792
1-8 NC	H4	4	30	16789	16790

*bold numbers are EDPs for ordering

Popular Custom Threading Options

- Special Pitch Diameter limits
- Custom thread forms
- Tailored dimensions and chamfers
- Variety of enhanced PVD tool coatings

CUSTOM COMES STANDARD

GENERAL PURPOSE

HSS Taps For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

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THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES																																							
<p>Spiral Flute Tap - Metric</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Stocked Bright finish • Spiral flute tap for blind holes • ANSI Tap - Refer to USCTI Table 302/303 for dimensions • Custom taps as fast as 24hrs 																																									
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STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL																														
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																													
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● Best ○ Good

Series 107M **Spiral Flute Tap | Metric | Plug & Bottom**

Thread Size	Thread Limit	Flutes	Helix	Plug	Bottom
M3 X 0.5	D3	2	30	20074	20075
M3 X 0.5	D3	2	52	20078	20079
M3.5 X 0.6	D4	2	52	20105	20106
M3.5 X 0.6	D4	2	30	20101	20102
M4 X 0.7	D4	2	30	20140	20141
M4 X 0.7	D4	3	52	20144	20145
M4.5X0.75	D4	2	30	20179	20180
M4.5 X 0.75	D4	3	52	20183	20184
M5 X 0.8	D4	2	30	20218	20219
M5 X 0.8	D4	3	52	20222	20223
M6 X 1.0	D5	3	30	20257	20258
M6 X 1.0	D5	3	52	20261	20262
M8 X 1.0	D5	3	30	20367	20368
M8 X 1.0	D5	3	52	20371	20372
M8 X 1.25	D5	3	30	20333	20334
M8 X 1.25	D5	3	52	20337	20338
M10 X 1.25	D5	0	30	20434	20435
M10 X 1.25	D5	3	52	20438	20439
M10 X 1.5	D6	3	30	20400	20401
M10 X 1.5	D6	3	52	20404	20405
M12 X 1.25	D5	3	30	20506	20507
M12 X 1.25	D5	3	52	20510	20511
M12 X 1.75	D6	3	30	20472	20473
M12 X 1.75	D6	3	52	20476	20477
M14 X 1.50	D6	3	52	18940	18941
M14 X 2.0	D7	3	52	18942	18943
M16 X 2.0	D7	3	52	18944	18945
M16 X 1.50	D6	3	52	18946	18947
M18 X 2.50	D7	4	52	18948	18949
M18 X 1.50	D6	4	52	18950	18951
M20 X 2.5	D7	4	30	21051	21052
M20 X 1.50	D6	4	52	18952	18953

*bold numbers are EDPs for ordering

GENERAL PURPOSE

HSS Taps For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Spiral Point Tap</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Stocked Bright finish • Gun tap for through holes • ANSI Tap - Refer to USCTI Table 302/303 for dimensions • Custom taps as fast as 24hrs 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 105 Spiral Point Tap | Plug

Thread Size	Thread Limit	Flutes	EDP
00-90 NS	H1	0	15001
00-96 NS	H1	0	15003
0-80 NF	H3	0	15008
1-56 NS	H1	0	15020
2-56 NC	H3	2	17734
2-56 NC	H4	2	17735
2-56 NC	H5	2	17668
2-56 NC	H7	2	17691
4-40 NC	H3	2	15078
4-40 NC	H4	2	17910
4-40 NC	H5	2	17593
4-40 NC	H7	2	17670
4-40 NC	H11	2	17557
5-40 NC	H5	2	17697
5-40 NC	H7	2	17954
5-40 NC	H11	2	17675
6-32 NC	H5	2	15120
6-32 NC	H7	2	15126
6-32 NC	H11	2	15132
6-40 NF	H3	2	15150
6-48 NS	H2	2	15156
8-32 NC	H5	2	15180
8-32 NC	H7	2	15186
8-32 NC	H11	2	15192
8-40 NS	H2	2	15216
10-24 NC	H5	2	15234
10-24 NC	H7	2	15240
10-24 NC	H11	2	15246
10-32 NF	H4	2	15282
10-32 NF	H5	2	15288
10-32 NF	H7	2	15294
10-32 NF	H11	2	15300
10-40 NS	H2	2	15324
12-32 NEF	H3	2	15384
1/4-20 NC	H7	2	15492
1/4-20 NC	H11	2	15498
1/4-24 NS	H3	2	15534
1/4-28 NF	H5	2	15552
1/4-28 NF	H7	2	15558
1/4-28 NF	H11	2	15564
1/4-32 NEF	H3	2	15588
1/4-36 NS	H2	2	15594
1/4-36 NS	H3	2	17572
1/4-40 NS	H2	3	17573
5/16-18 NC	H11	2	15654

*bold numbers are EDPs for ordering

GENERAL PURPOSE

HSS Taps For Ferrous And Non-Ferrous Materials



Series 105 | Spiral Point Tap | Plug

Thread Size	Thread Limit	Flutes	EDP
5/16-18 NC	H7	2	15648
5/16-24 NF	H5	2	17737
5/16-24 NF	H11	2	15706
5/16-32 NEF	H3	2	15728
3/8-16 NC	H3	2	17738
3/8-16 NC	H7	3	15764
3/8-16 NC	H11	3	15769
3/8-24 NF	H5	3	15846
3/8-24 NF	H7	3	15851
3/8-24 NF	H11	3	15856
3/8-32 NEF	H3	3	15876
7/16-14 NC	H11	3	15906
7/16-20 NF	H11	3	15961
15/32-32 NS	H3	3	16011
1/2-13 NC	H11	3	16046
1/2-20 NF	H11	3	16138
1/2-28 NEF	H3	3	16163
9/16-12 NC	H3	3	18331
9/16-18 NF	H3	3	18337
9/16-18 NF	H5	3	17655
9/16-18 NF	H11	3	16213
9/16-20 NS	H3	3	16223
5/8-11 NC	H11	3	16273
5/8-18 NF	H3	3	18353
5/8-18 NF	H5	3	17683
3/4-10 NC	H11	3	16452
3/4-16 NF	H3	3	18374
3/4-16 NF	H5	3	17692
7/8-9 NC	H4	3	16645
7/8-14 NF	H4	3	17656
1-14 NS	H4	3	17906
1-8 NC	H4	3	16778
1-8 NC	H11	3	16783
1-1/4-7	H4	3	17920

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

HSS Taps For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

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THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Spiral Point Tap - Metric</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Stocked Bright finish • Gun tap for through holes • ANSI Tap - Refer to USCTI Table 302/303 for dimensions • Custom taps as fast as 24hrs 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 105M Spiral Point Tap | Metric | Plug

Thread Size	Thread Limit	Flutes	EDP
M1.6 X 0.35	D3	0	20008
M1.8 X 0.35	D3	0	20020
M2 X 0.4	D3	2	20032
M2.5 X 0.45	D1	2	20050
M2.2 X 0.45	D3	2	20044
M2.5 X 0.45	D3	2	20056
M3 X 0.5	D1	2	20062
M3 X 0.5	D3	2	20068
M3 X 0.5	D5	2	21021
M3 X 0.5	D7	2	20938
M3.5 X 0.6	D1	2	20083
M3.5 X 0.6	D4	2	20089
M3.5 X 0.6	D11	2	20110
M4 X 0.7	D2	2	20122
M4 X 0.7	D4	2	20128
M4 X 0.7	D5	2	21033
M4 X 0.70	D7	2	20923
M4 X 0.7	D11	2	20149
M4.5 X .75	D2	2	20161
M4.5 X .75	D4	2	20167
M4.5 X .75	D11	2	20188
M5 X 0.8	D3	2	20912
M5 X 0.8	D2	2	20200
M5 X 0.8	D4	2	20206
M5 X 0.8	D7	2	20924
M5 X 0.8	D11	2	20227
M5 X 0.9	D3	2	21186
M5.5 X 0.9	D3	2	21191
M6 X 0.75	D3	2	20278
M6 X 1.0	D3	2	20239
M6 X 1.0	D5	2	20245
M6 X 1.0	D11	2	20266
M7 X 1.0	D5	2	20288
M7 X 1.0	D11	2	20307
M8 X 1.0	D3	2	20351
M8 X 1.0	D5	2	20356
M8 X 1.0	D11	2	20374
M8 X 1.25	D3	2	20317
M8 X 1.25	D5	2	20322
M8 X 1.25	D11	2	20341
M10 X 1.0	D5	3	20978
M10 X 1.25	D3	3	20418
M10 X 1.25	D5	3	20423
M10 X 1.5	D11	3	20441
M10 X 1.5	D3	3	20384

*bold numbers are EDPs for ordering

GENERAL PURPOSE

HSS Taps For Ferrous And Non-Ferrous Materials



Series 105M Spiral Point Tap | Metric | Plug

Thread Size	Thread Limit	Flutes	EDP
M10 X 1.5	D6	3	20389
M10 X 1.5	D7	3	21043
M11 X 1.5	D6	3	20451
M12 X 1.0	D5	3	20914
M12 X 1.25	D3	3	20490
M12 X 1.25	D5	3	20495
M12X1.5	D6	3	21027
M12 X 1.75	D3	3	20456
M12 X 1.75	D6	3	20461
M12 X 1.75	D11	3	20480
M14 X 1.5	D3	3	20538
M14 X 1.5	D6	3	20543
M14 X 2	D3	3	20523
M14 X 2	D7	3	20528
M16 X 1.5	D3	3	20579
M16 X 1.5	D6	3	20584
M16 X 2	D4	3	20559
M16 X 2	D7	3	20564
M16 X 2	D11	3	20574
M18 X 2.5	D7	3	20599
M20 X 2.5	D7	3	20634
M24X3.0	D8	3	21029

*bold numbers are EDPs for ordering

Popular Custom Threading Options

- Special Pitch Diameter limits
- Custom thread forms
- Tailored dimensions and chamfers
- Variety of enhanced PVD tool coatings

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FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Forming Tap</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Stocked Bright finish • Forming tap eliminates chips by displacing material to create threads • ANSI Tap - Refer to USCTI Table 302A for dimensions • Custom taps as fast as 24hrs 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 104 Forming Tap | Plug & Bottom

Thread Size	Thread Limit	Min Tap/Drill Size	Max Tap/Drill Size	Plug	Bottom
0-80 NF	H2	0.0536	0.0549	-	19000
0-80 NF	H3	0.0536	0.0549	-	19001
1-64 NC	H2	0.0650	0.0667	-	19002
1-64 NC	H3	0.0650	0.0667	-	19003
1-72 NF	H2	0.0659	0.0673	-	19004
1-72 NF	H3	0.0659	0.0673	-	19005
2-56 NC	H2	0.0769	0.0787	-	19006
2-56 NC	H3	0.0769	0.0787	-	19007
2-64 NF	H2	0.0780	0.0796	-	19008
2-64 NF	H3	0.0780	0.0796	-	19009
3-48 NC	H2	0.0884	0.0905	-	19010
3-48 NC	H3	0.0884	0.0905	-	19011
3-56 NF	H2	0.0899	0.0917	-	19012
3-56 NF	H3	0.0899	0.0917	-	19013
4-40 NC	H3	0.0993	0.1018	19014	19015
4-40 NC	H5	0.0993	0.1018	19016	19017
4-48 NF	H3	0.1014	0.1035	19018	19019
4-48 NF	H5	0.1014	0.1035	19020	19021
5-40 NC	H3	0.1123	0.1148	19022	19023
5-40 NC	H5	0.1123	0.1148	19024	19025
5-44 NF	H3	0.1135	0.1157	19026	19027
5-44 NF	H5	0.1135	0.1157	19028	19029
6-32 NC	H3	0.1221	0.1253	19030	19031
6-32 NC	H5	0.1221	0.1253	19032	19033
6-32 NC	H10	0.1221	0.1253	19034	19035
6-40 NF	H3	0.1253	0.1278	19036	19037
6-40 NF	H5	0.1253	0.1278	19038	19039
8-32 NC	H3	0.1481	0.1513	19040	19041
8-32 NC	H5	0.1481	0.1513	19042	19043
8-32 NC	H10	0.1481	0.1513	19044	19045
8-36 NF	H3	0.1498	0.1527	19046	19047
8-36 NF	H5	0.1498	0.1527	19048	19049
10-24 NC	H4	0.1688	0.1730	19050	19051
10-24 NC	H6	0.1688	0.1730	19052	19053
10-24 NC	H10	0.1688	0.1730	19054	19055
10-32 NF	H4	0.1741	0.1776	19056	19057
10-32 NF	H6	0.1741	0.1776	19058	19059
10-32 NF	H10	0.1741	0.1776	19060	19061
12-24 NC	H4	0.1948	0.1990	19062	19063
12-24 NC	H6	0.1948	0.1990	19064	19065
12-28 NF	H4	0.1978	0.2014	19066	19067
12-28 NF	H6	0.1978	0.2014	19068	19069
1/4-20 NC	H4	0.2245	0.2296	19070	19071
1/4-20 NC	H6	0.2245	0.2296	19072	19073
1/4-20 NC	H10	0.2245	0.2296	19074	19075

*bold numbers are EDPs for ordering

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Series 104 Forming Tap | Plug & Bottom

Thread Size	Thread Limit	Min Tap/Drill Size	Max Tap/Drill Size	Plug	Bottom
1/4-28 NF	H4	0.2318	0.2354	19076	19077
1/4-28 NF	H6	0.2318	0.2354	19078	19079
1/4-28 NF	H10	0.2318	0.2354	19080	19081
5/16-18 NC	H5	0.2842	0.2898	19082	19083
5/16-18 NC	H7	0.2842	0.2898	19084	19085
5/16-18 NC	0	0.2842	0.2898	19086	19087
5/16-24 NF	H5	0.2913	0.2955	19088	19089
5/16-24 NF	H7	0.2913	0.2955	19090	19091
5/16-24 NF	H10	0.2913	0.2955	19092	19093
3/8-16 NC	H5	0.3431	0.3495	19094	19095
3/8-16 NC	H7	0.3431	0.3495	19096	19097
3/8-16 NC	H10	0.3431	0.3495	19098	19099
3/8-24 NF	H5	0.3538	0.3580	19100	19101
3/8-24 NF	H7	0.3538	0.3580	19102	19103
3/8-24 NF	H10	0.3538	0.3580	19104	19105
7/16-14 NC	H5	0.4011	0.4084	19106	19107
7/16-14 NC	H8	0.4011	0.4084	19108	19109
7/16-20 NF	H5	0.4120	0.4171	19144	19145
7/16-20 NF	H8	0.4120	0.4171	19146	19147
1/2-13 NC	H5	0.4608	0.4686	19110	19111
1/2-13 NC	H8	0.4608	0.4686	19112	19113
1/2-20 NF	H5	0.4745	0.4796	19114	19115
1/2-20 NF	H8	0.4745	0.4796	19116	19117
1/2-20 NF	H10	0.4745	0.4796	19118	19119
9/16-12 NC	H7	0.5200	0.5285	19120	19121
9/16-12 NC	H10	0.5200	0.5285	19122	19123
9/16-18 NF	H7	0.5342	0.5398	19124	19125
9/16-18 NF	H10	0.5342	0.5398	19126	19127
5/8-11 NC	H7	0.5786	0.5879	19128	19129
5/8-11 NC	H10	0.5786	0.5879	19130	19131
5/8-18 NF	H7	0.5967	0.6023	19132	19133
5/8-18 NF	H10	0.5967	0.6023	19134	19135
3/4-10 NC	H7	0.6990	0.7092	19136	19137
3/4-10 NC	H10	0.6990	0.7092	19138	19139
3/4-16 NF	H7	0.7181	0.7245	19140	19141
3/4-16 NF	H10	0.7181	0.7245	19142	19143

*bold numbers are EDPs for ordering

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FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Forming Tap - Metric</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Stocked Bright finish • Forming tap eliminates chips by displacing material to create threads • ANSI Tap - Refer to USCTI Table 302A for dimensions • Custom taps as fast as 24hrs 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 104M Forming Tap | Metric | Plug & Bottom

Thread Size	Thread Limit	Min Tap/Drill Size	Max Tap/Drill Size	Plug	Bottom
M3 X 0.5	D5	2.7500	2.8000	19200	19201
M3.5 X 0.6	D6	3.1900	3.2600	19202	19203
M4 X 0.7	D6	3.6400	3.7100	19204	19205
M4.5 X 0.75	D6	4.1200	4.1700	19206	19207
M5 X 0.8	D7	4.5900	4.6700	19208	19209
M6 X 1.0	D8	5.5000	5.5900	19210	19211
M7 X 1.0	D8	6.4900	6.5600	19212	19213
M8 X 1.25	D9	7.3600	7.4900	19214	19215
M8 X 1.0	D8	7.4900	7.5600	19216	19217
M10 X 1.25	D9	9.3600	9.4500	19220	19221
M10 X 1.5	D10	9.2400	9.3900	19218	19219
M12 X 1.25	D10	11.3600	11.4500	19224	19225
M12 X 1.75	D11	11.1100	11.2900	19222	19223
M14 X 1.5	D11	13.2400	13.3400	19228	19229
M14 X 2.0	D12	12.9800	13.1200	19226	19227
M16 X 2.0	D14	14.9800	15.1200	19230	19231
M18 X 1.5	D12	17.2400	17.3400	19232	19233

*bold numbers are EDPs for ordering

Popular Custom Threading Options

- Special Pitch Diameter limits
- Custom thread forms
- Tailored dimensions and chamfers
- Variety of enhanced PVD tool coatings

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FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Pipe Tap - NPT/F</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Stocked Bright finish • Pipe tap for NPT/NPTF threads • ANSI Tap - Refer to USCTI Table 311 for dimensions • Custom taps as fast as 24hrs 	 	

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 131 | Pipe Tap | NPT/F | Extended Length | Plug

Thread Size	OAL	Flutes	EDP
1/16-27	4	4	17665
1/16-27	6	4	15410
1/8-27	4	4	15416
1/8-27	6	4	15419
1/8-27	8	4	17956
1/8-27	10	4	17959
1/8-27	12	4	17962
1/4-18	4	4	15458
1/4-18	6	4	15461
1/4-18	8	4	15467
3/8-18	6	4	15815
3/8-18	8	4	15821
1/2-14	6	4	16092
1/2-14	8	4	16098
1/2-14	10	4	17987
3/4-14	6	5	16511
3/4-14	8	5	16517
3/4-14	10	5	18105
1-11	6	5	16821
1-11	10	5	16824

*bold numbers are EDPs for ordering

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FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Pipe Tap - NPSF - 6"</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Stocked Bright finish • Pipe tap for NPSF threads • ANSI Tap - Refer to USCTI Table 311 for dimensions • Custom taps as fast as 24hrs 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 131F Pipe Tap | NPSF | 6" OAL | Plug

Thread Size	Standard	OAL(L)	Flutes	EDP
1/8-27	NPSF	6	4	17710
1/4-18	NPSF	6	4	17703
3/8-18	NPSF	6	4	17922
1/2-14	NPSF	6	4	17720

*bold numbers are EDPs for ordering

Popular Custom Threading Options

- Special Pitch Diameter limits
- Custom thread forms
- Tailored dimensions and chamfers
- Variety of enhanced PVD tool coatings

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FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Pipe Tap - NPS & NPSI</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Stocked Bright finish • Pipe tap for NPSI threads • ANSI Tap - Refer to USCTI Table 311 for dimensions • Custom taps as fast as 24hrs 	 	

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

● Best ○ Good

Series 1311 | Pipe Tap | NPS, NPSI | Plug

Thread Size	Standard	Flutes	EDP
1/8-27	NPSI	4	15431
1/4-18	NPSI	4	15476
3/8-18	NPSI	4	15827
1/2-14	NPSI	4	16104
3/4-14	NPSI	5	16523
1-1/4-11	NPS	5	17069
1-1/2-11	NPS	7	17240
2-11	NPS	7	17370

*bold numbers are EDPs for ordering

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FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Pipe Tap - NPT/F</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Stocked Bright finish • Spiral flute pipe tap for blind holes • ANSI Tap - Refer to USCTI Table 311 for dimensions • Custom taps as fast as 24hrs 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>	

● Best ○ Good

Series 132 Pipe Tap | NPT/F | Spiral Flute | Plug

Thread Size	Flutes	EDP
1/8-27	4	17554
1/4-18	4	15452
3/8-18	4	15809
1/2-14	4	16086
3/4-14	5	16505

*bold numbers are EDPs for ordering

Popular Custom Threading Options

- Special Pitch Diameter limits
- Custom thread forms
- Tailored dimensions and chamfers
- Variety of enhanced PVD tool coatings

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FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Pipe Tap - Interrupted Thread - NPT/F</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Stocked Bright finish • ANSI Tap - Refer to USCTI Table 311 for dimensions • Custom taps as fast as 24hrs 	 	

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

● Best ○ Good

Series 133 Pipe Tap | NPT/F | Interrupted Thread | Plug

Thread Size	OAL	Flutes	EDP
1/16-27	ANSI	5	17677
1/8-27	6	5	15422
1/4-18	6	5	15464
3/8-18	6	5	15818
1/2-14	6	5	16095
3/4-14	6	5	16514
1-11-1/2	6	5	18954
3-8 NS	ANSI	9	17478
3 1/2-8 NS	ANSI	9	17517
4-8 NS	ANSI	9	17547

*bold numbers are EDPs for ordering

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FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Pipe - British Standard - BSPP</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Stocked Bright finish • British standard (Whitworth) 55° pipe tap • Custom taps as fast as 24hrs 	 	

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 134 | Pipe Tap | British Standard | BSPP | 55° | Modified

Thread Size	Flutes	Plug	Bottom
1/8-28	4	15437	15438
1/4-19	4	15482	15483
3/8-19	4	15833	15834
1/2-14	4	16110	16111
3/4-14	5	16529	16530
1-11	5	16815	16816
1-1/4-11	5	17063	17064
1-1/2-11	7	17234	17235
2-11	7	17364	17365

*bold numbers are EDPs for ordering

Popular Custom Threading Options

- Special Pitch Diameter limits
- Custom thread forms
- Tailored dimensions and chamfers
- Variety of enhanced PVD tool coatings

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FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Pipe - British Standard - BSPT</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Stocked Bright finish • British standard (Whitworth) 55° pipe tap • Custom taps as fast as 24hrs 	 	

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

● Best ○ Good

Series 135 Pipe Tap | British Standard | BSPT | 55° | Modified

Thread Size	Flutes	Plug	Bottom
1/8-28	4	15434	15435
1/4-19	4	15479	15480
3/8-19	4	15830	15831
1/2-14	4	16107	16108
3/4-14	5	16526	16527
1-11	5	16812	16813
1-1/4-11	5	17060	17061
1-1/2-11	7	17231	17232
2-11	7	17361	17362

*bold numbers are EDPs for ordering

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FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Pipe - British Standard - BSPP</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Stocked Bright finish • British standard (Whitworth) 55° pipe tap • Custom taps as fast as 24hrs 	 	

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 136P Pipe Tap | British Standard | BSPP | 55° | Full

Thread Size	Flutes	Plug	Bottom
1/8-28	4	17923	18117
1/4-19	4	17924	18119
3/8-19	4	17925	18121
1/2-14	4	17926	18123
3/4-14	5	17927	18125
1-11	5	17928	18127
1-1/4-11	5	17929	18129
1-1/2-11	7	17930	18131
2-11	7	17931	-

*bold numbers are EDPs for ordering

Popular Custom Threading Options

- Special Pitch Diameter limits
- Custom thread forms
- Tailored dimensions and chamfers
- Variety of enhanced PVD tool coatings

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FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Pipe - British Standard - BSPT</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Stocked Bright finish • British standard (Whitworth) 55° pipe tap • Custom taps as fast as 24hrs 	 	

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>	

● Best ○ Good

Series 136 Pipe Tap | British Standard | BSPT | 55° | Full

Thread Size	Flutes	EDP
1/8-28	4	17932
1/4-19	4	17933
3/8-19	4	17934
1/2-14	4	17935
3/4-14	5	17936
1-11	5	17937
1-1/4-11	5	17938
1-1/2-11	7	17939
2-11	7	17940

*bold numbers are EDPs for ordering

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FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Pipe - British Standard - BSF/BSW</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Stocked Bright finish • British standard (Whitworth) 55° pipe tap • Custom taps as fast as 24hrs 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 137 Pipe Tap | British Standard | BSF/BSW | 55° | Modified

Thread Size	Standard	Flutes	Taper	Plug	Bottom
1/4-20	BSW	4	15529	15530	15531
1/4-26	BSF	4	17619	17620	17621
5/16-18	BSW	4	17624	17625	17626
5/16-22	BSF	4	15689	15690	15691
3/8-20	BSF	4	17629	17630	17631
1/2-12	BSW	4	16032	16033	16034
5/8-11	BSW	4	16264	16265	16266

*bold numbers are EDPs for ordering

GENERAL PURPOSE

HSS Taps For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION		APPLICATION	FEATURES																																								
<p>Hand Tap - Left Hand</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Stocked Bright finish • Left hand tap • ANSI Tap - Refer to USCTI Table 302/303 for dimensions • Custom taps as fast as 24hrs 																																											
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STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL																																
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																															
○	○	○			○	○	○	○			○																																

● Best ○ Good

Series 164 Hand Tap | Left Hand | Taper, Plug, Bottom

Thread Size	Thread Limit	Flutes	Taper	Plug	Bottom
0-80 NF	H1	2	-	17951	17952
2-56 NC	H2	2	15037	15038	15039
3-48 NC	H2	2	15049	15050	15051
4-40 NC	H2	3	15073	15074	15075
4-48 NF	H2	3	15085	15086	15087
5-40 NC	H2	3	15097	15098	15099
6-32 NC	H3	3	15109	15110	15111
6-40 NF	H2	3	15145	15146	15147
8-32 NC	H3	4	15169	15170	15171
8-36 NF	H2	4	15205	15206	15207
10-24 NC	H3	4	15229	15230	15231
10-32 NF	H3	4	15277	15278	15279
12-24 NC	H3	4	15373	15374	15375
12-28 NF	H3	4	15379	15380	15381
1/4-20 NC	H3	4	15487	15488	15489
1/4-28 NF	H3	4	15547	15548	15549
1/4-32 NEF	H3	4	17783	17784	17785
5/16-18 NC	H3	4	15643	15644	15645
5/16-24 NF	H3	4	15695	15696	15697
3/8-16 NC	H3	4	15755	15756	15757
3/8-24 NF	H3	4	15842	15843	15844
7/16-14 NC	H3	4	15902	15903	15904
7/16-20 NF	H3	4	15947	15948	15949
1/2-13 NC	H3	4	16037	16038	16039
1/2-20 NF	H3	4	16129	16130	16131
9/16-12 NC	H3	4	16189	16190	16191
9/16-18 NF	H3	4	16204	16205	16206
5/8-11 NC	H3	4	16269	16270	16271
5/8-18 NF	H3	4	16329	16330	16331
11/16-11 NS	H3	4	16383	16384	16385
11/16-16 NS	H3	4	16388	16389	16390
11/16-18 NS	H3	4	17575	17576	17577
3/4-10 NC	H3	4	16448	16449	16450
3/4-16 NF	H3	4	16533	16534	16535
3/4-16 NF	H5	4	17787	17788	17789
3/4-20 NEF	H3	6	17662	17663	17664
7/8-9 NC	H4	4	16641	16642	16643
7/8-14 NF	H4	4	16670	16671	16672
1-8 NC	H4	4	16774	16775	16776
1-12 NF	H4	4	16828	16829	16830
1-14 NS	H4	4	16843	16844	16845
1-16 NS	H3	6	17694	17695	17696
1-20 NEF	H3	6	17579	17580	17581
1-1/8-7 NC	H4	4	16938	16939	16940
1-1/8-12 NF	H4	4	16950	16951	16952

*bold numbers are EDPs for ordering

GENERAL PURPOSE

HSS Taps For Ferrous And Non-Ferrous Materials



Series 164 Hand Tap | Left Hand | Taper, Plug, Bottom

Thread Size	Thread Limit	Flutes	Taper	Plug	Bottom
1-1/4-7 NC	H4	4	17028	17029	17030
1-1/4-12 NS	H4	6	17075	17076	17077
1 3/8-6 NC	H4	4	17153	17154	17155
1 3/8-12 NF	H4	6	17165	17166	17167
1-1/2-6 NC	H4	4	17203	17204	17205
1-1/2-12 NS	H4	6	17243	17244	17245

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Popular Custom Threading Options

- Special Pitch Diameter limits
- Custom thread forms
- Tailored dimensions and chamfers
- Variety of enhanced PVD tool coatings

CUSTOM COMES STANDARD

GENERAL PURPOSE

HSS Taps For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES																																							
<p>Hand Tap - Left Hand</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Stocked Bright finish • Left hand tap • ANSI Tap - Refer to USCTI Table 302/303 for dimensions • Custom taps as fast as 24hrs 																																									
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STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL																														
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																													
○	○	○			○	○	○	○			○																														

● Best ○ Good

Series 164M Hand Tap | Left Hand | Metric | Taper, Plug, Bottom

Thread Size	Thread Limit	Flutes	Taper	Plug	Bottom
M4 X 0.7	D4	4	20135	20136	20137
M4.5 X 0.75	D4	4	20174	20175	20176
M5 X 0.8	D4	4	20213	20214	20215
M6 X 1.0	D5	4	20252	20253	20254
M7 X 1.0	D5	4	20294	20295	20296
M8 X 1.25	D5	4	20328	20329	20330
M8 X 1.0	D5	4	20362	20363	20364
M10 X 1.25	D5	4	20429	20430	20431
M10 X 1.5	D6	4	20395	20396	20397
M12 X 1.25	D5	4	20501	20502	20503
M12 X 1.75	D6	4	20467	20468	20469
M14 X 1.5	D6	4	20550	20551	20552
M14 X 2	D7	4	20534	20535	20536
M16 X 1.5	D6	4	20590	20591	20592
M16 X 2	D7	4	20570	20571	20572
M18 X 1.5	D6	4	20625	20626	20627
M18 X 2.5	D7	4	20605	20606	20607
M20 X 1.5	D6	4	20660	20661	20662
M20 X 2.5	D7	4	20640	20641	20642
M22 X 1.5	D6	4	20695	20696	20697
M22 X 2.5	D7	4	20680	20681	20682
M24 X 2	D7	4	20735	20736	20737
M24 X 3	D8	4	20715	20716	20717
M27 X 3	D8	4	20750	20751	20752
M30 X 3.5	D9	4	20780	20781	20782
M10 X 1.0	D5	4	20948	20949	20950

*bold numbers are EDPs for ordering

GENERAL PURPOSE

HSS Taps For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES																																							
<p>Spiral Point Tap - Left Hand</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Stocked Bright finish • Left hand spiral point tap for through holes • ANSI Tap - Refer to USCTI Table 302/303 for dimensions • Custom taps as fast as 24hrs 	 	 																																							
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STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL																														
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																													
○	○	○			○	○	○	○			○																														

Series 165 | Spiral Point Tap | Left Hand | Plug

Thread Size	Thread Limit	Flutes	EDP
0-80 NF	H1	0	15012
0-80 NF	H1	2	17953
2-56 NC	H2	2	15036
3-48 NC	H2	2	15048
4-40 NC	H2	2	15072
4-48 NF	H2	2	15083
5-40 NC	H2	2	15096
6-32 NC	H3	2	15108
8-32 NC	H3	2	15168
8-36 NF	H2	2	15204
10-24 NC	H3	2	15228
10-32 NF	H3	2	15276
1/4-20 NC	H3	2	15486
1/4-28 NF	H3	2	15546
5/16-18 NC	H3	2	15642
5/16-24 NF	H3	2	15694
3/8-16 NC	H3	3	15754
3/8-24 NF	H3	3	15841
7/16-14 NC	H3	3	15901
1/2-13 NC	H3	3	16036
1/2-20 NF	H3	3	16128
5/8-11 NC	H3	3	16268

*bold numbers are EDPs for ordering

GENERAL PURPOSE

HSS Taps For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES																																							
<p>Hand Tap - STI</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Stocked Bright finish • Screw thread insert (STI) tap for helicoil threads • ANSI-STI tap dimensions apply • Custom taps as fast as 24hrs 	 	 																																							
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STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL																														
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																													
○	○	○			○	○	○	○			○																														

● Best ○ Good

Series 166 Hand Tap | Screw Thread Insert (STI) | Plug & Bottom

Thread Size	Thread Limit	Flutes	Plug	Bottom
4-40 NC	H1	3	17794	17795
4-40 NC	H2	3	17798	17799
6-32 NC	H2	3	17802	17803
6-32 NC	H3	3	17806	17807
8-32 NC	H2	3	17810	17811
8-32 NC	H3	3	17814	17815
10-24 NC	H2	3	17818	17819
10-24 NC	H3	3	17822	17823
10-32 NF	H2	3	17826	17827
10-32 NF	H3	3	17830	17831
1/4-20 NC	H2	3	17834	17835
1/4-20 NC	H3	3	17838	17839
1/4-28 NF	H2	3	17842	17843
1/4-28 NF	H3	3	17846	17847
5/16-18 NC	H3	4	17850	17851
5/16-18 NC	H4	4	17854	17855
5/16-24 NF	H2	4	17858	17859
5/16-24 NF	H3	4	17862	17863
3/8-16 NC	H3	4	17866	17867
3/8-16 NC	H4	4	17870	17871
3/8-24 NF	H2	4	17874	17875
3/8-24 NF	H3	4	17878	17879
7/16-14 NC	H3	4	17882	17883
7/16-20 NF	H3	4	17886	17887
1/2-13 NC	H3	4	17890	17891
1/2-20 NF	H3	4	17894	17895

*bold numbers are EDPs for ordering

GENERAL PURPOSE

HSS Taps For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Spiral Point Tap - STI</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Stocked Bright finish • Screw thread insert (STI) tap for helicoil threads • ANSI-STI tap dimensions apply • Custom taps as fast as 24hrs 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 167 | Spiral Point Tap | Screw Thread Insert (STI) | Plug

Thread Size	Thread Limit	Flutes	EDP
4-40 NC	H1	2	17796
4-40 NC	H2	2	17800
6-32 NC	H2	2	17804
6-32 NC	H3	2	17808
8-32 NC	H2	2	17812
8-32 NC	H3	2	17816
10-24 NC	H2	2	17820
10-24 NC	H3	2	17824
10-32 NF	H2	2	17828
10-32 NF	H3	2	17832
1/4-20 NC	H2	2	17836
1/4-20 NC	H3	2	17840
1/4-28 NF	H2	2	17844
1/4-28 NF	H3	2	17848
5/16-18 NC	H3	3	17852
5/16-18 NC	H4	3	17856
5/16-24 NF	H2	3	17860
5/16-24 NF	H3	3	17864
3/8-16 NC	H3	3	17868
3/8-16 NC	H4	3	17872
3/8-24 NF	H2	3	17876
3/8-24 NF	H3	3	17880
7/16-14 NC	H3	3	17884
7/16-20 NF	H3	3	17888
1/2-13 NC	H3	3	17892
1/2-20 NF	H3	3	17896

*bold numbers are EDPs for ordering

GENERAL PURPOSE

HSS Taps For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION		APPLICATION	FEATURES																																							
<p>Conduit Tap</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Stocked Bright finish • Conduit tap • Custom conduit taps in 3-5 days pending blank availability 		 	 	 																																						
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STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL																															
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																														
○	○	○			○	○	○	○			○																															

● Best ○ Good

Series 170C **Conduit Tap | Metric | PG7 - PG48 | Plug & Bottom**

Thread Size	Pipe Size	Flutes	Plug	Bottom
M12.5X1.27	PG7	4	20992	20993
M15.2X1.41	PG9	4	20995	20996
M18.6X1.41	PG11	4	20998	20999
M20.4X1.41	PG13	4	21001	21002
M22.5X1.41	PG16	4	21004	21005
M28.3X1.588	PG21	6	21007	21008
M37X1.588	PG29	6	21010	21011
M47X1.588	PG36	6	21013	21014
M54X1.588	PG42	6	21016	21017
M59.3X1.588	PG48	6	21019	21020

*bold numbers are EDPs for ordering

Popular Custom Threading Options

<ul style="list-style-type: none"> Special Pitch Diameter limits Custom thread forms Tailored dimensions and chamfers Variety of enhanced PVD tool coatings 	<p>CUSTOM COMES STANDARD</p>	
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GENERAL PURPOSE

HSS Taps For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>ACME Tap</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Stocked Bright finish • 2G Class of Fit • see ACME table for tap dimensions • For ACME taps, chamfer length designations are approximate and may be shorter or longer than standard • Custom ACME taps in 3-5 days pending blank availability 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 168 Hand Tap | ACME | Taper, Plug


Thread Size	Class of Fit	Taper	Plug
1/2-10	2G	16016	16017
5/8-8	2G	16248	16249
3/4-5	2G	-	18102
3/4-6	2G	16431	16432
3/4-8	2G	16441	16442
3/4-10	2G	16492	16493
7/8-6	2G	16630	16631
1-5	2G	16759	16760
1-8	2G	16769	16770
1-1/8-5	2G	16928	16929
1-1/4-5	2G	17018	17019
1 3/8-4	2G	17143	17144
1-1/2-4	2G	17193	17194








*bold numbers are EDPs for ordering

GENERAL PURPOSE

HSS Taps For Ferrous And Non-Ferrous Materials





FEATURES/DESCRIPTION				APPLICATION		FEATURES						
ACME Tap - Tandem <ul style="list-style-type: none"> Popular Specials High Speed Steel (HSS) Stocked Bright finish ACME tandem tap 2G Class of Fit For ACME taps, chamfer length designations are approximate and may be shorter or longer than standard Custom ACME taps in 3-5 days pending blank availability 				 		    						
STEEL		STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL		
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

● Best ○ Good

Series 168T Hand Tap | ACME | Tandem | 2G

Thread Size	Class of Fit	Flutes	EDP
3/8-12	2G	4	15752
1/2-10	2G	4	16023
5/8-8	2G	4	16255
3/4-6	2G	4	16438
3/4-8	2G	4	16444
7/8-6	2G	4	16637
1-5	2G	4	16766
1-1/8-5	2G	4	16935
1-1/4-5	2G	4	17025
1 3/8-4	2G	4	17150
1-1/2-4	2G	4	17200

*bold numbers are EDPs for ordering

Popular Custom Threading Options

- Special Pitch Diameter limits
- Custom thread forms
- Tailored dimensions and chamfers
- Variety of enhanced PVD tool coatings

**CUSTOM
COMES
STANDARD**



INTRO
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 INSERTS

GENERAL PURPOSE

HSS Taps For Ferrous And Non-Ferrous Materials



INTRO

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FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>ACME Tap - Left Hand</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Stocked Bright finish • ACME Left Hand tap • 2G Class of Fit • For ACME taps, chamfer length designations are approximate and may be shorter or longer than standard • Custom ACME taps in 3-5 days pending blank availability 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>	

● Best ○ Good

Series 169 Hand Tap | ACME | Left Hand | Taper & Plug

Thread Size	Class of Fit	Flutes	Taper	Plug
1/2-10	2G	4	16020	16021
5/8-8	2G	4	16252	16253
3/4-6	2G	4	16435	16436
7/8-6	2G	4	16634	16635
1-5	2G	4	16763	16764
1-1/8-5	2G	4	16932	16933
1-1/4-5	2G	4	17022	17023
1 3/8-4	2G	4	17147	17148
1-1/2-4	2G	4	17197	17198

*bold numbers are EDPs for ordering

GENERAL PURPOSE

HSS Taps For Ferrous And Non-Ferrous Materials



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FEATURES/DESCRIPTION	APPLICATION	FEATURES																																							
<p>ACME Tap - Tandem LH</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Stocked Bright finish • ACME tandem left handed tap • 2G Class of Fit • For ACME taps, chamfer length designations are approximate and may be shorter or longer than standard • Custom ACME taps in 3-5 days pending blank availability 	 	 																																							
<table border="1"> <thead> <tr> <th colspan="3">STEEL</th> <th colspan="2">STAINLESS</th> <th colspan="2">CAST IRON</th> <th colspan="2">NON-FERROUS</th> <th colspan="2">HSSA</th> <th colspan="2">HARDENED STEEL</th> </tr> <tr> <th>P1</th> <th>P2</th> <th>P3</th> <th>M1</th> <th>M2</th> <th>K1</th> <th>K2</th> <th>N1</th> <th>N2</th> <th>S1</th> <th>S2</th> <th>H1</th> <th>H2</th> </tr> </thead> <tbody> <tr> <td><input type="radio"/></td> <td><input type="radio"/></td> <td><input type="radio"/></td> <td></td> <td></td> <td><input type="radio"/></td> <td><input type="radio"/></td> <td><input type="radio"/></td> <td><input type="radio"/></td> <td><input type="radio"/></td> <td><input type="radio"/></td> <td><input type="radio"/></td> <td><input type="radio"/></td> </tr> </tbody> </table>			STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL		P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL																														
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● Best ○ Good

Series 169T Hand Tap | ACME | Tandem | Left Hand

Thread Size	Class of Fit	Flutes	EDP
1/2-10	2G	4	16024
5/8-8	2G	4	16256
3/4-6	2G	4	16439
3/4-8	2G	4	16445
7/8-6	2G	4	16638
1-5	2G	4	16767
1-1/8-5	2G	4	16936
1-1/4-5	2G	4	17026
1-1/2-4	2G	4	17201

*bold numbers are EDPs for ordering

Popular Custom Threading Options

- Special Pitch Diameter limits
- Custom thread forms
- Tailored dimensions and chamfers
- Variety of enhanced PVD tool coatings

CUSTOM
COMES
STANDARD

GENERAL PURPOSE

HSS Taps For Ferrous And Non-Ferrous Materials



INTRO

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FEATURES/DESCRIPTION		APPLICATION	FEATURES																																							
<p>Pulley/Extended Length Tap</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Stocked Bright finish • Extended length/pulley hand taps 		 	 																																							
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STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL																															
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																														
○	○	○			○	○	○	○			○																															

● Best ○ Good

Series 101L Hand Tap | Pulley/Extended | Taper, Plug, Bottom

Thread Size	Thread Limit	OAL	Shank	Flutes	Taper	Plug	Bottom
6-32 NC	H3	6	0.141	3	15139	15140	15141
8-32 NC	H3	6	0.168	4	15199	15200	15201
10-24 NC	H3	6	0.194	4	15259	15260	15261
10-32 NF	H3	6	0.194	4	15313	15314	15315
1/4-20 NC	H3	6	0.255	4	15517	15518	15519
1/4-20 NC	H3	8	0.255	4	15523	15524	15525
1/4-20 NC	H3	6	0.185	4	-	17570	17571
1/4-28 NF	H3	6	0.255	4	15577	15578	15579
5/16-18 NC	H3	6	0.240	4	-	17608	17609
5/16-18 NC	H3	6	0.318	4	15672	15673	15674
5/16-18 NC	H3	8	0.318	4	15677	15678	15679
5/16-24 NF	H3	6	0.318	4	15712	15713	15714
3/8-16 NC	H3	6	0.381	4	15785	15786	15787
3/8-16 NC	H5	6	0.381	4	17657	17658	17659
3/8-16 NC	H3	8	0.381	4	15790	15791	15792
3/8-16 NC	H3	10	0.381	4	15795	15796	15797
3/8-16 NC	H3	6	0.275	4	15800	15801	15802
3/8-24 NF	H3	6	0.381	4	15862	15863	15864
7/16-14 NC	H3	6	0.323	4	15932	15933	15934
7/16-20 NF	H3	6	0.323	4	15972	15973	15974
7/16-20 NF	H3	6	0.444	4	15967	15968	15969
1/2-13 NC	H3	6	0.367	4	16082	16083	16084
1/2-13 NC	H3	8	0.367	4	-	17973	17974
1/2-13 NC	H3	10	0.367	4	-	17978	17979
1/2-13 NC	H3	12	0.367	4	-	17983	17984
1/2-20 NF	H3	6	0.507	4	16144	16145	16146
1/2-20 NF	H3	6	0.367	4	16149	16150	16151
9/16-12 NC	H3	6	0.429	4	-	17653	17654
9/16-18 NF	H3	6	0.429	4	16219	16220	16221
5/8-11 NC	H3	6	0.480	4	16308	16309	16310
5/8-11 NC	H3	8	0.480	4	16313	16314	16315
5/8-11 NC	H3	10	0.480	4	-	17991	17992
5/8-11 NC	H3	12	0.480	4	-	17996	17997
5/8-18 NF	H3	6	0.480	4	16343	16344	16345
3/4-10 NC	H3	6	0.590	4	16477	16478	16479
3/4-10 NC	H3	8	0.590	4	16482	16483	16484
3/4-10 NC	H3	10	0.590	4	16487	16488	16489
7/8-9 NC	H4	8	0.697	4	17699	17700	17701
1-8 NC	H4	8	0.800	4	16793	16794	16795
1-8 NC	H4	10	0.800	4	16798	16799	16800
1-8 NC	H4	12	0.800	4	-	18109	18110
1-1/4-7 NC	H4	10	1.021	4	17036	17037	17038
1-1/4-7 NC	H4	12	1.021	4	17040	17041	17042
1-1/4-8 NS	H5	10	1.021	4	17048	17049	17050
1-1/4-8 NS	H5	12	1.021	4	17052	17053	17054

*bold numbers are EDPs for ordering

GENERAL PURPOSE

HSS Taps For Ferrous And Non-Ferrous Materials



Series 101L Hand Tap | Pulley/Extended | Taper, Plug, Bottom

Thread Size	Thread Limit	OAL	Shank	Flutes	Taper	Plug	Bottom
1-1/2-6 NC	H4	10	1.233	4	17207	17208	17209
1-1/2-6 NC	H4	12	1.233	4	17211	17212	17213
1-1/2-8 NS	H5	10	1.233	4	17219	17220	17221
1-1/2-8 NS	H5	12	1.233	4	17223	17224	17225

*bold numbers are EDPs for ordering

Popular Custom Threading Options

- Special Pitch Diameter limits
- Custom thread forms
- Tailored dimensions and chamfers
- Variety of enhanced PVD tool coatings

CUSTOM COMES STANDARD

INTRO

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GENERAL PURPOSE

HSS Taps For Ferrous And Non-Ferrous Materials



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FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Pulley/Extended Length Tap</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Stocked Bright finish • Extended length/pulley gun taps 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 105L | Spiral Point Tap | Pulley/Extended | Plug

Thread Size	Thread Limit	OAL	Shank	Flutes	EDP
6-32 NC	H3	4	0.141	2	17605
6-32 NC	H3	6	0.141	2	15138
8-32 NC	H3	4	0.168	2	17582
8-32 NC	H3	6	0.168	2	15198
10-24 NC	H3	4	0.194	2	17606
10-24 NC	H3	6	0.194	2	15258
10-32 NF	H3	6	0.194	2	15312
10-32 NF	H3	4	0.194	2	17583
1/4-20 NC	H3	4	0.255	2	17584
1/4-20 NC	H3	6	0.185	2	17569
1/4-20 NC	H3	4	0.185	2	17964
1/4-20 NC	H3	6	0.255	2	15516
1/4-28 NF	H3	6	0.255	2	15576
1/4-28 NF	H3	4	0.185	2	17965
1/4-28 NF	H3	6	0.185	2	17607
5/16-18 NC	H3	4	0.318	2	17585
5/16-18 NC	H3	6	0.240	2	17610
5/16-18 NC	H3	4	0.240	2	17966
5/16-18 NC	H3	6	0.318	2	15671
5/16-24 NF	H3	6	0.318	2	15711
5/16-24 NF	H3	6	0.240	2	17611
5/16-24 NF	H3	4	0.240	2	17967
3/8-16 NC	H3	6	0.381	3	15784
3/8-16 NC	H3	6	0.275	3	15799
3/8-16 NC	H5	6	0.381	3	17666
3/8-16 NC	H3	4	0.381	3	17586
3/8-16 NC	H3	4	0.275	3	17969
3/8-24 NF	H3	4	0.275	3	17970
3/8-24 NF	H3	6	0.381	3	15861
7/16-14 NC	H3	6	0.323	3	15931
7/16-20 NF	H3	6	0.323	3	15971
1/2-13 NC	H3	6	0.367	3	16081
1/2-20 NF	H3	6	0.367	3	16148
5/8-11 NC	H3	6	0.480	3	16307
3/4-10 NC	H3	6	0.590	3	17632

*bold numbers are EDPs for ordering

GENERAL PURPOSE

HSS Taps For Ferrous And Non-Ferrous Materials



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FEATURES/DESCRIPTION		APPLICATION	FEATURES																																							
<p>Pulley/Extended Length Tap</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Stocked Bright finish • Extended length/pulley hand taps 		 	 	 																																						
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STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL																															
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																														
○	○	○			○	○	○	○			○																															

● Best ○ Good

Series 108M Hand Tap | Pulley/Extended | Metric | Taper, Plug, Bottom

Thread Size	Thread Limit	OAL	Shank	Flutes	Taper	Plug	Bottom
M3.5 X 0.6	D4	6	0.141	3	20117	20118	20119
M4 X 0.7	D4	6	0.168	4	-	20157	20158
M4.5 X 0.75	D4	6	0.194	4	20195	20196	20197
M5 X 0.8	D4	6	0.194	4	-	20235	20236
M6 X 1.0	D5	6	0.255	4	-	20274	20275
M8 X 1.25	D5	6	0.318	4	20347	20348	20349
M10 X 1.5	D6	6	0.381	4	20414	20415	20416
M10X1.5	D6	6	0.323	4	-	21194	21195
M12 X 1.75	D6	6	0.367	4	20486	20487	20488
M16 X 2.0	D7	6	0.480	4	20954	20953	20952
M20 X 2.5	D7	6	0.652	4	20934	20933	20932

*bold numbers are EDPs for ordering

Popular Custom Threading Options

- Special Pitch Diameter limits
- Custom thread forms
- Tailored dimensions and chamfers
- Variety of enhanced PVD tool coatings

**CUSTOM
COMES
STANDARD**

GENERAL PURPOSE

HSS Taps For Ferrous And Non-Ferrous Materials



INTRO

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FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Pulley/Extended Length Tap</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Stocked Bright finish • Extended length/pulley gun taps 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

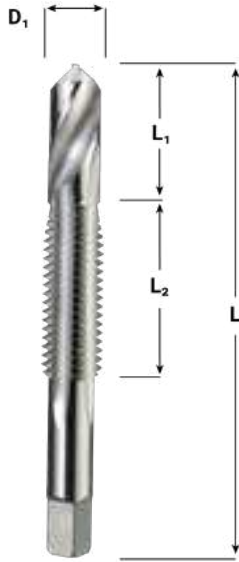
Series 109M | Spiral Point Tap | Pulley/Extended | Metric | Plug

Thread Size	Thread Limit	OAL	Shank	Flutes	EDP
M3.5 X 0.6	D4	6	0.141	2	20116
M4 X 0.7	D4	6	0.168	2	20155
M4.5 X .75	D4	6	0.194	2	20194
M5 X 0.8	D4	6	0.194	2	20233
M6 X 1.0	D5	6	0.255	2	20272
M8 X 1.25	D5	6	0.318	2	21022
M10 X 1.5	D6	6	0.381	3	21026
M12 X 1.75	D6	6	0.367	3	20913
M16 X 2	D7	6	0.480	3	21028

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Combination Drill/Tap For Ferrous And Non-Ferrous Materials



FEATURES/DESCRIPTION		APPLICATION	FEATURES																																							
<p>Combo Drill/Tap</p> <ul style="list-style-type: none"> Popular Specials High Speed Steel (HSS) Combination drill and tap in one tool Stocked Bright finish 																																										
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STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL																															
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																														
○	○	○			○	○	○	○			○																															

● Best ○ Good

Series 156 | General Purpose | Combo Drill/Tap

Thread Size	Cutter Dia. (D ₁)	OAL (L)	Drill Len. (L ₁)	Thread Len. (L ₂)	EDP
4-40 NC	0.091	1 1/78	1/4	3/8	29000
6-32 NC	0.112	2	5/16	7/16	29004
8-32 NC	0.138	2 1/8	3/8	1/2	29006
10-24 NC	0.155	2 3/8	13/32	5/8	29008
10-32 NF	0.164	2 3/8	13/32	5/8	29009
12-24 NC	0.180	2 3/8	15/32	21/32	29010
1/4-20 NC	0.208	2 1/2	17/32	25/32	29012
1/4-28 NF	0.220	2 1/2	17/32	25/32	29013
5/16-18 NC	0.266	2 23/32	11/16	15/16	29014
5/16-24 NF	0.277	2 23/32	11/16	15/16	29015
3/8-16 NC	0.322	2 15/16	13/16	1-1/8	29016
3/8-24 NF	0.340	2 15/16	13/16	1-1/8	29017
7/16-14 NC	0.377	3 3/4	1	1-1/4	29018
7/16-20 NF	0.395	3 3/4	1	1-1/4	29019
1/2-13 NC	0.435	4 1/16	1-1/8	1-3/8	29020
1/2-20 NF	0.458	4 1/16	1-1/8	1-3/8	29022
5/8-11 NC	0.548	5 1/16	1-1/2	1-3/8	29036

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

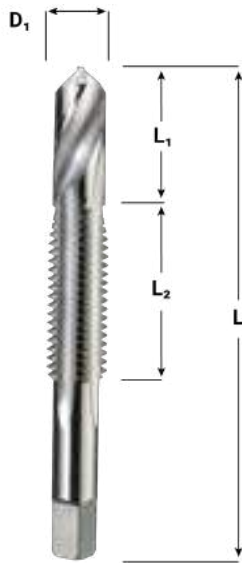
HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Combination Drill/Tap For Ferrous And Non-Ferrous Materials



FEATURES/DESCRIPTION		APPLICATION	FEATURES																																							
<p>COST CUTTER™</p> <p>Combo Drill/Tap</p> <ul style="list-style-type: none"> Popular Specials High Speed Steel (HSS) Combination drill and tap in one tool Stocked Bright finish 		 	 																																							
<table border="1"> <thead> <tr> <th colspan="3">STEEL</th> <th colspan="2">STAINLESS</th> <th colspan="2">CAST IRON</th> <th colspan="2">NON-FERROUS</th> <th colspan="2">HRSA</th> <th colspan="2">HARDENED STEEL</th> </tr> <tr> <th>P1</th> <th>P2</th> <th>P3</th> <th>M1</th> <th>M2</th> <th>K1</th> <th>K2</th> <th>N1</th> <th>N2</th> <th>S1</th> <th>S2</th> <th>H1</th> <th>H2</th> </tr> </thead> <tbody> <tr> <td>○</td> <td>○</td> <td>○</td> <td></td> <td></td> <td>○</td> <td>○</td> <td>○</td> <td>○</td> <td></td> <td></td> <td>○</td> <td></td> </tr> </tbody> </table>				STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL		P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2	○	○	○			○	○	○	○			○	
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL																															
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																														
○	○	○			○	○	○	○			○																															

● Best ○ Good

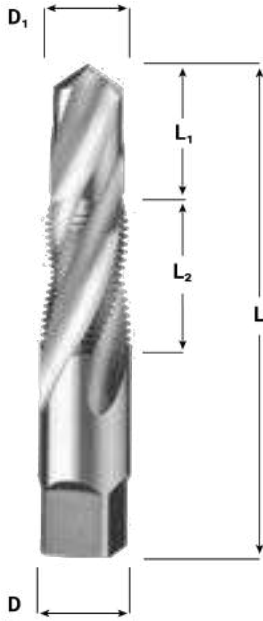
Series 156M **General Purpose | Combo Drill/Tap | Metric**

Thread Size	Cutter Dia. (D ₁)	OAL (L)	Drill Len. (L ₁)	Thread Len. (L ₂)	EDP
M3 X.5	0.102	1 15/16	9/32	13/32	29024
M3.5 X.6	0.120	2	5/16	7/16	29025
M4 X.7	0.134	2 1/8	3/8	1/2	29026
M4.5 X.7	0.152	2 3/8	13/32	5/8	29027
M5 X.8	0.172	2 3/8	13/32	5/8	29028
M6 X 1	0.203	2 1/2	17/32	25/32	29029
M7 X 1	0.242	2 23/32	11/16	15/16	29030
M8 X 1.25	0.274	2 23/32	11/16	15/16	29031
M10 X 1.5	0.344	2 15/16	13/16	1-1/8	29032
M12 X 1.75	0.414	4 1/16	1-1/8	1-3/8	29033

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Combination Drill/Tap For Ferrous And Non-Ferrous Materials



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>COST CUTTER™</p> <p>Combo Drill/Tap - NPTF</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Combination drill and tap in one tool • Stocked Bright finish 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 157 | General Purpose | Combo Drill/Tap | NPTF

Thread Size	Cutter Dia. (D ₁)	OAL (L)	Drill Len. (L ₁)	Thread Len. (L ₂)	EDP
1/16-27	0.242	2 13/16	11/16	11/16	29040
1/8-27	0.332	2 7/8	3/4	3/4	29041
1/4-18	0.438	3 5/16	7/8	1-1/16	29042
3/8-18	0.562	3 1/2	15/16	1-1/16	29043
1/2-14	0.703	4 3/8	1-1/4	1-3/8	29044
3/4-14	0.906	4 9/16	1 5/16	1-3/8	29045
1-11-1/2	1.141	5 3/8	1 5/8	1 3/4	29046

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

Combination Drill/Tap For Ferrous And Non-Ferrous Materials



INTRO

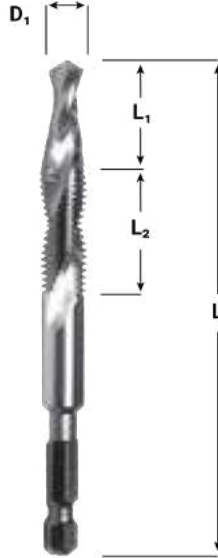
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION		APPLICATION	FEATURES																																							
<p>COST CUTTER™</p> <p>Combo Drill/Tap - Quick Change</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Combination drill and tap in one tool • Quick change hex adapter • Accessories and adapters available 																																										
<table border="1"> <thead> <tr> <th colspan="3">STEEL</th> <th colspan="2">STAINLESS</th> <th colspan="2">CAST IRON</th> <th colspan="2">NON-FERROUS</th> <th colspan="2">HSSA</th> <th colspan="2">HARDENED STEEL</th> </tr> <tr> <th>P1</th> <th>P2</th> <th>P3</th> <th>M1</th> <th>M2</th> <th>K1</th> <th>K2</th> <th>N1</th> <th>N2</th> <th>S1</th> <th>S2</th> <th>H1</th> <th>H2</th> </tr> </thead> <tbody> <tr> <td>○</td> <td>○</td> <td>○</td> <td></td> <td></td> <td>○</td> <td>○</td> <td>○</td> <td>○</td> <td></td> <td></td> <td>○</td> <td></td> </tr> </tbody> </table>				STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL		P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2	○	○	○			○	○	○	○			○	
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL																															
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																														
○	○	○			○	○	○	○			○																															

● Best ○ Good

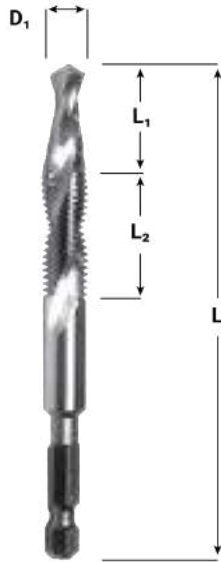
Series 158 | General Purpose | Combo Drill/Tap | Hex

Thread Size	Cutter Dia.(D ₁)	OAL(L)	Drill Len.(L ₁)	Thread Len.(L ₂)	Bright	TiN
4-40 NC	0.091	2 7/8	1/4	3/8	QC29000	QC29000-TiN
6-32 NC	0.112	3	7/16	7/16	QC29004	QC29004-TiN
8-32 NC	0.138	3 1/8	1/2	1/2	QC29006	QC29006-TiN
10-24 NC	0.155	3 3/8	5/8	5/8	QC29008	QC29008-TiN
10-32 NF	0.164	3 3/8	5/8	5/8	QC29009	QC29009-TiN
1/4-20 NC	0.208	3 1/2	25/32	25/32	QC29012	QC29012-TiN
1/4-28 NF	0.22	3 1/2	25/32	25/32	QC29013	QC29013-TiN
5/16-18 NC	0.266	3 23/32	11/16	15/16	QC29014	QC29014-TiN
5/16-24 NF	0.277	3 23/32	11/16	15/16	QC29015	QC29015-TiN
3/8-16 NC	0.322	3 15/16	13/16	1-1/8	QC29016	QC29016-TiN
3/8-24 NF	0.34	3 15/16	13/16	1-1/8	QC29017	QC29017-TiN

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Combination Drill/Tap For Ferrous And Non-Ferrous Materials



FEATURES/DESCRIPTION		APPLICATION	FEATURES																																							
<p>COST CUTTER™</p> <p>Combo Drill/Tap - Quick Change</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Combination drill and tap in one tool • Quick change hex adapter • Accessories and adapters available 		 	 																																							
<table border="1"> <thead> <tr> <th colspan="3">STEEL</th> <th colspan="2">STAINLESS</th> <th colspan="2">CAST IRON</th> <th colspan="2">NON-FERROUS</th> <th colspan="2">HSSA</th> <th colspan="2">HARDENED STEEL</th> </tr> <tr> <th>P1</th> <th>P2</th> <th>P3</th> <th>M1</th> <th>M2</th> <th>K1</th> <th>K2</th> <th>N1</th> <th>N2</th> <th>S1</th> <th>S2</th> <th>H1</th> <th>H2</th> </tr> </thead> <tbody> <tr> <td>○</td> <td>○</td> <td>○</td> <td></td> <td></td> <td>○</td> <td>○</td> <td>○</td> <td>○</td> <td></td> <td></td> <td>○</td> <td></td> </tr> </tbody> </table>				STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL		P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2	○	○	○			○	○	○	○			○	
STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL																															
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2																														
○	○	○			○	○	○	○			○																															

● Best ○ Good

Series 158M **General Purpose | Combo Drill/Tap | Hex | Metric**

Thread Size	Cutter Dia.(D ₁)	OAL(L)	Drill Len.(L ₁)	Thread Len.(L ₂)	Bright	TiN
M4 X 0.7	0.134	3 1/8	3/8	1/2	QC29026	QC29026-TiN
M4.5 X .75	0.152	3 3/8	13/32	5/8	QC29027	QC29027-TiN
M5 X 0.8	0.172	3 3/8	13/32	5/8	QC29028	QC29028-TiN
M6 X 1.0	0.203	3 1/2	17/32	25/32	QC29029	QC29029-TiN
M7 X 1.0	0.242	3 23/32	11/16	15/16	QC29030	QC29030-TiN
M8 X 1.25	0.274	3 23/32	11/16	15/16	QC29031	QC29031-TiN
M10 X 1.5	0.344	3 15/16	13/16	1-1/8	QC29032	QC29032-TiN

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

HSS Round Dies For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Round Die</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Split-round dies for creating external threads 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 141 General Purpose | Round Die

Thread Size	Outside Dia.	EDP	Thread Size	Outside Dia.	EDP
5-40 NC	13/16	13020	7/16-40 NS	1-1/2	13158
6-32 NC	1	13022	15/32-32 NS	1-1/2	13160
6-40 NF	1	13024	1/2-12 NS	1-1/2	13162
6-48 NS	1	13026	1/2-13 NC	1-1/2	13164
8-32 NC	1	13028	1/2-14 NS	1-1/2	13166
8-40 NS	1	13032	1/2-16 NS	1-1/2	13168
10-24 NC	1	13036	1/2-18 NS	1-1/2	13170
10-32 NF	1	13038	1/2-20 NF	1-1/2	13172
10-36 NS	1	13040	1/2-24 NS	1-1/2	13174
10-40 NS	1	13042	1/2-27 NS	1-1/2	13176
10-56 NS	1	13046	1/2-28 NEF	1-1/2	13178
12-32 NEF	1	13052	1/2-32 NS	1-1/2	13180
12-36 NS	1	13054	1/2-40 NS	1-1/2	13182
14-24 NS	1	13060	9/16-12 NC	1-1/2	13188
1/4-20 NC	1	13074	9/16-16 NS	1-1/2	13190
1/4-24 NS	1	13076	9/16-18 NF	1-1/2	13192
1/4-27 NS	1	13078	9/16-20 NS	1-1/2	13194
1/4-28 NF	1	13080	9/16-24 NEF	1-1/2	13196
1/4-32 NEF	1	13082	9/16-27 NS	1-1/2	13198
1/4-40 NS	1	13084	9/16-32 NC	1-1/2	13200
1/4-48 NS	1	13086	5/8-11 NC	1-1/2	13204
1/4-56 NS	1	13088	5/8-18 NF	1-1/2	13212
1/4-80 NS	1	13090	5/8-20 NS	1-1/2	13214
5/16-18 NC	1	13100	5/8-24 NEF	1-1/2	13216
5/16-20 NS	1	13102	5/8-27 NS	1-1/2	13218
5/16-24 NF	1	13104	5/8-28 NS	1-1/2	13220
5/16-27 NS	1	13106	5/8-32 NS	1-1/2	13222
5/16-32 NEF	1	13108	11/16-18 NS	2	13230
5/16-40 NS	1	13110	11/16-20 NS	2	13232
3/8-16 NC	1	13116	11/16-24 NEF	2	13234
3/8-18 NS	1	13118	11/16-32 NS	2	13238
3/8-20 NS	1	13120	3/4-10 NC	2	13240
3/8-24 NF	1	13122	3/4-12 NS	2	13242
3/8-27 NS	1	13124	3/4-16 NF	2	13246
3/8-32 NEF	1	13128	3/4-18 NS	2	13248
3/8-40 NS	1	13132	3/4-20 NEF	2	13250
7/16-14 NC	1-1/2	13142	3/4-24 NS	2	13252
7/16-16 NS	1-1/2	13144	3/4-27 NS	2	13254
7/16-18 NS	1-1/2	13146	3/4-32 NS	2	13256
7/16-20 NF	1-1/2	13148	13/16-16 NS	2	13264
7/16-24 NS	1-1/2	13150	13/16-18 NS	2	13266
7/16-27 NS	1-1/2	13152	13/16-20 NEF	2	13268
7/16-28 NEF	1-1/2	13154	13/16-24 NS	2	13270
7/16-32 NS	1-1/2	13156	7/8-9 NC	2	13272

GENERAL PURPOSE

HSS Round Dies For Ferrous And Non-Ferrous Materials



Series 141 | General Purpose | Round Die

Thread Size	Outside Dia.	EDP
7/8-12 NS	2	13274
7/8-14 NF	2	13276
7/8-16 NS	2	13278
7/8-18 NS	2	13280
7/8-20 NEF	2	13282
7/8-24 NS	2	13284
7/8-32 NS	2	13286
15/16-12 NS	2	13288
15/16-14 NS	2	13290
15/16-16 NS	2	13292
15/16-18 NC	2	13294
15/16-20 NS	2	13296
15/16-32 NEF	2	13298
1-8 NC	2	13300
1-12 NF	2	13306
1-14 NS	2	13308
1-16 NS	2	13310
1-18 NS	2	13312
1-20 NEF	2	13314
1-24 NS	2	13316
1-27 NS	2	13318
1-32 NS	2	13320
1 1/16-12 NS	2	13322
1 1/16-16 NS	2	13326
1 1/16-18 NEF	2	13330
1 1/16-20 NS	2	13332
1-1/8-7 NC	2-1/2	13334
1-1/8-1 NF	2-1/2	13336
1-1/8-1 NS	2-1/2	13340
1-1/8-1 NEF	2-1/2	13342
1-1/8-2 NS	2-1/2	13344
1 3/16-12 NS	2-1/2	13346
1 3/16-18 NEF	2-1/2	13350
1-1/4-7 NC	2-1/2	13352
1-1/4-12 NSF	2-1/2	13354
1-1/4-16 NS	2-1/2	13356
1-1/4-18 NEF	2-1/2	13358
1-1/4-20 NC	2-1/2	13360
1-1/4-24 NS	2-1/2	13362
1 5/16-1 NS	2-1/2	13364
1 5/16-1 NEF	2-1/2	13370
1 3/8-6 NC	2-1/2	13372
1 3/8-12 NF	2-1/2	13374
1 3/8-16 NC	2-1/2	13378
1 3/8-18 NS	2-1/2	13380
1 3/8-20 NS	2-1/2	13382
1-1/2-6 NC	2-1/2	13392
1-1/2-12 NSF	2-1/2	13394
1-1/2-16 NS	2-1/2	13398
1-1/2-18 NS	2-1/2	13400
1-1/2-20 NF	2-1/2	13402
1-9/16-1 NEF	3	13408
1-5/8-12 NS	3	13412
1-5/8-16 NS	3	13414
1-5/8-18 NF	3	13416
1-3/4-5 NC	3	13420
1-3/4-12 NS	3	13422
1-3/4-16 NF	3	13426
1-3/4-18 NS	3	13428
1-7/8-12 NS	3	13436
1-7/8-16 NS	3	13438
2-4 1/2 NC	3	13446
1/4-36 NS	3	13451
2-12 NS	3	13452
2-16 NS	3	13456
2-20 NS	3	13460
1-1/8-8 NS	2-1/2	13464
1-1/4-8 NS	2-1/2	13466
1 3/8-8 NS	2-1/2	13468
1-1/2-8 NS	2-1/2	13470
1-3/4-8 NS	3	13474
1-7/8-8 NS	3	13476
2-8 NS	3	13478

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

HSS Round Dies For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Round Die</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Split-round dies for creating external pipe threads • Various straight & tapered pipe configurations • NPS, NPT, NSPT, NSPT 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 141P General Purpose | Round Die | Pipe

Thread Size	Outside Dia.	EDP
1/16-27 NPS	1	13064
1/8-27 NPT	1	13070
1/8-27 NPS	1	13072
1/4-18 NPT	1-1/2	13092
1/4-18 NPS	1-1/2	13094
3/8-18 NPT	1-1/2	13136
3/8-18 NPS	1-1/2	13138
1/2-14 NPT	2	13184
1/2-14 NPS	2	13186
3/4-14 NPT	2	13258
3/4-14 NPS	2	13260
1-11 NPT	2-1/2	13302
1-11 NPS	2-1/2	13304

*bold numbers are EDPs for ordering

GENERAL PURPOSE

HSS Round Dies For Ferrous And Non-Ferrous Materials



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Round Die</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Split-round dies for creating external threads 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 141M **General Purpose | Round Die | Metric**

Thread Size	Outside Dia.	EDP
M3 X.5	13/16	13518
M3.5 X.6	13/16	13522
M4 X.7	13/16	13524
M4.5 X.7	13/16	13528
M5 X.8	13/16	13530
M6 X 0.7	1	13536
M6 X 1.0	1	13538
M7 X 1.0	1	13542
M8 X 1.2	1	13546
M8 X 1.0	1	13548
M10 X 1.0	1-1/2	13554
M10 X 1.5	1	13556
M10 X 1.25	1-1/2	13558
M11 X 1.5	1-1/2	13560
M12 X 1.75	1-1/2	13564
M12 X 1.25	1-1/2	13566
M14 X 1.25	1-1/2	13568
M14 X 2.0	1-1/2	13570
M14 X 1.5	1-1/2	13572
M16 X 2.0	1-1/2	13576
M16 X 1.5	1-1/2	13578
M18 X 2.5	1-1/2	13584
M18 X 1.5	1-1/2	13586
M20 X 2.5	2	13592
M20 X 1.5	2	13594
M22 X 2.5	2	13598
M22 X 1.5	2	13600
M24 X 3.0	2	13604
M24 X 2.0	2	13606
M27 X 3.0	2-1/2	13614
M27 X 2.0	2-1/2	13616
M30 X 3.5	2-1/2	13624
M30 X 2.0	2-1/2	13626
M33 X 2.0	2-1/2	13634
M36 X 4.0	2-1/2	13638
M36 X 3.0	2-1/2	13640
M39 X 3.0	3	13648

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

HSS Round Dies For Ferrous And Non-Ferrous Materials



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Round Die - Left Hand</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Left hand split-round dies for creating external LH threads 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 142 General Purpose | Round Die | Left Hand

Thread Size	Outside Dia.	EDP
6-32 NC	1	13023
6-40 NF	1	13025
8-32 NC	1	13029
10-24 NC	1	13037
10-32 NF	1	13039
12-24 NC	1	13049
12-28 NF	1	13051
1/4-20 NC	1	13075
1/4-28 NF	1	13081
5/16-18 NC	1	13101
5/16-24 NF	1	13105
3/8-16 NC	1	13117
3/8-24 NF	1	13123
7/16-14 NC	1-1/2	13143
7/16-20 NF	1-1/2	13149
1/2-13 NC	1-1/2	13165
1/2-20 NF	1-1/2	13173
9/16-12 NC	1-1/2	13189
9/16-18 NF	1-1/2	13193
5/8-11 NC	1-1/2	13205
5/8-18 NF	1-1/2	13213
11/16-16 NS	2	13229
3/4-10 NC	2	13241
3/4-16 NF	2	13247
7/8-9 NC	2	13273
7/8-14 NF	2	13277
1-8 NC	2	13301
1-12 NF	2	13307
1-14 NS	2	13309
1-1/8-7 NC	2-1/2	13335
1-1/8-1 NF	2-1/2	13337
1-1/4-7 NC	2-1/2	13353
1-1/4-12 NS	2-1/2	13355
1 3/8-12 NF	2-1/2	13375
1-1/2-6 NC	2-1/2	13393
1-1/2-12 NS	2-1/2	13395

*bold numbers are EDPs for ordering

GENERAL PURPOSE

HSS Round Dies For Ferrous And Non-Ferrous Materials



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Round Die - Left Hand</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Left hand split-round dies for creating external LH threads 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HSSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 142M **General Purpose | Round Die | Metric | Left Hand**

Thread Size	Outside Dia.	EDP
M4 X 7	3/16	13525
M5 X 8	13/16	13531
M6 X 1.0	1	13539
M7 X 1.0	1	13543
M8 X 1.2	1	13547
M8 X 1.0	1	13549
M10 X 1.5	1-1/2	13557
M10 X 1.25	1-1/2	13559
M12 X 1.75	1-1/2	13565
M12 X 1.25	1-1/2	13567
M14 X 2.0	1-1/2	13571
M14 X 1.5	1-1/2	13573
M16 X 2.0	1-1/2	13577
M16 X 1.5	1-1/2	13579
M18 X 2.5	1-1/2	13585
M20 X 2.5	2	13593
M20 X 1.5	2	13595
M24 X 3.0	2	13605
M24 X 2.0	2	13607
M30 X 3.5	2	13625

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GENERAL PURPOSE

HSS Round Dies For Ferrous And Non-Ferrous Materials



FEATURES/DESCRIPTION	APPLICATION	FEATURES
<p>Round Die - BSPT & BSPP</p> <ul style="list-style-type: none"> • Popular Specials • High Speed Steel (HSS) • Split-round dies for creating external british standard threads • BSPT & BSPP 		

STEEL			STAINLESS		CAST IRON		NON-FERROUS		HRSA		HARDENED STEEL	
P1	P2	P3	M1	M2	K1	K2	N1	N2	S1	S2	H1	H2
○	○	○			○	○	○	○			○	

● Best ○ Good

Series 143 | General Purpose | Round Die | BSPT & BSPP

Thread Size	Outside Dia.	EDP
1/8-28 BSPT	1	13692
1/4-19 BSPT	1-1/2	13694
3/8-19 BSPT	1-1/2	13696
1/2-14 BSPT	2	13698
3/4-14 BSPT	2	13700
1/8-28 BSPP	1	13693
1/4-19 BSPP	1-1/2	13695
3/8-19 BSPP	1-1/2	13697
1/2-14 BSPP	2	13699
3/4-14 BSPP	2	13701

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Tap Extensions For Long Reach Applications



INTRO

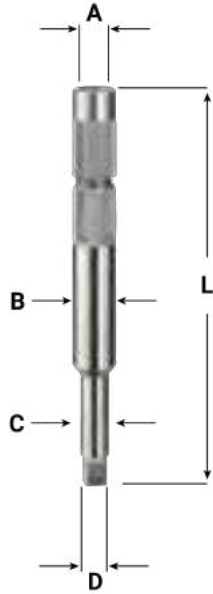
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION

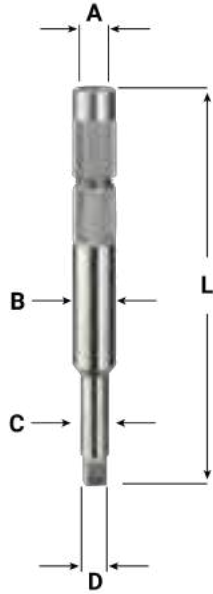
Tap Extensions - ANSI

- HSS
- Increase reach of your tap with extensions
- 5", 6" and 9" Lengths
- Internal square drive for taps
- Compression cap for easy tightening, no wrench needed
- Slim profile provides better reach vs. standard extensions
- Available in Sets

Series 117 General Purpose | ANSI | Inch

Tap Size	Tap Dia.(A)	Body Dia.(B)	OAL(L)	Shank(C)	Square Size(D)	Depth Tap Enters	EDP
#0-6	0.141	1/4	5	0.194	0.152	7/8	21700
#0-6	0.141	1/4	9	0.194	0.152	7/8	21805
#8	0.168	5/16	5	0.194	0.152	7/8	21701
#8	0.168	5/16	9	0.194	0.152	7/8	21710
#10	0.194	3/8	5	0.194	0.152	1	21702
#10	0.194	3/8	9	0.194	0.152	1	21711
#12	0.220	3/8	5	0.194	0.152	1	21703
#12	0.220	3/8	9	0.194	0.152	1	21712
1/4	0.255	7/16	5	0.255	0.191	1	21704
1/4	0.255	7/16	9	0.255	0.191	1	21713
5/16	0.318	1/2	5	0.318	0.238	1-1/16	21705
5/16	0.318	1/2	9	0.318	0.238	1-1/16	21714
3/8	0.381	9/16	5	0.381	0.286	1-1/8	21706
3/8	0.381	9/16	9	0.381	0.286	1-1/8	21715
7/16	0.323	1/2	5	0.323	0.242	1-1/16	21707
7/16	0.323	1/2	9	0.323	0.242	1-1/16	21716
1/2	0.367	9/16	5	0.367	0.275	1-1/8	21708
1/2	0.367	9/16	9	0.367	0.275	1-1/8	21717
9/16	0.429	3/4	6	0.429	0.320	1-1/4	21719
11/16	0.542	7/8	6	0.542	0.406	1-1/4	21722
5/8	0.480	3/4	6	0.480	0.360	1-1/4	21721
3/4	0.590	7/8	6	0.590	0.440	1-3/8	21724
7/8	0.697	1	6	0.697	0.520	1-3/8	21725
1	0.800	1	6	0.800	0.600	1/2	21798

*bold numbers are EDPs for ordering



FEATURES/DESCRIPTION

Tap Extensions - ANSI - Coolant

- HSS
- Coolant-through
- Increase reach with extensions
- 5", 6" and 9" Lengths
- Internal square drive for taps
- Compression cap for easy tightening
- Slim profile provides better reach vs. standard extensions
- Available in Sets

Series 117H | General Purpose | ANSI | Coolant | Inch

Tap Size	Tap Dia.(A)	Body Dia.(B)	OAL(L)	Shank(C)	Square Size(D)	Depth Tap Enters	EDP
#0-6	0.141	1/4	5	0.194	0.152	7/8	21728
#0-6	0.141	1/4	9	0.194	0.152	7/8	21737
#8	0.168	5/16	5	0.194	0.152	7/8	21729
#8	0.168	5/16	9	0.194	0.152	7/8	21738
#10	0.194	3/8	5	0.194	0.152	1	21730
#10	0.194	3/8	9	0.194	0.152	1	21739
#12	0.220	3/8	5	0.194	0.152	1	21731
#12	0.220	3/8	9	0.194	0.152	1	21740
1/4	0.255	7/16	5	0.255	0.191	1	21732
1/4	0.255	7/16	9	0.255	0.191	1	21741
5/16	0.318	1/2	5	0.318	0.238	1-1/16	21733
5/16	0.318	1/2	9	0.318	0.238	1-1/16	21742
3/8	0.381	9/16	5	0.381	0.286	1-1/8	21734
3/8	0.381	9/16	9	0.381	0.286	1-1/8	21743
7/16	0.323	1/2	5	0.323	0.242	1-1/16	21735
7/16	0.323	1/2	9	0.323	0.242	1-1/16	21744
1/2	0.367	9/16	5	0.367	0.275	1-1/8	21736
1/2	0.367	9/16	9	0.367	0.275	1-1/8	21745
9/16	0.429	3/4	6	0.429	0.320	1-1/4	21746
5/8	0.480	3/4	6	0.480	0.360	1-1/4	21748
11/16	0.542	7/8	6	0.542	0.406	2-1/4	21749
3/4	0.590	7/8	6	0.590	0.440	1-3/8	21751
7/8	0.697	1	6	0.697	0.520	1-3/8	21752
1	0.800	1	6	0.800	0.600	1-1/2	21755

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Tap Extensions For Long Reach Applications



INTRO

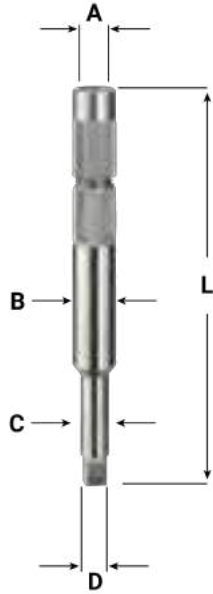
MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION

Tap Extensions - DIN

- HSS
- Increase reach of your tap with extensions
- 5", 6" and 9" Lengths
- Internal square drive for taps
- Compression cap for easy tightening, no wrench needed
- Slim profile provides better reach vs. standard extensions

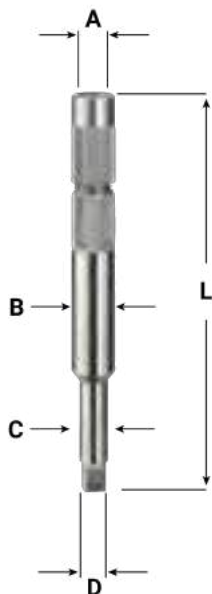
Series 118S General Purpose | DIN Taps

Tap Dia.(A)	Body Dia.(B)	OAL(L)	Tap Size	Shank(C)	Square Size(D)	Depth Tap Enters	EDP
2.8mm	1/4	5	M2/M4	6mm	4.9mm	7/8	21756
2.8mm	1/4	9	M3/M5	6mm	4.9mm	7/8	21767
3.5mm	5/16	5	M3/M5	6mm	4.9mm	7/8	21757
3.5mm	5/16	9	M3.5	6mm	4.9mm	7/8	21768
4.0mm	3/8	5	M3.5	6mm	4.9mm	7/8	21758
4.0mm	3/8	9	M4/M6	6mm	4.9mm	7/8	21769
4.5mm	3/8	5	M4/M6	6mm	4.9mm	7/8	21759
4.5mm	3/8	9	M4.5/M8	6mm	4.9mm	7/8	21770
6.0mm	7/16	5	M4.5-M8	7mm	5.5mm	1	21760
6.0mm	7/16	9	M7/M10	7mm	5.5mm	1	21771
7.0mm	1/2	5	M7/M10	7mm	5.5mm	1	21761
7.0mm	1/2	9	M8/M11	7mm	5.5mm	1	21772
8.0mm	1/2	5	M8/M11	8mm	6.2mm	1-1/8	21762
8.0mm	1/2	9	M9/M12	8mm	6.2mm	1-1/8	21773
9.0mm	5/8	5	M9/M12	9mm	7mm	1-3/16	21763
9.0mm	5/8	9	M10	9mm	7mm	1-3/16	21774
10.0mm	5/8	5	M10	10mm	8mm	1-1/4	21764
10.0mm	5/8	9	M11/M14	10mm	8mm	1-1/4	21775
11.0mm	3/4	5	M11/M14	11mm	9mm	1-3/8	21765
11.0mm	3/4	5	M12/M16	11mm	9mm	1-3/8	21801
12.0mm	3/4	9	M12/M16	12mm	9mm	1-3/8	21802
12.0mm	3/4	9	M2/M4	12mm	9mm	1-3/8	21766

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Tap Extensions For Long Reach Applications



FEATURES/DESCRIPTION

Tap Extensions - Coolant & Solid - DIN

- HSS
- Coolant-through & Solid
- Increase reach of your tap with extensions
- 5", 6" and 9" Lengths
- Internal square drive for taps
- Compression cap for easy tightening, no wrench needed
- Slim profile provides better reach vs. standard extensions

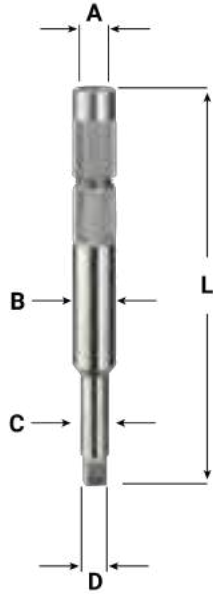
Series 118H | General Purpose | DIN Taps | Coolant & Solid

Tap Dia.(A)	Body Dia.(B)	OAL(L)	Tap Size	Shank(C)	Square Size(D)	Depth Tap Enters	EDP
2.8mm	1/4	5	M2/M4	6mm	4.9mm	7/8	21776
2.8mm	1/4	9	M2/M4	6mm	4.9mm	7/8	21786
3.5mm	5/16	5	M3/M5	6mm	4.9mm	7/8	21777
3.5mm	5/16	9	M3/M5	6mm	4.9mm	7/8	21787
4mm	3/8	5	M3.5	6mm	4.9mm	7/8	21778
4mm	3/8	9	M3.5	6mm	4.9mm	7/8	21788
4.5mm	3/8	5	M4/M6	6mm	4.9mm	7/8	21779
4.5mm	3/8	9	M4/M6	6mm	4.9mm	7/8	21789
6mm	7/16	9	M4.5/M8	7mm	5.5mm	1	21790
6mm	7/16	5	M4.5/M8	7mm	5.5mm	1	21780
7mm	1/2	5	M7/M10	7mm	5.5mm	1	21781
7mm	1/2	9	M7/M10	7mm	5.5mm	1	21791
8mm	1/2	5	M8/M11	8mm	6.2mm	1-1/8	21782
8mm	1/2	9	M8/M11	8mm	6.2mm	1-1/8	21792
9mm	5/8	5	M9/M12	9mm	7mm	1-3/16	21783
9mm	5/8	9	M9/M12	9mm	7mm	1-3/16	21793
10mm	5/8	5	M10	10mm	8mm	1-1/4	21784
10mm	5/8	9	M10	10mm	8mm	1-1/4	21794
11mm	3/4	9	M11/M14	11mm	3/4	1-3/8	21795
11mm	3/4	5	M14	11mm	9mm	1-3/8	21785
12mm	3/4	5	M12/M16	12mm	9mm	1-3/8	21803
12mm	3/4	9	M12/M16	12mm	9mm	1-3/8	21804

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Tap Extensions For Long Reach Applications



FEATURES/DESCRIPTION

Tap Extensions - NPT

- HSS
- Increase reach of your tap with extensions
- 5", 6" and 9" Lengths
- Internal square drive for taps
- Compression cap for easy tightening, no wrench needed
- Slim profile provides better reach vs. standard extensions

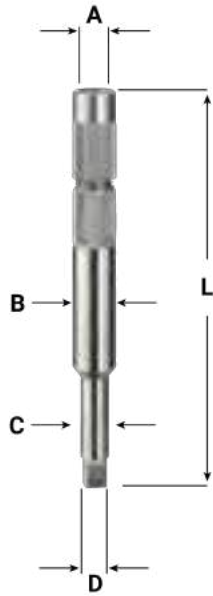
Series 119 General Purpose | ANSI | NPT

Pipe Size	Tap Dia.(A)	Body Dia.(B)	OAL(L)	Shank(C)	Square Size(D)	Depth Tap Enters	EDP
1/16	0.312	1/2	5	0.312	0.234	1	21709
1/16	0.312	1/2	9	0.312	0.234	1	21718
1/8	0.437	3/4	6	0.437	0.328	1	21720
1/4	0.562	7/8	6	0.562	0.420	1	21723
3/8	0.700	1	6	0.700	0.530	1-3/16	21726
1/2	0.687	1	6	0.687	0.515	1-1/4	21727

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Tap Extensions For Long Reach Applications



FEATURES/DESCRIPTION

Tap Extensions - NPT - Coolant

- HSS
- Coolant-through
- Increase reach of your tap with extensions
- 5", 6" and 9" Lengths
- Internal square drive for taps
- Compression cap for easy tightening, no wrench needed
- Slim profile provides better reach vs. standard extensions

Series 119H | General Purpose | ANSI | NPT | Coolant

Pipe Size	Tap Dia.(A)	Body Dia.(B)	OAL(L)	Shank(C)	Square Size(D)	Depth Tap Enters	EDP
1/16	0.312	1/2	5	0.312	0.234	1	21799
1/16	0.312	1/2	9	0.312	0.234	1	21800
1/8	0.437	3/4	6	0.437	1.000	0.328	21747
1/4	0.562	7/8	6	0.562	0.420	1	21750
3/8	0.700	1	6	0.700	0.530	1-3/16	21753
1/2	0.687	1	6	0.687	0.515	1-1/4	21754

*bold numbers are EDPs for ordering

FEATURES/DESCRIPTION

Thread Plug Gage - Taperlock

- A mechanical thread inspection tool used to check a work piece against its allowed thread tolerances
- Hardened High Speed Steel construction



Series 195 General Purpose | Plug Gage | Taperlock

Thread Size	Class of Fit	Type	EDP
0-80 NF	-	Go	23000
0-80 NF	2B	NoGo	23001
0-80 NF	3B	NoGo	23002
0-80 NF	2B	Go/NoGo	23003
0-80 NF	3B	Go/NoGo	23004
1-64 NC	-	Go	23005
1-64 NC	2B	NoGo	23006
1-64 NC	3B	NoGo	23007
1-64 NC	2B	Go/NoGo	23008
1-64 NC	3B	Go/NoGo	23009
1-72 NF	-	Go	23010
1-72 NF	2B	NoGo	23011
1-72 NF	3B	NoGo	23012
1-72 NF	2B	Go/NoGo	23013
1-72 NF	3B	Go/NoGo	23014
2-56 NC	-	Go	23015
2-56 NC	2B	NoGo	23016
2-56 NC	3B	NoGo	23017
2-56 NC	2B	Go/NoGo	23018
2-56 NC	3B	Go/NoGo	23019
2-64 NF	-	Go	23020
2-64 NF	2B	NoGo	23021
2-64 NF	3B	NoGo	23022
2-64 NF	2B	Go/NoGo	23023
2-64 NF	3B	Go/NoGo	23024
3-48 NC	-	Go	23025
3-48 NC	2B	NoGo	23026
3-48 NC	3B	NoGo	23027
3-48 NC	2B	Go/NoGo	23028
3-48 NC	3B	Go/NoGo	23029
3-56 NF	-	Go	23030
3-56 NF	2B	NoGo	23031
3-56 NF	3B	NoGo	23032
3-56 NF	2B	Go/NoGo	23033
3-56 NF	3B	Go/NoGo	23034
4-40 NC	-	Go	23035
4-40 NC	2B	NoGo	23036
4-40 NC	3B	NoGo	23037
4-40 NC	2B	Go/NoGo	23038
4-40 NC	3B	Go/NoGo	23039
4-48 NF	-	Go	23040
4-48 NF	2B	NoGo	23041
4-48 NF	3B	NoGo	23042
4-48 NF	2B	Go/NoGo	23043
4-48 NF	3B	Go/NoGo	23044
5-40 NC	-	Go	23045
5-40 NC	2B	NoGo	23046
5-40 NC	3B	NoGo	23047
5-40 NC	2B	Go/NoGo	23048
5-40 NC	3B	Go/NoGo	23049
5-44 NF	-	Go	23050
5-44 NF	2B	NoGo	23051
5-44 NF	3B	NoGo	23052
5-44 NF	2B	Go/NoGo	23053

Thread Size	Class of Fit	Type	EDP
5-44 NF	3B	Go/NoGo	23054
6-32 NC	-	Go	23055
6-32 NC	2B	NoGo	23056
6-32 NC	3B	NoGo	23057
6-32 NC	2B	Go/NoGo	23058
6-32 NC	3B	Go/NoGo	23059
6-40 NF	-	Go	23060
6-40 NF	2B	NoGo	23061
6-40 NF	3B	NoGo	23062
6-40 NF	2B	Go/NoGo	23063
6-40 NF	3B	Go/NoGo	23064
8-32 NC	-	Go	23065
8-32 NC	2B	NoGo	23066
8-32 NC	3B	NoGo	23067
8-32 NC	2B	Go/NoGo	23068
8-32 NC	3B	Go/NoGo	23069
8-36 NF	-	Go	23070
8-36 NF	2B	NoGo	23071
8-36 NF	3B	NoGo	23072
8-36 NF	2B	Go/NoGo	23073
8-36 NF	3B	Go/NoGo	23074
10-24 NC	-	Go	23075
10-24 NC	2B	NoGo	23076
10-24 NC	3B	NoGo	23077
10-24 NC	2B	Go/NoGo	23078
10-24 NC	3B	Go/NoGo	23079
10-32 NF	-	Go	23080
10-32 NF	2B	NoGo	23081
10-32 NF	3B	NoGo	23082
10-32 NF	2B	Go/NoGo	23083
10-32 NF	3B	Go/NoGo	23084
12-24 NC	-	Go	23085
12-24 NC	2B	NoGo	23086
12-24 NC	3B	NoGo	23087
12-24 NC	2B	Go/NoGo	23088
12-24 NC	3B	Go/NoGo	23089
12-28 NF	-	Go	23090
12-28 NF	2B	NoGo	23091
12-28 NF	3B	NoGo	23092
12-28 NF	2B	Go/NoGo	23093
12-28 NF	3B	Go/NoGo	23094
12-32 NEF	-	Go	23095
12-32 NEF	2B	NoGo	23096
12-32 NEF	3B	NoGo	23097
12-32 NEF	2B	Go/NoGo	23098
12-32 NEF	3B	Go/NoGo	23099
1/4-20 NC	-	Go	23100
1/4-20 NC	2B	NoGo	23101
1/4-20 NC	3B	NoGo	23102
1/4-20 NC	2B	Go/NoGo	23103
1/4-20 NC	3B	Go/NoGo	23104
1/4-28 NF	-	Go	23105
1/4-28 NF	2B	NoGo	23106
1/4-28 NF	3B	NoGo	23107

Series 195				General Purpose | Plug Gage | Taperlock			
Thread Size	Class of Fit	Type	EDP	Thread Size	Class of Fit	Type	EDP
1/4-28 NF	2B	Go/NoGo	23108	9/16-18 NF	3B	NoGo	23182
1/4-28 NF	3B	Go/NoGo	23109	9/16-18 NF	2B	Go/NoGo	23183
1/4-32 NEF	-	Go	23110	9/16-18 NF	3B	Go/NoGo	23184
1/4-32 NEF	2B	NoGo	23111	9/16-24 NEF	-	Go	23185
1/4-32 NEF	3B	NoGo	23112	9/16-24 NEF	2B	NoGo	23186
1/4-32 NEF	2B	Go/NoGo	23113	9/16-24 NEF	3B	NoGo	23187
1/4-32 NEF	3B	Go/NoGo	23114	9/16-24 NEF	2B	Go/NoGo	23188
5/16-18 NC	-	Go	23115	9/16-24 NEF	3B	Go/NoGo	23189
5/16-18 NC	2B	NoGo	23116	5/8-11 NC	-	Go	23190
5/16-18 NC	3B	NoGo	23117	5/8-11 NC	2B	NoGo	23191
5/16-18 NC	2B	Go/NoGo	23118	5/8-11 NC	3B	NoGo	23192
5/16-18 NC	3B	Go/NoGo	23119	5/8-11 NC	2B	Go/NoGo	23193
5/16-24 NF	-	Go	23120	5/8-11 NC	3B	Go/NoGo	23194
5/16-24 NF	2B	NoGo	23121	5/8-18 NF	-	Go	23195
5/16-24 NF	3B	NoGo	23122	5/8-18 NF	2B	NoGo	23196
5/16-24 NF	2B	Go/NoGo	23123	5/8-18 NF	3B	NoGo	23197
5/16-24 NF	3B	Go/NoGo	23124	5/8-18 NF	2B	Go/NoGo	23198
5/16-32 NEF	-	Go	23125	5/8-18 NF	3B	Go/NoGo	23199
5/16-32 NEF	2B	NoGo	23126	5/8-24 NEF	-	Go	23200
5/16-32 NEF	3B	NoGo	23127	5/8-24 NEF	2B	NoGo	23201
5/16-32 NEF	2B	Go/NoGo	23128	5/8-24 NEF	3B	NoGo	23202
5/16-32 NEF	3B	Go/NoGo	23129	5/8-24 NEF	2B	Go/NoGo	23203
3/8-16 NC	-	Go	23130	5/8-24 NEF	3B	Go/NoGo	23204
3/8-16 NC	2B	NoGo	23131	11/16-24 NEF	-	Go	23205
3/8-16 NC	3B	NoGo	23132	11/16-24 NEF	2B	NoGo	23206
3/8-16 NC	2B	Go/NoGo	23133	11/16-24 NEF	3B	NoGo	23207
3/8-16 NC	3B	Go/NoGo	23134	11/16-24 NEF	2B	Go/NoGo	23208
3/8-24 NF	-	Go	23135	11/16-24 NEF	3B	Go/NoGo	23209
3/8-24 NF	2B	NoGo	23136	3/4-10 NC	-	Go	23210
3/8-24 NF	3B	NoGo	23137	3/4-10 NC	2B	NoGo	23211
3/8-24 NF	2B	Go/NoGo	23138	3/4-10 NC	3B	NoGo	23212
3/8-24 NF	3B	Go/NoGo	23139	3/4-10 NC	2B	Go/NoGo	23213
3/8-32 NEF	-	Go	23140	3/4-10 NC	3B	Go/NoGo	23214
3/8-32 NEF	2B	NoGo	23141	3/4-16 NF	-	Go	23215
3/8-32 NEF	3B	NoGo	23142	3/4-16 NF	2B	NoGo	23216
3/8-32 NEF	2B	Go/NoGo	23143	3/4-16 NF	3B	NoGo	23217
3/8-32 NEF	3B	Go/NoGo	23144	3/4-16 NF	2B	Go/NoGo	23218
7/16-14 NC	-	Go	23145	3/4-16 NF	3B	Go/NoGo	23219
7/16-14 NC	2B	NoGo	23146	3/4-20 NEF	-	Go	23220
7/16-14 NC	3B	NoGo	23147	3/4-20 NEF	2B	NoGo	23221
7/16-14 NC	2B	Go/NoGo	23148	3/4-20 NEF	3B	NoGo	23222
7/16-14 NC	3B	Go/NoGo	23149	3/4-20 NEF	2B	Go/NoGo	23223
7/16-20 NF	-	Go	23150	3/4-20 NEF	3B	Go/NoGo	23224
7/16-20 NF	2B	NoGo	23151	1 3/16-12 NS	-	Go	24984
7/16-20 NF	3B	NoGo	23152	1 3/16-12 NS	2B	NoGo	24985
7/16-20 NF	2B	Go/NoGo	23153	1 3/16-12 NS	3B	NoGo	24986
7/16-20 NF	3B	Go/NoGo	23154	1 3/16-12 NS	2B	Go/NoGo	24987
7/16-28 NEF	-	Go	23155	1 3/16-12 NS	3B	Go/NoGo	24988
7/16-28 NEF	2B	NoGo	23156	13/16-20 NEF	-	Go	23225
7/16-28 NEF	3B	NoGo	23157	13/16-20 NEF	2B	NoGo	23226
7/16-28 NEF	2B	Go/NoGo	23158	13/16-20 NEF	3B	NoGo	23227
7/16-28 NEF	3B	Go/NoGo	23159	13/16-20 NEF	2B	Go/NoGo	23228
1/2-13 NC	-	Go	23160	13/16-20 NEF	3B	Go/NoGo	23229
1/2-13 NC	2B	NoGo	23161	7/8-9 NC	-	Go	23230
1/2-13 NC	3B	NoGo	23162	7/8-9 NC	2B	NoGo	23231
1/2-13 NC	2B	Go/NoGo	23163	7/8-9 NC	3B	NoGo	23232
1/2-13 NC	3B	Go/NoGo	23164	7/8-9 NC	2B	Go/NoGo	23233
1/2-20 NF	-	Go	23165	7/8-9 NC	3B	Go/NoGo	23234
1/2-20 NF	2B	NoGo	23166	7/8-14 NF	-	Go	23235
1/2-20 NF	3B	NoGo	23167	7/8-14 NF	2B	NoGo	23236
1/2-20 NF	2B	Go/NoGo	23168	7/8-14 NF	3B	NoGo	23237
1/2-20 NF	3B	Go/NoGo	23169	7/8-14 NF	2B	Go/NoGo	23238
1/2-28 NEF	-	Go	23170	7/8-14 NF	3B	Go/NoGo	23239
1/2-28 NEF	2B	NoGo	23171	7/8-20 NEF	-	Go	23240
1/2-28 NEF	3B	NoGo	23172	7/8-20 NEF	2B	NoGo	23241
1/2-28 NEF	2B	Go/NoGo	23173	7/8-20 NEF	3B	NoGo	23242
1/2-28 NEF	3B	Go/NoGo	23174	7/8-20 NEF	2B	Go/NoGo	23243
9/16-12 NC	-	Go	23175	7/8-20 NEF	3B	Go/NoGo	23244
9/16-12 NC	2B	NoGo	23176	15/16-20 NS	-	Go	23245
9/16-12 NC	3B	NoGo	23177	15/16-20 NS	2B	NoGo	23246
9/16-12 NC	2B	Go/NoGo	23178	15/16-20 NS	3B	NoGo	23247
9/16-12 NC	3B	Go/NoGo	23179	15/16-20 NS	2B	Go/NoGo	23248
9/16-18 NF	-	Go	23180	15/16-20 NS	3B	Go/NoGo	23249
9/16-18 NF	2B	NoGo	23181	1-8 NC	-	Go	23250

GENERAL PURPOSE

Premium HSS Thread Plug Gages



Series 195 | General Purpose | Plug Gage | Taperlock

Thread Size	Class of Fit	Type	EDP
1-8 NC	2B	NoGo	23251
1-8 NC	3B	NoGo	23252
1-8 NC	2B	Go/NoGo	23253
1-8 NC	3B	Go/NoGo	23254
1-12 NF	-	Go	23255
1-12 NF	2B	NoGo	23256
1-12 NF	3B	NoGo	23257
1-12 NF	2B	Go/NoGo	23258
1-12 NF	3B	Go/NoGo	23259
1-14 NS	-	Go	23260
1-14 NS	2B	NoGo	23261
1-14 NS	3B	NoGo	23262
1-14 NS	2B	Go/NoGo	23263
1-14 NS	3B	Go/NoGo	23264
1-20 NEF	-	Go	23265
1-20 NEF	2B	NoGo	23266
1-20 NEF	3B	NoGo	23267
1-20 NEF	2B	Go/NoGo	23268
1-20 NEF	3B	Go/NoGo	23269
1 1/16-12 NS	-	Go	24979
1 1/16-12 NS	2B	NoGo	24980
1 1/16-12 NS	3B	NoGo	24981
1 1/16-12 NS	2B	Go/NoGo	24982
1 1/16-12 NS	3B	Go/NoGo	24983
1 1/16-18 NEF	-	Go	23270
1 1/16-18 NEF	2B	NoGo	23271
1 1/16-18 NEF	3B	NoGo	23272
1 1/16-18 NEF	2B	Go/NoGo	23273
1 1/16-18 NEF	3B	Go/NoGo	23274
1-1/8-7 NC	-	Go	23275
1-1/8-7 NC	2B	NoGo	23276
1-1/8-7 NC	3B	NoGo	23277
1-1/8-7 NC	2B	Go/NoGo	23278
1-1/8-7 NC	3B	Go/NoGo	23279
1-1/8-12 NF	-	Go	23280
1-1/8-12 NF	2B	NoGo	23281
1-1/8-12 NF	3B	NoGo	23282
1-1/8-12 NF	2B	Go/NoGo	23283
1-1/8-12 NF	3B	Go/NoGo	23284
1-1/8-18 NEF	-	Go	23285
1-1/8-18 NEF	2B	NoGo	23286
1-1/8-18 NEF	3B	NoGo	23287
1-1/8-18 NEF	2B	Go/NoGo	23288
1-1/8-18 NEF	3B	Go/NoGo	23289
1 3/16-18 NEF	-	Go	23290
1 3/16-18 NEF	2B	NoGo	23291
1 3/16-18 NEF	3B	NoGo	23292
1 3/16-18 NEF	2B	Go/NoGo	23293
1 3/16-18 NEF	3B	Go/NoGo	23294
1-1/4-7 NC	-	Go	23295
1-1/4-7 NC	2B	NoGo	23296
1-1/4-7 NC	3B	NoGo	23297
1-1/4-7 NC	2B	Go/NoGo	23298
1-1/4-7 NC	3B	Go/NoGo	23299
1-1/4-12 NS	-	Go	23300
1-1/4-12 NS	2B	NoGo	23301
1-1/4-12 NS	3B	NoGo	23302
1-1/4-12 NS	2B	Go/NoGo	23303
1-1/4-12 NS	3B	Go/NoGo	23304
1-1/4-18 NEF	-	Go	23305
1-1/4-18 NEF	2B	NoGo	23306
1-1/4-18 NEF	3B	NoGo	23307
1-1/4-18 NEF	2B	Go/NoGo	23308
1-1/4-18 NEF	3B	Go/NoGo	23309
1 5/16-12 NS	-	Go	24989
1 5/16-12 NS	2B	NoGo	24990
1 5/16-12 NS	3B	NoGo	24991
1 5/16-12 NS	2B	Go/NoGo	24992
1 5/16-12 NS	3B	Go/NoGo	24993
1 5/16-18 NC	-	Go	23310
1 5/16-18 NC	2B	NoGo	23311
1 5/16-18 NC	3B	NoGo	23312
1 5/16-18 NC	2B	Go/NoGo	23313
1 5/16-18 NC	3B	Go/NoGo	23314

Thread Size	Class of Fit	Type	EDP
1 3/8-6 NC	-	Go	23315
1 3/8-6 NC	2B	NoGo	23316
1 3/8-6 NC	3B	NoGo	23317
1 3/8-6 NC	2B	Go/NoGo	23318
1 3/8-6 NC	3B	Go/NoGo	23319
1 3/8-12 NF	-	Go	23320
1 3/8-12 NF	2B	NoGo	23321
1 3/8-12 NF	3B	NoGo	23322
1 3/8-12 NF	2B	Go/NoGo	23323
1 3/8-12 NF	3B	Go/NoGo	23324
1 3/8-18 NS	-	Go	23325
1 3/8-18 NS	2B	NoGo	23326
1 3/8-18 NS	3B	NoGo	23327
1 3/8-18 NS	2B	Go/NoGo	23328
1 3/8-18 NS	3B	Go/NoGo	23329
1 7/16-18 NS	-	Go	23330
1 7/16-18 NS	2B	NoGo	23331
1 7/16-18 NS	3B	NoGo	23332
1 7/16-18 NS	2B	Go/NoGo	23333
1 7/16-18 NS	3B	Go/NoGo	23334
1-1/2-6 NC	-	Go	23335
1-1/2-6 NC	2B	NoGo	23336
1-1/2-6 NC	3B	NoGo	23337
1-1/2-6 NC	2B	Go/NoGo	23338
1-1/2-6 NC	3B	Go/NoGo	23339
1-1/2-12 NS	-	Go	23340
1-1/2-12 NS	2B	NoGo	23341
1-1/2-12 NS	3B	NoGo	23342
1-1/2-12 NS	2B	Go/NoGo	23343
1-1/2-12 NS	3B	Go/NoGo	23344
1-1/2-18 NS	-	Go	23345
1-1/2-18 NS	2B	NoGo	23346
1-1/2-18 NS	3B	NoGo	23347
1-1/2-18 NS	2B	Go/NoGo	23348
1-1/2-18 NS	3B	Go/NoGo	23349

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION

Thread Plug Gage - Taperlock - Metric

- A mechanical thread inspection tool used to check a work piece against its allowed thread tolerances
- M39 X 3 gages are Tri-lock style
- Hardened High Speed Steel construction

Series 195M **General Purpose | Plug Gage | Taperlock | Metric**

Thread Size	Class of Fit	Type	EDP
M1.6 X.35	-	Go	25000
M1.6 X.35	6H	Go/NoGo	25003
M1.6 X.35	6H	NoGo	25001
M1.8 X.35	-	Go	25005
M1.8 X.35	6H	Go/NoGo	25006
M1.8 X.35	6H	NoGo	25008
M2 X.4	-	Go	25010
M2 X.4	6H	Go/NoGo	25013
M2 X.4	6H	NoGo	25011
M2.2 X.45	-	Go	25015
M2.2 X.45	6H	Go/NoGo	25018
M2.2 X.45	6H	NoGo	25016
M2.5 X.45	-	Go	25020
M2.5 X.45	6H	Go/NoGo	25023
M2.5 X.45	6H	NoGo	25021
M3 X.5	-	Go	25025
M3 X.5	6H	Go/NoGo	25028
M3 X.5	6H	NoGo	25026
M3.5 X.6	-	Go	25030
M3.5 X.6	6H	Go/NoGo	25033
M3.5 X.6	6H	NoGo	25031
M4 X.7	-	Go	25035
M4 X.7	6H	Go/NoGo	25038
M4 X.7	6H	NoGo	25036
M4.5 X.75	-	Go	25040
M4.5 X.75	6H	Go/NoGo	25043
M4.5 X.75	6H	NoGo	25041
M5 X.8	-	Go	25045
M5 X.8	6H	Go/NoGo	25048
M5 X.8	6H	NoGo	25046
M6 X 1	-	Go	25050
M6 X 1	6H	Go/NoGo	25053
M6 X 1	6H	NoGo	25051
M7 X 1	-	Go	25055
M7 X 1	6H	Go/NoGo	25058
M7 X 1	6H	NoGo	25056
M8 X 1	6H	Go	25065
M8 X 1.25	-	Go	25060
M8 X 1.25	6H	Go/NoGo	25063
M8 X 1.25	6H	NoGo	25061
M8 X 1	6H	Go/NoGo	25068
M8 X 1	6H	NoGo	25066
M10 X 1.25	-	Go	25075
M10 X 1.25	6H	Go/NoGo	25078
M10 X 1.25	6H	NoGo	25076
M10 X 1.5	-	Go	25070
M10 X 1.5	6H	Go/NoGo	25073
M10 X 1.5	6H	NoGo	25071
M12 X 1.25	-	Go	25085
M12 X 1.25	6H	Go/NoGo	25088
M12 X 1.25	6H	NoGo	25086
M12 X 1.75	-	Go	25080
M12 X 1.75	6H	Go/NoGo	25083
M12 X 1.75	6H	NoGo	25081

Thread Size	Class of Fit	Type	EDP
M14 X 1.5	-	Go	25095
M14 X 1.5	6H	Go/NoGo	25098
M14 X 1.5	6H	NoGo	25096
M14 X 2	-	Go	25090
M14 X 2	6H	Go/NoGo	25093
M14 X 2	6H	NoGo	25091
M16 X 1.5	-	Go	25105
M16 X 1.5	6H	Go/NoGo	25108
M16 X 1.5	6H	NoGo	25106
M16 X 2	-	Go	25100
M16 X 2	6H	Go/NoGo	25103
M16 X 2	6H	NoGo	25101
M18 X 1.5	-	Go	25115
M18 X 1.5	6H	Go/NoGo	25118
M18 X 1.5	6H	NoGo	25116
M18 X 2.5	-	Go	25110
M18 X 2.5	6H	Go/NoGo	25113
M18 X 2.5	6H	NoGo	25111
M20 X 1.0	6H	Go/NoGo	21512
M20 X 1.5	-	Go	25125
M20 X 1.5	6H	Go/NoGo	25128
M20 X 1.5	6H	NoGo	25126
M20 X 2.5	-	Go	25120
M20 X 2.5	6H	Go/NoGo	25123
M20 X 2.5	6H	NoGo	25121
M22 X 1.5	-	Go	25135
M22 X 1.5	6H	Go/NoGo	25138
M22 X 1.5	6H	NoGo	25136
M22 X 2.5	-	Go	25130
M22 X 2.5	6H	Go/NoGo	25133
M22 X 2.5	6H	NoGo	25131
M24 X 2	-	Go	25145
M24 X 2	6H	Go/NoGo	25148
M24 X 2	6H	NoGo	25146
M24 X 3	-	Go	25140
M24 X 3	6H	Go/NoGo	25143
M24 X 3	6H	NoGo	25141
M27 X 2	-	Go	25160
M27 X 2	6H	Go/NoGo	25163
M27 X 2	6H	NoGo	25161
M27 X 3	-	Go	25155
M27 X 3	6H	Go/NoGo	25158
M27 X 3	6H	NoGo	25156
M30 X 1.5	6H	Go/NoGo	21593
M30 X 2	-	Go	25170
M30 X 2	6H	Go/NoGo	25173
M30 X 2	6H	NoGo	25171
M30 X 3.5	-	Go	25165
M30 X 3.5	6H	Go/NoGo	25168
M30 X 3.5	6H	NoGo	25166
M32 X 1.5	6H	Go/NoGo	21611
M32 X 2.0	6H	Go/NoGo	21602
M33 X 2	-	Go	25180
M33 X 2	6H	Go/NoGo	25183

GENERAL PURPOSE

Premium HSS Thread Plug Gages



Series 195M | General Purpose | Plug Gage | Taperlock | Metric

Thread Size	Class of Fit	Type	EDP
M33 X 2	6H	NoGo	25181
M33 X 3.5	-	Go	25175
M33 X 3.5	6H	Go/NoGo	25178
M33 X 3.5	6H	NoGo	25176
M35 X 1.5	6H	Go/NoGo	21632
M36 X 1.5	6H	Go/NoGo	21662
M36 X 2.0	6H	Go/NoGo	21653
M36 X 3	-	Go	25190
M36 X 3	6H	Go/NoGo	25193
M36 X 3	6H	NoGo	25191
M36 X 4	-	Go	25185
M36 X 4	6H	Go/NoGo	25188
M36 X 4	6H	NoGo	25186
M39 X 3	-	Go	25200
M39 X 3	6H	Go/NoGo	25203
M39 X 3	6H	NoGo	25201
M39 X 4	-	Go	25195
M39 X 4	6H	Go/NoGo	25198
M39 X 4	6H	NoGo	25196

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION

Thread Plug Gage - Reversible

- A mechanical thread inspection tool used to check a work piece against its allowed thread tolerances
- Hardened High Speed Steel construction

Series 190 General Purpose | Plug Gage | Reversible

Thread Size	Class of Fit	Type	EDP
0-80 NF	2B	Go/NoGo	24194
0-80 NF	3B	Go/NoGo	24195
1-64 NC	2B	Go/NoGo	24199
1-64 NC	3B	Go/NoGo	24200
1-72 NF	2B	Go/NoGo	24204
1-72 NF	3B	Go/NoGo	24205
2-56 NC	2B	Go/NoGo	24209
2-56 NC	3B	Go/NoGo	24210
2-64 NF	2B	Go/NoGo	24214
2-64 NF	3B	Go/NoGo	24215
3-48 NC	2B	Go/NoGo	24219
3-48 NC	3B	Go/NoGo	24220
3-56 NF	2B	Go/NoGo	24224
3-56 NF	3B	Go/NoGo	24225
4-40 NC	2B	Go/NoGo	24229
4-40 NC	3B	Go/NoGo	24230
4-48 NF	2B	Go/NoGo	24234
4-48 NF	3B	Go/NoGo	24235
5-40 NC	2B	Go/NoGo	24239
5-40 NC	3B	Go/NoGo	24240
5-44 NF	2B	Go/NoGo	24244
5-44 NF	3B	Go/NoGo	24245
6-32 NC	3B	Go/NoGo	24249
6-32 NC	2B	Go/NoGo	24250
6-40 NF	2B	Go/NoGo	24254
6-40 NF	3B	Go/NoGo	24255
8-32 NC	2B	Go/NoGo	24259
8-32 NC	3B	Go/NoGo	24260
8-36 NF	2B	Go/NoGo	24264
8-36 NF	3B	Go/NoGo	24265
10-24 NC	2B	Go/NoGo	24269
10-24 NC	3B	Go/NoGo	24270
10-32 NF	2B	Go/NoGo	24274
10-32 NF	3B	Go/NoGo	24275
12-24 NC	2B	Go/NoGo	24279
12-24 NC	3B	Go/NoGo	24280
12-28 NF	2B	Go/NoGo	24284
12-28 NF	3B	Go/NoGo	24285
12-32 NEF	2B	Go/NoGo	24932
12-32 NEF	3B	Go/NoGo	24933
1/4-20 NC	2B	Go/NoGo	24289
1/4-20 NC	3B	Go/NoGo	24290
1/4-28 NF	2B	Go/NoGo	24294
1/4-28 NF	3B	Go/NoGo	24295
1/4-32 NEF	2B	Go/NoGo	24937
1/4-32 NEF	3B	Go/NoGo	24938
5/16-18 NC	2B	Go/NoGo	24299
5/16-18 NC	3B	Go/NoGo	24300
5/16-24 NF	2B	Go/NoGo	24304
5/16-24 NF	3B	Go/NoGo	24305
5/16-32 NEF	2B	Go/NoGo	24942
5/16-32 NEF	3B	Go/NoGo	24943
3/8-16 NC	2B	Go/NoGo	24309
3/8-16 NC	3B	Go/NoGo	24310

Thread Size	Class of Fit	Type	EDP
3/8-24 NF	2B	Go/NoGo	24314
3/8-24 NF	3B	Go/NoGo	24315
3/8-32 NEF	2B	Go/NoGo	24947
3/8-32 NEF	3B	Go/NoGo	24948
7/16-14 NC	2B	Go/NoGo	24319
7/16-14 NC	3B	Go/NoGo	24320
7/16-20 NF	2B	Go/NoGo	24324
7/16-20 NF	3B	Go/NoGo	24325
7/16-28 NEF	2B	Go/NoGo	24952
7/16-28 NEF	3B	Go/NoGo	24953
1/2-13 NC	2B	Go/NoGo	24329
1/2-13 NC	3B	Go/NoGo	24330
1/2-20 NF	2B	Go/NoGo	24334
1/2-20 NF	3B	Go/NoGo	24335
1/2-28 NEF	2B	Go/NoGo	24957
1/2-28 NEF	3B	Go/NoGo	24958
9/16-12 NC	2B	Go/NoGo	24339
9/16-12 NC	3B	Go/NoGo	24340
9/16-18 NF	2B	Go/NoGo	24344
9/16-18 NF	3B	Go/NoGo	24345
9/16-24 NEF	2B	Go/NoGo	24962
9/16-24 NEF	3B	Go/NoGo	24963
5/8-11 NC	2B	Go/NoGo	24349
5/8-11 NC	3B	Go/NoGo	24350
5/8-18 NF	2B	Go/NoGo	24354
5/8-18 NF	3B	Go/NoGo	24355
5/8-24 NEF	2B	Go/NoGo	24967
5/8-24 NEF	3B	Go/NoGo	24968
11/16-24 NEF	2B	Go/NoGo	24972
11/16-24 NEF	3B	Go/NoGo	24973
3/4-10 NC	2B	Go/NoGo	24359
3/4-10 NC	3B	Go/NoGo	24360
3/4-16 NF	2B	Go/NoGo	24364
3/4-16 NF	3B	Go/NoGo	24365
3/4-20 NEF	2B	Go/NoGo	24977
3/4-20 NEF	3B	Go/NoGo	24978



FEATURES/DESCRIPTION

Thread Plug Gage - Reversible - Metric

- A mechanical thread inspection tool used to check a work piece against its allowed thread tolerances
- Hardened High Speed Steel construction

Series 190M General Purpose | Plug Gage | Reversible | Metric

Thread Size	Class of Fit	Type	EDP
M1.6 X.35	6H	Go/NoGo	25645
M1.8 X.35	6H	Go/NoGo	25650
M2 X.4	6H	Go/NoGo	25655
M2.2 X.45	6H	Go/NoGo	25660
M2.5 X.45	6H	Go/NoGo	25665
M3 X.5	6H	Go/NoGo	25670
M3.5 X.6	6H	Go/NoGo	25675
M4 X.7	6H	Go/NoGo	25680
M4.5 X.75	6H	Go/NoGo	25685
M5 X.8	6H	Go/NoGo	25690
M6 X 1	6H	Go/NoGo	25695
M7 X 1	6H	Go/NoGo	25700
M8 X 1.25	6H	Go/NoGo	25705
M8 X 1	-	Go/NoGo	25710
M10 X 1.25	6H	Go/NoGo	25720
M10 X 1.5	6H	Go/NoGo	25715
M12 X 1.25	6H	Go/NoGo	25730
M12 X 1.75	6H	Go/NoGo	25725
M14 X 1.5	6H	Go/NoGo	25740
M14 X 2	6H	Go/NoGo	25735
M16 X 1.5	6H	Go/NoGo	25750
M16 X 2	6H	Go/NoGo	25745
M18 X 1.5	6H	Go/NoGo	25760
M18 X 2.5	6H	Go/NoGo	25755

*bold numbers are EDPs for ordering



FEATURES/DESCRIPTION

Thread Plug Gage - STI Threads

- A mechanical thread inspection tool used to check a work piece against its allowed tolerances
- For inspection of screw thread insert (STI) threads
- Hardened High Speed Steel construction

Series 191 | General Purpose | Plug Gage | STI

Thread Size	Class of Fit	Type	EDP
2-56 NC	-	Go	24594
2-56 NC	2B	NoGo	24595
2-56 NC	3B	NoGo	24596
2-56 NC	2B	Go/NoGo	24597
2-56 NC	3B	Go/NoGo	24598
4-40 NC	-	Go	24614
4-40 NC	2B	NoGo	24615
4-40 NC	3B	NoGo	24616
4-40 NC	2B	Go/NoGo	24617
4-40 NC	3B	Go/NoGo	24618
4-48 NF	-	Go	24619
4-48 NF	2B	NoGo	24620
4-48 NF	3B	NoGo	24621
4-48 NF	2B	Go/NoGo	24622
4-48 NF	3B	Go/NoGo	24623
5-40 NC	-	Go	24624
5-40 NC	2B	NoGo	24625
5-40 NC	3B	NoGo	24626
5-40 NC	2B	Go/NoGo	24627
5-40 NC	3B	Go/NoGo	24628
6-32 NC	-	Go/NoGo	24637
6-32 NC	2B	Go	24634
6-32 NC	3B	NoGo	24635
6-32 NC	2B	NoGo	24636
6-32 NC	3B	Go/NoGo	24638
6-40 NF	-	Go	24639
6-40 NF	2B	NoGo	24640
6-40 NF	3B	NoGo	24641
6-40 NF	2B	Go/NoGo	24642
6-40 NF	3B	Go/NoGo	24643
8-32 NC	-	Go	24644
8-32 NC	2B	NoGo	24645
8-32 NC	3B	NoGo	24646
8-32 NC	2B	Go/NoGo	24647
8-32 NC	3B	Go/NoGo	24648
8-36 NF	-	Go	24649
8-36 NF	2B	NoGo	24650
8-36 NF	3B	NoGo	24651
8-36 NF	2B	Go/NoGo	24652
8-36 NF	3B	Go/NoGo	24653
10-24 NC	-	Go	24654
10-24 NC	2B	NoGo	24655
10-24 NC	3B	NoGo	24656
10-24 NC	2B	Go/NoGo	24657
10-24 NC	3B	Go/NoGo	24658
10-32 NF	-	Go	24659
10-32 NF	2B	NoGo	24660
10-32 NF	3B	NoGo	24661
10-32 NF	2B	Go/NoGo	24662
10-32 NF	3B	Go/NoGo	24663
12-24 NC	-	Go	24664
12-24 NC	2B	NoGo	24665
12-24 NC	3B	NoGo	24666
12-24 NC	2B	Go/NoGo	24667

Thread Size	Class of Fit	Type	EDP
12-24 NC	3B	Go/NoGo	24668
1/4-20 NC	-	Go	24674
1/4-20 NC	2B	NoGo	24675
1/4-20 NC	3B	NoGo	24676
1/4-20 NC	2B	Go/NoGo	24677
1/4-20 NC	3B	Go/NoGo	24678
1/4-28 NF	-	Go	24679
1/4-28 NF	2B	NoGo	24680
1/4-28 NF	3B	NoGo	24681
1/4-28 NF	2B	Go/NoGo	24682
1/4-28 NF	3B	Go/NoGo	24683
5/16-18 NC	-	Go	24684
5/16-18 NC	2B	NoGo	24685
5/16-18 NC	3B	NoGo	24686
5/16-18 NC	2B	Go/NoGo	24687
5/16-18 NC	3B	Go/NoGo	24688
5/16-24 NF	-	Go	24689
5/16-24 NF	2B	NoGo	24690
5/16-24 NF	3B	NoGo	24691
5/16-24 NF	2B	Go/NoGo	24692
5/16-24 NF	3B	Go/NoGo	24693
3/8-16 NC	-	Go	24694
3/8-16 NC	2B	NoGo	24695
3/8-16 NC	3B	NoGo	24696
3/8-16 NC	2B	Go/NoGo	24697
3/8-16 NC	3B	Go/NoGo	24698
3/8-24 NF	-	Go	24699
3/8-24 NF	2B	NoGo	24700
3/8-24 NF	3B	NoGo	24701
3/8-24 NF	2B	Go/NoGo	24702
3/8-24 NF	3B	Go/NoGo	24703
7/16-14 NC	-	Go	24704
7/16-14 NC	2B	NoGo	24705
7/16-14 NC	3B	NoGo	24706
7/16-14 NC	2B	Go/NoGo	24707
7/16-14 NC	3B	Go/NoGo	24708
7/16-20 NF	-	Go	24709
7/16-20 NF	2B	NoGo	24710
7/16-20 NF	3B	NoGo	24711
7/16-20 NF	2B	Go/NoGo	24712
7/16-20 NF	3B	Go/NoGo	24713
1/2-13 NC	-	Go	24714
1/2-13 NC	2B	NoGo	24715
1/2-13 NC	3B	NoGo	24716
1/2-13 NC	2B	Go/NoGo	24717
1/2-13 NC	3B	Go/NoGo	24718
1/2-20 NF	-	Go	24719
1/2-20 NF	2B	NoGo	24720
1/2-20 NF	3B	NoGo	24721
1/2-20 NF	2B	Go/NoGo	24722
1/2-20 NF	3B	Go/NoGo	24723
5/8-11 NC	-	Go	24734
5/8-11 NC	2B	NoGo	24735
5/8-11 NC	3B	NoGo	24736

GENERAL PURPOSE

Premium HSS Thread Plug Gages



Series 191 | General Purpose | Plug Gage | STI

Thread Size	Class of Fit	Type	EDP
5/8-11 NC	2B	Go/NoGo	24737
5/8-11 NC	3B	Go/NoGo	24738
5/8-18 NF	-	Go	24739
5/8-18 NF	2B	NoGo	24740
5/8-18 NF	3B	NoGo	24741
5/8-18 NF	2B	Go/NoGo	24742
5/8-18 NF	3B	Go/NoGo	24743
3/4-10 NC	-	Go	24744
3/4-10 NC	2B	NoGo	24745
3/4-10 NC	3B	NoGo	24746
3/4-10 NC	2B	Go/NoGo	24747
3/4-10 NC	3B	Go/NoGo	24748
3/4-16 NF	-	Go	24749
3/4-16 NF	2B	NoGo	24750
3/4-16 NF	3B	NoGo	24751
3/4-16 NF	2B	Go/NoGo	24752
3/4-16 NF	3B	Go/NoGo	24753

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION

Plug Thread Gage - NPT & NPTF

- A mechanical thread inspection tool used to check a work piece against its allowed thread tolerances
- Internal pipe threads inspection
- NPT & NPTF
- With or without handle

Series 192 General Purpose | Plug Gage | NPT & NPTF

Thread Size	Standard	Handle	Type	EDP
1/16-27	NPT	No	L1	24367
1/16-27	NPT	Yes	L1	24368
1/16-27	NPTF	No	L1	24414
1/16-27	NPTF	No	6-Step	24522
1/16-27	NPTF	Yes	6-Step	24524
1/16-27	NPTF	No	L3	24416
1/16-27	NPTF	Yes	L1	24418
1/16-27	NPTF	Yes	L3	24420
1/8-27	NPT	No	L1	24370
1/8-27	NPT	Yes	L1	24371
1/8-27	NPTF	No	L1	24422
1/8-27	NPTF	No	L3	24424
1/8-27	NPTF	Yes	L1	24426
1/8-27	NPTF	Yes	L3	24428
1/8-27	NPTF	No	6-Step	24526
1/8-27	NPTF	Yes	6-Step	24528
1/4-18	NPT	No	L1	24373
1/4-18	NPT	Yes	L1	24374
1/4-18	NPTF	No	L1	24430
1/4-18	NPTF	No	L3	24432
1/4-18	NPTF	Yes	L1	24434
1/4-18	NPTF	Yes	L3	24436
1/4-18	NPTF	No	6-Step	24530
1/4-18	NPTF	Yes	6-Step	24532
3/8-18	NPT	No	L1	24376
3/8-18	NPT	Yes	L1	24377
3/8-18	NPTF	No	L1	24438
3/8-18	NPTF	No	L3	24440
3/8-18	NPTF	Yes	L1	24442
3/8-18	NPTF	Yes	L3	24444
3/8-18	NPTF	No	6-Step	24534
3/8-18	NPTF	Yes	6-Step	24536
1/2-14	NPT	No	L1	24379
1/2-14	NPT	Yes	L1	24380
1/2-14	NPTF	No	L1	24446
1/2-14	NPTF	No	L3	24448
1/2-14	NPTF	Yes	L1	24450
1/2-14	NPTF	Yes	L3	24452
1/2-14	NPTF	No	6-Step	24538
1/2-14	NPTF	Yes	6-Step	24540
3/4-14	NPT	No	L1	24382
3/4-14	NPT	Yes	L1	24383
3/4-14	NPTF	No	L1	24454
3/4-14	NPTF	No	L3	24456
3/4-14	NPTF	Yes	L1	24458

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Premium HSS Thread Plug Gages



Series 192

General Purpose | Plug Gage | NPT & NPTF

Thread Size	Standard	Handle	Type	EDP
3/4-14	NPTF	Yes	L3	24460
3/4-14	NPTF	No	6-Step	24542
3/4-14	NPTF	Yes	6-Step	24544
1-11-1/2	NPT	No	L1	24385
1-11-1/2	NPT	Yes	L1	24386
1-11-1/2	NPTF	No	L1	24462
1-11-1/2	NPTF	No	L3	24464
1-11-1/2	NPTF	Yes	L1	24466
1-11-1/2	NPTF	Yes	L3	24468
1-11-1/2	NPTF	No	6-Step	24546
1-11-1/2	NPTF	Yes	6-Step	24548
1-1/2-11	NPT	No	L1	24391
1-1/2-11	NPT	Yes	L1	24392
1-1/2-11-1/2	NPTF	Yes	L1	24482
1-1/2-11-1/2	NPTF	Yes	L3	24484
1-1/2-11-1/2	NPTF	No	L1	24478
1-1/2-11-1/2	NPTF	No	L3	24480
1-1/2-11-1/2	NPTF	No	6-Step	24554
1-1/2-11-1/2	NPTF	Yes	6-Step	24556
1-1/4-11-1/2	NPTF	No	6-Step	24550
1-1/4-11-1/2	NPTF	Yes	6-Step	24552
1-1/4-11	NPT	No	L1	24388
1-1/4-11	NPT	Yes	L1	24389
1-1/4-11-1/2	NPTF	Yes	L1	24474
1-1/4-11-1/2	NPTF	Yes	L3	24476
1-1/4-11-1/2	NPTF	No	L1	24470
1-1/4-11-1/2	NPTF	No	L3	24472
2-11-1/2	NPT	No	L1	24397
2-11-1/2	NPT	Yes	L1	24398
3-11-1/2	NPT	No	L1	24403
3-11-1/2	NPT	Yes	L1	24404
2-11-1/2	NPT	No	L1	24394
2-11-1/2	NPT	Yes	L1	24395
3-8	NPT	No	L1	24400
3-8	NPT	Yes	L1	24401
4-8	NPT	No	L1	24406
4-8	NPT	Yes	L1	24407
5-8	NPT	No	L1	24409
5-8	NPT	Yes	L1	24410
6-8	NPT	No	L1	24412
6-8	NPT	Yes	L1	24413

*bold numbers are EDPs for ordering

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION
<p>Plug Thread Gage - BSPT & BSPP</p> <ul style="list-style-type: none"> • A mechanical thread inspection tool used to check a work piece against its allowed thread tolerances • Plug gages for inspection of internal british standard pipe threads • BSPT = Single End Gage • BSPP = Double Ended Gage • Optional handle • Hardened High Speed Steel construction

Series 194 | General Purpose | Plug Gage | Pipe Thread | BSPT & BSPP

Thread Size	Standard	Handle	Type	EDP
1/8-28	BSPT	No	-	27001
1/8-28	BSPT	Yes	-	27002
1/8-28	BSPP	No	Go	27039
1/8-28	BSPP	No	No Go	27040
1/8-28	BSPP	Yes	Go/NoGo	27041
1/4-19	BSPT	No	-	27004
1/4-19	BSPT	Yes	-	27005
1/4-19	BSPP	No	Go/NoGo	27042
1/4-19	BSPP	No	No Go	27043
1/4-19	BSPP	Yes	Go/NoGo	27044
3/8-19	BSPT	No	-	27007
3/8-19	BSPT	Yes	-	27008
3/8-19	BSPP	No	Go	27045
3/8-19	BSPP	No	No Go	27046
3/8-19	BSPP	Yes	Go/NoGo	27047
1/2-14	BSPT	No	-	27010
1/2-14	BSPT	Yes	-	27011
1/2-14	BSPP	No	Go	27048
1/2-14	BSPP	No	No Go	27049
1/2-14	BSPP	Yes	Go/NoGo	27050
3/4-14	BSPT	No	-	27013
3/4-14	BSPT	Yes	-	27014
3/4-14	BSPP	No	Go	27051
3/4-14	BSPP	No	No Go	27052
3/4-14	BSPP	Yes	Go/NoGo	27053
1-11	BSPT	No	-	27016
1-11	BSPT	Yes	-	27017
1-11	BSPP	No	Go	27054
1-11	BSPP	No	No Go	27055
1-11	BSPP	Yes	Go/NoGo	27056
1-1/2-11	BSPT	No	-	27022
1-1/2-11	BSPT	Yes	-	27023
1-1/2-11	BSPP	No	Go	27060
1-1/2-11	BSPP	No	No Go	27061
1-1/2-11	BSPP	Yes	Go/NoGo	27062
1-1/4-11	BSPT	No	-	27019
1-1/4-11	BSPT	Yes	-	27020
1-1/4-11	BSPP	No	Go	27057
1-1/4-11	BSPP	No	No Go	27058
1-1/4-11	BSPP	Yes	Go/NoGo	27059

*bold numbers are EDPs for ordering



FEATURES/DESCRIPTION

Thread Ring Gage

- A mechanical thread inspection tool used to check a work piece against its allowed thread tolerance
- Ring gages for inspection of external threads
- Hardened High Speed Steel construction

Series 196 | General Purpose | Ring Gage

Thread Size	Class of Fit	Handle	Type	EDP
0-80 NF	2A	No	Go	23350
0-80 NF	3A	No	Go	23351
0-80 NF	2A	No	NoGo	23352
0-80 NF	3A	No	NoGo	23353
0-80 NF	2A	Yes	Go/NoGo	23354
0-80 NF	3A	Yes	Go/NoGo	23355
1-64 NC	2A	No	Go	23356
1-64 NC	3A	No	Go	23357
1-64 NC	2A	No	NoGo	23358
1-64 NC	3A	No	NoGo	23359
1-64 NC	2A	Yes	Go/NoGo	23360
1-64 NC	3A	Yes	Go/NoGo	23361
1-72 NF	2A	No	Go	23362
1-72 NF	3A	No	Go	23363
1-72 NF	2A	No	NoGo	23364
1-72 NF	3A	No	NoGo	23365
1-72 NF	2A	Yes	Go/NoGo	23366
1-72 NF	3A	Yes	Go/NoGo	23367
2-56 NC	2A	No	Go	23368
2-56 NC	3A	No	Go	23369
2-56 NC	2A	No	NoGo	23370
2-56 NC	3A	No	NoGo	23371
2-56 NC	2A	Yes	Go/NoGo	23372
2-56 NC	3A	Yes	Go/NoGo	23373
2-64 NF	2A	No	Go	23374
2-64 NF	3A	No	Go	23375
2-64 NF	2A	No	NoGo	23376
2-64 NF	3A	No	NoGo	23377
2-64 NF	2A	Yes	Go/NoGo	23378
2-64 NF	3A	Yes	Go/NoGo	23379
3-48 NC	2A	No	Go	23380
3-48 NC	3A	No	Go	23381
3-48 NC	2A	No	NoGo	23382
3-48 NC	3A	No	NoGo	23383
3-48 NC	2A	Yes	Go/NoGo	23384
3-48 NC	3A	Yes	Go/NoGo	23385
3-56 NF	2A	No	Go	23386
3-56 NF	3A	No	Go	23387
3-56 NF	2A	No	NoGo	23388
3-56 NF	3A	No	NoGo	23389
3-56 NF	2A	Yes	Go/NoGo	23390
3-56 NF	3A	Yes	Go/NoGo	23391
4-40 NC	2A	No	Go	23392
4-40 NC	3A	No	Go	23393
4-40 NC	2A	No	NoGo	23394
4-40 NC	3A	No	NoGo	23395
4-40 NC	2A	Yes	Go/NoGo	23396
4-40 NC	3A	Yes	Go/NoGo	23397
4-48 NF	2A	No	Go	23398
4-48 NF	3A	No	Go	23399
4-48 NF	2A	No	NoGo	23400
4-48 NF	3A	No	NoGo	23401
4-48 NF	2A	Yes	Go/NoGo	23402
4-48 NF	3A	Yes	Go/NoGo	23403

Thread Size	Class of Fit	Handle	Type	EDP
5-40 NC	2A	No	Go	23404
5-40 NC	3A	No	Go	23405
5-40 NC	2A	No	NoGo	23406
5-40 NC	3A	No	NoGo	23407
5-40 NC	2A	Yes	Go/NoGo	23408
5-40 NC	3A	Yes	Go/NoGo	23409
5-44 NF	2A	No	Go	23410
5-44 NF	3A	No	Go	23411
5-44 NF	2A	No	NoGo	23412
5-44 NF	3A	No	NoGo	23413
5-44 NF	2A	Yes	Go/NoGo	23414
5-44 NF	3A	Yes	Go/NoGo	23415
6-32 NC	2A	No	Go	23416
6-32 NC	3A	No	Go	23417
6-32 NC	2A	No	NoGo	23418
6-32 NC	3A	No	NoGo	23419
6-32 NC	2A	Yes	Go/NoGo	23420
6-32 NC	3A	Yes	Go/NoGo	23421
6-40 NF	2A	No	Go	23422
6-40 NF	3A	No	Go	23423
6-40 NF	2A	No	NoGo	23424
6-40 NF	3A	No	NoGo	23425
6-40 NF	2A	Yes	Go/NoGo	23426
6-40 NF	3A	Yes	Go/NoGo	23427
8-32 NC	2A	No	Go	23428
8-32 NC	3A	No	Go	23429
8-32 NC	2A	No	NoGo	23430
8-32 NC	3A	No	NoGo	23431
8-32 NC	2A	Yes	Go/NoGo	23432
8-32 NC	3A	Yes	Go/NoGo	23433
8-36 NF	2A	No	Go	23434
8-36 NF	3A	No	Go	23435
8-36 NF	2A	No	NoGo	23436
8-36 NF	3A	No	NoGo	23437
8-36 NF	2A	Yes	Go/NoGo	23438
8-36 NF	3A	Yes	Go/NoGo	23439
10-24 NC	2A	No	Go	23440
10-24 NC	3A	No	Go	23441
10-24 NC	2A	No	NoGo	23442
10-24 NC	3A	No	NoGo	23443
10-24 NC	2A	Yes	Go/NoGo	23444
10-24 NC	3A	Yes	Go/NoGo	23445
10-32 NF	2A	No	Go	23446
10-32 NF	3A	No	Go	23447
10-32 NF	2A	No	NoGo	23448
10-32 NF	3A	No	NoGo	23449
10-32 NF	2A	Yes	Go/NoGo	23450
10-32 NF	3A	Yes	Go/NoGo	23451
12-24 NC	2A	No	Go	23452
12-24 NC	3A	No	Go	23453
12-24 NC	2A	No	NoGo	23454
12-24 NC	3A	No	NoGo	23455
12-24 NC	2A	Yes	Go/NoGo	23456
12-24 NC	3A	Yes	Go/NoGo	23457

GENERAL PURPOSE

Premium HSS Thread Ring Gages



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Series 196					General Purpose | Ring Gage				
Thread Size	Class of Fit	Handle	Type	EDP	Thread Size	Class of Fit	Handle	Type	EDP
12-28 NF	2A	No	Go	23458	7/16-20 NF	2A	No	NoGo	23532
12-28 NF	3A	No	Go	23459	7/16-20 NF	3A	No	NoGo	23533
12-28 NF	2A	No	NoGo	23460	7/16-20 NF	2A	Yes	Go/NoGo	23534
12-28 NF	3A	No	NoGo	23461	7/16-20 NF	3A	Yes	Go/NoGo	23535
12-28 NF	2A	Yes	Go/NoGo	23462	7/16-28 NEF	2A	No	Go	23536
12-28 NF	3A	Yes	Go/NoGo	23463	7/16-28 NEF	3A	No	Go	23537
12-32 NEF	2A	No	Go	23464	7/16-28 NEF	2A	No	NoGo	23538
12-32 NEF	3A	No	Go	23465	7/16-28 NEF	3A	No	NoGo	23539
12-32 NEF	2A	No	NoGo	23466	7/16-28 NEF	2A	Yes	Go/NoGo	23540
12-32 NEF	3A	No	NoGo	23467	7/16-28 NEF	3A	Yes	Go/NoGo	23541
12-32 NEF	2A	Yes	Go/NoGo	23468	1/2-13 NC	2A	No	Go	23542
12-32 NEF	3A	Yes	Go/NoGo	23469	1/2-13 NC	3A	No	Go	23543
1/4-20 NC	2A	No	Go	23470	1/2-13 NC	2A	No	NoGo	23544
1/4-20 NC	3A	No	Go	23471	1/2-13 NC	3A	No	NoGo	23545
1/4-20 NC	2A	No	NoGo	23472	1/2-13 NC	2A	Yes	Go/NoGo	23546
1/4-20 NC	3A	No	NoGo	23473	1/2-13 NC	3A	Yes	Go/NoGo	23547
1/4-20 NC	2A	Yes	Go/NoGo	23474	1/2-20 NF	2A	No	Go	23548
1/4-20 NC	3A	Yes	Go/NoGo	23475	1/2-20 NF	3A	No	Go	23549
1/4-28 NF	2A	No	Go	23476	1/2-20 NF	2A	No	NoGo	23550
1/4-28 NF	3A	No	Go	23477	1/2-20 NF	3A	No	NoGo	23551
1/4-28 NF	2A	No	NoGo	23478	1/2-20 NF	2A	Yes	Go/NoGo	23552
1/4-28 NF	3A	No	NoGo	23479	1/2-20 NF	3A	Yes	Go/NoGo	23553
1/4-28 NF	2A	Yes	Go/NoGo	23480	1/2-28 NEF	2A	No	Go	23554
1/4-28 NF	3A	Yes	Go/NoGo	23481	1/2-28 NEF	3A	No	Go	23555
1/4-32 NEF	2A	No	Go	23482	1/2-28 NEF	2A	No	NoGo	23556
1/4-32 NEF	3A	No	Go	23483	1/2-28 NEF	3A	No	NoGo	23557
1/4-32 NEF	2A	No	NoGo	23484	1/2-28 NEF	2A	Yes	Go/NoGo	23558
1/4-32 NEF	3A	No	NoGo	23485	1/2-28 NEF	3A	Yes	Go/NoGo	23559
1/4-32 NEF	2A	Yes	Go/NoGo	23486	9/16-12 NC	2A	No	Go	23560
1/4-32 NEF	3A	Yes	Go/NoGo	23487	9/16-12 NC	3A	No	Go	23561
5/16-18 NC	2A	No	Go	23488	9/16-12 NC	2A	No	NoGo	23562
5/16-18 NC	3A	No	Go	23489	9/16-12 NC	3A	No	NoGo	23563
5/16-18 NC	2A	No	NoGo	23490	9/16-12 NC	2A	Yes	Go/NoGo	23564
5/16-18 NC	3A	No	NoGo	23491	9/16-12 NC	3A	Yes	Go/NoGo	23565
5/16-18 NC	2A	Yes	Go/NoGo	23492	9/16-18 NF	2A	No	Go	23566
5/16-18 NC	3A	Yes	Go/NoGo	23493	9/16-18 NF	3A	No	Go	23567
5/16-24 NF	2A	No	Go	23494	9/16-18 NF	2A	No	NoGo	23568
5/16-24 NF	3A	No	Go	23495	9/16-18 NF	3A	No	NoGo	23569
5/16-24 NF	2A	No	NoGo	23496	9/16-18 NF	2A	Yes	Go/NoGo	23570
5/16-24 NF	3A	No	NoGo	23497	9/16-18 NF	3A	Yes	Go/NoGo	23571
5/16-24 NF	2A	Yes	Go/NoGo	23498	9/16-24 NEF	2A	No	Go	23572
5/16-24 NF	3A	Yes	Go/NoGo	23499	9/16-24 NEF	3A	No	Go	23573
5/16-32 NEF	2A	No	Go	23500	9/16-24 NEF	2A	No	NoGo	23574
5/16-32 NEF	3A	No	Go	23501	9/16-24 NEF	3A	No	NoGo	23575
5/16-32 NEF	2A	No	NoGo	23502	9/16-24 NEF	2A	Yes	Go/NoGo	23576
5/16-32 NEF	3A	No	NoGo	23503	9/16-24 NEF	3A	Yes	Go/NoGo	23577
5/16-32 NEF	2A	Yes	Go/NoGo	23504	5/8-11 NC	2A	No	Go	23578
5/16-32 NEF	3A	Yes	Go/NoGo	23505	5/8-11 NC	3A	No	Go	23579
3/8-16 NC	2A	No	Go	23506	5/8-11 NC	2A	No	NoGo	23580
3/8-16 NC	3A	No	Go	23507	5/8-11 NC	3A	No	NoGo	23581
3/8-16 NC	2A	No	NoGo	23508	5/8-11 NC	2A	Yes	Go/NoGo	23582
3/8-16 NC	3A	No	NoGo	23509	5/8-11 NC	3A	Yes	Go/NoGo	23583
3/8-16 NC	2A	Yes	Go/NoGo	23510	5/8-18 NF	2A	No	Go	23584
3/8-16 NC	3A	Yes	Go/NoGo	23511	5/8-18 NF	3A	No	Go	23585
3/8-24 NF	2A	No	Go	23512	5/8-18 NF	2A	No	NoGo	23586
3/8-24 NF	3A	No	Go	23513	5/8-18 NF	3A	No	NoGo	23587
3/8-24 NF	2A	No	NoGo	23514	5/8-18 NF	2A	Yes	Go/NoGo	23588
3/8-24 NF	3A	No	NoGo	23515	5/8-18 NF	3A	Yes	Go/NoGo	23589
3/8-24 NF	2A	Yes	Go/NoGo	23516	5/8-24 NEF	2A	No	Go	23590
3/8-24 NF	3A	Yes	Go/NoGo	23517	5/8-24 NEF	3A	No	Go	23591
3/8-32 NEF	2A	No	Go	23518	5/8-24 NEF	2A	No	NoGo	23592
3/8-32 NEF	3A	No	Go	23519	5/8-24 NEF	3A	No	NoGo	23593
3/8-32 NEF	2A	No	NoGo	23520	5/8-24 NEF	2A	Yes	Go/NoGo	23594
3/8-32 NEF	3A	No	NoGo	23521	5/8-24 NEF	3A	Yes	Go/NoGo	23595
3/8-32 NEF	2A	Yes	Go/NoGo	23522	11/16-24 NEF	2A	No	Go	23596
3/8-32 NEF	3A	Yes	Go/NoGo	23523	11/16-24 NEF	3A	No	Go	23597
7/16-14 NC	2A	No	Go	23524	11/16-24 NEF	2A	No	NoGo	23598
7/16-14 NC	3A	No	Go	23525	11/16-24 NEF	3A	No	NoGo	23599
7/16-14 NC	2A	No	NoGo	23526	11/16-24 NEF	2A	Yes	Go/NoGo	23600
7/16-14 NC	3A	No	NoGo	23527	11/16-24 NEF	3A	Yes	Go/NoGo	23601
7/16-14 NC	2A	Yes	Go/NoGo	23528	3/4-16 NF	2A	Yes	Go/NoGo	23612
7/16-14 NC	3A	Yes	Go/NoGo	23529	3/4-16 NF	3A	Yes	Go/NoGo	23613
7/16-20 NF	2A	No	Go	23530	3/4-20 NEF	2A	Yes	Go/NoGo	23618
7/16-20 NF	3A	No	Go	23531	3/4-20 NEF	3A	Yes	Go/NoGo	23619

GENERAL PURPOSE

Premium HSS Thread Ring Gages



Series 196

General Purpose | Ring Gage

Thread Size	Class of Fit	Handle	Type	EDP
13/16-20 NEF	2A	Yes	Go/NoGo	23624
13/16-20 NEF	3A	Yes	Go/NoGo	23625
7/8-9 NC	2A	Yes	Go/NoGo	23630
7/8-9 NC	3A	Yes	Go/NoGo	23631
7/8-14 NF	2A	Yes	Go/NoGo	23636
7/8-14 NF	3A	Yes	Go/NoGo	23637
7/8-20 NEF	2A	Yes	Go/NoGo	23642
7/8-20 NEF	3A	Yes	Go/NoGo	23643
15/16-20 NS	2A	Yes	Go/NoGo	23648
15/16-20 NS	3A	Yes	Go/NoGo	23649
1-8 NC	2A	Yes	Go/NoGo	23654
1-8 NC	3A	Yes	Go/NoGo	23655
1-12 NF	2A	Yes	Go/NoGo	23660
1-12 NF	3A	Yes	Go/NoGo	23661
1-14 NS	2A	Yes	Go/NoGo	23666
1-14 NS	3A	Yes	Go/NoGo	23667
1-20 NEF	2A	Yes	Go/NoGo	23672
1-20 NEF	3A	Yes	Go/NoGo	23673
1 1/16-18 NEF	2A	Yes	Go/NoGo	23678
1 1/16-18 NEF	3A	Yes	Go/NoGo	23679
1-1/8-7 NC	2A	Yes	Go/NoGo	23684
1-1/8-7 NC	3A	Yes	Go/NoGo	23685
1-1/8-12 NF	2A	Yes	Go/NoGo	23690
1-1/8-12 NF	3A	Yes	Go/NoGo	23691
1-1/8-18 NEF	2A	Yes	Go/NoGo	23696
1-1/8-18 NEF	3A	Yes	Go/NoGo	23697
1 3/16-18 NEF	2A	No	NoGo	23700
1 3/16-18 NEF	3A	No	NoGo	23701
1 3/16-18 NEF	2A	Yes	Go/NoGo	23702
1 3/16-18 NEF	3A	Yes	Go/NoGo	23703
1-1/4-7 NC	2A	No	Go	23704
1-1/4-7 NC	3A	No	Go	23705
1-1/4-7 NC	2A	No	NoGo	23706
1-1/4-7 NC	3A	No	NoGo	23707
1-1/4-7 NC	2A	Yes	Go/NoGo	23708
1-1/4-7 NC	3A	Yes	Go/NoGo	23709
1-1/4-12 NS	2A	No	Go	23710
1-1/4-12 NS	3A	No	Go	23711
1-1/4-12 NS	2A	No	NoGo	23712
1-1/4-12 NS	3A	No	NoGo	23713
1-1/4-12 NS	2A	Yes	Go/NoGo	23714
1-1/4-12 NS	3A	Yes	Go/NoGo	23715
1-1/4-18 NEF	2A	No	Go	23716
1-1/4-18 NEF	3A	No	Go	23717
1-1/4-18 NEF	2A	No	NoGo	23718
1-1/4-18 NEF	3A	No	NoGo	23719
1-1/4-18 NEF	2A	Yes	Go/NoGo	23720
1-1/4-18 NEF	3A	Yes	Go/NoGo	23721
1 5/16-18 NC	2A	No	Go	23722
1 5/16-18 NC	3A	No	Go	23723
1 5/16-18 NC	2A	No	NoGo	23724
1 5/16-18 NC	3A	No	NoGo	23725
1 5/16-18 NC	2A	Yes	Go/NoGo	23726
1 5/16-18 NC	3A	Yes	Go/NoGo	23727
1 3/8-6 NC	2A	No	Go	23728
1 3/8-6 NC	3A	No	Go	23729
1 3/8-6 NC	2A	No	NoGo	23730
1 3/8-6 NC	3A	No	NoGo	23731
1 3/8-6 NC	2A	Yes	Go/NoGo	23732
1 3/8-6 NC	3A	Yes	Go/NoGo	23733
1 3/8-12 NF	2A	No	Go	23734
1 3/8-12 NF	3A	No	Go	23735
1 3/8-12 NF	2A	No	NoGo	23736
1 3/8-12 NF	3A	No	NoGo	23737
1 3/8-12 NF	2A	Yes	Go/NoGo	23738
1 3/8-12 NF	3A	Yes	Go/NoGo	23739
1 3/8-18 NS	2A	No	Go	23740
1 3/8-18 NS	3A	No	Go	23741
1 3/8-18 NS	2A	No	NoGo	23742
1 3/8-18 NS	3A	No	NoGo	23743
1 3/8-18 NS	2A	Yes	Go/NoGo	23744
1 3/8-18 NS	3A	Yes	Go/NoGo	23745
1 7/16-18 NS	2A	No	Go	23746
1 7/16-18 NS	3A	No	Go	23747

Thread Size	Class of Fit	Handle	Type	EDP
1 7/16-18 NS	2A	No	NoGo	23748
1 7/16-18 NS	3A	No	NoGo	23749
1 7/16-18 NS	2A	Yes	Go/NoGo	23750
1 7/16-18 NS	3A	Yes	Go/NoGo	23751
1-1/2-6 NC	2A	No	Go	23752
1-1/2-6 NC	3A	No	Go	23753
1-1/2-6 NC	2A	No	NoGo	23754
1-1/2-6 NC	3A	No	NoGo	23755
1-1/2-6 NC	2A	Yes	Go/NoGo	23756
1-1/2-6 NC	3A	Yes	Go/NoGo	23757
1-1/2-12 NS	2A	No	Go	23758
1-1/2-12 NS	3A	No	Go	23759
1-1/2-12 NS	2A	No	NoGo	23760
1-1/2-12 NS	3A	No	NoGo	23761
1-1/2-12 NS	2A	Yes	Go/NoGo	23762
1-1/2-12 NS	3A	Yes	Go/NoGo	23763
1-1/2-18 NS	2A	No	Go	23764
1-1/2-18 NS	3A	No	Go	23765
1-1/2-18 NS	2A	No	NoGo	23766
1-1/2-18 NS	3A	No	NoGo	23767
1-1/2-18 NS	2A	Yes	Go/NoGo	23768
1-1/2-18 NS	3A	Yes	Go/NoGo	23769

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION

Thread Ring Gage - Metric

- A mechanical thread inspection tool used to check a work piece against its allowed thread tolerance
- Ring gages for inspection of external threads
- Hardened High Speed Steel construction

Series 196M **General Purpose | Ring Gage | Metric**

Thread Size	Class of Fit	Handle	Type	EDP
M1.6 X.35	6g	Yes	Go/NoGo	25208
M1.6 X.35	6g	No	NoGo	25206
M1.6 X.35	6g	No	Go	25205
M1.8 X.35	6g	Yes	Go/NoGo	25213
M1.8 X.35	6g	No	NoGo	25211
M1.8 X.35	6g	No	Go	25210
M2 X.4	6g	Yes	Go/NoGo	25218
M2 X.4	6g	No	NoGo	25216
M2 X.4	6g	No	Go	25215
M2.2 X.45	6g	Yes	Go/NoGo	25223
M2.2 X.45	6g	No	NoGo	25221
M2.2 X.45	6g	No	Go	25220
M2.5 X.45	6g	Yes	Go/NoGo	25228
M2.5 X.45	6g	No	NoGo	25226
M2.5 X.45	6g	No	Go	25225
M3 X.5	6g	Yes	Go/NoGo	25233
M3 X.5	6g	No	NoGo	25231
M3 X.5	6g	No	Go	25230
M3.5 X.6	6g	Yes	Go/NoGo	25238
M3.5 X.6	6g	No	NoGo	25236
M3.5 X.6	6g	No	Go	25235
M4 X.7	6g	Yes	Go/NoGo	25243
M4 X.7	6g	No	NoGo	25241
M4 X.7	6g	No	Go	25240
M4.5 X.75	6g	Yes	Go/NoGo	25248
M4.5 X.75	6g	No	NoGo	25246
M4.5 X.75	6g	No	Go	25245
M5 X.8	6g	Yes	Go/NoGo	25253
M5 X.8	6g	No	NoGo	25251
M5 X.8	6g	No	Go	25250
M6 X 1	6g	Yes	Go/NoGo	25258
M6 X 1	6g	No	NoGo	25256
M6 X 1	6g	No	Go	25255
M7 X 1	6g	Yes	Go/NoGo	25263
M7 X 1	6g	No	NoGo	25261
M7 X 1	6g	No	Go	25260
M8 X 1	6g	Yes	Go/NoGo	25273
M8 X 1	6g	No	NoGo	25271
M8 X 1	6g	No	Go	25270
M8 X 1.25	6g	Yes	Go/NoGo	25268
M8 X 1.25	6g	No	NoGo	25266
M8 X 1.25	6g	No	Go	25265
M10 X 1.25	6g	Yes	Go/NoGo	25153
M10 X 1.25	6g	No	NoGo	25151
M10 X 1.25	6g	No	Go	25150
M10 X 1.5	6g	Yes	Go/NoGo	25278
M10 X 1.5	6g	No	NoGo	25276
M10 X 1.5	6g	No	Go	25275
M12 X 1.25	6g	Yes	Go/NoGo	25288
M12 X 1.25	6g	No	NoGo	25286
M12 X 1.25	6g	No	Go	25285
M12 X 1.75	6g	Yes	Go/NoGo	25283
M12 X 1.75	6g	No	NoGo	25281
M12 X 1.75	6g	No	Go	25280

Thread Size	Class of Fit	Handle	Type	EDP
M14 X 1.5	6g	Yes	Go/NoGo	25298
M14 X 1.5	6g	No	NoGo	25296
M14 X 1.5	6g	No	Go	25295
M14 X 2	6g	Yes	Go/NoGo	25293
M14 X 2	6g	No	NoGo	25291
M14 X 2	6g	No	Go	25290
M16 X 1.5	6g	Yes	Go/NoGo	25308
M16 X 1.5	6g	No	NoGo	25306
M16 X 1.5	6g	No	Go	25305
M16 X 2	6g	Yes	Go/NoGo	25303
M16 X 2	6g	No	NoGo	25301
M16 X 2	6g	No	Go	25300
M18 X 1.5	6g	Yes	Go/NoGo	25318
M18 X 1.5	6g	No	NoGo	25316
M18 X 1.5	6g	No	Go	25315
M18 X 2.5	6g	Yes	Go/NoGo	25313
M18 X 2.5	6g	No	NoGo	25311
M18 X 2.5	6g	No	Go	25310
M20 X 1.0	6g	No	NoGo	21513
M20 X 1.0	6g	No	Go	21514
M20 X 1.5	6g	Yes	Go/NoGo	25328
M20 X 1.5	6g	No	NoGo	25326
M20 X 1.5	6g	No	Go	25325
M20 X 2.5	6g	Yes	Go/NoGo	25323
M20 X 2.5	6g	No	NoGo	25321
M20 X 2.5	6g	No	Go	25320
M22 X 1.5	6g	Yes	Go/NoGo	25338
M22 X 1.5	6g	No	NoGo	25336
M22 X 1.5	6g	No	Go	25335
M22 X 2.5	6g	Yes	Go/NoGo	25333
M22 X 2.5	6g	No	NoGo	25331
M22 X 2.5	6g	No	Go	25330
M24 X 2	6g	Yes	Go/NoGo	25348
M24 X 2	6g	No	NoGo	25346
M24 X 2	6g	No	Go	25345
M24 X 3	6g	Yes	Go/NoGo	25343
M24 X 3	6g	No	NoGo	25341
M24 X 3	6g	No	Go	25340
M27 X 2	6g	Yes	Go/NoGo	25358
M27 X 2	6g	No	NoGo	25356
M27 X 2	6g	No	Go	25355
M27 X 3	6g	Yes	Go/NoGo	25353
M27 X 3	6g	No	NoGo	25351
M27 X 3	6g	No	Go	25350
M30 X 1.5	6g	No	NoGo	21594
M30 X 1.5	6g	No	NoGo	21595
M30 X 2	6g	Yes	Go/NoGo	25368
M30 X 2	6g	No	NoGo	25366
M30 X 2	6g	No	Go	25365
M30 X 3.5	6g	Yes	Go/NoGo	25363
M30 X 3.5	6g	No	NoGo	25361
M30 X 3.5	6g	No	Go	25360
M32 X 1.5	6g	No	NoGo	21612
M32 X 1.5	6g	No	NoGo	21613

GENERAL PURPOSE

Premium HSS Thread Ring Gages



Series 196M | General Purpose | Ring Gage | Metric

Thread Size	Class of Fit	Handle	Type	EDP
M32 X 2.0	6g	No	Go	21603
M32 X 2.0	6g	No	NoGo	21604
M33 X 2	6g	Yes	Go/NoGo	25378
M33 X 2	6g	No	NoGo	25376
M33 X 2	6g	No	Go	25375
M33 X 3.5	6g	Yes	Go/NoGo	25373
M33 X 3.5	6g	No	NoGo	25371
M33 X 3.5	6g	No	Go	25370
M35 X 1.5	6g	No	Go	21633
M35 X 1.5	6g	No	NoGo	21634
M36 X 1.5	6g	No	Go	21663
M36 X 1.5	6g	No	NoGo	21664
M36 X 2.0	6g	No	Go	21654
M36 X 2.0	6g	No	NoGo	21655
M36 X 3	6g	Yes	Go/NoGo	25388
M36 X 3	6g	No	NoGo	25386
M36 X 3	6g	No	Go	25385
M36 X 4	6g	Yes	Go/NoGo	25383
M36 X 4	6g	No	NoGo	25381
M36 X 4	6g	No	Go	25380
M39 X 3	6g	No	Go	25395
M39 X 3	6g	No	NoGo	25396
M39 X 4	6g	No	Go	25390
M39 X 4	6g	No	NoGo	25391

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION

Thread Ring Gage - NPT & NPTF

- A mechanical thread inspection tool used to check a work piece against its allowed thread tolerance
- Ring gages for inspection of external pipe threads
- Hardened High Speed Steel construction

Series 197 | General Purpose | Ring Gage | NPT & NPTF

Thread Size	Standard	Type	EDP
1/16-27	NPT	L1	24366
1/8-27	NPT	L1	24369
1/4-18	NPT	L1	24372
3/8-18	NPT	L1	24375
1/2-14	NPT	L1	24378
3/4-14	NPT	L1	24381
1-11-1/2	NPT	L1	24384
1-1/4-11	NPT	L1	24387
1-1/2-11	NPT	L1	24390
2-11-1/2	NPT	L1	24393
2 1/2-8	NPT	L1	24396
3-8	NPT	L1	24399
3 1/2-8	NPT	L1	24402
4-8	NPT	L1	24405
5-8	NPT	L1	24408
6-8	NPT	L1	24411
1/16-27	NPTF	L1	24486
1/16-27	NPTF	L2	24488
1/8-27	NPTF	L1	24490
1/8-27	NPTF	L2	24492
1/4-18	NPTF	L1	24494
1/4-18	NPTF	L2	24496
3/8-18	NPTF	L1	24498
3/8-18	NPTF	L2	24500
1/2-14	NPTF	L1	24502
1/2-14	NPTF	L2	24504
3/4-14	NPTF	L1	24506
3/4-14	NPTF	L2	24508
1-11-1/2	NPTF	L1	24510
1-11-1/2	NPTF	L2	24512
1-1/4-11-1/2	NPTF	L1	24514
1-1/4-11-1/2	NPTF	L2	24516
1-1/2-11-1/2	NPTF	L1	24518
1-1/2-11-1/2	NPTF	L2	24520

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Premium HSS Ring Gages



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS



FEATURES/DESCRIPTION

Thread Ring Gage - 6 Step - NPTF

- A mechanical inspection tool used to check a work piece against its allowed tolerances
- Ring gages for inspection of external features
- Hardened High Speed Steel construction

Series 193P | General Purpose | Ring Gage | 6 Step | NPTF

Thread Size	Standard	EDP
1/16-27	NPTF	24558
1/8-27	NPTF	24562
1/4-18	NPTF	24566
3/8-18	NPTF	24570
1/2-14	NPTF	24574
3/4-14	NPTF	24578
1-11-1/2	NPTF	24582
1-1/4-11-1/2	NPTF	24586
1-1/2-11-1/2	NPTF	24590

*bold numbers are EDPs for ordering

GENERAL PURPOSE

Tapping Fluid For Internal And External Threading Applications



FEATURES/DESCRIPTION

Tapping Oil

- Premium tapping fluid for internal and external threading
- Provides ideal mechanical lubricity critical to threading applications
- Available in multiple volume sizes
- Hardened High Speed Steel construction

Series Fluid Tapping Oil

Description	Amount	EDP
SMART CUT 1 GAL TAP FLUID	1 GAL	FL125
SMART CUT 5 TAP FLUID	5 GAL	FL130
SMART CUT 55DRUM TAP FLUID	55 GAL	FL135
SMART CUT 16 TAP FLUID	16 OZ	FL110
SMART CUT 16 OZ TAP FLUID	16 OZ	FL115
SMART CUT 1 TAP FLUID	1 GAL	FL120
SMART CUT 1 OZ TAP FLUID	1 OZ	FL105

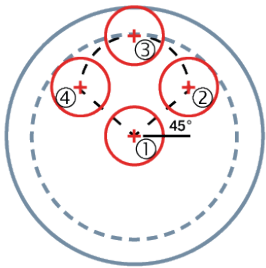
*bold numbers are EDPs for ordering

TECHNICAL DATA

THREADING



Thread Mill Programming Example

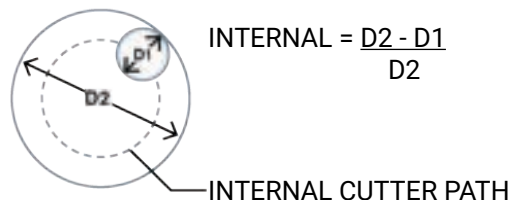


This example will produce an internal right hand thread

- Position to ① (centerline of thread)
- GO 1 to desired Z depth
- GO 1 to ②
- GO 3 to ③ (while Z moves up 1/8 pitch)
- GO 3 to ③ (while Z moves up 1 pitch)
- GO 3 to ④ (while Z moves up 1/8 pitch)
- GO 1 to ①
- Retract from hole

Feed Rate Compensation

To obtain the correct feed rate for the centerline of the tool, multiply the desired feed rate at the cutting edge by the appropriate factor.



$$\text{INTERNAL} = \frac{D2 - D1}{D2}$$

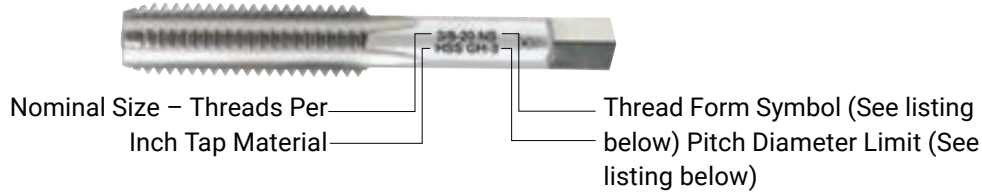
D1 = TOOL CUTTING DIAMETER
D2 = THREAD DIAMETER

Recommended Speeds & Feeds

	SFM				Feed (Inches/Tooth)						
	Uncoated	TiALN	ALCrN	ZrN	3/16"	1/4"	5/16"	3/8"	1/2"	5/8"	3/4"
Aluminum	400-800	-	-	600-1400	0.0005	0.0008	0.0012	0.0015	0.0020	0.0025	0.0030
Brass	200-400	-	-	400-800	0.0005	0.0008	0.0012	0.0015	0.0020	0.0025	0.0030
Cast Iron	150-250	200-400	220-440	-	0.0004	0.0005	0.0006	0.0007	0.0010	0.0015	0.0020
Carbon Steel	150-250	250-500	275-550	-	0.0004	0.0005	0.0006	0.0007	0.0010	0.0015	0.0020
Stainless Steel	100-150	150-400	165-440	-	0.0004	0.0005	0.0006	0.0007	0.0010	0.0015	0.0020
High Temp Alloy	50-100	80-150	90-165	-	0.0004	0.0006	0.0007	0.0008	0.0009	0.0010	0.0012
Titanium	50-125	80-250	90-275	-	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0010

STANDARD SYSTEM OF TAP MARKING

Taps, dies and other types of threading tools are marked according to the Standard System of Marking Ground Thread Taps. Tools are marked with the nominal size, number of threads per inch (pitch), and the appropriate thread form symbol and pitch diameter symbol. Symbols typically used are listed.



PITCH DIAMETER LIMIT SYMBOLS

All standard ground thread taps are marked with the letter "G" to designate Ground Thread. The letter G will be followed by the letter "H" to designate above basic; or the letter "L" to designate below basic. The number following H or L signifies the number of .0005" steps above or below the basic pitch diameter. For instance, the tap pictured above is a 3/8" dia. tap with 20 threads per inch (pitch), and has a NS (American National Special Thread) thread form. The tap is made from High Speed Steel, and the GH-3 pitch diameter limit symbol indicates a Ground Thread tap with pitch diameter limits .0010 to .0015 over basic.

Pitch Diameter Limits for taps to 1" diameter inclusive:

- L1 = Basic to Basic minus .0005
- H1 = Basic to Basic plus .0005
- H2 = Basic plus .0005 to Basic plus .0010
- H3 = Basic plus .0010 to Basic plus .0015
- H4 = Basic plus .0015 to Basic plus .0020
- H5 = Basic plus .0020 to Basic plus .0025
- H6 = Basic plus .0025 to Basic plus .0030

Taps larger than 1" dia. are ground to a .0010" tolerance on the pitch diameter and are, for example, H4 (Basic plus .0010" to Basic plus .0020").

THREAD FORM SYMBOLS

ACME-C	Acme Thread-Centralizing
ACME-G	Acme Thread-General Purpose
AMO	American Standard Microscope Objective Thread
ANPT	Aeronautical National Form Taper Pipe Thread (Ground thread tap marked NPT)
BA	British Association Standard Thread
BSF	British Standard Fine Thread Series
BSP	British Standard Pipe
BSPP	British Standard Pipe (Parallel) Thread
BSPT	British Standard Taper Pipe Thread
BSW	British Standard Whitworth Coarse Thread Series
M	Metric Screw Thread Series
N	American National 8, 12 and 16 Thread Series (8N, 12N, 16N)
NBUTT	American Buttress Screw Thread
NC	American National Coarse Thread Series
NEF	American National Extra Fine Thread Series
NF	American National Fine Thread Series
NGO	National Gas Outlet Thread
NGT	National Gas Taper Thread (see "SGT")
NH	American National Hose Coupling and Fire Hose Coupling Threads
NPS	For tap marking only (See NPSC, NPSM)
NPSC	American National Standard Straight Pipe Thread in Pipe Couplings (Tap marked NPS)
NPSF	Dryseal American National Standard Fuel Internal Straight Pipe Thread
NPSH	American National Standard Straight Pipe Thread for Hose Couplings
NPSI	Dryseal American National Standard Intermediate Internal Straight Pipe Thread
NPSL	American National Standard Straight Pipe Thread for Loose Fitting Mechanical Joints with Locknuts
NPSM	American National Standard Straight Pipe Threads for Free-Fitting Mechanical Joints for Fixtures (Tap marked NPS)
NPT	American National Standard Taper Pipe Thread (See ANPT, NPTR)

NPTF	Dryseal American National Standard Taper Pipe Thread
NPTR	American National Standard Taper Pipe Thread for Railing Joints (Tap marked NPT)
NS	American National Thread-Special
PG	Panzer Gewinde
PTF	Dryseal SAE Short Taper Pipe Thread
SGT	Special Gas Taper Thread
SPL-PTF	Dryseal Special Taper Pipe Thread
STI	Special Thread for Helical Coil Wire Screw Thread Inserts
Stub Acme	Stub Acme Thread
*UN	Unified Constant Pitch Thread Series
*UNC	Unified Coarse Thread Series
*UNEF	Unified Extra Fine Thread Series
*UNF	Unified Fine Thread Series
UNJ**	Unified Thread Series with a 0.15011P to 0.18042P Controlled Root Radius on External Thread only.
UNJC	Unified Coarse Thread Series with a 0.15011P to 0.18042P Controlled Root Radius on External Thread only.
UNJF	Unified Fine Thread Series with a 0.15011P to 0.18042P Controlled Root Radius on External Thread only.
UNM	Unified Miniature Thread Series
UNR	Unified Constant Pitch Thread Series with a 0.108P to 0.144P Controlled Root Radius; Ext. thread only.
UNRC	Unified Coarse Thread Series with a 0.108P to 0.144P Controlled Root Radius; Ext. thread only.
UNRF	Unified Fine Thread Series with a 0.108P to 0.144P Controlled Root Radius; External thread only. Unified Thread-Special
*UNS	A 60° "V" thread with Truncated Crest and Root. The theoretical "V" Form is usually flattened to the user's specifications.
V	
WHIT	British Standard Whitworth Special Thread

* Taps are not marked with "U" but with the symbol for the corresponding American Standard thread form with which it is compatible.

INCH SCREW THREADS - UNJ PROFILE
CONTROLLED ROOT RADIUS WITH INCREASED MINOR DIAMETER

The UNJ thread standard (ASME B1.15) defines a system of threads for highly stressed applications requiring high fatigue strength. It was derived from a military specification (MIL-S-8879). MIL-S-8879 was primarily thought of and used for aerospace fastener and threaded component applications. Due to the increase in both its use and types of applications, the American Society of Mechanical Engineers developed and published ASME B1.15 in 1995.

FORM. UNJ screw threads are of the same form as Unified Screw Threads to ASME/ANSI B1.1 except:

External threads: the root has a maximum and minimum prescribed continuous radius, and is not merely rounded due to tool wear.

Internal threads: the minor diameter is increased to accommodate the maximum root radius of the external thread. There is no radius requirement for either the crest or the root of the internal thread.

Designation. UNJ product threads are identified by the letter "J" in the thread symbol, and a thread class symbol including an "A" for external threads or a "B" for internal threads.

Use of Unified Tooling. Many of the UNJ thread form characteristics are the same as for UN threads. Therefore, some of the tooling used to produce one form can be used to produce the other.

External UNJ threads must be produced with a prescribed root radius; therefore, standard Unified Screw Thread (UN) tooling may not be used.

Internal UNJ threads are not required to have a root radius; therefore, ground thread taps designed to produce Unified Screw Threads of the proper class of fit may be used. The letter "J" need not be marked on the tap. The larger product minor diameter of the UNJ internal thread requires the use of a larger tap drill than is used when producing Unified Screw Threads.

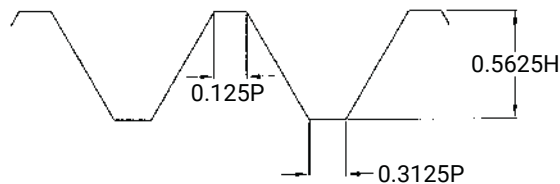
- UNJ Thread Form: Unified Thread Series with a 0.15011P to 0.18042P controlled root radius on external thread only. (As defined by MIL-S-8879C)

- UNJ internal threads do not require radius; only external thread requires radius on root.

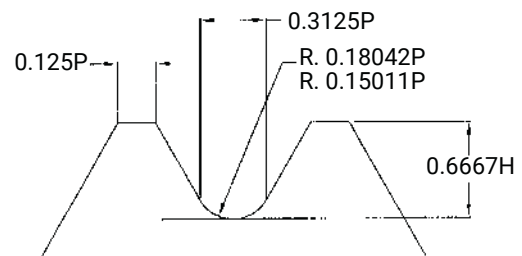
- UNJ external thread assembles only with UNJ internal thread.

- UNJ tap is standard 2B or 3B class of fit.

UNJ INTERNAL THREAD
ROOT TO CLEAR 0.125P WIDTH-FLAT OR ROUNDED ASSEMBLES WITH ALL UN EXTERNAL THREADS



UNJ CLASSES 3B AND 3BG
NO RADIUS REQUIRED ON
INTERNAL THREADS



UNJ EXTERNAL THREAD ASSEMBLES ONLY WITH UNJ INTERNAL



CLASSES OF THREADS AND TAP SIZE:

There is a direct relationship between the size of a tap and the size of the thread that it cuts. Size refers to pitch diameter and its relationship to the class of fit required. If two threaded parts are assembled, the looseness or tightness of the fit is determined by contact on the flanks of the threads only. This contact is controlled by the pitch diameters of each part.

CLASSES OF THREAD:

When threaded parts are mated, the two parts must assemble with a degree of tightness dictated by the use of the fastener. In addition, the internal thread must be large enough to allow the external thread to enter it for the required length of engagement. A system of thread classes, each representing a comparative degree of tightness, has been established and universally adopted, to provide manufacturers and users of threaded products with a common language of specification. The thread classes designate minimum and maximum pitch diameters for internal and external threads. It is important to remember that classes of thread actually represents manufacturing tolerances. The closer the tolerance required, the higher the cost involved in producing the parts. Therefore, designers and engineers should always try to select the class of thread with the widest permissible tolerance.

TAP SIZE:

Due to material variability and machining conditions, taps rarely cut their own size. The thread size produced is usually larger, but can be smaller due to shrinkage. Tap manufacturers realized that to tap a specified class of thread, several different ground thread tap limits would be required. These limits represent small, defined variations in tap size. A numbering system was developed to designate each series of

limits, but these limit numbers are not to be confused with the classes of threads. Ground thread tap limits are designated by the letter H (high) above basic pitch diameter, or L (low) below basic pitch diameter, and these numbers establish the tolerance range in relation to basic pitch diameter. As an example, in sizes 1" and smaller, an H1 tap has a tolerance range of from basic to .0005" over basic; an H2 tap from .0005" over basic to .001" over basic, (see chart 1A on this page). In addition, metric threads are also designated in much the same way. The thread tap limits are designated by the letter D (ground, high) above basic pitch diameter, or U (ground, low) below basic pitch diameter. As an example, in sizes M25 and smaller, a D1 tap has a size of .0005" over basic to tap max. P.D.; a D2 tap has a size of .001" over basic to tap max. P.D., (see Chart 1B). The Tables on pages 115-117 list recommended limit numbers for different classes of thread. Several different limit numbers are available for each diameter and pitch combination. Consequently, it is possible to select the "H" or "L" limit, or the "D" or "U" limit most suitable for the required tapping operation. Please contact our Customer Service Dept. for questions regarding tap limits and their relation to classes of fit.

CHART 1A

Pitch Diameter Limits for taps to 1" diameter inclusive:

- L1 = Basic to Basic minus .0005
- H1 = Basic to Basic plus .0005
- H2 = Basic plus .0005 to Basic plus .0010
- H3 = Basic plus .0010 to Basic plus .0015
- H4 = Basic plus .0015 to Basic plus .0020
- H5 = Basic plus .0020 to Basic plus .0025
- H6 = Basic plus .0025 to Basic plus .0030

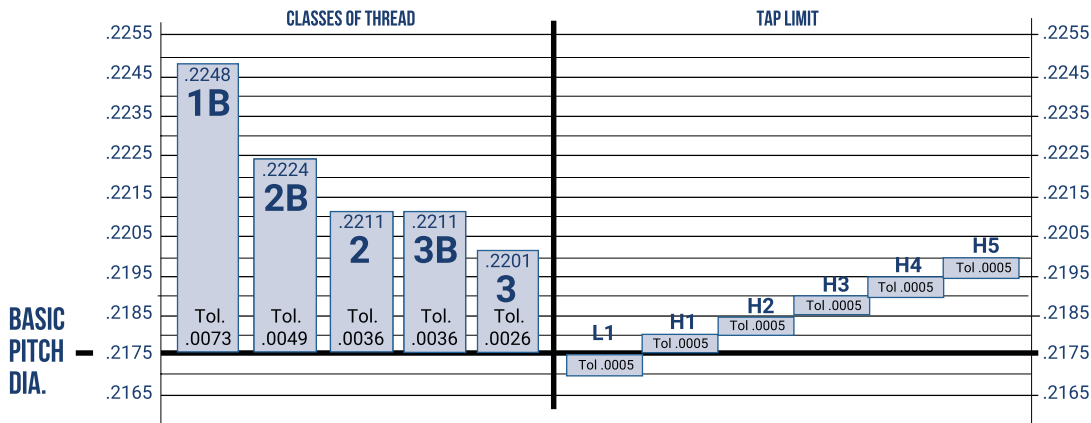
Taps larger than 1" dia. are ground to a .0010" tolerance on the pitch diameter and are, for example, H4 (Basic plus .0010" to Basic plus .0020").

CHART 1B

Pitch Diameter Limits for taps to 1" diameter inclusive: (Metric taps generally have more manufacturing tolerance than .0005 to the minus side.)

- U1 = Basic minus .0005 = min. tap P.D.
- D1 = Basic plus .0005 = max. tap P.D.
- D2 = Basic plus .0010 = max. tap P.D.
- D3 = Basic plus .0015 = max. tap P.D.
- D4 = Basic plus .0020 = max. tap P.D.
- D5 = Basic plus .0025 = max. tap P.D.
- D6 = Basic plus .0030 = max. tap P.D.

CHART 2A COMPARISON OF PITCH DIAMETER LIMITS TO CLASS OF FIT



On Charts 2A and 2B (below), examples of the relationship of Class of Fit to various tap limit sizes is shown for both Imperial and Metric sizes. In chart 2A, using a 1/4"-20NC or UNC thread size, it is obvious that an H5 limit (+.0025" over basic pitch diameter) can be used to cut the tightest class of thread in most machining situations, as can the H1 limit (+.0005" over basic P.D.). However, tool wear would force the discarding of the H1 tap long before the H5 would be worn to an undersize condition. The rule is obvious: always select the largest "H" limit possible to achieve proper class of fit, and maximum tool life.

CHART 2B COMPARISON OF PITCH DIAMETER LIMITS TO CLASS OF FIT

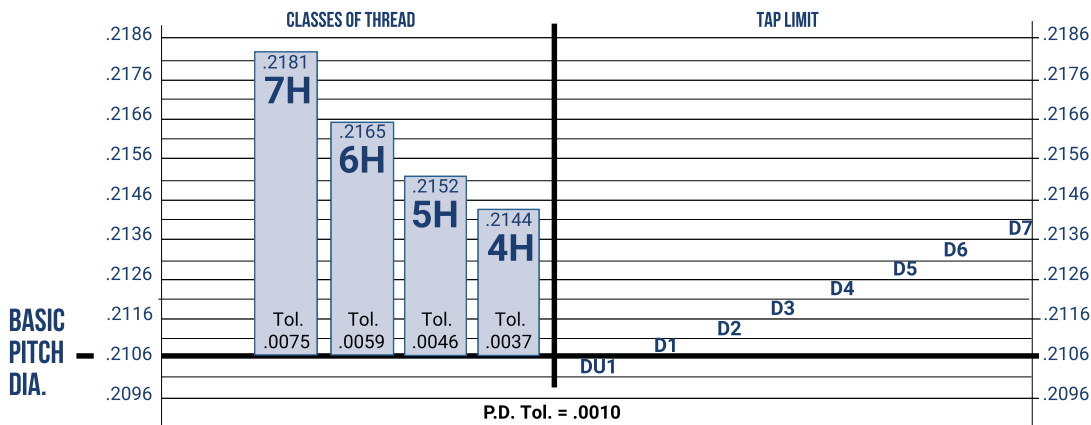


Chart 2B shows the same relationship with a metric thread. Using a M6 X 1.0, it is obvious that a D5 limit (+.0025" over basic pitch diameter) can be used to cut the standard class of thread in most machining situations, as can the D1 limit (+.0005" over basic P.D.). However, tool wear would force the discarding of the D1 tap long before the D5 would be worn to an undersize condition. The rule is obvious: always select the largest "D" limit possible to achieve proper class of fit, and maximum tool life.

SCREW THREAD CLASSES OVERVIEW: Screw thread classes are distinguished from each other by the amount of tolerance and allowance.

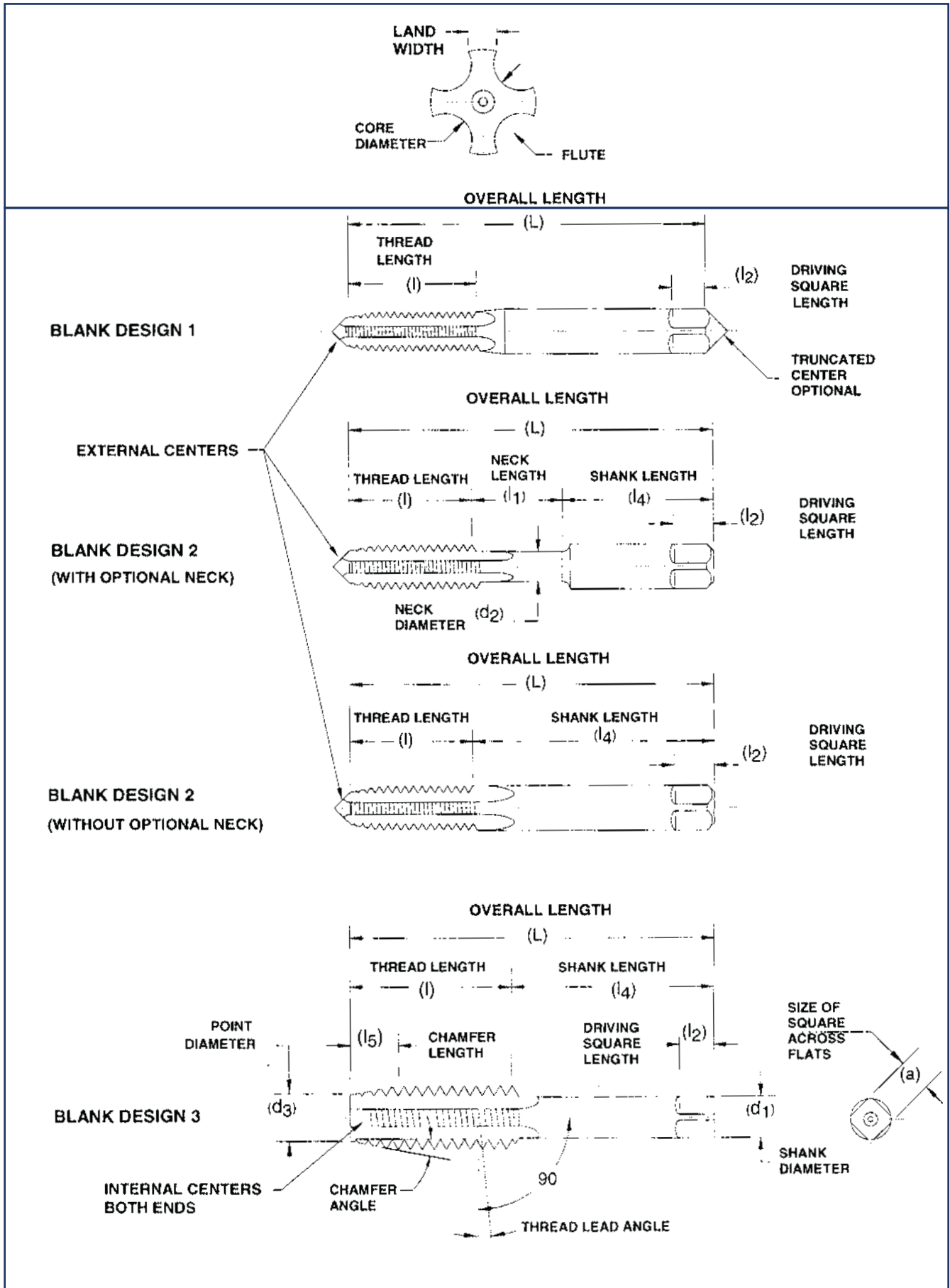
Class 1A and Class 1B: The combination of Class 1A for external threads and Class 1B for internal threads is intended to cover the manufacture of threaded parts where quick and easy assembly is necessary or desired, and an allowance is provided to permit ready assembly.

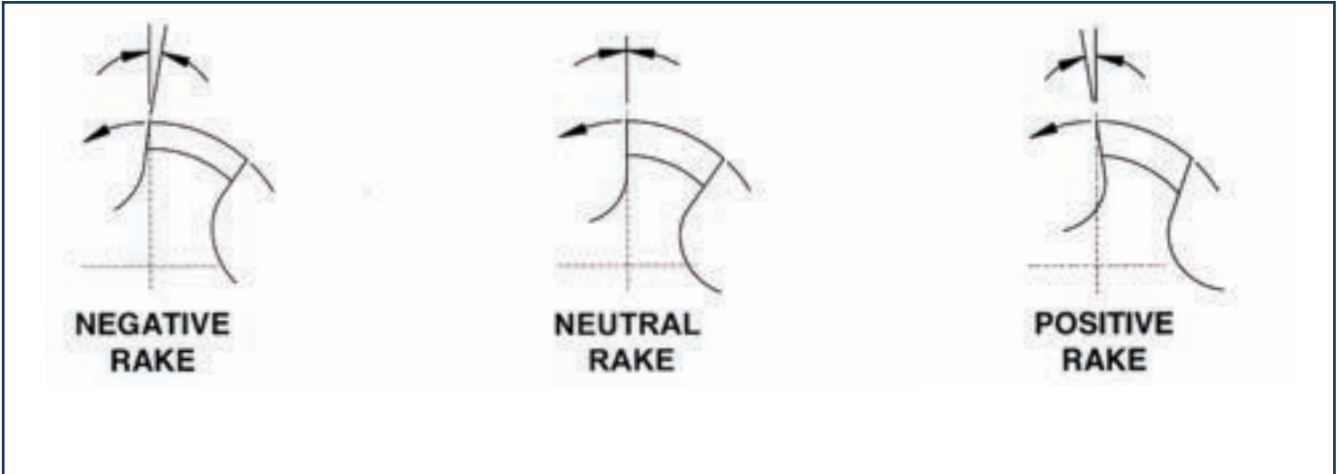
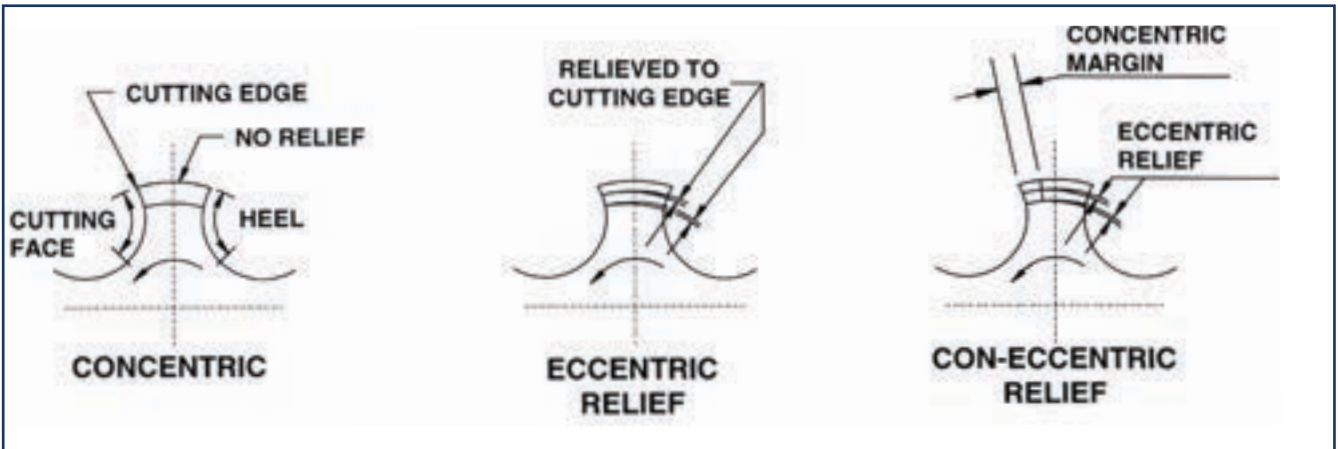
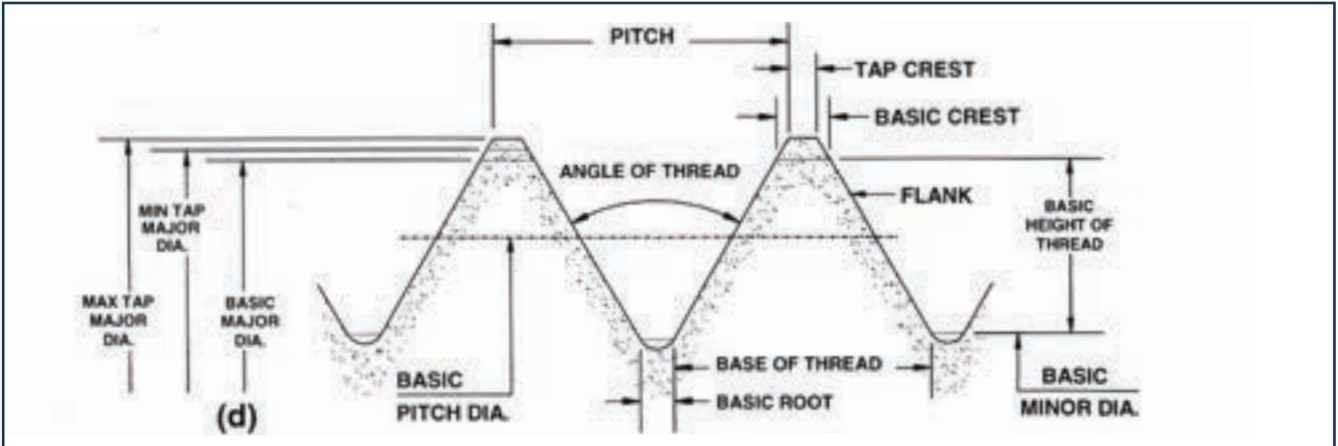
Class 2A and Class 2B: The combination of Class 2A for external threads and Class 2B for internal threads designed for screws, bolts and nuts, is also suitable for a variety of other applications. A similar allowance

is provided which minimizes galling and seizure encountered in assembly and use. It also accommodates, to a limited extent, plating, finishes or coatings.

Class 3A and 3B: The combination of Class 3A for external threads and Class 3B for internal threads is provided for those applications where closeness of fit and accuracy of lead and angle of thread are important. These threads are obtained consistently only by use of high quality production equipment supported by a very efficient system of gauging and inspection.

No allowance is provided.





ANGLE OF THREAD

The angle included between the sides of the thread measured in an axial plane.

AXIS

The imaginary straight line that forms the longitudinal centerline of the tool or threaded part.

BACK TAPER

A gradual decrease in the diameter of the thread form on a tap from the chamfered end of the land towards the back which creates a slight radial relief in the threads.

BASE OF THREAD

The bottom section of the thread; the greatest section between the two adjacent roots.

BASIC SIZE

The theoretical or nominal standard size from which all variations are derived by application of allowances and tolerances.

CHAMFER

The tapering of the threads at the front end of each land of a tap by cutting away and relieving the crest of the first few teeth to distribute the cutting action over several teeth; Taper taps are chamfered 7-10 threads; plug taps are chamfered 3-5 threads; semi bottoming taps are chamfered 2-2.5 threads; bottoming taps are chamfered 1-2 threads; taper pipe taps are chamfered 2-3.5 threads.

CHAMFER RELIEF

The gradual decrease in land height from cutting edge to heel on the chamfered portion, to provide clearance for the cutting action as the tap advances.

CREST

The top surface joining the two sides or flanks of the thread; the crest of an external thread is at its major diameter, while the crest of an internal thread is at its minor diameter.

CUTTING FACE

The leading side of the land in the direction of cutting rotation on which the chip forms.

FLUTE

The longitudinal channels formed in a tap to create cutting edges on the thread profile, and to provide chip spaces and cutting fluid passages.

HEEL

The edge of the land opposite the cutting edge.

HELIX ANGLE

The angle made by the advance of the thread as it wraps around an imaginary cylinder.

HOOK

The undercut on the face of the teeth.

HOOK ANGLE

The inclination of a concave cutting face, usually specified either as Chordal Hook or Tangential Hook.

Chordal Hook Angle: The angle between the chord passing through the root and crest of a thread form at the cutting face, and a radial line through the crest at the cutting edge.

Tangential Hook Angle: The angle between a line tangent to a hook cutting face at the cutting edge and a radial line to the same point.

INTERRUPTED THREAD TAP

A tap having an odd number of lands with alternate teeth along the thread helix removed. In some cases alternate teeth are removed only for a portion of the thread length.

LAND

The part of the tap body which remains after the flutes are cut, and on which the threads are finally ground. The threaded section between the flutes of a tap.

LEAD

The axial distance a tap will advance along its axis in one complete turn. On a single start, the lead and the pitch are identical; on a double start, the lead is twice the pitch.

MAJOR DIAMETER

Commonly known as the "outside diameter." It is the largest diameter of the thread.

MINOR DIAMETER

Commonly known as the "root diameter." It is the smallest diameter of the thread.

PERCENT OF THREAD

One-half the difference between the basic major diameter and the actual minor diameter of an internal thread, divided by the basic thread height, expressed as a percentage.

PITCH

The distance from any point on a screw thread to a corresponding point on the next thread, measured parallel to the axis and on the same side of the axis. The pitch equals one divided by the number of threads per inch.

PITCH DIAMETER

On a straight thread, the pitch diameter is the diameter of the imaginary co-axial cylinder...the surface of which would pass through the thread profiles at such points as to make the width of the groove equal to one-half of the basic pitch. On a perfect thread this occurs at the point where the widths of the thread and groove are equal. On a taper thread, the pitch diameter at a given position on the thread axis is the diameter of the pitch cone at that position.

RAKE

The angular relationship of the straight cutting face of a tooth with respect to a radial line through the crest of the tooth at the cutting edge. Positive rake means that the crest of the cutting face is angularly ahead of the balance of the cutting face of the tooth. Negative rake means that the crest of the cutting face is angularly behind the balance of the cutting face of the tooth. Zero rake means that the cutting face is directly on a radial line.

RELIEF (OR THREAD RELIEF)

The removal of metal from behind the cutting edge to provide clearance and reduce friction between the part being threaded and the threaded land.

CHAMFERS FOR THREAD CUTTING TAPS

The tap chamfer is the tapering of the threads to distribute cutting action over several teeth. The type of hole to be tapped has much to do with the chamfer style of that tap that's best suited. Some holes go all the way through; some, while not through-holes, are relatively deep; some are quite shallow (a little deeper than diameter). Each of these three kinds of holes - through, deep-bottoming blind, and shallow bottoming - has a tap chamfer best suited to threading requirements.



TAPER TAPS - This style, with a **7-10 thread chamfer**, has the longest chamfer of the three to distribute action over the maximum number of teeth; and the taper also acts as a guide in starting the cutting action in the hole.

Taper style taps start the thread square with the workpiece. Taper taps are commonly used in through holes and in materials where a tapered guide is necessary.

ROOT

The bottom surface joining the sides of two adjacent threads, and is identical with or immediately adjacent to the cylinder or cone from which the thread projects.

SPIRAL FLUTE

A flute with uniform axial lead in a spiral path around the axis of a tap.

SPIRAL POINT

The angular fluting in the cutting face of the land at the chamfered end; formed at an angle with respect to the tap axis of opposite hand to that of rotation. Its length is usually greater than the chamfer length and its angle with respect to the tap axis is usually made great enough to direct the chips ahead of the taps cutting action.

STRAIGHT FLUTE

A flute that forms a cutting edge lying in an axial plane.

TOLERANCE

In producing a tap to given specifications, tolerance is: (a.) the total permissible variation of a size; (b.) the difference between the limits of size.



PLUG TAPS - This style, with a **3-5 thread chamfer**, is most widely used in through holes and where there is sufficient room at the bottom in blind holes.

SEMI-BOTTOMING TAPS - This style, with a **2 to 2.5 thread chamfer**, should be used whenever possible in difficult material applications in blind holes, when threads are not required to the bottom of the hole.



BOTTOMING TAPS - This style, designed with a **1 to 2 thread chamfer**, is made with just enough chamfer for starting in the hole; as the name implies, it is designed to thread blind holes to the bottom.

NOTE: Taper, plug and bottoming taps as a set, in a given size (for example: 1/4-20 NC) are identical as to size, length and vital measurements; the difference is in the chamfered threaded portion at the point. As a rule, such taps when used by hand are furnished in sets of three of a given size...namely, taper, plug and bottoming (and should be used in that order).

HAND TAP



These standard style taps have straight flutes of a number specified as either standard or optional. Hand taps are for general purpose applications such as production tapping or hand tapping operations. Taper, plug and bottoming styles provide versatility in tough materials, blind and through holes.

SPIRAL POINT TAP



As to general physical dimensions, spiral point taps are identical with the standard hand tap. However, the spiral point tap has the cutting face of the first few threads cut at a predetermined angle relative to the tap's axis angle to force the evacuation of chips ahead of the cutting action. This feature, plus the excellent shearing action of the flute, make spiral pointed taps ideal for production tapping of through holes. Typically, this type of tap has a shallower flute passage than conventional taps. This gives the spiral point tap more cross-sectional area, which means greater strength, allows higher tapping speeds, and requires less power to drive.

SPIRAL FLUTED TAP



Regular (or Slow) Spiral



Fast Spiral

These taps, as the name implies, are made with spiral flutes instead of straight flutes. This spiral fluting feature aids in drawing chips out of a hole, or serves to bridge a gap inside the hole such as a keyway or cross-hole. Commonly available in slow spiral (18-30° helix angle) or fast spiral (45-52°). Spiral flute taps are available in left hand style.

INTERRUPTED THREAD TAP



These taps have an odd number of lands with alternate teeth in the thread helix removed. The removal of every other tooth helps to break the chip and allows a greater supply of lubrication to reach the cutting teeth, reducing the incidence of torn threads. Ideal for tapping non-ferrous metals and low carbon steel; as well as use in titanium and high hardness alloys.

THREAD FORMING TAP (TRU-FLO™)



These taps are fluteless except as optionally designed with one or more lubrication grooves. The thread form is lobed so there is a finite number of points contacting the work. This tap does not cut, so it is 'chipless', and consequently will not cause a chip problem. The tool forms the thread by extrusion, thus thread size can be closely maintained. The fluteless design allows high quality threads, faster tapping speeds, higher production, and generates no chips which simplifies tapping of blind bottoming holes (threads can be formed the full depth of the hole).

PIPE TAP



Straight Pipe Tap



Taper Pipe Tap

These taps are for producing standard straight or tapered pipe threads in a wide range of pipe connections. Manufactured with the appropriate design variations to cut specified pipe thread forms.

COMBINED DRILL & TAP (COST CUTTER™)



This high production tool is specially designed to drill and tap in one pass only. By design, this value-added tool reduces machining operations and subsequent parts handling. The drill end features a split point, and the tool shank and square fit standard tap holders.

ACME THREAD TAP



Acme screw threads were devised to allow rotary and transversing motion on machines; and are also used in jacks, valves, presses and other mechanisms where heavy loads are encountered. The acme thread is characterized by a 29° included angle. Acme taps typically require specialized engineering and design due to the nature and severity of cut required in producing Acme threads.

TANDEM ACME TAP



These taps combine the initial roughing cut with the final finishing cut, in one pass, to achieve an acme screw thread. These taps are economical and enhance production levels by saving on the operation of two tools. Since acme thread pitches are generally coarse relative to diameters, these taps are subjected to heavy chip loads. To achieve a high quality acme thread in a cost-effective manner, roughing and finishing operations are recommended.

EXTENSION TAPS (INCL. NUT & PULLEY TAPS)



Extension Tap - These taps are made to conventional tap dimensions, except that they have an extended shank in order to tap hard to reach holes. Thread length, shank diameter, and shank square are made to standard specifications listed in Table 302. Extension taps are available in both hand and spiral point styles, and in small shank style.

THREAD PLUG & RING GAGES

- Thread Plug Gages - UNC, UNF & UNEF
Class 2B - 3B, Taperlock & Reversible,
+ Metric Sizes - Class 6H
- Thread Ring Gages - UNC, UNF, UNEF
Class 2A-3A
+ Metric Sizes - Class 6g
- Truncated Thread Setting Plug Gages
Class 2A-3A
+ Metric Sizes - Class 6g
- Thread Plug Gages - STI
Screw Thread Insert
- BSP Plug Gages
(BSPT, BSPP)
- Taper Pipe Gages - Plugs & Rings NPT-
L1, L1 & L2 Rings,
NPTF L1 & L3 Plugs,
NPTF Crest Check Plugs & Rings

... contact GWS Tool Group for your special gaging requirements.



Pulley Tap - The hub portion of pulley parts contain oil cups and set screw holes, most of which cannot be reached with ordinary hand taps. Pulley taps have the same basic thread dimensions as hand taps, but pulley taps differ in that they have a longer shank which is of the same basic major diameter as the threaded portion. When tapping pulley hub holes, the taps are inserted through holes in the rims which are slightly larger than the shanks of the taps. These holes serve as guides or bushings for the taps to assure proper alignment when tapping. Pulley taps can also be used for general tapping in parts where an extra long length is required to reach the holes being tapped.



Nut Tap - Nut taps feature a long chamfer which assists in entering the drilled hole, and distributes the cutting action over several teeth. These taps were initially designed for tapping nuts and have a long thread length. The shank diameter is smaller than the tap's minor diameter to allow the accumulation of several nuts after tapping. Nut taps also feature an extended square length.



Thread Plug Gage



Reversible Thread Plug Gage



Thread Ring Gage

THREAD FORMING TAP ENTRY LENGTHS: Entry taper length is measured on the full diameter of the thread forming lobes and is the axial distance from the entry diameter position to the theoretical intersection of tap major diameter and entry taper angle.

Whenever entry taper length is specified in terms of number of threads, this length is measured in number of pitches (p).

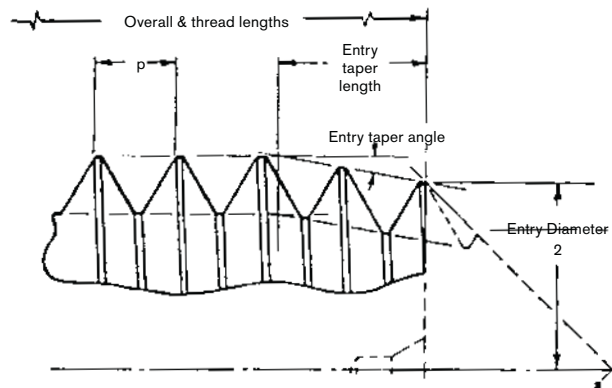
BOTTOMING LENGTH = 1-1/2 to 2-1/2 PITCHES

PLUG LENGTH = 3 to 5 PITCHES

The chamfer on Tru-Flo BOTTOM taps is approximately 2 threads long and requires a drilled hole depth 3-4 pitches beyond the full thread required. When a controlled maximum chamfer shorter than 2 threads is required, an additional charge will apply. We will not guarantee the performance of taps with the shorter chamfer.

Entry diameter, measured at the thread crest nearest the front of the tap, is an appropriate amount smaller than the diameter of the hole drilled for tapping. See below for tap/drill size formulas, and formulas to determine maximum and minimum drill hole sizes for appropriate percent of thread.

TAPPING SPEEDS: TRU-FLO taps operate most efficiently at spindle speeds 1-1/2 to 2 times faster than those recommended for conventional cutting taps, especially



in softer materials and/or with fine pitch TRU-FLO taps. As higher speeds are attained, adequate lubrication is essential for prolonged tap life and thread quality.

LUBRICATION: Since it is more important to 'lubricate' the cold-forming tap than to 'cool' the tap, TRU-FLO taps should be used with conventional lubricating cutting oils or EP (extreme pressure) rated oil...soluble oils and similar coolants are not recommended.

PRE-TAPPED HOLE SIZE: TRU-FLO cold forming taps require a larger pre-tapped hole size than conventional cutting taps. To insure a properly tapped (cold formed) hole, adhere to the following:

FORMULA FOR TAP/DRILL SIZES FOR DECIMAL/INCH TRU-FLO TAPS:

$$\text{HOLE SIZE} = \text{Basic Tap O.D.} - \left(\frac{.0068 \times \% \text{ of Thread}^*}{\text{Threads per Inch}} \right)$$

For example:

To determine drill size for a 1/4-20 thread forming tap at 65% of thread: .250 -

$$\left(\frac{.0068 \times 65}{20} \right) = .2279$$

FORMULA FOR TAP/DRILL SIZES FOR METRIC TRU-FLO TAPS:

$$\text{HOLE SIZE (mm)} = \text{Basic Tap O.D.(mm)} - \left(\frac{\% \text{ of Thread} \times \text{mm Pitch}}{147.06} \right)$$

* Use whole number for % of thread...for 65%, use 65 (not .65).

There is no true method of predicting percent of thread that will be obtained when tapping with forming taps due to the many variables involved. As a starting point, however, 55% for maximum drill size and 75% for minimum drill size can be used as a guide. Any desired percent of thread can be approximated by using drill sizes in between. To determine theoretical maximum and minimum drill sizes (for average operating conditions), see formulas below.

FOR UNIFIED INCH THREADS:

Max. Drill Size = Basic Major Diameter - $\frac{3}{8N}$

Min. Drill Size = Basic Major Diameter - $\frac{1}{2N}$

-N = T.P.I. (Threads per Inch)

FOR 60° METRIC THREADS:

Max. Drill Size = Basic Major Diameter - 0.375P

Min. Drill Size = Basic Major Diameter - 0.5P
P = Pitch

Note: For Basic Major Diameter and Pitch, use millimeter value to obtain drill size in mm. To convert mm to inch value, divide by 25.4:
 $\frac{\text{mm Value}}{25.4} = \text{Inch Value}$

TAP SIZE		CUTTING TAPS		TRU-FLO™ FORMING TAPS	
INCH	METRIC	DRILL SIZE	DECIMAL EQUIVALENT	DRILL SIZE	DECIMAL EQUIVALENT
0-80		3/64	.0469	54	.0550
	M1.6 X 0.35	1.25mm	.0492	1.45mm	.0571
	M1.8 X 0.35	1.45mm	.0571	1.65mm	.0650
1-64		53	.0595	51	.0650
1-72		53	.0595	51	.0650
	M2 X 0.40	1.60mm	.0630	1.80mm	.0709
2-56		50	.0700	5/64	.0781
2-64		50	.0700	47	.0785
	M2.2 X 0.45	1.75mm	.0689	2.00mm	.0787
	M2.5 X 0.45	2.05mm	.0807	2.30mm	.0906
3-48		47	.0785	43	.0890
3-56		46	.0810	2.30mm	.0905
4-40		43	.0890	38	.1015
4-48		42	.0935	2.60mm	.1024
	M3 X 0.50	2.50mm	.0984	7/64	.1094
5-40		38	.1015	33	.1130
5-44		37	.1040	2.90mm	.1142
	M3.5 X 0.60	2.90mm	.1142	3.20mm	.1260
6-32		36	.1065	1/8	.1250
6-40		33	.1130	3.25mm	.1280
	M4 X 0.70	3.30mm	.1299	3.70mm	.1457
8-32		29	.1360	25	.1495
8-36		29	.1360	24	.1520
	M4.5 X 0.75	3.70mm	.1476	4.10mm	.1614
10-24		26	.1470	11/64	.1719
10-32		21	.1590	16	.1770
	M5 X 0.80	4.20mm	.1654	14	.1820
12-24		16	.1770	5mm	.1969
12-28		15	.1800	7	.2010
	M6 X 1.00	5.00mm	.1969	7/32	.2188
1/4-20		7	.2010	1	.2280
1/4-28		3	.2130	15/64	.2340
	M7 X 1.00	6.00mm	.2362	F	.2570
5/16-18		F	.2570	L	.2900
5/16-24		I	.2720	M	.2950
	M8 X 1.25	6.70mm	.2638	7.40mm	.2913
	M8 X 1.0	7.00mm	.2756	19/64	.2969
3/8-16		5/16	.3125	S	.3480
3/8-24		Q	.3320	T	.3580
	M10 X 1.50	8.50mm	.3346	U	.3680
	M10 X 1.25	8.70mm	.3425	9.40mm	.3701
7/16-14		U	.3680	Y	.4040
7/16-20		25/64	.3906	Z	.4130
	M12 X 1.75	10.20mm	.4016	11.20mm	.4409
	M12 X 1.25	10.80mm	.4252	11.50mm	.4528
1/2-13		27/64	.4219	15/32	.4682
1/2-20		29/64	.4531	12.25mm	.4823
	M14 X 2.00	12.00mm	.4224	33/64	.5156
9/16-12		31/64	.4844	17/32	.5312
9/16-18		33/64	.5156	13.50mm	.5315
5/8-11		17/32	.5312	14.75mm	.5807
5/8-18		37/64	.5781	15.25mm	.6004
	M16 X 2.00	14.00mm	.5512	19/32	.5938
	M16 X 1.50	14.50mm	.5906	15.25mm	.6004
	M18 X 2.50	15.50mm	.6102	39/64	.6094
	M18 X 1.50	16.50mm	.6496	17.25mm	.6791

Drill sizes given are the 'closest' drill size.

TAP SIZE		CUTTING TAPS		TRU-FLO™ FORMING TAPS	
INCH	METRIC	DRILL SIZE	DECIMAL EQUIVALENT	DRILL SIZE	DECIMAL EQUIVALENT
3/4-10		21/32	.6562	45/64	.7031
3/4-16		11/16	.6875	23/32	.7188
	M20 X 2.50	17.50mm	.6890		
	M20 X 1.50	18.50mm	.7283		
	M22 X 2.50	19.50mm	.7677		
	M22 X 1.50	20.50mm	.8071		
7/8-9		49/64	.7656		
7/8-14		13/16	.8125		
	M24 X 3.00	21.00mm	.8268		
	M24 X 2.00	22.00mm	.8661		
1-8		7/8	.8750		
1-12		59/64	.9219		
	M27 X 3.00	24.00mm	.9449		
	M27 X 2.00	25.00mm	.9843		
1-1/8-7		63/64	.9844		
1-1/8-12		1-3/64	1.0469		
	M30 X 3.50	26.50mm	1.0433		
	M30 X 2.00	28.00mm	1.1024		
1-1/4-7		1-7/64	1.1094		
1-1/4-12		1-11/64	1.1719		
	M33 X 3.50	29.50mm	1.1614		
	M33 X 2.00	31.00mm	1.2205		
1-3/8-6		1-7/32	1.2188		
1-3/8-12		1-19/64	1.2969		
	M36 X 4.00	32.00mm	1.2598		
	M36 X 3.00	33.00mm	1.2992		
1-1/2-6		1-11/32	1.3438		
1-1/2-12		1-27/64	1.4219		
	M39 X 4.00	35.00mm	1.3780		
	M39 X 3.00	36.00mm	1.4173		

PIPE THREAD DRILLED HOLE SIZES

NOMINAL SIZE	NPT	NPTF	NPSC	NPSM	NPSF	NPSI	BSPT	BSPP
1/16 - 27	D (0.246)	D (0.246)	.250		.250	.250		
1/8 - 27	Q (0.332)	Q (0.332)	.3437	.3593	.3437	.3437		
1/8 - 28							.3281	.3437
1/4 - 18	.4375	.4375	.4375	.4687	.4375	.4375		
1/4 - 19							.4375	.4531
3/8 - 18	.5625	.5781	.5781	.6093	.5781	.5781		
3/8 - 19							.5781	.5937
1/2 - 14	.7031	.7031	.7187	.750	.7187	.7187	.7187	.7343
5/8 - 14								.8125
3/4 - 14	.9062	.9218	.9218	.9646			.9380	.9650
7/8 - 14								1.1093
1 - 11							1.1718	1.1875
1 - 11-1/2	1.1406	1.1562	1.1562	1.2031				
1-1/4 - 11							1.500	1.5468
1-1/4 - 11-1/2	1.4843	1.500	1.500	1.5468				
1-1/2 - 11							1.750	1.7656
1-1/2 - 11-1/2	1.7343	1.7343	1.750	1.7913				
1-3/4 - 11								2.000
2 - 11							2.2187	2.250
2 - 11-1/2	2.2031	2.2187	2.2187	2.2638				

Drill sizes given are the 'closest' drill size.

FORMULA FOR TAP/DRILL SIZES (INCH)

METHOD 1:

$$\text{Drilled Hole Size (in.)} = \text{Basic Major Dia. Of Thread (in.)} - \frac{.013 \times \% \text{ of Full Thread}^*}{\# \text{ of Threads per Inch (T.P.I.)}$$

*Use whole numbers for % of thread...for 65% (not .65).

METHOD 2:

$$\text{Nominal O.D. - (Dbl. Thread Depth} \times \% \text{ of Full Thread)} = \text{Drilled Hole Size}$$

EXAMPLE: To find the hole size for obtaining 75% of thread in a 1/4-20 tapped hole, follow first column down to 20 threads, then across to 75% of thread. This figure (.0485), when subtracted from the .250 diameter, is .2015, which is the required diameter of hole. See equation: .250 - .0485 = .2015

To figure whether or not pitch is too coarse for diameter: (Double thread depth) X 3 = x
x = the smallest diameter possible for that T.P.I.

THREADS PER INCH	DOUBLE THREAD DEPTH	50% THREAD	55% THREAD	60% THREAD	RECOMMENDED RANGE			80% THREAD	85% THREAD
					65% THREAD	70% THREAD	75% THREAD		
6	.21651	.1083	.1192	.1300	.1408	.1517	.1625	.1733	.1842
7	.18558	.0929	.1021	.1114	.1207	.1300	.1393	.1486	.1579
8	.16238	.0813	.0894	.0975	.1056	.1138	.1219	.1300	.1381
9	.14434	.0722	.0794	.0866	.0939	.1011	.1083	.1156	.1228
10	.12990	.0649	.0714	.0779	.0844	.0909	.0974	.1039	.1105
11	.11809	.0590	.0649	.0708	.0767	.0826	.0885	.0944	.1005
12	.10825	.0541	.0595	.0649	.0702	.0755	.0808	.0861	.0921
13	.09992	.0499	.0549	.0599	.0649	.0699	.0749	.0799	.0850
14	.09278	.0464	.0510	.0556	.0602	.0648	.0694	.0740	.0789
16	.08119	.0406	.0446	.0486	.0526	.0566	.0606	.0646	.0691
18	.07217	.0361	.0396	.0431	.0466	.0501	.0536	.0571	.0614
20	.06495	.0325	.0357	.0389	.0421	.0453	.0485	.0517	.0553
24	.05412	.0270	.0298	.0326	.0354	.0382	.0410	.0438	.0460
27	.04811	.0240	.0264	.0288	.0312	.0336	.0360	.0384	.0409
28	.04639	.0232	.0254	.0276	.0298	.0324	.0347	.0370	.0395
30	.04330	.0216	.0238	.0260	.0282	.0304	.0326	.0348	.0368
32	.04059	.0203	.0223	.0243	.0263	.0283	.0303	.0323	.0345
36	.03608	.0180	.0198	.0216	.0234	.0252	.0270	.0288	.0307
40	.03247	.0162	.0178	.0194	.0210	.0226	.0242	.0258	.0276
44	.02952	.0147	.0162	.0177	.0192	.0207	.0222	.0237	.0251
48	.02706	.0135	.0148	.0161	.0174	.0187	.0200	.0213	.0230
56	.02319	.0116	.0127	.0138	.0149	.0160	.0171	.0182	.0197
64	.02029	.0101	.0111	.0121	.0131	.0141	.0151	.0161	.0173
72	.01804	.0090	.0099	.0107	.0115	.0123	.0131	.0139	.0153
80	.01623	.0081	.0089	.0097	.0105	.0113	.0121	.0129	.0138

Figures in table show amount to subtract from O.D. of screw to obtain specific percentages of thread. Select nearest size commercial stock drill.

FORMULA FOR TAP/DRILL SIZES (METRIC)

METHOD 1:

$$\text{Drilled Hole Size (mm)} = \text{Basic Major Dia. Of Thread (mm)} - \frac{\% \text{ of Full Thread} \times \text{mm Pitch}}{76.98}$$

*Use whole numbers for % of thread...for 65%, use 65 (not .65).

METHOD 2:

$$\text{Nominal O.D.} - (\text{Dbl. Thread Depth} \times \% \text{ of Full Thread}) = \text{Drilled Hole Size}$$

EXAMPLE: To find the hole size for obtaining 75% of thread in a (M6) 6mm x 1.00 tapped hole, follow first column down to 1.00 threads, then across to 75% of thread. This figure (.9743), when subtracted from 6mm diameter, is 5.0257, which is the required diameter of hole. See equation: M6 - (1.2990 X 75) = (6 - .9743) = 5.0257mm

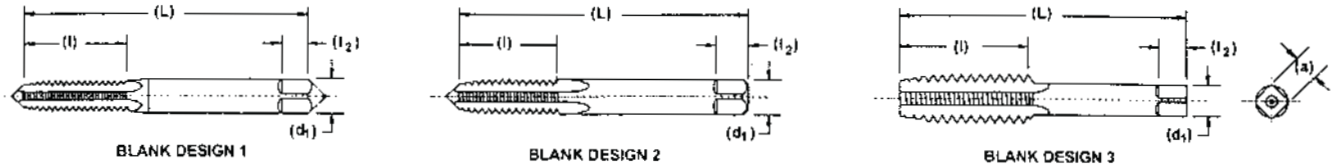
To figure whether or not pitch is too coarse for diameter: (Double thread depth) X 3 = x
x = the smallest diameter possible for that T.P.I.

MM PITCH	DOUBLE THREAD DEPTH	50% THREAD	55% THREAD	60% THREAD	RECOMMENDED RANGE		75% THREAD	80% THREAD	85% THREAD
					65% THREAD	70% THREAD			
4.0	5.1963	2.5982	2.8580	3.1178	3.3776	3.6374	3.8972	4.1570	4.4169
3.50	4.5466	2.2733	2.5006	2.7280	2.9553	3.1826	3.4100	3.6373	3.8646
3.00	3.8969	1.9485	2.1433	2.3381	2.5330	2.7278	2.9227	3.1175	3.3124
2.50	3.2476	1.6238	1.7862	1.9486	2.1109	2.2733	2.4357	2.5981	2.7605
2.00	2.5979	1.2990	1.4288	1.5587	1.6886	1.8185	1.9484	2.0783	2.2082
1.75	2.2733	1.1367	1.2503	1.3640	1.4776	1.5913	1.7050	1.8186	1.9323
1.50	1.9487	.9744	1.0718	1.1692	1.2667	1.3641	1.4615	1.5590	1.6564
1.25	1.6236	.8118	.8930	.9742	1.0553	1.1365	1.2177	1.2989	1.3801
1.00	1.2990	.6495	.7145	.7794	.8444	.9093	.9743	1.0392	1.1042
.90	1.1687	.5844	.6428	.7012	.7597	.8181	.8765	.9350	.9934
.80	1.0394	.5197	.5717	.6236	.6756	.7276	.7796	.8315	.8835
.75	.9743	.4871	.5359	.5846	.6333	.6820	.7307	.7794	.8282
.70	.9093	.4547	.5001	.5456	.5910	.6365	.6820	.7274	.7729
.60	.7793	.3897	.4286	.4676	.5065	.5455	.5845	.6234	.6624
.50	.6421	.3211	.3532	.3853	.4174	.4495	.4816	.5137	.5458
.45	.5847	.2924	.3216	.3508	.3801	.4093	.4385	.4678	.4970
.40	.5197	.2599	.2858	.3118	.3378	.3638	.3898	.4158	.4417
.35	.4547	.2274	.2501	.2728	.2956	.3183	.3410	.3638	.3865
.30	.3896	.1948	.2143	.2338	.2532	.2727	.2922	.3117	.3312
.25	.3246	.1663	.1785	.1948	.2110	.2272	.2434	.2597	.2759

Figures in table show amount to subtract from O.D. of screw to obtain specific percentages of thread. Select nearest size commercial stock drill.

STANDARD TAP DIMENSIONS • GROUND THREAD (REF. USCTI TABLE 302)

GENERAL DIMENSIONS



NOMINAL DIAMETER RANGE - INCHES		MACHINE SCREW SIZE NO.	NOMINAL FRACTIONAL DIAMETER INCHES	NOMINAL METRIC DIAMETER MILLIMETERS, (INCHES)	BLANK DESIGN NO.	TAP DIMENSIONS - INCHES				
OVER	TO (INC.)					OVERALL LENGTH L	THREAD LENGTH l	SQUARE LENGTH l ₂	SHANK DIAMETER d ₁	SIZE OF SQUARE a
.052	.065	0 (.0600)		M1.6 (.0630)	1	1.63	.31	.19	.1410	.110
.065	.078	1 (.0730)		M1.8 (.0709)	1	1.69	.38	.19	.1410	.110
.078	.091	2 (.0860)		M2 (.0787), M2.2 (.0866)	1	1.75	.44	.19	.1410	.110
.091	.104	3 (.0990)		M2.5 (.0984)	1	1.81	.50	.19	.1410	.110
.104	.117	4 (.1120)			1	1.88	.56	.19	.1410	.110
.117	.130	5 (.1250)		M3 (.1181)	1	1.94	.63	.19	.1410	.110
.130	.145	6 (.1380)		M3.5 (.1378)	1	2.00	.69	.19	.1410	.110
.145	.171	8 (.1640)		M4 (.1575)	1	2.13	.75	.25	.1680	.131
.171	.197	10 (.1900)		M4.5 (.1772), M5 (.1969)	1	2.38	.88	.25	.1940	.152
.197	.223	12 (.2160)			1	2.38	.94	.28	.2200	.165
.223	.260		1/4 (.2500)	M6 (.2362)	2	2.50	1.00	.31	.2550	.191
.260	.323		5/16 (.3125)	M7 (.2756), M8 (.3150)	2	2.72	1.13	.38	.3180	.238
.323	.395		3/8 (.3750)	M10 (.3937)	2	2.94	1.25	.44	.3810	.286
.395	.448		7/16 (.4375)		3	3.16	1.44	.41	.3230	.242
.448	.510		1/2 (.5000)	M12 (.4724)	3	3.38	1.66	.44	.3670	.275
.510	.573		9/16 (.5625)	M14 (.5512)	3	3.59	1.66	.50	.4290	.322
.573	.635		5/8 (.6250)	M16 (.6299)	3	3.81	1.81	.56	.4800	.360
.635	.709		11/16 (.6875)	M18 (.7087)	3	4.03	1.81	.63	.5420	.406
.709	.760		3/4 (.7500)		3	4.25	2.00	.69	.5900	.442
.760	.823		13/16 (.8125)	M20 (.7874)	3	4.47	2.00	.69	.6520	.489
.823	.885		7/8 (.8750)	M22 (.8661)	3	4.69	2.22	.75	.6970	.523
.885	.948		15/16 (.9375)	M24 (.9449)	3	4.91	2.22	.75	.7600	.570
.948	1.010		1 (1.0000)	M25 (.9843)	3	5.13	2.50	.81	.8000	.600
1.010	1.073		1 - 1/16 (1.0625)	M27 (1.0630)	3	5.13	2.50	.88	.8960	.672
1.073	1.135		1 - 1/8 (1.1250)		3	5.44	2.56	.88	.8960	.672
1.135	1.198		1 - 3/16 (1.1875)	M30 (1.1811)	3	5.44	2.56	1.00	1.0210	.766
1.198	1.260		1 - 1/4 (1.2500)		3	5.75	2.56	1.00	1.0210	.766
1.260	1.323		1 - 5/16 (1.3125)	M33 (1.2992)	3	5.75	2.56	1.06	1.1080	.831
1.323	1.385		1 - 3/8 (1.3750)		3	6.06	3.00	1.06	1.1080	.831
1.385	1.448		1 - 7/16 (1.4375)	M36 (1.4173)	3	6.06	3.00	1.13	1.2330	.925
1.448	1.510		1 - 1/2 (1.5000)		3	6.38	3.00	1.13	1.2330	.925
1.510	1.635		1 - 5/8 (1.6250)	M39 (1.5354)	3	6.69	3.19	1.13	1.3050	.979
1.635	1.760		1 - 3/4 (1.7500)	M42 (1.6535)	3	7.00	3.19	1.25	1.4300	1.072
1.760	1.885		1 - 7/8 (1.8750)		3	7.31	3.56	1.25	1.5190	1.139
1.885	2.010		2 (2.0000)	M48 (1.8898)	3	7.63	3.56	1.38	1.6440	1.233

cont.

STANDARD TAP DIMENSIONS • GROUND THREAD (REF. USCTI TABLE 302) CONT.

GENERAL DIMENSIONS

NOMINAL DIAMETER RANGE - INCHES		MACHINE SCREW SIZE NO.	NOMINAL FRACTIONAL DIAMETER INCHES	NOMINAL METRIC DIAMETER MILLIMETERS, (INCHES)	BLANK DESIGN NO.	TAP DIMENSIONS - INCHES				
OVER	TO (INC.)					OVERALL LENGTH L	THREAD LENGTH l	SQUARE LENGTH l ₂	SHANK DIAMETER d ₁	SIZE OF SQUARE a
2.010	2.135		2 1/8 (2.1250)		3	8.00	3.56	1.38	1.7690	1.327
2.135	2.260		2 1/4 (2.2500)	M56 (2.2047)	3	8.25	3.56	1.44	1.8940	1.420
2.260	2.385		2 3/8 (2.3750)		3	8.50	4.00	1.44	2.0190	1.514
2.385	2.510		2 1/2 (2.5000)		3	8.75	4.00	1.50	2.1000	1.575
2.510	2.635		2 5/8 (2.6250)	M64 (2.5197)	3	8.75	4.00	1.50	2.2250	1.669
2.635	2.760		2 3/4 (2.7500)		3	9.25	4.00	1.56	2.3500	1.762
2.760	2.885		2 7/8 (2.8750)	M72 (2.8346)	3	9.25	4.00	1.56	2.4750	1.856
2.885	3.010		3 (3.0000)		3	9.75	4.56	1.63	2.5430	1.907
3.010	3.135		3 1/8 (3.1250)		3	9.75	4.56	1.63	2.6680	2.001
3.135	3.260		3 1/4 (3.2500)	M80 (3.1496)	3	10.00	4.56	1.75	2.7930	2.095
3.260	3.385		3 3/8 (3.3750)		3	10.00	4.56	1.75	2.8830	2.162
3.385	3.510		3 1/2 (3.5000)		3	10.25	4.94	2.00	3.0080	2.256
3.510	3.635		3 5/8 (3.6250)	M90 (3.5433)	3	10.25	4.94	2.00	3.1330	2.350
3.635	3.760		3 3/4 (3.7500)		3	10.50	5.31	2.13	3.2170	2.413
3.760	3.885		3 7/8 (3.8750)		3	10.50	5.31	2.13	3.3420	2.506
3.885	4.010		4 (4.0000)	M100 (3.9370)	3	10.75	5.31	2.25	3.4670	2.600

SPECIAL TAPS

Unless otherwise specified:

Special taps over 1.010" to 1.510" diameter inclusive, having 14 or more threads per inch or 1.75 millimeter pitch and finer, and sizes over 1.510" diameter with 10 or more threads per inch or 2.5 millimeter pitch and finer, are made to general dimensions shown in Table 303.

Special tap thread limits are determined by using the formulas shown in Table 331 for Unified Inch Screw Threads and Table 341 for Metric M-Profile Screw Threads.

NOTES

Tap sizes .395" and smaller have an external center on the threadend (may be removed on bottoming taps). Sizes .223" and smaller have an external center on the shank end. Sizes .224" thru .395" have truncated partial cone centers on the shank end (length of cone approx. 1/4 of diameter of shank). Sizes over .395" have internal centers on both the thread and shank ends.

For standard thread limits and tolerances for Unified Inch Screw Threads see table 327 and for Metric Threads see Table 337.

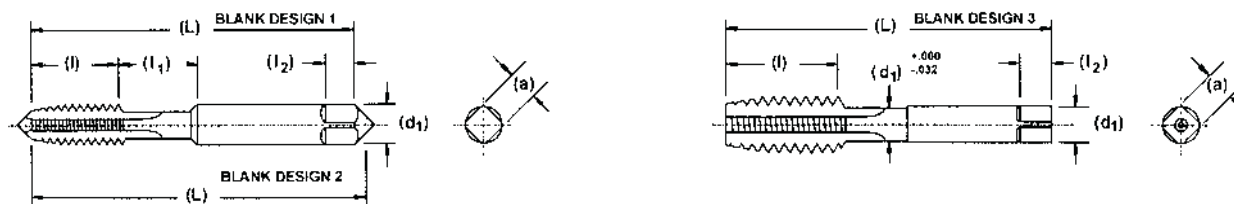
For eccentricity tolerances of tap elements see Table 317.

TOLERANCES

ELEMENT	NOMINAL DIAMETER RANGE IN INCHES		DIRECTION	TOLERANCE (INCHES)
	OVER	TO (INC.)		
Length Overall - L	.0520	1.0100	Plus or Minus	.031
	1.0100	4.0100	Plus or Minus	.063
Length of Thread - l	.0520	.2230	Plus or Minus	.047
	.2230	.5100	Plus or Minus	.063
	.5100	1.5100	Plus or Minus	.094
	1.5100	4.0100	Plus or Minus	.125
Length of square - l ₂	.0520	1.0100	Plus or Minus	.031
	1.0100	4.0100	Plus or Minus	.063
Diameter of shank - d ₁	.0520	.2230	Minus	.0015
	.2230	.6350	Minus	.0015
	.6350	1.0100	Minus	.0020
	1.0100	1.5100	Minus	.0020
Size of square - a	1.5100	2.0100	Minus	.0030
	2.0100	4.0100	Minus	.0030
	.0520	.5100	Minus	.004
Size of square - a	.5100	1.0100	Minus	.006
	1.0100	2.0100	Minus	.008
	2.0100	4.0100	Minus	.010

OPTIONAL NECK AND OPTIONAL SHORTENED THREAD LENGTH TAP DIMENSIONS, GROUND THREAD (REF. USCTI TABLE 302-A)

GENERAL DIMENSIONS



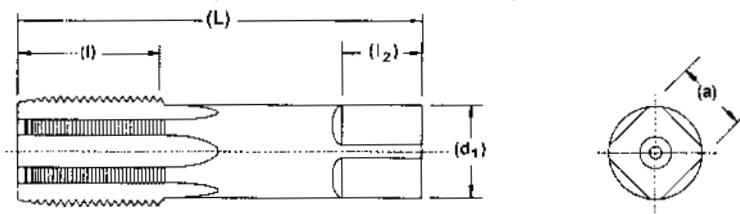
NOMINAL DIAMETER RANGE - INCHES		MACHINE SCREW SIZE NO.	NOMINAL FRACTIONAL DIAMETER INCHES	NOMINAL METRIC DIAMETER MILLIMETERS, (INCHES)	BLANK DESIGN NO.	TAP DIMENSIONS - INCHES					
						OVERALL LENGTH L	THREAD LENGTH l	NECK LENGTH l ₁	SQUARE LENGTH l ₂	SHANK DIAMETER d ₁	SIZE OF SQUARE a
.104	.117	4 (.1120)			1	1.88	.31	.25	.19	.1410	.110
.117	.130	5 (.1250)		M3 (.1181)	1	1.94	.31	.31	.19	.1410	.110
.130	.145	6 (.1380)		M3.5 (.1378)	1	2.00	.38	.31	.19	.1410	.110
.145	.171	8 (.1640)		M4 (.1575)	1	2.13	.38	.38	.25	.1680	.131
.171	.197	10 (.1900)		M4.5 (.1772), M5 (.1969)	1	2.38	.50	.38	.25	.1940	.152
.197	.223	12 (.2160)			1	2.38	.50	.44	.28	.2200	.165
.223	.260		1/4 (.2500)	M6 (.2362)	2	2.50	.63	.38	.31	.2550	.191
.260	.323		5/16 (.3125)	M7 (.2756), M8 (.3150)	2	2.72	.69	.44	.38	.3180	.238
.323	.395		3/8 (.3750)	M10 (.3937)	2	2.94	.75	.50	.44	.3810	.286
.395	.448		7/16 (.4375)		3	3.16	.88	-	.41	.3230	.242
.448	.510		1/2 (.5000)	M12 (.4724)	3	3.38	.94	-	.44	.3670	.275
.510	.573		9/16 (.5625)	M14 (.5512)	3	3.59	1.00	-	.50	.4290	.322
.573	.635		5/8 (.6250)	M16 (.6299)	3	3.81	1.09	-	.56	.4800	.360
.635	.709		11/16 (.6875)	M18 (.7087)	3	4.03	1.09	-	.63	.5420	.406
.709	.760		3/4 (.7500)		3	4.25	1.22	-	.69	.5900	.442
.760	.823		13/16 (.8125)	M20 (.7874)	3	4.47	1.22	-	.69	.6520	.489
.823	.885		7/8 (.8750)	M22 (.8661)	3	4.69	1.34	-	.75	.6970	.523
.885	.948		15/16 (.9375)	M24 (.9449)	3	4.91	1.34	-	.75	.7600	.570
.948	1.010		1 (1.0000)	M25 (.9843)	3	5.13	1.50	-	.81	.8000	.600

NOTES

1. Thread Length "l" is based on a length of 12 pitches of the UNC thread series.
2. Thread Length "l" is a minimum value and has no tolerance.
3. When Thread Length "l" is added to Neck Length "l₁" the total shall be no less than the minimum Table 302 Thread Length "l".
4. Unless otherwise specified, all tolerances are in accordance with Table 302.
5. For eccentricity tolerances, see Table 317.

SPECIAL FINE PITCH TAPS, SHORT SERIES, GROUND THREAD (REF. USCTI TABLE 303)

GENERAL DIMENSIONS



Unless otherwise specified, special taps 1.010" to 1.510" diameter inclusive, having 14 or more threads per inch or 1.75 millimeter pitch and finer, and sizes over 1.510" diameter with 10 or more threads per inch, or 2.5 millimeter pitch and finer, will be made to the general dimensions shown below:

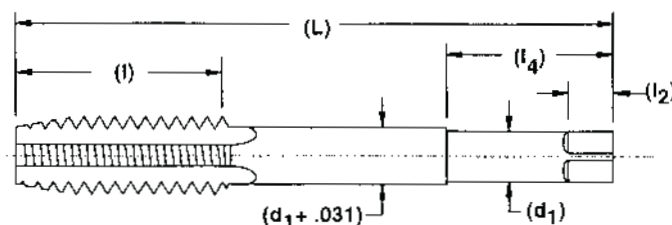
NOMINAL DIAMETER RANGE - INCHES		NOMINAL FRACTIONAL DIAMETER INCHES	NOMINAL METRIC DIAMETER MILLIMETERS	TAP DIMENSIONS - INCHES				
OVER	TO (INCL.)			OVERALL LENGTH L	THREAD LENGTH l	SQUARE LENGTH l ₂	SHANK DIAMETER d ₁	SIZE OF SQUARE a
1.010	1.073	1 1/16	M27	4.00	1.50	.88	.8960	.672
1.073	1.135	1 1/8		4.00	1.50	.88	.8960	.672
1.135	1.198	1 3/16	M30	4.00	1.50	1.00	1.0210	.766
1.198	1.260	1 1/4		4.00	1.50	1.00	1.0210	.766
1.260	1.323	1 5/16	M33	4.00	1.50	1.00	1.1080	.831
1.323	1.385	1 3/8		4.00	1.50	1.00	1.1080	.831
1.385	1.448	1 7/16	M36	4.00	1.50	1.00	1.2330	.925
1.448	1.510	1 1/2		4.00	1.50	1.00	1.2330	.925
1.510	1.635	1 5/8	M39	5.00	2.00	1.13	1.3050	.979
1.635	1.760	1 3/4	M42	5.00	2.00	1.25	1.4300	1.072
1.760	1.885	1 7/8		5.00	2.00	1.25	1.5190	1.139
1.885	2.010	2	M48	5.00	2.00	1.38	1.6440	1.233
2.010	2.135	2 1/8		5.25	2.00	1.38	1.7690	1.327
2.135	2.260	2 1/4	M56	5.25	2.00	1.44	1.8940	1.420
2.260	2.385	2 3/8		5.25	2.00	1.44	2.0190	1.514
2.385	2.510	2 1/2		5.25	2.00	1.50	2.1000	1.575
2.510	2.635	2 5/8	M64	5.50	2.00	1.50	2.1000	1.575
2.635	2.760	2 3/4		5.50	2.00	1.50	2.1000	1.575
2.760	2.885	2 7/8	M72	5.50	2.00	1.50	2.1000	1.575
2.885	3.010	3		5.50	2.00	1.50	2.1000	1.575
3.010	3.135	3 1/8		5.75	2.00	1.50	2.1000	1.575
3.135	3.260	3 1/4	M80	5.75	2.00	1.50	2.1000	1.575
3.260	3.385	3 3/8		5.75	2.00	1.50	2.1000	1.575
3.385	3.510	3 1/2		5.75	2.00	1.50	2.1000	1.575
3.510	3.635	3 5/8	M90	6.00	2.00	1.75	2.1000	1.575
3.635	3.760	3 3/4		6.00	2.00	1.75	2.1000	1.575
3.760	3.885	3 7/8		6.00	2.00	1.75	2.1000	1.575
3.885	4.010	4	M100	6.00	2.00	1.75	2.1000	1.575

NOTES

For tolerances see Table 302.

For standard thread limits and tolerances for Unified Inch Screw Threads see Table 327A. For standard thread limits and tolerances for Metric Threads see Tables 337 and 341. For eccentricity tolerances of tap elements see Table 317.

SPECIAL EXTENSION TAPS, GROUND THREAD (REF. USCTI TABLE 303-A)



Unless otherwise specified, special extension taps will be furnished with dimensions and tolerances as shown for Machine Screw and Fractional taps in Tables 302 and 303, and for Pipe taps in Table 311.

Exceptions:

1. Types of centers are optional with manufacturer.
2. Tolerances on shank diameter d_1 for l_4 length as shown in the following table.
3. Shank eccentricity tolerance in Table 317 applies only to the l_4 length shown in the following table.
4. Length of Close Tolerance Shank, (L_4) is minimum.

NOMINAL TAP SIZE		l THREAD LENGTH	d ₁ SHANK DIAMETER	l ₂ SQUARE LENGTH	SQUARE SIZE	l ₄ GROUND SHANK LENGTH
FRACTIONAL	MACHINE SCREW					
	6	0.69	0.1410	0.19	.110	1.13
	8	0.75	0.1680	0.25	.131	1.25
	10 - 12	0.88	0.1940	0.25	.152	1.38
1/4	14	1.00	0.2550	0.31	.191	1.50
1/4*		1.00	0.1850	0.25	.138	Full Length
5/16		1.13	0.3180	0.38	.238	1.56
5/16*		1.13	0.2400	0.28	.180	Full Length
3/8		1.25	0.3810	0.44	.286	1.63
3/8*		1.25	0.2750	0.38	.206	Full Length
7/16		1.44	0.3230	0.41	.242	1.69
1/2		1.66	0.3670	0.44	.275	1.69
9/16		1.66	0.4290	0.50	.322	1.88
5/8		1.81	0.4800	0.56	.360	2.00
3/4		2.00	0.5900	0.69	.442	2.25
7/8		2.22	0.6970	0.75	.523	2.50
1"		2.50	0.8000	0.81	.600	2.63
1-1/8		2.56	0.8960	0.88	.672	2.75
1-1/4		2.56	1.0210	1.00	.766	2.88
1-3/8		3.00	1.1080	1.06	.831	3.00
1-1/2		3.00	1.2330	1.13	.925	3.00

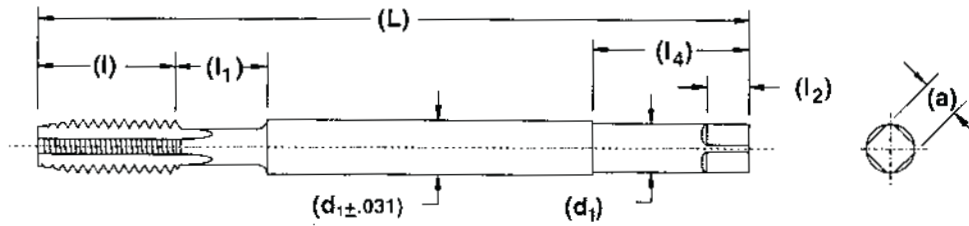
* Small Shank

TOLERANCES FOR SHANK DIAMETER, d_1 AND l_4 LENGTH

SIZE RANGE		DIRECTION	TOLERANCES
FRACTIONAL	MACHINE SCREW		
1/4 to 5/8 incl.	0 - 14 incl.	Minus	.003
11/16 to 1-1/2 incl.		Minus	.004

PULLEY TAP DIMENSIONS • GROUND THREAD (REF. USCTI TABLE 310)

GENERAL DIMENSIONS



NOMINAL FRACTION DIAMETER INCHES	TAP DIMENSIONS - INCHES						
	OVERALL LENGTH L	THREAD LENGTH l	NECK LENGTH l ₁	SQUARE LENGTH l ₂	LENGTH OF SHANK CLOSE TOL. SECTION l ₄	SHANK DIAMETER d ₁	SIZE OF SQUARE a
1/4 (.2500)	6,8	1.00	.38	.31	1.50	.2550	.191
5/16 (.3125)	6,8	1.13	.38	.38	1.56	.3180	.238
3/8 (.3750)	6,8,10	1.25	.38	.44	1.63	.3810	.286
7/16 (.4375)	6,8	1.44	.44	.50	1.69	.4440	.333
1/2 (.5000)	6,8,10,12	1.66	.50	.56	1.69	.5070	.380
5/8 (.6250)	6,8,10,12	1.81	.63	.69	2.00	.6330	.475
3/4 (.7500)	10,12	2.00	.75	.75	2.25	.7590	.569

TOLERANCES

ELEMENT	SIZE RANGE	DIRECTION	TOLERANCE
Overall Length - L	1/4 to 3/4 included	Plus or Minus	.063
Thread Length - l	1/4 to 3/4 included	Plus or Minus	.063
Neck Length - l ₁	1/4 to 3/4 included	See Note - 1	See Note - 1
Square Length - l ₂	1/4 to 3/4 included	Plus or Minus	.031
Length of Shank (close tol.) l ₄	1/4 to 3/4 included	See Note - 2	See Note - 2
Size of Diameter - d ₁	1/4 to 3/4 included	Minus	.0050
Size of Square - a	1/4 to 1/2 included	Minus	.004
	5/8 to 3/4 included	Minus	.006

NOTES

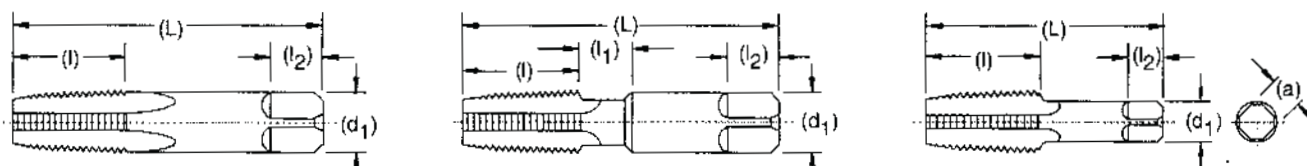
1. l₁, (Neck Length); neck and its length is optional with manufacturer.
2. l₄, (Length of Close Tolerance Shank) is minimum length which is held to eccentricity tolerances per Table 317.

GENERAL NOTES

- a. These taps have an internal center in the thread end.
- b. These taps are made to the H3 limits shown in Table 327.
- c. For eccentricity tolerances of taps elements see Table 317.
- d. d₁, (Shank diameter) is approximately the same as the maximum major diameter for that size.
- e. a, (Size of Square) is equal to .75 X d₁ to the nearest .001 inch.

STANDARD PIPE TAP DIMENSIONS • STRAIGHT AND TAPER, GROUND THREAD (REF. USCTI TABLE 311)

GENERAL DIMENSIONS



NOMINAL SIZE INCHES	LENGTH OVERALL L	LENGTH OF THREAD l	LENGTH OF SQUARE l ₂	DIA. OF SHANK d ₁	SIZE OF SQUARE a	LENGTH OPTIONAL NECK l ₁
1/16	2.13	.69	.38	.3125	.234	.375
1/8*	2.13	.75	.38	.3125	.234	...
1/8	2.13	.75	.38	.4375	.328	.375
1/4	2.44	1.06	.44	.5625	.421	.375
3/8	2.56	1.06	.50	.7000	.531	.375
1/2	3.13	1.38	.63	.6875	.515	...
3/4	3.25	1.38	.69	.9063	.679	...
1"	3.75	1.75	.81	1.1250	.843	...
1 - 1/4	4.00	1.75	.94	1.3125	.984	...
1 - 1/2	4.25	1.75	1.00	1.5000	1.125	...
2"	4.50	1.75	1.13	1.8750	1.406	...
2 - 1/2	5.50	2.56	1.25	2.2500	1.687	...
3"	6.00	2.63	1.38	2.6250	1.968	...
3 - 1/2	6.50	2.69	1.50	2.8125	2.108	...
4"	6.75	2.75	1.56	3.0000	2.250	...

* Small Shank

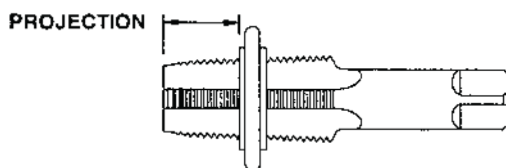
TOLERANCES

ELEMENT	RANGE	DIRECTION	TOLERANCE
Length Overall - L	1/16 to 3/4 inc.	Plus or Minus	.031
	1" to 4" inc.	Plus or Minus	.063
Length of Thread - l	1/16 to 3/4 inc.	Plus or Minus	.063
	1" to 1 - 1/4 inc.	Plus or Minus	.094
	1 - 1/2 to 4"	Plus or Minus	.125
Length of Square - l ₂	1/16 to 3/4 inc.	Plus or Minus	.031
	1" to 4" inc.	Plus or Minus	.063
Diameter of Shank - d ₁	1/16 to 1/8	Minus	.0015
	1/4 to 1" inc.	Minus	.0020
	1 - 1/4 to 4" inc.	Minus	.0030
Size of Square - a	1/16 to 1/8	Minus	.004
	1/4 to 3/4 inc.	Minus	.006
	1" to 4" inc.	Minus	.008

NOTE

For thread limits and tolerances see USCTI Tables 335, 335A and 338. For eccentricity tolerances of taps see Table 317.

TAPER PIPE TAP, THREAD LIMITS, GROUND THREAD (REF. USCTI TABLE 338)



- American National Standard Taper Pipe Thread Form (NPT)
- Aeronautical National Taper Pipe Thread Form (ANPT)
- Dryseal American National Standard Taper Pipe Thread Form (NPTF)

NOMINAL SIZE INCHES	THREADS PER INCH	THREAD TAP LIMITS				L ₁ LENGTH
		PROJECTION* INCHES	PROJECTION TOLERANCE + OR -	TAPER PER FOOT LIMITS		
				MINIMUM	MAXIMUM	
1/16	27	.312	.063	.719	.781	.160
1/8	27	.312	.063	.719	.781	.1615
1/4	18	.459	.063	.719	.781	.2278
3/8	18	.454	.063	.719	.781	.240
1/2	14	.579	.063	.719	.781	.320
3/4	14	.565	.063	.719	.781	.339
1"	11-1/2	.678	.094	.719	.781	.400
1-1/4	11-1/2	.686	.094	.719	.781	.420
1-1/2	11-1/2	.699	.094	.719	.781	.420
2"	11-1/2	.667	.094	.719	.781	.436
2-1/2	8	.925	.094	.734	.781	.682
3"	8	.925	.094	.734	.781	.766
3-1/2	8	.938	.125	.734	.781	.821
4	8	.950	.125	.734	.781	.844

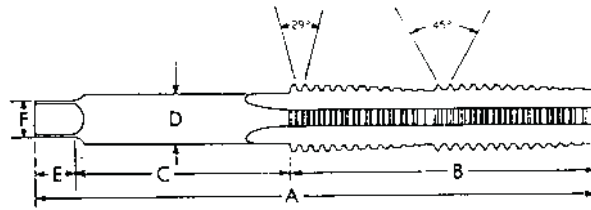
NOTES

- * Distance small end of tap projects through L₁ Taper Thread Ring Gage.
See page 114 for pipe tap drill sizes.

LEAD TOLERANCE

A maximum lead deviation of plus or minus .0005" within any two threads not farther than 1" is permitted.

TANDEM ACME TAP DIMENSIONS

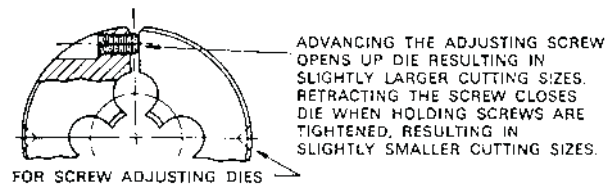
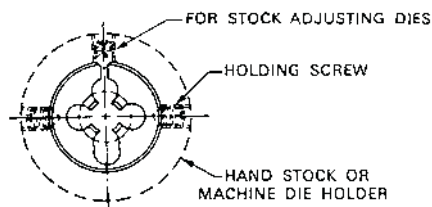
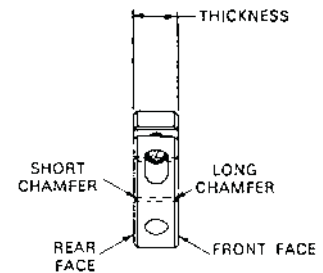
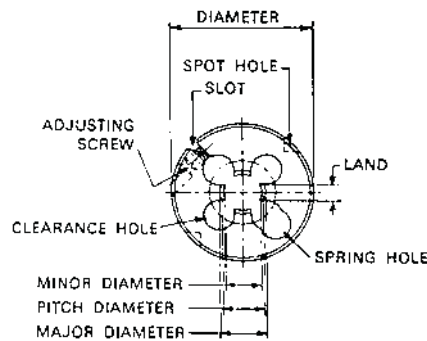


SIZE & PITCH	A OVERALL LENGTH	B LENGTH THREAD END	ROUND SHANK		SQUARE		MAXIMUM DEPTH OF NUT	
			C LENGTH	D DIA.	E LENGTH	F ACROSS FLATS	BRONZE & STEEL	BRASS & CAST IRON
1/4 -16	3"	1 3/4	1"	.185	1/4	.138	1/2	3/4
5/16 -14	3 13/32	1 7/8	1 1/4	.220	9/32	.165	5/8	7/8
3/8 -12	4 1/16	2 1/8	1 5/8	.255	5/16	.191	5/8	1"
1/2 -10	5"	2 9/16	2"	.367	7/16	.275	1"	1 1/2
5/8 -8	6 1/4	3 3/16	2 1/2	.480	9/16	.360	1 1/4	1 7/8
3/4 -6	7 15/16	4 5/16	3"	.542	5/8	.406	1 1/2	2 1/4
3/4 -8	7 15/16	4 5/16	3"	.542	5/8	.406	1 1/2	2 1/4
7/8 -6	8 5/8	4 3/8	3 1/2	.697	3/4	.523	1 3/4	2 5/8
1" -5	10 1/8	5 1/4	4"	.697	3/4	.523	2"	3"
1 1/8 -5	10 3/4	5 1/4	4 1/2	.800	13/16	.600	2 1/4	3 3/8
1 1/4 -5	11 1/8	5 1/4	4 3/4	.896	7/8	.672	2 1/2	3 3/4
1 3/8 -4	12 1/4	5 7/8	5 1/8	1.108	1 1/4	.831	2 3/4	4 1/8
1 1/2 -4	12 5/8	5 7/8	5 1/2	1.233	1 1/4	.925	3"	4 1/2
1 3/4 -4	13 3/8	5 7/8	6 1/4	1.430	1 1/4	1.072	3 1/2	5"
2" -4	14 7/8	6 1/2	7"	1.644	1 3/8	1.233	4"	6"

ROUND ADJUSTABLE DIES TECHNICAL DATA

DIE THICKNESS CHART

O.D.(INCH)	O.D.(MM)	THICKNESS
13/16	20.6 mm	1/4
1"	25.4 mm	3/8
1-1/2	38.1 mm	1/2
2"	50.8 mm	5/8
2-1/2	63.5 mm	3/4
3" (10 pitch & coarser)	76.2 mm	1"
3" (11 pitch & finer)	76.2 mm	3/4

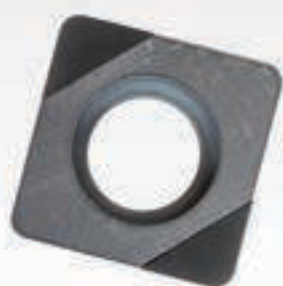


INSERTS

A wide array of high performance PCD, CBN and patented Ceramic inserts grades, available from stock in standard and other ISO configurations.

Custom Comes Standard - If we don't have the perfect tool on the shelf, we can build it for you.





ULTIMATE PERFORMANCE

Polycrystalline Diamond (PCD) Inserts For Milling And Turning



GWS EDP Creator

C N G A 4 3 2 T 008 20 + Grade
Shape Clearance Tolerance Type Size Thickness Radius Edges Width Angle GWS

Work Material	Grade	Type	PCD (Vol.%)	Grain Size	Application
N Non-Ferrous Materials Aluminum Alloy, Aluminum + 12% Si, Brass, Copper, Fiberglass, Plastics, Composite	PCD	Carbide Backed	92	10	General purpose grade, good surface finish, good wear resistance
	PCD3	Carbide Backed	94	30	Superior wear resistance, strong diamond bond
	PCD - F	Carbide Backed	90	4	Good surface finishing
	PCD - UF	Carbide Backed	90	2	Excellent surface finish
	PCD - RUF	Carbide Backed	90	0.5	Excellent surface finish, good wear resistance, suited for woodworking applications

Series 6500 Single Tipped Inserts | PCD | ISO

CCMW	Insert Number	Thickness	Hole	IC	Radius	ISO Designation
	CCMW 21.51	0.094	0.110	0.250	0.016	CCMW 06 02 04
	CCMW 21.52	0.094	0.110	0.250	0.032	CCMW 06 02 08
	CCMW 32.51	0.156	0.173	0.375	0.016	CCMW 09 T3 04
	CCMW 32.52	0.156	0.173	0.375	0.032	CCMW 09 T3 08
	CCMW 431	0.188	0.216	0.500	0.016	CCMW 12 04 04
	CCMW 432	0.188	0.216	0.500	0.032	CCMW 12 04 08
CNGA	Insert Number	Thickness	Hole	IC	Radius	ISO Designation
	CNGA 431	0.188	0.203	0.500	0.016	CNGA 12 04 04
	CNGA 432	0.188	0.203	0.500	0.032	CNGA 12 04 08
	CNGA 433	0.188	0.203	0.500	0.047	CNGA 12 04 12
CPMW	Insert Number	Thickness	Hole	IC	Radius	ISO Designation
	CPMW 21.51	0.094	0.110	0.250	0.016	CPMW 06 02 04
	CPMW 21.52	0.094	0.110	0.250	0.032	CPMW 06 02 08
	CPMW 32.51	0.156	0.173	0.375	0.016	CPMW 09 T3 04
	CPMW 32.52	0.156	0.173	0.375	0.032	CPMW 09 T3 08
	CPMW 431	0.188	0.216	0.500	0.016	CPMW 12 04 04
	CPMW 432	0.188	0.216	0.500	0.032	CPMW 12 04 08
DCMW	Insert Number	Thickness	Hole	IC	Radius	ISO Designation
	DCMW 21.51	0.094	0.110	0.250	0.016	DCMW 07 02 04
	DCMW 21.52	0.094	0.110	0.250	0.032	DCMW 07 02 08
	DCMW 32.51	0.156	0.173	0.375	0.016	DCMW 11 T3 04
	DCMW 32.52	0.156	0.173	0.375	0.032	DCMW 11 T3 08
DNGA	Insert Number	Thickness	Hole	IC	Radius	ISO Designation
	DNGA 431	0.188	0.203	0.500	0.016	DNGA 15 04 04
	DNGA 432	0.188	0.203	0.500	0.032	DNGA 15 04 08
DPMW	Insert Number	Thickness	Hole	IC	Radius	ISO Designation
	DPMW 21.51	0.094	0.110	0.250	0.016	DPMW 07 02 04
	DPMW 21.52	0.094	0.110	0.250	0.032	DPMW 07 02 08
	DPMW 32.51	0.156	0.173	0.375	0.016	DPMW 11 T3 04
	DPMW 32.52	0.156	0.173	0.375	0.032	DPMW 11 T3 08

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

ULTIMATE PERFORMANCE

Polycrystalline Diamond (PCD) Inserts For Milling And Turning



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Series 6500		Single Tipped Inserts | PCD | ISO					
SNGA		Insert Number	Thickness	Hole	IC	Radius	ISO Designation
		SNGA 431	0.188	0.203	0.500	0.016	SNGA 12 04 04
		SNGA 432	0.188	0.203	0.500	0.032	SNGA 12 04 08
		SNGA 433	0.188	0.203	0.500	0.047	SNGA 12 04 12
SNGN		Insert Number	Thickness	Hole	IC	Radius	ISO Designation
		SNGN 431	0.188	-	0.500	0.016	SNGN 12 04 04
		SNGN 432	0.188	-	0.500	0.032	SNGN 12 04 08
		SNGN 433	0.188	-	0.500	0.047	SNGN 12 04 12
SPGN		Insert Number	Thickness	Hole	IC	Radius	ISO Designation
		SPGN 431	0.188	-	0.500	0.016	SPGN 12 04 04
		SPGN 432	0.188	-	0.500	0.032	SPGN 12 04 08
		SPGN 433	0.188	-	0.500	0.047	SPGN 12 04 12
TCGW		Insert Number	Thickness	Hole	IC	Radius	ISO Designation
		TCGW 1.81.51	0.094	0.188	0.219	0.016	TCGW 09 02 04
		TCGW 21.51	0.094	0.110	0.250	0.016	TCGW 11 02 04
		TCGW 21.52	0.094	0.110	0.250	0.032	TCGW 11 02 08
		TCGW 32.51	0.156	0.173	0.375	0.016	TCGW 16 T3 04
		TCGW 32.52	0.156	0.173	0.375	0.032	TCGW 16 T3 08
TNG		Insert Number	Thickness	Hole	IC	Radius	ISO Designation
		TNG 221	0.125	-	0.250	0.016	TNGN 11 03 04
		TNG 222	0.125	-	0.250	0.032	TNGN 11 03 08
		TNG 321	0.125	-	0.375	0.016	TNGN 16 03 04
		TNG 322	0.125	-	0.375	0.032	TNGN 16 03 08
		TNG 331	0.188	-	0.375	0.016	TNGN 16 04 04
		TNG 332	0.188	-	0.375	0.032	TNGN 16 04 08
		TNG 431	0.188	-	0.500	0.016	TNGN 22 04 04
		TNG 432	0.188	-	0.500	0.032	TNGN 22 04 08
TNG 433	0.188	-	0.500	0.047	TNGN 22 04 12		
TNMA		Insert Number	Thickness	Hole	IC	Radius	ISO Designation
		TNMA 331	0.188	0.125	0.375	0.016	TNMA 16 04 04
		TNMA 332	0.188	0.125	0.375	0.032	TNMA 16 04 08
		TNMA 431	0.188	0.203	0.500	0.016	TNMA 22 04 04
		TNMA 432	0.188	0.203	0.500	0.032	TNMA 22 04 08
TNMA 433	0.188	0.203	0.500	0.047	TNMA 22 04 12		
TPGW		Insert Number	Thickness	Hole	IC	Radius	ISO Designation
		TPGW 1.81.51	0.094	0.188	0.219	0.016	TPGW 09 02 04
		TPGW 21.51	0.094	0.110	0.250	0.016	TPGW 11 02 04

ULTIMATE PERFORMANCE

Polycrystalline Diamond (PCD) Inserts For Milling And Turning



Series 6500		Single Tipped Inserts | PCD | ISO				
TPGW	Insert Number	Thickness	Hole	IC	Radius	ISO Designation
	TPGW 21.52	0.094	0.110	0.250	0.032	TPGW 11 02 08
	TPGW 32.51	0.156	0.173	0.375	0.016	TPGW 16 T3 04
	TPGW 32.52	0.156	0.173	0.375	0.032	TPGW 16 T3 08
VBMW	Insert Number	Thickness	Hole	IC	Radius	ISO Designation
	VBMW 21.51	0.094	-	0.250	0.016	VBMW 11 02 04
	VBMW 331	0.188	-	0.375	0.016	VBMW 16 04 04
	VBMW 332	0.188	-	0.375	0.032	VBMW 16 04 08
VCMW	Insert Number	Thickness	Hole	IC	Radius	ISO Designation
	VCMW 21.51	0.094	-	0.250	0.016	VCMW 11 02 04
	VCMW 331	0.188	-	0.375	0.016	VCMW 16 04 04
	VCMW 332	0.188	-	0.375	0.032	VCMW 16 04 08
VNMA	Insert Number	Thickness	Hole	IC	Radius	ISO Designation
	VNMA 331	0.188	0.150	0.375	0.016	VNMA 16 04 04
	VNMA 332	0.188	0.150	0.375	0.032	VNMA 16 04 08
VPMW	Insert Number	Thickness	Hole	IC	Radius	ISO Designation
	VPMW 21.51	0.094	-	0.250	0.016	VPMW 11 02 04
	VPMW 331	0.188	-	0.375	0.016	VPMW 16 04 04
	VPMW 332	0.188	-	0.375	0.032	VPMW 16 04 08
WNGA	Insert Number	Thickness	Hole	IC	Radius	ISO Designation
	WNGA 431	0.188	0.203	0.500	0.016	WNGA 08 04 04
	WNGA 432	0.188	0.203	0.500	0.032	WNGA 08 04 08

Popular Custom Insert Options

- Specialty forms including top notch and grooving
- Single and double-lead thread whirling inserts
- Additional PCD, PCBN and Ceramic grades
- Specialized steel body constructions for turning, milling and holmaking

CUSTOM
COMES
STANDARD

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

ULTIMATE PERFORMANCE

Cubic Boron Nitride (PCBN) Inserts For For Milling And Turning



INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

GWS EDP Creator

C N G A 4 3 2 T 008 20 + Grade
Shape Clearance Tolerance Type Size Thickness Radius Edges Width Angle GWS

Work Material	Grade	Type	CBN (Vol. %)	Grain Size	Major Binder	Application
H Hardened Steels ~45 RC	CBN 45	Carbide Backed	45	<1	Titanium Nitride	Low thermal conductivity, strong edge due to low edge compressiveness
	CBN 50	Carbide Backed	50	2	Titanium Carbide	Good thermal stability and crater resistance, high-speed continuous machining of hardened steel
	CBN 60	Carbide Backed	60	2	Titanium Nitride	Combination of wear resistance and impact strength, general usage in continuous and interrupted cutting of hardened steel
	CBN 70	Carbide Backed	70	2	Titanium Carbonitride	High degree of toughness due to fine microstructure of CBN and ceramic binder, rough and interrupted machining of hardened steel
S1 HRSA Hastelloy, Inconel, Stellite, TiAl6V4	CBN 80	Carbide Backed	80	3	Titanium Nitride	Combination of wear resistance and thermal properties, superior to other grades in machining superalloy
K Cast Irons Ductile Iron, Grey Cast, Nodular, DCL Powdered Metal	CBN 90	Carbide Backed	90	3	Titanium Nitride	Higher toughness and heat resistance as an alternative to CBN 95, machining non-homogenous cast iron and powdered metal alloys
	CBN 95	Carbide Backed	95	3	Titanium Alloy	Extreme wear resistance due to high content CBN and metal binder, excellent at machining various cast iron
	CBN 100	Solid Form	90	10	Aluminum Nitride	Extreme wear resistance due to coarser CBN and high content, rough machining of cast iron and powdered metal alloys

Series 6800 Full Top Inserts | PCBN | ISO

CNG	Insert Number	Thickness	IC	Radius	ISO Designation
	CNG 321	0.125	0.375	0.016	CNG 09 03 04
	CNG 322	0.125	0.375	0.032	CNG 09 03 08
	CNG 431	0.188	0.500	0.016	CNG 12 04 04
	CNG 432	0.188	0.500	0.032	CNG 12 04 08
	CNG 433	0.188	0.500	0.047	CNG 12 04 12
CNGA	Insert Number	Thickness	IC	Radius	ISO Designation
	CNGA 431	0.188	0.500	0.016	CNGA 12 04 04
	CNGA 432	0.188	0.500	0.032	CNGA 12 04 08
	CNGA 433	0.188	0.500	0.047	CNGA 12 04 12
	CNGA 434	0.188	0.500	0.062	CNGA 12 04 16
DNGA	Insert Number	Thickness	IC	Radius	ISO Designation
	DNGA 431	0.188	0.500	0.016	DNGA 12 04 04
	DNGA 432	0.188	0.500	0.032	DNGA 12 04 08
	DNGA 433	0.188	0.500	0.047	DNGA 12 04 12
	DNGA 434	0.188	0.500	0.062	DNGA 12 04 16
RNG	Insert Number	Thickness	IC	Radius	ISO Designation
	RNG 22	0.125	0.250	-	RNGN 06 03 00
	RNG 32	0.125	0.375	-	RNGN 09 03 00
	RNG 42	0.125	0.500	-	RNGN 12 03 00
	RNG 43	0.188	0.500	-	RNGN 12 04 00
RNGA	Insert Number	Thickness	IC	Radius	ISO Designation
	RNGA 43	0.188	0.500	-	RNGA 12 04 00
	RNGA 53	0.188	0.625	-	RNGA 15 04 00
	RNGA 83	0.188	1.000	-	RNGA 25 04 00

ULTIMATE PERFORMANCE

Cubic Boron Nitride (PCBN) Inserts For For Milling And Turning



Series 6800		Full Top Inserts | PCBN | ISO			
SNG	Insert Number	Thickness	IC	Radius	ISO Designation
	SNG 321	0.125	0.375	0.016	SNGN 09 03 04
	SNG 322	0.125	0.375	0.032	SNGN 09 03 08
	SNG 431	0.188	0.500	0.016	SNGN 12 04 04
	SNG 432	0.188	0.500	0.032	SNGN 12 04 08
	SNG 433	0.188	0.500	0.047	SNGN 12 04 12
	SNG 434	0.188	0.500	0.062	SNGN 12 04 16
SNGA	Insert Number	Thickness	IC	Radius	ISO Designation
	SNGA 431	0.188	0.500	0.016	SNGA 12 04 04
	SNGA 432	0.188	0.500	0.032	SNGA 12 04 08
	SNGA 433	0.188	0.500	0.047	SNGA 12 04 12
	SNGA 434	0.188	0.500	0.062	SNGA 12 04 16
	SNGA 832	0.188	1.000	0.032	SNGA 25 04 08
	SNGA 833	0.188	1.000	0.047	SNGA 25 04 12
SNGA 834	0.188	1.000	0.062	SNGA 25 04 16	
TNG	Insert Number	Thickness	IC	Radius	ISO Designation
	TNG 221	0.125	0.250	0.016	TNGN 11 03 04
	TNG 222	0.125	0.250	0.032	TNGN 11 03 08
	TNG 321	0.125	0.375	0.016	TNGN 16 03 04
	TNG 322	0.125	0.375	0.032	TNGN 16 03 08
	TNG 331	0.188	0.375	0.016	TNGN 16 04 04
	TNG 332	0.188	0.375	0.032	TNGN 16 04 08
TNG 432	0.188	0.500	0.032	TNGN 22 04 08	
TNG 433	0.188	0.500	0.047	TNGN 22 04 12	
TNGA	Insert Number	Thickness	IC	Radius	ISO Designation
	TNGA 331	0.188	0.375	0.016	TNGA 16 04 04
	TNGA 332	0.188	0.375	0.032	TNGA 16 04 08
	TNGA 333	0.188	0.375	0.047	TNGA 16 04 12

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Series 6800		Solid Inserts | PCBN | ISO				
	CNG	Insert Number	Thickness	IC	Radius	ISO Designation
		CNG 321	0.125	0.375	0.016	CNG 09 03 04
		CNG 322	0.125	0.375	0.032	CNG 09 03 08
		CNG 431	0.188	0.500	0.016	CNG 12 04 04
		CNG 432	0.188	0.500	0.032	CNG 12 04 08
	CNG 433	0.188	0.500	0.047	CNG 12 04 12	
	CNGA	Insert Number	Thickness	IC	Radius	ISO Designation
		CNGA 431	0.188	0.500	0.016	CNGA 12 04 04
		CNGA 432	0.188	0.500	0.032	CNGA 12 04 08
		CNGA 433	0.188	0.500	0.047	CNGA 12 04 12
	CNGA 434	0.188	0.500	0.062	CNGA 12 04 16	
	DNGA	Insert Number	Thickness	IC	Radius	ISO Designation
		DNGA 431	0.188	0.500	0.016	DNGA 12 04 04
		DNGA 432	0.188	0.500	0.032	DNGA 12 04 08
		DNGA 433	0.188	0.500	0.047	DNGA 12 04 12
	DNGA 434	0.188	0.500	0.062	DNGA 12 04 16	
	RNG	Insert Number	Thickness	IC	Radius	ISO Designation
		RNG 22	0.125	0.250	-	RNGN 06 03 00
		RNG 32	0.125	0.375	-	RNGN 09 03 00
		RNG 42	0.125	0.500	-	RNGN 12 03 00
	RNG 43	0.188	0.500	-	RNGN 12 04 00	
	RNGA	Insert Number	Thickness	IC	Radius	ISO Designation
		RNGA 43	0.188	0.500	-	RNGA 12 04 00
		RNGA 53	0.188	0.625	-	RNGA 15 04 00
	RNGA 83	0.188	1.000	-	RNGA 25 04 00	
	SNG	Insert Number	Thickness	IC	Radius	ISO Designation
		SNG 321	0.125	0.375	0.016	SNGN 09 03 04
		SNG 322	0.125	0.375	0.032	SNGN 09 03 08
		SNG 431	0.188	0.500	0.016	SNGN 12 04 04
		SNG 432	0.188	0.500	0.032	SNGN 12 04 08
	SNG 433	0.188	0.500	0.047	SNGN 12 04 12	

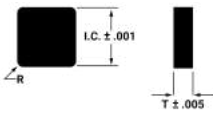
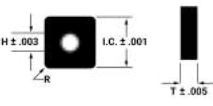
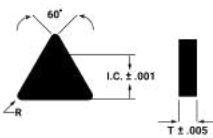
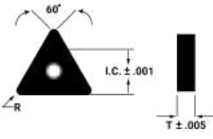
Popular Custom Insert Options

- Specialty forms including top notch and grooving
- Single and double-lead thread whirling inserts
- Additional PCD, PCBN and Ceramic grades
- Specialized steel body constructions for turning, milling and holemaking

ULTIMATE PERFORMANCE

Cubic Boron Nitride (PCBN) Inserts For Turning



Series 6800		Solid Inserts | PCBN | ISO				
SNG	Insert Number	Thickness	IC	Radius	ISO Designation	
	SNG 434	0.188	0.500	0.062	SNGN 12 04 16	
SNGA	Insert Number	Thickness	IC	Radius	ISO Designation	
	SNGA 431	0.188	0.500	0.016	SNGA 12 04 04	
	SNGA 432	0.188	0.500	0.032	SNGA 12 04 08	
	SNGA 433	0.188	0.500	0.047	SNGA 12 04 12	
	SNGA 434	0.188	0.500	0.062	SNGA 12 04 16	
	SNGA 832	0.188	1.000	0.032	SNGA 25 04 08	
	SNGA 833	0.188	1.000	0.047	SNGA 25 04 12	
	SNGA 834	0.188	1.000	0.062	SNGA 25 04 16	
TNG	Insert Number	Thickness	IC	Radius	ISO Designation	
	TNG 221	0.125	0.250	0.016	TNGN 11 03 04	
	TNG 222	0.125	0.250	0.032	TNGN 11 03 08	
	TNG 321	0.125	0.375	0.016	TNGN 16 03 04	
	TNG 322	0.125	0.375	0.032	TNGN 16 03 08	
	TNG 331	0.188	0.375	0.016	TNGN 16 04 04	
	TNG 332	0.188	0.375	0.032	TNGN 16 04 08	
	TNG 432	0.188	0.500	0.032	TNGN 22 04 08	
TNG 433	0.188	0.500	0.047	TNGN 22 04 12		
TNGA	Insert Number	Thickness	IC	Radius	ISO Designation	
	TNGA 331	0.188	0.375	0.016	TNGA 16 04 04	
	TNGA 332	0.188	0.375	0.032	TNGA 16 04 08	
	TNGA 333	0.188	0.375	0.047	TNGA 16 04 12	

INTRO

MILLING

SPECIALTY

HOLEMAKING

THREADING

INSERTS

Series 6800		Cartridge Inserts | PCBN/PCD			
	EDR	Thickness	Width	Radius	ISO Designation
		0.250	0.375	0.030	EDR-100-031-E1
		0.250	0.375	0.030	EDR-100-031-E3
		0.250	0.375	0.030	EDR-100-031-E4
		0.250	0.375	0.030	EDR-100-031-E5
		0.250	0.375	0.030	EDR-102-031-E1W2
		0.250	0.375	0.030	EDR-102-031-E3W2
		0.250	0.375	0.030	EDR-102-031-E4W2
	0.250	0.375	0.030	EDR-102-031-E5W2	
	SDL	Thickness	Width	Radius	ISO Designation
		0.250	0.375	0.020	SDL-200-020-E1
		0.250	0.375	0.020	SDL-200-020-E3
		0.250	0.375	0.020	SDL-200-020-E5
		0.250	0.375	0.031	SDL-200-031-E1
		0.250	0.375	0.031	SDL-200-031-E3
		0.250	0.375	0.031	SDL-200-031-E5
		0.250	0.375	0.020	SDL-202-020-E1W1
		0.250	0.375	0.020	SDL-202-020-E1W2
		0.250	0.375	0.020	SDL-202-020-E3W1
		0.250	0.375	0.020	SDL-202-020-E3W2
		0.250	0.375	0.020	SDL-202-020-E5W1
		0.250	0.375	0.020	SDL-202-020-E5W2
		0.250	0.375	0.030	SDL-202-031-E1W1
		0.250	0.375	0.030	SDL-202-031-E1W2
		0.250	0.375	0.030	SDL-202-031-E3W1
	0.250	0.375	0.030	SDL-202-031-E3W2	
	0.250	0.375	0.030	SDL-202-031-E5W1	
	0.250	0.375	0.030	SDL-202-031-E5W2	
	SDR	Thickness	Width	Radius	ISO Designation
		0.250	0.375	0.020	SDR-100-020-E1
		0.250	0.375	0.020	SDR-100-020-E3
		0.250	0.375	0.020	SDR-100-020-E5
		0.250	0.375	0.031	SDR-100-031-E1
		0.250	0.375	0.031	SDR-100-031-E3
		0.250	0.375	0.031	SDR-100-031-E5
		0.250	0.375	0.020	SDR-102-020-E1W1
		0.250	0.375	0.020	SDR-102-020-E1W2
		0.250	0.375	0.020	SDR-102-020-E3W1
		0.250	0.375	0.020	SDR-102-020-E3W2
		0.250	0.375	0.020	SDR-102-020-E5W1
		0.250	0.375	0.020	SDR-102-020-E5W2
		0.250	0.375	0.030	SDR-102-031-E1W1
		0.250	0.375	0.030	SDR-102-031-E1W2
		0.250	0.375	0.030	SDR-102-031-E3W1
	0.250	0.375	0.030	SDR-102-031-E3W2	
	0.250	0.375	0.030	SDR-102-031-E5W1	
	0.250	0.375	0.030	SDR-102-031-E5W2	
	UCDR	Thickness	Width	Radius	ISO Designation
		0.600	0.750	0.010	UCDR-11-00
		0.600	0.750	0.010	UCDR-11-01
		0.600	0.750	0.030	UCDR-20-00
	0.600	0.750	0.030	UCDR-22-00	

ULTIMATE PERFORMANCE

Ceramic Inserts For Milling And Turning Applications





GWS EDP Creator

C N G A 4 3 2 T 008 20 + Grade
Shape Clearance Tolerance Type Size Thickness Radius Edges Width Angle GWS

Work Material		Operation	I-50	I-100	MW37*	MW43*	MW43B*	TITAN2*	MWW*	CG-88
P	Steels (<40 RC)	Turning	●							
	Steels (<40 RC)	Milling		●						●
S	High Temperature Alloys Inconel 718, Inconel 625, Hastelloy	Turning			●				●	●
		Milling			●					●
K	Cast Irons (<300 BHN)	Turning	●	●		●	●			
		Milling		●			●	●		
N	Brass, Bronze, Carbon, Plastics	Turning		●			●	●		
		Milling					●	●		
is Coolant Tolerant?			No	Yes	Yes	No	Yes	Yes	Yes	Yes

*Features GWS patented MicroWear microwave sintering technology, for finer and more uniform grain structure that improves toughness and wear resistance.

Series 6000 Ceramic Inserts | ISO

CDH	Insert Number	Thickness	IC	Radius	ISO Designation
	CDH 33	0.375	0.750	-	RCMA 19 09 00
	CDH 43	0.375	1.000	-	RCMA 25 19 00
	CDH 53	0.375	1.250	-	RCMA 31 19 00
CNG	Insert Number	Thickness	IC	Radius	ISO Designation
	CNG 431	0.188	0.500	0.016	CNGN 12 04 04
	CNG 432	0.188	0.500	0.031	CNGN 12 04 08
	CNG 433	0.188	0.500	0.047	CNGN 12 04 12
	CNG 434	0.188	0.500	0.063	CNGN 12 04 16
	CNG 441	0.250	0.500	0.016	CNGN 12 06 04
	CNG 442	0.250	0.500	0.031	CNGN 12 06 08
	CNG 443	0.250	0.500	0.047	CNGN 12 06 12
	CNG 444	0.250	0.500	0.063	CNGN 12 06 16
	CNG 451	0.313	0.500	0.016	CNGN 12 07 04
	CNG 452	0.313	0.500	0.031	CNGN 12 07 08
	CNG 453	0.313	0.500	0.047	CNGN 12 07 12
	CNG 454	0.313	0.500	0.063	CNGN 12 07 16
	CNG 531	0.188	0.625	0.016	CNGN 16 04 04
	CNG 532	0.188	0.625	0.031	CNGN 16 04 08
	CNG 533	0.188	0.625	0.047	CNGN 16 04 12
	CNG 534	0.188	0.625	0.063	CNGN 16 04 16
	CNG 541	0.250	0.625	0.016	CNGN 16 06 04
	CNG 542	0.250	0.625	0.031	CNGN 16 06 08
	CNG 543	0.250	0.625	0.047	CNGN 16 06 12
	CNG 544	0.250	0.625	0.063	CNGN 16 06 16
	CNG 551	0.313	0.625	0.016	CNGN 16 07 04
	CNG 552	0.313	0.625	0.031	CNGN 16 07 08
	CNG 553	0.313	0.625	0.047	CNGN 16 07 12
	CNG 554	0.313	0.625	0.063	CNGN 16 07 16
	CNG 631	0.188	0.750	0.016	CNGN 19 04 04
	CNG 632	0.188	0.750	0.031	CNGN 19 04 08
	CNG 633	0.188	0.750	0.047	CNGN 19 04 12
	CNG 634	0.188	0.750	0.063	CNGN 19 04 16
	CNG 641	0.250	0.750	0.016	CNGN 19 06 04
	CNG 642	0.250	0.750	0.031	CNGN 19 06 08
	CNG 643	0.250	0.750	0.047	CNGN 19 06 12
	CNG 644	0.250	0.750	0.063	CNGN 19 06 16
CNG 651	0.313	0.750	0.016	CNGN 19 07 04	
CNG 652	0.313	0.750	0.031	CNGN 19 07 08	
CNG 653	0.313	0.750	0.047	CNGN 19 07 12	
CNG 654	0.313	0.750	0.063	CNGN 19 07 16	

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Series 6000		Ceramic Inserts ISO			
CNGA	Insert Number	Thickness	IC	Radius	ISO Designation
	CNGA 431	0.188	0.500	0.016	CNGA 12 04 04
	CNGA 432	0.188	0.500	0.031	CNGA 12 04 08
	CNGA 433	0.188	0.500	0.047	CNGA 12 04 12
	CNGA 434	0.188	0.500	0.063	CNGA 12 04 16
	CNGA 441	0.250	0.500	0.016	CNGA 12 06 04
	CNGA 442	0.250	0.500	0.031	CNGA 12 06 08
	CNGA 443	0.250	0.500	0.047	CNGA 12 06 12
	CNGA 444	0.250	0.500	0.063	CNGA 12 06 16
	CNGA 451	0.313	0.500	0.016	CNGA 12 07 04
	CNGA 452	0.313	0.500	0.031	CNGA 12 07 08
	CNGA 453	0.313	0.500	0.047	CNGA 12 07 12
	CNGA 454	0.313	0.500	0.063	CNGA 12 07 16
	CNGA 531	0.188	0.625	0.016	CNGA 16 04 04
	CNGA 532	0.188	0.625	0.031	CNGA 16 04 08
	CNGA 533	0.188	0.625	0.047	CNGA 16 04 12
	CNGA 534	0.188	0.625	0.063	CNGA 16 04 16
	CNGA 541	0.250	0.625	0.016	CNGA 16 06 04
	CNGA 542	0.250	0.625	0.031	CNGA 16 06 08
	CNGA 543	0.250	0.625	0.047	CNGA 16 06 12
	CNGA 544	0.250	0.625	0.063	CNGA 16 06 16
	CNGA 551	0.313	0.625	0.016	CNGA 16 07 04
	CNGA 552	0.313	0.625	0.031	CNGA 16 07 08
	CNGA 553	0.313	0.625	0.047	CNGA 16 07 12
	CNGA 554	0.313	0.625	0.063	CNGA 16 07 16
	CNGA 631	0.188	0.750	0.016	CNGA 19 04 04
	CNGA 632	0.188	0.750	0.031	CNGA 19 04 08
	CNGA 633	0.188	0.750	0.047	CNGA 19 04 12
	CNGA 634	0.188	0.750	0.063	CNGA 19 04 16
	CNGA 641	0.250	0.750	0.016	CNGA 19 06 04
	CNGA 642	0.250	0.750	0.031	CNGA 19 06 08
	CNGA 643	0.250	0.750	0.047	CNGA 19 06 12
	CNGA 644	0.250	0.750	0.063	CNGA 19 06 16
	CNGA 651	0.313	0.750	0.016	CNGA 19 07 04
	CNGA 652	0.313	0.750	0.031	CNGA 19 07 08
CNGA 653	0.313	0.750	0.047	CNGA 19 07 12	
CNGA 654	0.313	0.750	0.063	CNGA 19 07 16	
CNGX	Insert Number	Thickness	IC	Radius	ISO Designation
	CNGX 452	0.313	0.500	0.031	CNGX 12 07 08
	CNGX 453	0.313	0.500	0.047	CNGX 12 07 12
	CNGX 454	0.313	0.500	0.063	CNGX 12 07 16
CNMA	Insert Number	Thickness	IC	Radius	ISO Designation
	CNMA 434	0.188	0.500	0.063	CNMA 12 04 16
	CNMA 454	0.313	0.500	0.063	CNMA 12 07 16
CNMN	Insert Number	Thickness	IC	Radius	ISO Designation
	CNMN 434	0.188	0.500	0.063	CNMN 12 04 16

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Series 6000		Ceramic Inserts ISO				
CNMN	Insert Number	Thickness	IC	Radius	ISO Designation	
	CNMN 454	0.313	0.500	0.063	CNMN 12 07 16	
CNMX	Insert Number	Thickness	IC	Radius	ISO Designation	
	CNMX 453	0.313	0.500	0.047	CNMX 12 07 12	
	CNMX 454	0.313	0.500	0.063	CNMX 12 07 16	
DNG	Insert Number	Thickness	IC	Radius	ISO Designation	
	DNG 431	0.188	0.500	0.016	DNGN 15 04 04	
	DNG 432	0.188	0.500	0.031	DNGN 15 04 08	
	DNG 433	0.188	0.500	0.047	DNGN 15 04 12	
	DNG 434	0.188	0.500	0.063	DNGN 15 04 16	
	DNG 441	0.250	0.500	0.016	DNGN 15 06 04	
	DNG 442	0.250	0.500	0.031	DNGN 15 06 08	
	DNG 443	0.250	0.500	0.047	DNGN 15 06 12	
	DNG 444	0.250	0.500	0.063	DNGN 15 06 16	
	DNG 451	0.313	0.500	0.016	DNGN 15 07 04	
	DNG 452	0.313	0.500	0.031	DNGN 15 07 08	
	DNG 453	0.313	0.500	0.047	DNGN 15 07 12	
	DNG 454	0.313	0.500	0.063	DNGN 15 07 16	
DNGA	Insert Number	Thickness	IC	Radius	ISO Designation	
	DNGA 431	0.188	0.500	0.016	DNGA 15 04 04	
	DNGA 432	0.188	0.500	0.031	DNGA 15 04 08	
	DNGA 433	0.188	0.500	0.047	DNGA 15 04 12	
	DNGA 434	0.188	0.500	0.063	DNGA 15 04 16	
	DNGA 441	0.250	0.500	0.016	DNGA 15 06 04	
	DNGA 442	0.250	0.500	0.031	DNGA 15 06 08	
	DNGA 443	0.250	0.500	0.047	DNGA 15 06 12	
	DNGA 444	0.250	0.500	0.063	DNGA 15 06 16	
	DNGA 451	0.313	0.500	0.016	DNGA 15 07 04	
	DNGA 452	0.313	0.500	0.031	DNGA 15 07 08	
	DNGA 453	0.313	0.500	0.047	DNGA 15 07 12	
	DNGA 454	0.313	0.500	0.063	DNGA 15 07 16	
DNGX	Insert Number	Thickness	IC	Radius	ISO Designation	
	DNGX 351	0.313	0.375	0.016	DNGX 12 07 04	
	DNGX 352	0.313	0.375	0.031	DNGX 12 07 08	
	DNGX 353	0.313	0.375	0.047	DNGX 12 07 12	
	DNGX 354	0.313	0.375	0.063	DNGX 12 07 16	
	DNGX 451	0.313	0.500	0.016	DNGX 15 07 04	
	DNGX 452	0.313	0.500	0.031	DNGX 15 07 08	
	DNGX 453	0.313	0.500	0.047	DNGX 15 07 12	
	DNGX 454	0.313	0.500	0.063	DNGX 15 07 16	
DNMX	Insert Number	Thickness	IC	Radius	ISO Designation	
	DNMX 353	0.313	0.375	0.047	DNMX 12 07 12	
	DNMX 354	0.313	0.375	0.063	DNMX 12 07 16	
	DNMX 454	0.313	0.500	0.063	DNMX 15 07 16	
IGK	Insert Number	Thickness	IC	Radius	ISO Designation	
	IGK 8250-2T	0.328	0.250	0.031	-	
	IGK 8250-3T	0.328	0.250	0.047	-	
	IGK 8250-4T	0.328	0.250	0.063	-	
	IGK 8312-2T	0.328	0.3125	0.031	-	

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Series 6000		Ceramic Inserts ISO			
IGK	Insert Number	Thickness	IC	Radius	ISO Designation
	IGK 8312-4T	0.328	0.3125	0.063	-
	IGK 8375-2T	0.328	0.375	0.031	-
	IGK 8375-4T	0.328	0.375	0.063	-
	IGK 9250-2T	0.328	0.250	0.031	-
	IGK 9250-4T	0.328	0.250	0.063	-
	IGK 9375-2T	0.328	0.375	0.031	-
	IGK 9375-4T	0.328	0.375	0.063	-
IGW	Insert Number	Thickness	IC	Radius	ISO Designation
	IGW 4187-1T	0.1875	0.1875	0.031	-
	IGW 4187-2T	0.1875	0.1875	0.047	-
	IGW 4187-4T	0.1875	0.1875	0.063	-
	IGW 6250-2T	0.250	0.250	0.031	-
	IGW 6250-3T	0.250	0.250	0.063	-
	IGW 6250-4T	0.250	0.250	0.031	-
	IGW 8312-2T	0.337	0.3125	0.063	-
	IGW 8312-3T	0.337	0.3125	0.031	-
	IGW 8312-4T	0.337	0.3125	0.063	-
	IGW 8375-2T	0.337	0.375	0.031	-
	IGW 8375-4T	0.337	0.375	0.063	-
LNU	Insert Number	Thickness	IC	Radius	ISO Designation
	LNU 6688	0.500	0.750	0.125	LNUN 66 88
ONC	Insert Number	Thickness	IC	Radius	ISO Designation
	ONC 631	0.188	0.750	0.016	ONCN 19 04 04
	ONC 632	0.188	0.750	0.031	ONCN 19 04 08
	ONC 633	0.188	0.750	0.047	ONCN 19 04 12
	ONC 634	0.188	0.750	0.063	ONCN 19 04 16
RCGX	Insert Number	Thickness	IC	Radius	ISO Designation
	RCGX 35	0.313	0.375	-	RCGX 09 07 00
	RCGX 45	0.313	0.500	-	RCGX 12 07 00
	RCGX 55	0.313	0.625	-	RCGX 15 07 00
	RCGX 66	0.375	0.750	-	RCGX 19 09 00
	RCGX 88	0.465	1.000	-	RCGX 25 12 00
RNG	Insert Number	Thickness	IC	Radius	ISO Designation
	RNG 32	0.125	0.375	-	RNGN 09 03 00
	RNG 33	0.188	0.375	-	RNGN 09 04 00
	RNG 35	0.313	0.375	-	RNGN 09 07 00
	RNG 42	0.125	0.500	-	RNGN 12 03 00
	RNG 43	0.188	0.500	-	RNGN 12 04 00
	RNG 44	0.250	0.500	-	RNGN 12 06 00
	RNG 45	0.313	0.500	-	RNGN 12 07 00
	RNG 54	0.250	0.625	-	RNGN 15 06 00
	RNG 55	0.313	0.625	-	RNGN 15 07 00
	RNG 64	0.250	0.750	-	RNGN 19 06 00
	RNG 65	0.313	0.750	-	RNGN 19 07 00
	RNG 86	0.375	0.375	-	RNGN 25 09 00
	RNGX	Insert Number	Thickness	IC	Radius
	RNGX 43	0.188	0.500	-	RNGX 12 04 00
	RNGX 45	0.313	0.500	-	RNGX 12 07 00

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Series 6000		Ceramic Inserts ISO			
RPG	Insert Number	Thickness	IC	Radius	ISO Designation
	RPG 32	0.125	0.375	-	RPGN 09 03 00
	RPG 33	0.188	0.375	-	RPGN 09 04 00
	RPG 43	0.188	0.500	-	RPGN 12 04 00
	RPG 44	0.250	0.500	-	RPGN 12 06 00
	RPG 45	0.313	0.500	-	RPGN 12 07 00
	RPG 54	0.250	0.625	-	RPGN 15 06 00
	RPG 55	0.313	0.625	-	RPGN 15 07 00
	RPG 64	0.250	0.750	-	RPGN 19 06 00
	RPG 65	0.313	0.750	-	RPGN 19 07 00
	RPG 85	0.313	1.000	-	RPGN 25 07 00
RPG 86	0.375	1.000	-	RPGN 25 09 00	
RPGX	Insert Number	Thickness	IC	Radius	ISO Designation
	RPGX 35	0.313	0.375	-	RPGX 09 07 00
	RPGX 45	0.313	0.500	-	RPGX 12 07 00
	RPGX 55	0.313	0.625	-	RPGX 15 07 00
SCG	Insert Number	Thickness	IC	Radius	ISO Designation
	SCG 331	0.188	0.375	0.016	SCGN 09 04 04
	SCG 332	0.188	0.375	0.031	SCGN 09 04 08
	SCG 333	0.188	0.375	0.047	SCGN 09 04 12
	SCG 334	0.188	0.375	0.063	SCGN 09 04 16
SEAN	Insert Number	Thickness	IC	Radius	ISO Designation
	SEAN 42AFTN	0.125	0.500	-	SEAN 12 03 AFTN
	SEAN 43AFTN	0.188	0.500	-	SEAN 12 04 AFTN
SEMN	Insert Number	Thickness	IC	Radius	ISO Designation
	SEMN 43AZ	0.188	0.500	-	SEMN 12 04 AZ
SNC	Insert Number	Thickness	IC	Radius	ISO Designation
	SNC 431	0.188	0.500	0.016	SNCN 12 04 04
	SNC 432	0.188	0.500	0.031	SNCN 12 04 08
	SNC 433	0.188	0.500	0.047	SNCN 12 04 12
	SNC 434	0.188	0.500	0.063	SNCN 12 04 16
SNE	Insert Number	Thickness	IC	Radius	ISO Designation
	SNE 431	0.188	0.500	0.016	SNE 12 04 04
	SNE 432	0.188	0.500	0.031	SNE 12 04 08
	SNE 433	0.188	0.500	0.047	SNE 12 04 12
	SNE 434	0.188	0.500	0.063	SNE 12 04 16
	SNE 63A	0.188	0.750	-	SNE 19 04 00
SNG	Insert Number	Thickness	IC	Radius	ISO Designation
	SNG 321	0.125	0.375	0.016	SNGN 09 03 04
	SNG 322	0.125	0.375	0.031	SNGN 09 03 08
	SNG 323	0.125	0.375	0.047	SNGN 09 03 12
	SNG 324	0.125	0.375	0.063	SNGN 09 03 16
	SNG 331	0.188	0.375	0.016	SNGN 09 04 04
	SNG 332	0.188	0.375	0.031	SNGN 09 04 08
	SNG 333	0.188	0.375	0.047	SNGN 09 04 12
	SNG 334	0.188	0.375	0.063	SNGN 09 04 16
	SNG 421	0.125	0.500	0.016	SNGN 12 03 04
	SNG 422	0.125	0.500	0.031	SNGN 12 03 08
	SNG 423	0.125	0.500	0.047	SNGN 12 03 12
	SNG 424	0.125	0.500	0.063	SNGN 12 03 16

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Series 6000		Ceramic Inserts ISO			
SNG	Insert Number	Thickness	IC	Radius	ISO Designation
	SNG 431	0.188	0.500	0.016	SNGN 12 04 04
	SNG 432	0.188	0.500	0.031	SNGN 12 04 08
	SNG 433	0.188	0.500	0.047	SNGN 12 04 12
	SNG 434	0.188	0.500	0.063	SNGN 12 04 16
	SNG 436	0.188	0.500	0.094	SNGN 12 04 24
	SNG 438	0.188	0.500	0.125	SNGN 12 04 32
	SNG 441	0.250	0.500	0.016	SNGN 12 06 04
	SNG 442	0.250	0.500	0.031	SNGN 12 06 08
	SNG 443	0.250	0.500	0.047	SNGN 12 06 12
	SNG 444	0.250	0.500	0.063	SNGN 12 06 16
	SNG 451	0.313	0.500	0.016	SNGN 12 07 04
	SNG 452	0.313	0.500	0.031	SNGN 12 07 08
	SNG 453	0.313	0.500	0.047	SNGN 12 07 12
	SNG 454	0.313	0.500	0.063	SNGN 12 07 16
	SNG 531	0.188	0.625	0.016	SNGN 15 04 04
	SNG 532	0.188	0.625	0.031	SNGN 15 04 08
	SNG 533	0.188	0.625	0.047	SNGN 15 04 12
	SNG 534	0.188	0.625	0.063	SNGN 15 04 16
	SNG 541	0.250	0.625	0.016	SNGN 15 06 04
	SNG 542	0.250	0.625	0.031	SNGN 15 06 08
	SNG 543	0.250	0.625	0.047	SNGN 15 06 12
	SNG 544	0.250	0.625	0.063	SNGN 15 06 16
	SNG 551	0.313	0.625	0.016	SNGN 15 07 04
	SNG 552	0.313	0.625	0.031	SNGN 15 07 08
	SNG 553	0.313	0.625	0.047	SNGN 15 07 12
	SNG 554	0.313	0.625	0.063	SNGN 15 07 16
	SNG 561	0.375	0.625	0.016	SNGN 15 08 04
	SNG 562	0.375	0.625	0.031	SNGN 15 08 08
	SNG 563	0.375	0.625	0.047	SNGN 15 08 12
	SNG 564	0.375	0.625	0.063	SNGN 15 08 16
	SNG 631	0.188	0.750	0.016	SNGN 19 04 04
	SNG 632	0.188	0.750	0.031	SNGN 19 04 08
	SNG 633	0.188	0.750	0.047	SNGN 19 04 12
	SNG 634	0.188	0.750	0.063	SNGN 19 04 16
	SNG 641	0.250	0.750	0.016	SNGN 19 06 04
	SNG 642	0.250	0.750	0.031	SNGN 19 06 08
	SNG 643	0.250	0.750	0.047	SNGN 19 06 12
	SNG 644	0.250	0.750	0.063	SNGN 19 06 16
	SNG 651	0.3130	0.750	0.016	SNGN 19 07 04
	SNG 652	0.3130	0.750	0.031	SNGN 19 07 08
	SNG 653	0.3130	0.750	0.047	SNGN 19 07 12
	SNG 654	0.3130	0.750	0.063	SNGN 19 07 16



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Ceramic Inserts For Milling And Turning Applications



Series 6000		Ceramic Inserts ISO			
SNG	Insert Number	Thickness	IC	Radius	ISO Designation
	SNG 656	0.3130	0.750	0.094	SNGN 19 07 24
	SNG 661	0.3750	0.750	0.016	SNGN 19 08 04
	SNG 662	0.3750	0.750	0.031	SNGN 19 08 08
	SNG 663	0.3750	0.750	0.047	SNGN 19 08 12
	SNG 664	0.3750	0.750	0.063	SNGN 19 08 16
SNGA	Insert Number	Thickness	IC	Radius	ISO Designation
	SNGA 321	0.125	0.375	0.016	SNGA 09 03 04
	SNGA 322	0.125	0.375	0.031	SNGA 09 03 08
	SNGA 323	0.125	0.375	0.047	SNGA 09 03 12
	SNGA 324	0.125	0.375	0.063	SNGA 09 03 16
	SNGA 431	0.188	0.500	0.016	SNGA 12 04 04
	SNGA 432	0.188	0.500	0.031	SNGA 12 04 08
	SNGA 433	0.188	0.500	0.047	SNGA 12 04 12
	SNGA 434	0.188	0.500	0.063	SNGA 12 04 16
	SNGA 436	0.188	0.500	0.094	SNGA 12 04 24
	SNGA 441	0.250	0.500	0.016	SNGA 12 06 04
	SNGA 442	0.250	0.500	0.031	SNGA 12 06 08
	SNGA 443	0.250	0.500	0.047	SNGA 12 06 12
	SNGA 444	0.250	0.500	0.063	SNGA 12 06 16
	SNGA 451	0.313	0.500	0.016	SNGA 12 07 04
	SNGA 452	0.313	0.500	0.031	SNGA 12 07 08
	SNGA 453	0.313	0.500	0.047	SNGA 12 07 12
	SNGA 454	0.313	0.500	0.063	SNGA 12 07 16
	SNGA 531	0.188	0.625	0.016	SNGA 15 04 04
	SNGA 532	0.188	0.625	0.031	SNGA 15 04 08
	SNGA 533	0.188	0.625	0.047	SNGA 15 04 12
	SNGA 534	0.188	0.625	0.063	SNGA 15 04 16
	SNGA 536	0.188	0.625	0.094	SNGA 15 04 24
	SNGA 541	0.250	0.625	0.016	SNGA 15 06 04
	SNGA 542	0.250	0.625	0.031	SNGA 15 06 08
	SNGA 543	0.250	0.625	0.047	SNGA 15 06 12
	SNGA 544	0.250	0.625	0.063	SNGA 15 06 16
	SNGA 551	0.313	0.625	0.016	SNGA 15 07 04
	SNGA 552	0.313	0.625	0.031	SNGA 15 07 08
	SNGA 553	0.313	0.625	0.047	SNGA 15 07 12
	SNGA 554	0.313	0.625	0.063	SNGA 15 07 16
	SNGA 631	0.188	0.750	0.016	SNGA 19 04 04
	SNGA 632	0.188	0.750	0.031	SNGA 19 04 08
SNGA 633	0.188	0.750	0.047	SNGA 19 04 12	
SNGA 634	0.188	0.750	0.063	SNGA 19 04 16	
SNGA 641	0.250	0.750	0.016	SNGA 19 06 04	
SNGA 642	0.250	0.750	0.031	SNGA 19 06 08	
SNGA 643	0.250	0.750	0.047	SNGA 19 06 12	

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Series 6000		Ceramic Inserts ISO				
	SNGA	Insert Number	Thickness	IC	Radius	ISO Designation
		SNGA 644	0.250	0.750	0.063	SNGA 19 0616
		SNGA 651	0.313	0.750	0.016	SNGA 19 07 04
		SNGA 652	0.313	0.750	0.031	SNGA 19 07 08
		SNGA 653	0.313	0.750	0.047	SNGA 19 07 12
		SNGA 654	0.313	0.750	0.063	SNGA 19 07 16
	SNGX	Insert Number	Thickness	IC	Radius	ISO Designation
		SNGX 451	0.313	0.500	0.016	SNGX 12 07 04
		SNGX 452	0.313	0.500	0.031	SNGX 12 07 08
		SNGX 453	0.313	0.500	0.047	SNGX 12 07 12
		SNGX 454	0.313	0.500	0.063	SNGX 12 07 16
	SNMX	Insert Number	Thickness	IC	Radius	ISO Designation
		SNMX 453	0.313	0.500	0.047	SNMX 12 07 12
		SNMX 454	0.313	0.500	0.063	SNMX 12 07 16
	SNMX 554	0.313	0.625	0.063	SNMX 15 07 16	
	SPG	Insert Number	Thickness	IC	Radius	ISO Designation
		SPG 321	0.125	0.375	0.016	SPGN 09 03 04
		SPG 322	0.125	0.375	0.031	SPGN 09 03 08
		SPG 323	0.125	0.375	0.047	SPGN 09 03 12
		SPG 324	0.125	0.375	0.063	SPGN 09 03 16
		SPG 331	0.188	0.375	0.016	SPGN 09 04 04
		SPG 332	0.188	0.375	0.031	SPGN 09 04 08
		SPG 333	0.188	0.375	0.047	SPGN 09 04 12
		SPG 334	0.188	0.375	0.063	SPGN 09 04 16
		SPG 421	0.125	0.500	0.016	SPGN 12 03 04
		SPG 422	0.125	0.500	0.031	SPGN 12 03 08
		SPG 423	0.125	0.500	0.047	SPGN 12 03 12
		SPG 424	0.125	0.500	0.063	SPGN 12 03 16
		SPG 431	0.188	0.500	0.016	SPGN 12 04 04
		SPG 432	0.188	0.500	0.031	SPGN 12 04 08
		SPG 433	0.188	0.500	0.047	SPGN 12 04 12
		SPG 434	0.188	0.500	0.063	SPGN 12 04 16
		SPG 441	0.250	0.500	0.016	SPGN 12 06 04
		SPG 442	0.250	0.500	0.031	SPGN 12 06 08
		SPG 443	0.250	0.500	0.047	SPGN 12 06 12
		SPG 444	0.250	0.500	0.063	SPGN 12 06 16
		SPG 451	0.313	0.500	0.016	SPGN 12 07 04
		SPG 452	0.313	0.500	0.031	SPGN 12 07 08
		SPG 453	0.313	0.500	0.047	SPGN 12 07 12
		SPG 454	0.313	0.500	0.063	SPGN 12 07 16
		SPG 531	0.188	0.625	0.016	SPGN 15 04 04
		SPG 532	0.188	0.625	0.031	SPGN 15 04 08
		SPG 533	0.188	0.625	0.047	SPGN 15 04 12
	SPG 534	0.188	0.625	0.063	SPGN 15 04 16	
	SPG 541	0.250	0.625	0.016	SPGN 15 06 04	
	SPG 542	0.250	0.625	0.031	SPGN 15 06 08	

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Series 6000		Ceramic Inserts ISO			
SPG	Insert Number	Thickness	IC	Radius	ISO Designation
	SPG 543	0.250	0.625	0.047	SPGN 15 06 12
	SPG 544	0.250	0.625	0.063	SPGN 15 06 16
	SPG 551	0.313	0.625	0.016	SPGN 15 07 04
	SPG 552	0.313	0.625	0.031	SPGN 15 07 08
	SPG 553	0.313	0.625	0.047	SPGN 15 07 12
	SPG 554	0.313	0.625	0.063	SPGN 15 07 16
	SPG 631	0.188	0.750	0.016	SPGN 19 04 04
	SPG 632	0.188	0.750	0.031	SPGN 19 04 08
	SPG 633	0.188	0.750	0.047	SPGN 19 04 12
	SPG 634	0.188	0.750	0.063	SPGN 19 04 16
	SPG 63A	0.188	0.750	-	SPGN 19 04 00
	SPG 641	0.250	0.750	0.016	SPGN 19 06 04
	SPG 642	0.250	0.750	0.031	SPGN 19 06 08
	SPG 643	0.250	0.750	0.047	SPGN 19 06 12
	SPG 644	0.250	0.750	0.063	SPGN 19 06 16
	SPG 651	0.313	0.750	0.016	SPGN 19 07 04
	SPG 652	0.313	0.750	0.031	SPGN 19 07 08
	SPG 653	0.313	0.750	0.047	SPGN 19 07 12
	SPG 654	0.313	0.750	0.063	SPGN 19 07 16
	SPG 661	0.375	0.750	0.016	SPGN 19 08 04
SPG 662	0.375	0.750	0.031	SPGN 19 08 08	
SPG 663	0.375	0.750	0.047	SPGN 19 08 12	
SPG 664	0.375	0.750	0.063	SPGN 19 08 16	
SPK	Insert Number	Thickness	IC	Radius	ISO Designation
	SPK 42ZR	0.125	0.500	-	SPKN 12 03 ZR
	SPK 43ZR	0.188	0.500	-	SPKN 12 04 ZR
TNG	Insert Number	Thickness	IC	Radius	ISO Designation
	TNG 221	0.125	0.250	0.016	TNGN 11 03 04
	TNG 222	0.125	0.250	0.031	TNGN 11 03 08
	TNG 223	0.125	0.250	0.047	TNGN 11 03 12
	TNG 224	0.125	0.250	0.063	TNGN 11 03 16
	TNG 321	0.125	0.375	0.016	TNGN 16 03 04
	TNG 322	0.125	0.375	0.031	TNGN 16 03 08
	TNG 323	0.125	0.375	0.047	TNGN 16 03 12
	TNG 324	0.125	0.375	0.063	TNGN 16 03 16
	TNG 331	0.188	0.375	0.016	TNGN 16 04 04
	TNG 332	0.188	0.375	0.031	TNGN 16 04 08
	TNG 333	0.188	0.375	0.047	TNGN 16 04 12
	TNG 334	0.188	0.375	0.063	TNGN 16 04 16
	TNG 341	0.250	0.375	0.016	TNGN 16 06 04
	TNG 342	0.250	0.375	0.031	TNGN 16 06 08
	TNG 343	0.250	0.375	0.047	TNGN 16 06 12
	TNG 344	0.250	0.375	0.063	TNGN 16 06 16
	TNG 431	0.188	0.500	0.016	TNGN 22 04 04

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Series 6000		Ceramic Inserts ISO			
TNG	Insert Number	Thickness	IC	Radius	ISO Designation
	TNG 432	0.188	0.500	0.031	TNGN 22 04 08
	TNG 433	0.188	0.500	0.047	TNGN 22 04 12
	TNG 434	0.188	0.500	0.063	TNGN 22 04 16
	TNG 441	0.250	0.500	0.016	TNGN 22 06 04
	TNG 442	0.250	0.500	0.031	TNGN 22 06 08
	TNG 443	0.250	0.500	0.047	TNGN 22 06 12
	TNG 444	0.250	0.500	0.063	TNGN 22 06 16
	TNG 451	0.313	0.500	0.016	TNGN 22 07 04
	TNG 452	0.313	0.500	0.031	TNGN 22 07 08
	TNG 453	0.313	0.500	0.047	TNGN 22 07 12
	TNG 454	0.313	0.500	0.063	TNGN 22 07 16
	TNG 531	0.188	0.625	0.016	TNGN 27 04 04
	TNG 532	0.188	0.625	0.031	TNGN 27 04 08
	TNG 533	0.188	0.625	0.047	TNGN 27 04 12
	TNG 534	0.188	0.625	0.063	TNGN 27 04 16
TNGA	Insert Number	Thickness	IC	Radius	ISO Designation
	TNGA 321	0.125	0.375	0.016	TNGA 16 03 04
	TNGA 322	0.125	0.375	0.031	TNGA 16 03 08
	TNGA 323	0.125	0.375	0.047	TNGA 16 03 12
	TNGA 324	0.125	0.375	0.063	TNGA 16 03 16
	TNGA 326	0.125	0.375	0.094	TNGA 16 03 24
	TNGA 331	0.188	0.375	0.016	TNGA 16 04 04
	TNGA 332	0.188	0.375	0.031	TNGA 16 04 08
	TNGA 333	0.188	0.375	0.047	TNGA 16 04 12
	TNGA 334	0.188	0.375	0.063	TNGA 16 04 16
	TNGA 336	0.188	0.375	0.094	TNGA 16 04 24
	TNGA 338	0.188	0.375	0.125	TNGA 16 04 32
	TNGA 431	0.188	0.500	0.016	TNGA 22 04 04
	TNGA 432	0.188	0.500	0.031	TNGA 22 04 08
	TNGA 433	0.188	0.500	0.047	TNGA 22 04 12
	TNGA 434	0.188	0.500	0.063	TNGA 22 04 16
	TNGA 438	0.188	0.500	0.125	TNGA 22 04 32
	TNGA 441	0.250	0.500	0.016	TNGA 22 06 04
	TNGA 442	0.250	0.500	0.031	TNGA 22 06 08
	TNGA 443	0.250	0.500	0.047	TNGA 22 06 12
	TNGA 444	0.250	0.500	0.063	TNGA 22 06 16
TPG	Insert Number	Thickness	IC	Radius	ISO Designation
	TPG 221	0.125	0.250	0.016	TPGN 11 03 04
	TPG 222	0.125	0.250	0.031	TPGN 11 03 08
	TPG 223	0.125	0.250	0.047	TPGN 11 03 12
	TPG 224	0.125	0.250	0.063	TPGN 11 03 16
	TPG 321	0.125	0.375	0.016	TPGN 16 03 04
	TPG 322	0.125	0.375	0.031	TPGN 16 03 08
	TPG 323	0.125	0.375	0.047	TPGN 16 03 12

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Series 6000		Ceramic Inserts ISO				
TPG	Insert Number	Thickness	IC	Radius	ISO Designation	
	TPG 324	0.125	0.375	0.063	TPGN 16 03 16	
	TPG 331	0.188	0.375	0.016	TPGN 16 04 04	
	TPG 332	0.188	0.375	0.031	TPGN 16 04 08	
	TPG 333	0.188	0.375	0.047	TPGN 16 04 12	
	TPG 334	0.188	0.375	0.063	TPGN 16 04 16	
	TPG 341	0.250	0.375	0.016	TPGN 16 06 04	
	TPG 342	0.250	0.375	0.031	TPGN 16 06 08	
	TPG 343	0.250	0.375	0.047	TPGN 16 06 12	
	TPG 344	0.250	0.375	0.063	TPGN 16 06 16	
	TPG 431	0.188	0.500	0.016	TPGN 22 04 04	
	TPG 432	0.188	0.500	0.031	TPGN 22 04 08	
	TPG 433	0.188	0.500	0.047	TPGN 22 04 12	
	TPG 434	0.188	0.500	0.063	TPGN 22 04 16	
	TPG 441	0.250	0.500	0.016	TPGN 22 06 04	
	TPG 442	0.250	0.500	0.031	TPGN 22 06 08	
	TPG 443	0.250	0.500	0.047	TPGN 22 06 12	
	TPG 444	0.250	0.500	0.063	TPGN 22 06 16	
	TPG 451	0.313	0.500	0.016	TPGN 22 07 04	
	TPG 452	0.313	0.500	0.031	TPGN 22 07 08	
	TPG 453	0.313	0.500	0.047	TPGN 22 07 12	
	TPG 454	0.313	0.500	0.063	TPGN 22 07 16	
	TPG 531	0.188	0.625	0.016	TPGN 27 04 04	
	TPG 532	0.188	0.625	0.031	TPGN 27 04 08	
	TPG 533	0.188	0.625	0.047	TPGN 27 04 08	
TPG 534	0.188	0.625	0.063	TPGN 27 04 16		
TPGA	Insert Number	Thickness	IC	Radius	ISO Designation	
	TPGA 321	0.125	0.375	0.016	TPGA 16 03 04	
	TPGA 322	0.125	0.375	0.031	TPGA 16 03 08	
	TPGA 323	0.125	0.375	0.047	TPGA 16 03 12	
	TPGA 324	0.125	0.375	0.063	TPGA 16 03 16	
	TPGA 331	0.188	0.375	0.016	TPGA 16 04 04	
	TPGA 332	0.188	0.375	0.031	TPGA 16 04 08	
	TPGA 333	0.188	0.375	0.047	TPGA 16 04 12	
	TPGA 334	0.188	0.375	0.063	TPGA 16 04 16	
	TPGA 431	0.188	0.500	0.016	TPGA 22 04 04	
	TPGA 432	0.188	0.500	0.031	TPGA 22 04 08	
	TPGA 433	0.188	0.500	0.047	TPGA 22 04 12	
	TPGA 434	0.188	0.500	0.063	TPGA 22 04 16	
	TPGA 441	0.250	0.500	0.016	TPGA 22 06 04	
	TPGA 442	0.250	0.500	0.031	TPGA 22 06 08	
	TPGA 443	0.250	0.500	0.047	TPGA 22 06 12	
	TPGA 444	0.250	0.500	0.063	TPGA 22 06 16	
VNGA	Insert Number	Thickness	IC	Radius	ISO Designation	
	VNGA 331	0.188	0.375	0.016	VNGA 16 04 04	

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Series 6000		Ceramic Inserts ISO			
VNGA	Insert Number	Thickness	IC	Radius	ISO Designation
	VNGA 332	0.188	0.375	0.031	VNGA 16 04 08
	VNGA 333	0.188	0.375	0.047	VNGA 16 04 12
	VNGA 334	0.188	0.375	0.063	VNGA 16 04 16
VNGX	Insert Number	Thickness	IC	Radius	ISO Designation
	VNGX 352	0.313	0.375	0.031	VNGX 16 07 08
	VNGX 353	0.313	0.375	0.047	VNGX 16 07 12
	VNGX 354	0.313	0.375	0.063	VNGX 16 07 16
WNGA	Insert Number	Thickness	IC	Radius	ISO Designation
	WNGA 431	0.188	0.500	0.016	WNGA 08 04 04
	WNGA 432	0.188	0.500	0.031	WNGA 08 04 08
	WNGA 433	0.188	0.500	0.047	WNGA 08 04 12
	WNGA 434	0.188	0.500	0.063	WNGA 08 04 16

Popular Custom Insert Options

- Specialty forms including top notch and grooving
- Single and double-lead thread whirling inserts
- Additional PCD, PCBN and Ceramic grades
- Specialized steel body constructions for turning, milling and holemaking

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Series 6000		Indexafeed Wiper Ceramic ISO				
CNG	Insert Number	Thickness	IC	Radius	ISO Designation	
	CNG 43 IF	0.188	0.500	-	CNGN 12 04 ZZ	
CNGA	Insert Number	Thickness	IC	Radius	ISO Designation	
	CNGA 43 IF	0.188	0.500	-	CNGA 12 04 ZZ	
SCG	Insert Number	Thickness	IC	Radius	ISO Designation	
	SCG 33 IF	0.188	0.375	-	SCGN 09 04 ZZ	
SNG	Insert Number	Thickness	IC	Radius	ISO Designation	
	SNG 43 IF	0.188	0.500	-	SNGN 12 04 ZZ	

Popular Custom Insert Options

- Specialty forms including top notch and grooving
- Single and double-lead thread whirling inserts
- Additional PCD, PCBN and Ceramic grades
- Specialized steel body constructions for turning, milling and holmaking

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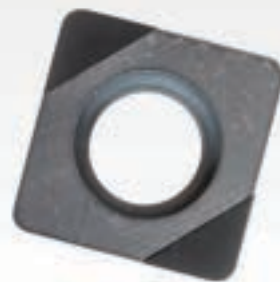
THREADING

INSERTS

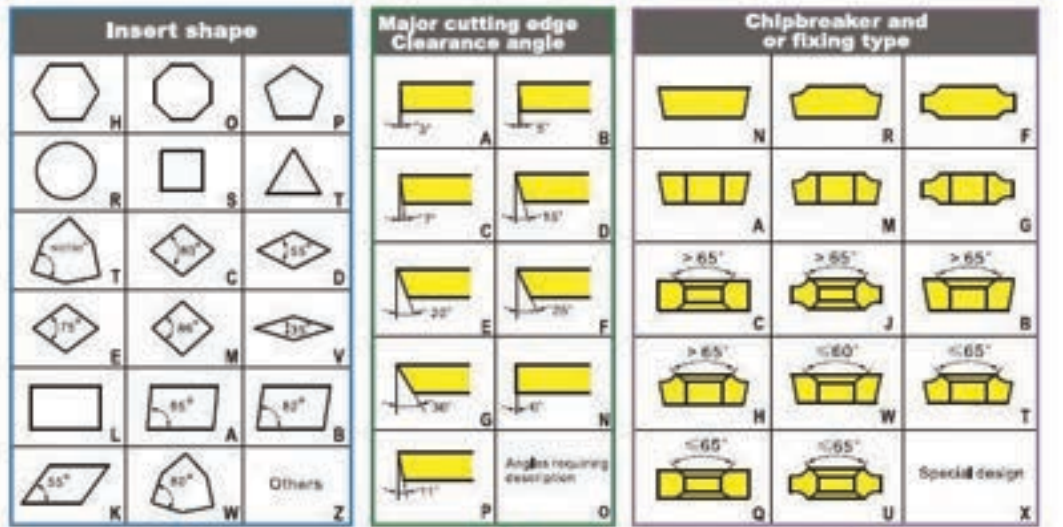
Series 6100		AlloyCat CG88 Whiskered Ceramic					
RNGN	EDP	Thickness	Width	IC	Radius	Edge Prep	ISO Designation
	600001	0.125	-	0.375	-	T1	RNGN-090300
	600002	0.125	-	0.375	-	T1A	RNGN-090300
	600003	0.125	-	0.375	-	T2A	RNGN-090300
	600004	0.187	-	0.375	-	T1	RNGN-090400
	600005	0.187	-	0.375	-	T1A	RNGN-090400
	600006	0.187	-	0.375	-	T2A	RNGN-090400
	600007	0.187	-	0.500	-	T1	RNGN-120400
	600008	0.187	-	0.500	-	T1A	RNGN-120400
	600009	0.187	-	0.500	-	T2	RNGN-120400
	600010	0.187	-	0.500	-	T2A	RNGN-120400
	600011	0.312	-	0.500	-	T1	RNGN-120700
	600012	0.312	-	0.500	-	T1A	RNGN-120700
	600013	0.312	-	0.500	-	T2	RNGN-120700
	600014	0.312	-	0.500	-	T2A	RNGN-120700
	600015	0.312	-	0.500	-	A	RNGN-120700
RPGN	EDP	Thickness	Width	IC	Radius	Edge Prep	ISO Designation
	600101	0.187	-	0.250	-	T1	RPGX-060400
	600102	0.187	-	0.250	-	T2A	RPGX-060400
	600103	0.312	-	0.375	-	T1	RPGX-090700
	600104	0.312	-	0.375	-	T2A	RPGX-090700
	600105	0.312	-	0.500	-	T1	RPGX-120700
	600106	0.312	-	0.500	-	T1A	RPGX-120700
	600107	0.312	-	0.500	-	T2A	RPGX-120700
RCGN	EDP	Thickness	Width	IC	Radius	Edge Prep	ISO Designation
	600201	0.187	-	0.250	-	T1	RCGX-060400
	600202	0.187	-	0.250	-	T2A	RCGX-060400
	600203	0.312	-	0.375	-	T1	RCGX-090700
	600204	0.312	-	0.375	-	T1A	RCGX-090700
	600205	0.312	-	0.375	-	T2A	RCGX-090700
	600206	0.312	-	0.375	-	T4B	RCGX-090700
	600207	0.312	-	0.500	-	T1	RCGX-120700
	600208	0.312	-	0.500	-	T1A	RCGX-120700
	600209	0.312	-	0.500	-	T2A	RCGX-120700
	600210	0.312	-	0.500	-	T2A	RCGX-120700
	600211	0.312	-	0.500	-	T5A	RCGX-120700
	600212	0.312	-	0.500	-	T5B	RCGX-120700
	600213	0.312	-	0.500	-	A	RCGX-120700
6003	EDP	Thickness	Width	IC	Radius	Edge Prep	ISO Designation
	600301	-	0.125	-	0.125	A	-
	600302	-	0.156	-	0.125	A	-
	600303	-	0.187	-	0.125	A	-
	600304	-	0.218	-	0.187	A	-
	600305	-	0.250	-	0.187	A	-
6004	EDP	Thickness	Width	IC	Radius	Edge Prep	ISO Designation
	600401	-	0.125	-	0.015	A	-
	600402	-	0.125	-	0.031	A	-
	600403	-	0.156	-	0.015	A	-
	600404	-	0.187	-	0.031	A	-
	600405	-	0.187	-	0.015	A	-
	600406	-	0.187	-	0.031	A	-
	600407	-	0.218	-	0.015	A	-
	600408	-	0.218	-	0.031	A	-
	600409	-	0.250	-	0.015	A	-
	600410	-	0.250	-	0.031	A	-
	600411	-	0.250	-	0.046	A	-
	600412	-	0.250	-	0.062	A	-

TECHNICAL DATA

INSERTS





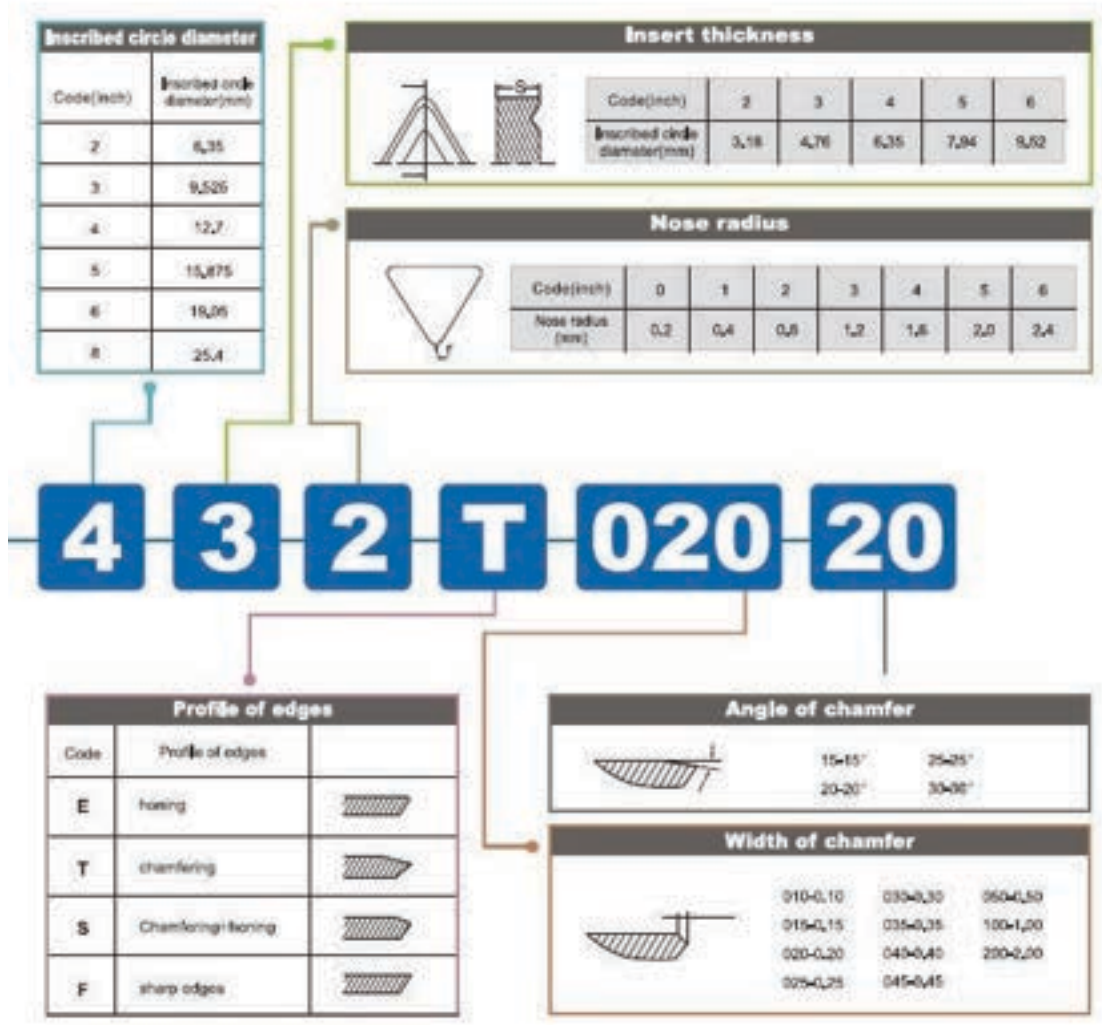


C N G A

Tolerances, Inch							
Letter Symbol	Tolerances in Inches			Letter Symbol	Tolerances in Inches		
	m	s	d		m	s	d
A	±0,0002	±0,001	±0,0010	J	±0,0002	±0,001	±0,0007 ±0,0005
F	±0,0002	±0,001	±0,0005	K	±0,0005	±0,001	±0,0002 ±0,0005
C	±0,0005	±0,001	±0,0010	L	±0,0010	±0,001	±0,0002 ±0,0005
H	±0,0005	±0,001	±0,0005	M	±0,0003 ±0,0007	±0,0005	±0,0002 ±0,0005
E	±0,0010	±0,001	±0,0010	N	±0,0003 ±0,0007	±0,0001	±0,0002 ±0,0005
G	±0,0010	±0,0005	±0,0010	U	±0,0005 ±0,0015	±0,0005	±0,0003 ±0,0010

Inscribed circle diameter	Tolerances for M		Tolerances for d	
	Class M	Class U	Class M, L, F, J, L	Class U
0,250	±0,0003	±0,0005	±0,0002	±0,0003
0,375	±0,0003	±0,0005	±0,0002	±0,0003
0,500	±0,0005	±0,0008	±0,0003	±0,0005
0,625	±0,0006	±0,0011	±0,0004	±0,0007
0,750	±0,0006	±0,0011	±0,0004	±0,0007
1,000	±0,0007	±0,0015	±0,0005	±0,0010

Insert shape D			Insert shape V		
Inscribed circle diameter	Tolerances for M	Tolerances for M	Inscribed circle diameter	Tolerances for M	Tolerances for M
0,250	±0,0004	±0,0002	0,250	±0,0006	±0,0002
0,375	±0,0004	±0,0002	0,375	±0,0006	±0,0002
0,500	±0,0006	±0,0003	0,500	±0,0008	±0,0003
0,625	±0,0007	±0,0004	0,625	±0,0011	±0,0004
0,750	±0,0007	±0,0004	0,750	±0,0011	±0,0004



TECHNICAL DATA

Ceramic Grade Applications

Grade	TRS (psi)	Hardness (Ra)	Toughness	Characteristics	General Applications
I-50	105,000	93.1	3.8	<ul style="list-style-type: none"> Toughened by ZrO₂ High chemical stability 	<ul style="list-style-type: none"> Finish/semi-finish/roughing of cast irons Finish/semi-finish cutting for steel
I-100	130,000	94.5	-	<ul style="list-style-type: none"> Excellent wear resistance High thermal shock resistance 	<ul style="list-style-type: none"> Roughing and semi-finishing of cast iron Can run with flood coolant Excellent milling grade
MW37	110,000	93	7.7	<ul style="list-style-type: none"> Excellent thermal shock resistance High fracture strength 	<ul style="list-style-type: none"> Suited for nickel based alloy material, High velocity rough machining
MW43	168,000	94.9	6.5	<ul style="list-style-type: none"> Exceptionally high resistance to fracture and thermal cracking Excellent wear resistance 	<ul style="list-style-type: none"> Designed for machining cast irons at high surface speeds Excellent finishing grade Coolant is not recommended with this grade
MW43B	-	94.2	7	<ul style="list-style-type: none"> Increased toughness over MW43 Compatible with coolant 	<ul style="list-style-type: none"> For general purpose machining of cast iron with or without coolant Excellent grade for nodular iron More forgiving to inclusions and other casting
TITAN	-	93.2	7.2	<ul style="list-style-type: none"> Exceptionally tough Excellent wear resistance 	<ul style="list-style-type: none"> Developed specifically for milling cast iron Suitable for rough turning nodular iron
MWW	-	94.4	-	<ul style="list-style-type: none"> Excellent wear resistance Whisker reinforced Resistant to cracking 	<ul style="list-style-type: none"> Developed for high productivity machining of hardened steels Ni and cobalt based alloys Excellent wear and notch resistance

Grade	Information
I-50	I-50 is an Al ₂ O ₃ grade, which is enhanced with Zirconia. This is a very stable grade and can be used for general machining and finish cutting of cast iron.
I-100	Shows excellent thermal shock and wear resistance. A general purpose machining grade for hardened steel. It can be used for finish and semi-finish cutting of soft cast iron without interruption.
MW37	Developed specifically for the high speed machining of nickel based alloys. It is capable of machining materials such as Inconel 718 (45HRC) at speeds up to 10 times faster than carbide.
MW43	Specifically for high speed general and finishing turning cast iron, MW43 offers enhanced hardness, toughness and high temperature strength. Because of this, MW43 has very high wear resistance, promoting longer tool life. This grade also displays increased chipping resistance as well as higher speeds and feeds over competitor's grades. We recommend to NOT use coolant with this grade, as the exceptional red-hardness of MW43 allows it to maintain stable life without the risk of premature wear due to heat.
MW43B	A modified version of our highly successful MW43 grade. MW43B has been engineered to provide a tougher cutting edge, specifically for applications that require a more forgiving substrate. This grade also works with or without coolant depending on your application requirements. MW43B is also successful in finish turning of nodular iron providing dependable tool life and toughness
TITAN	GWS Tool Group's TITAN was developed for milling applications involving cast irons. Titan offers high shock and impact resistance. Titan has proven exceptional at rough turning nodular irons.
MWW	Our whisker reinforced grade offers longer and more stable tool life over other competitors grades, with reduced chipping and notch wear. Specifically for machining hardened steels, nickel and cobalt based refractory alloys with greatly increased speeds and feeds over carbide.

TECHNICAL DATA

Ceramic Insert Grade Comparison Chart

	GWS	GREENLEAF	ISCAR	KENNAMETAL	KYOCERA	MITSUBISHI	NTK	ROMAY	SANDVIK	SPK	SSANGYONG	SUMIOTOMO	TAEGUTECH	TUNGALOY
CAST IRON	I-50	GEM19	IN11	-	KA30	MH1	HC1, HW2	CC10	-	-	SZ200, SZ300	-	AW20, AB120	-
	I-100, I-150	GEM7	IN22, IN23	KO90, KY1615	A65, A66N, PT600M	MH2, MH3	HC2, HC5, HC6	CC20, CC30	CC620, CC650	SH2	ST100, ST300, ST500, SD200, TC300, TA300	NB90S	AB30 AB30	LX11, LX21, CX710
		CSN200, CSN100	IS8, IS80	KYK25, KYK35, KY3000, KY3400, KY3500	CS7050, KS6000, KS6050	MK1, MK2, MK3	SX1, SX6, SP9	CC510, CC513, CC514,	CC6190, CC1690	SL506, SL508, SL554C, SL808, SL550C, SL654, SL854C	SN26, SN300, SN400, SN500, SN600, SN700, SN800	SN2000K, NS260, NS260C, SN2100K	AS10, SC10, AS500	FX105
HEAT RESISTANT ALLOY	MWW	WG300, WG600	IW7	KY4300	-	MSW	WA1	CC600	CC670	-	SW400, SW500, SW700	WX2000	TC430	-
		SIAIOX	-	KYS25, KYS30, KY2100, KY1525, KY1540	CF1	MS1	SX5, SX7, SX9		CC6060, CC6065	-	SN900	SN1000H	AS20	-
HARDENED MATERIAL	I-100, I-150	GEN7	IN22	KY4400	A65, KT66, A66N, PT600M	MH2, MH3	HC4, ZC4, HC7, ZC7		CC6050	-	-	NB90S	AB20	LX11
	MWW	WG300, WG600	IW7	KYS25, KY4300	-	MSW	WA1	-	CC670	-	SW400, SW500, SW700	-	-	-

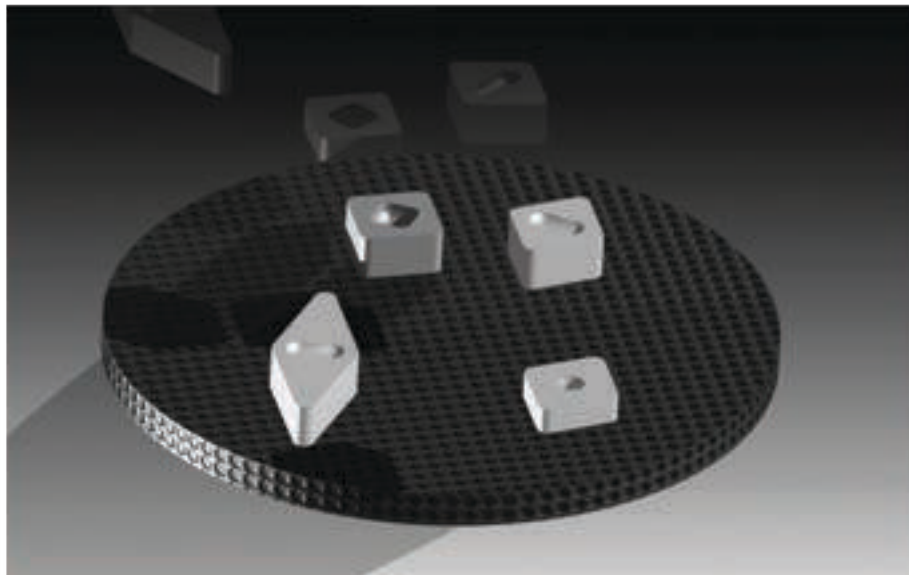
The application of T-lands (edge chamfers), hones, or both is generally required to increase the strength of ceramic cutting edges. Negative T-lands redirect the cutting forces into the body of the insert, thereby reducing the tensile stresses on the cutting edge. Honing or edge rounding eliminates the sharp edges at which chipping can occur in the early stages of use.

Selecting the proper edge preparation is often the most important factor affecting the performance of ceramic inserts. The size and type of the edge preparation required are related primarily to the feed rate and the severity of the operation. Light feed rates demand small T-lands and/or hones; heavy feed rates require larger T-lands and hones. The ideal edge preparation is the smallest which consistently provides adequate edge strength and resistance to chipping in a given operation.

As a general rule, the feed rate (in inches/revolution) should be 1 - 1.5 times the width of the T-land. GWS Tool Group's standard edge preparations have been selected to provide a high degree of edge security over a wide range of applications and machining conditions. These standards and corresponding general application guidelines are listed in the table below.

Designation	Land	Operation
T1	.002" X 30°	Precision Finishing Operations
T2	.004" X 30°	Finishing Operations
T3	.006" X 30°	Milling Operations
T4	.008" X 30°	Roughing & Finishing Operations
T5	.012" X 30°	High Speed Roughing
T6	.004" X 20°	Light Finishing
T7	.008" X 20°	Roughing & Finishing
T8	.012" X 20°	High Speed Roughing
T9	.060" X 10°	Steel Roll Applications
T10	.060" X 20°	Steel Roll Applications
T11	.060" X 30°	Steel Roll Applications
Designation	Hone Radius	Operation
A	.001" - .003"	Light Hone
B	.003" - .005"	Medium Hone
C	.006" - .008"	Heavy Hone

To add a hone size to the above edge preparations, the above letter should be used.



Relap/Resize/Retipping of PCD/PCBN Inserts and Cartridges

When considering any insert from this catalog, remember that a majority of these can be reconditioned. GWS offers 3 different ways to recondition your insert or cartridge to optimize the cost effectiveness of this tooling.

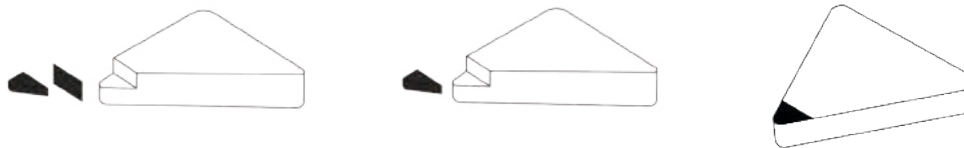
Relapping

This is accomplished by using CNC grinding technology to obtain the correct cutting edge quality desired. Insert or cartridge is reduced in size, and, if more than .015" (.381MM) needs to be ground, the tool will be rejected. It may be reconditioned using another of GWS' PCD/PCBN reconditioning processes if applicable. This is by far the most economical process available.



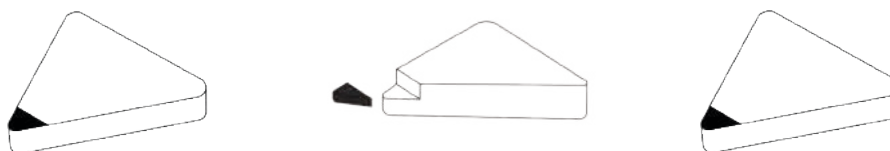
Resizing

Resizing the insert or cartridge is accomplished by removing the segment, preparing the pocket, and inserting a shim between the body and segment. This allows the tool to be returned to its original size, through CNC grinding technology. If more than .020"(.508MM) has to be removed, the tip is not acceptable, and must be retipped. If resizing is a viable option, it allows for an economical way to return the tooling to like-new standards.



Retipping

Once the tool can't be relapped or resized, retipping the tool becomes an option. Retipping allows the body of the insert to be retained, and a new PCD/PCBN tip is applied, CNC ground and returned to new tool quality and standards. Retipping is also an option when the segment has suffered severe fracture, but the tool body is not damaged.



TECHNICAL DATA

Speed & Feed Guide

Material	Hardness Bhn	Depth of Cut (in.)	Recommended Speed Range (sfm)					
			I-50	I-100	MW37	MW43	Titan2	MWW
Carbon Steels AISI Series 1000, 1100, 1200	150-200	.025	2000-3000	1800-2500	-	-	-	-
		.075	1800-2200	1500-2000	-	-	-	-
		.150		1200-1600	-	-	-	-
	200-250	.025	1600-2400	1200-1800	-	-	-	-
		.075	1200-1800	1000-1500	-	-	-	-
		.150		800-1200	-	-	-	-
	250-350	.020	1000-1500	1000-1500	-	-	-	-
		.060	800-1200	800-1200	-	-	-	-
		.125	-	700-1000	-	-	-	-
	40-50 Rc	.015	-	500-1000	-	-	-	-
		.030	-	400-800	-	-	-	-
		.060	-	350-600	-	-	-	-
	50-60 Rc	.010	-	350-600	-	-	-	-
		.020	-	300-500	-	-	-	-
		.040	-	250-400	-	-	-	-
Alloy Steels AISI Series 1300, 4000, 5000, 6000, 8000, 9000	130-200	.025	1600-2200	1500-2000	-	-	-	-
		.075	1400-1800	1200-1800	-	-	-	-
		.150	-	1000-1500	-	-	-	-
	200-250	.025	1200-1600	1000-1500	-	-	-	-
		.075	1000-1400	900-1300	-	-	-	-
		.150	-	800-1200	-	-	-	-
	250-350	.020	900-1300	800-1200	-	-	-	-
		.060	800-1200	700-1000	-	-	-	-
		.125	-	600-900	-	-	-	-
	40-50 Rc	.015	-	500-800	-	-	-	-
		.030	-	400-600	-	-	-	-
		.060	-	300-500	-	-	-	-
	50-60 Rc	.010	-	300-500	-	-	-	-
		.020	-	250-450	-	-	-	-
		.040	-	200-400	-	-	-	-
Tool Steels Bearing Steels	250-350	.025		1000-1500	-	-	-	-
		.075		800-1200	-	-	-	-
		.150		600-900	-	-	-	-
	45-50 Rc	.020		600-900	-	-	-	-
		.040		500-800	-	-	-	-
		.080		400-700	-	-	-	-
	50-55 Rc	.010		400-600	-	-	-	-
		.020		350-550	-	-	-	-
		.040		300-500	-	-	-	-
	55-60 Rc	.010		300-500	-	-	-	-
		.020		250-450	-	-	-	-
		.040		200-400	-	-	-	-

Material	Hardness Bhn	Depth of Cut (in.)	Recommended Speed Range (sfm)					
			I-50	I-100	MW37	MW43	Titan	MWW
Stainless Steels Austenitic Series 200, 300	130-180	.025	-	1000-1500	-	-	-	-
		.075	-	800-1200	-	-	-	-
		.150	-	700-1000	-	-	-	-
	180-250	.020	-	700-1000	-	-	-	-
		.060	-	600-900	-	-	-	-
		.125	-	500-800	-	-	-	-
Stainless Steels Martensitic and Ferritic Series 400, 500 Precipitation Hardened (PH) Stainless Steels	130-180	.025	-	1000-15000	-	-	-	-
		.075	-	900-1300	-	-	-	-
		.150	-	800-1200	-	-	-	-
	180-250	.025	-	800-1200	-	-	-	-
		.075	-	700-1000	-	-	-	-
		.125	-	600-900	-	-	-	-
	40-50 Rc	.015	-	500-700	-	-	-	-
		.030	-	400-600	-	-	-	-
		.060	-	300-500	-	-	-	-
	50-55 Rc	.010	-	300-500	-	-	-	-
		.020	-	250-350	-	-	-	-
		.040	-	200-300	-	-	-	-
Gray Cast Iron	150-200	.020	2400-3200	2000-3000	-	3000-4200	2500	-
		.080	2000-2800	1800-2400	-	2500-3500	2000	-
		AS CAST	1800-2400	1600-2000	-	2300-3300	1500	-
	200-250	.020	1600-2400	1400-1800	-	2000-3000	2000	-
		.040	1200-1800	1200-1600	-	1800-2800	1500	-
		.100	1000-1500	1000-1400	-	1500-2500	1500	-
Alloy Cast Irons	200-250	.020	1600-2400	1600-2400	-	2000-3000	-	-
		.060	1200-1800	1200-1800	-	2000-3000	-	-
		AS CAST	1000-1400	1000-1400	-	2000-3000	-	-
	250-300	.020	1200-1800	1000-1500	-	1500-2500	-	-
		.060	1000-1400	900-1300	-	1500-2500	-	-
		AS CAST	900-1300	800-1200	-	1500-2500	-	-
Chilled Irons	400-500	.020	-	500-800	-	-	-	-
		.060	-	500-800	500	500	-	-
		.125	-	400-600	500	500	-	-
	500-600	.015	-	300-450	-	-	-	-
		.030	-	250-400	-	-	-	-
		.060	-	200-300	300	300	-	-
Ni-resist Iron	130-200	.025	1500-2000	1500-2000	-	-	-	-
		.050	1200-1800	1200-1800	-	2000	-	-
		.075	-	-	-	1500	-	-
Nickel and Iron Base Alloys, Inconel, Waspaloy, Hastelloy	35-40 Rc	.010	-	800-1000	800-1000	-	-	950-1650
		.020	-	700-900	700-1000	-	-	800-1300
		.040	-	-	800	-	-	800-1000
	40-45 Rc	.020	-	700-900	650-1000	-	-	750-1000
		.040	-	600-800	600-800	-	-	750-1000
		.080	-	-	600-700	-	-	700-900
	50-60 Rc	.015	-	600-800	-	-	-	650-900
		.030	-	400-600	-	-	-	650-900
		.060	-	-	-	-	-	650-800

PCD Cutting Recommendations			
MATERIAL	SPEED (SF/M)	DOC	FEED
Aluminum <12%	1000-6000	.002 - .125	.004 - .015
Aluminum <18%	500-2500	.002 - .125	.002 - .010
Copper	1200-3500	.005 - .100	.005 - .020
Brass	1200-3500	.005 - .125	.005 - .020
Sintered Carbide	40-90	.005 - .125	.004 - .020
Unsintered Carbide	400-1200	.005 - .100	.004 - .025
Pressed Ceramics	200-800	.001 - .005	.001 - .005
Fiberglass	300-9000	.005 - .020	.001 - .010
Nylons and Acrylics	550-10000	.002 - .100	.005 - .020
Hard Rubber	550-2500	.005 - .125	.004 - .020
PCBN Cutting Recommendations			
Carbon Steel	200-500	.008	.020
Bearing Material	200-500	.008	.020
Alloy Steels	200-500	.008	.020
Tool/Die Steel	160-350	.008	.020
High Tensile Cast Irons	200-500	.060	.020
Chilled Cast Iron	130-260	.032	.020
Grey Cast Iron	2000-4000	.020	.020
Powered Metal	500-650	.016	.020
Inconel	500-650	.006	.020
Rene 42	500-650	.006	.020
Rene 77	450-550	.006	.020
Incoloy	750-900	.006	.020
Monel	550-650	.006	.020

INTRO
MILLING
SPECIALTY
HOLEMAKING
THREADING
INSERTS

Compressive stress: T-Land or Honing

It is important to maintain the cutting edge of PCBN tools under a compressive stress. In order to achieve this, most applications for PCBN require a t-land or honed edge.

Honing and t-lands are cutting edge shapes that maintain cutting edge strength.

Edge geometry is largely dependant on DOC, cutting mode (continuous or interrupted), surface condition and work piece, etc.

Effect of t-land or honing

Enlarging the t-land or hone increases cutting edge strength and reduces fracturing.

Enlarging t-land or hone size increases flank wear occurrence and shortens tool life.

Enlarging the t-land or hone size increases cutting resistance and chattering.

When to decrease t-land size

In finishing with a small depth of cut and small feed.

When work material is malleable.

When workpiece and/or the machine have poor rigidity.

When to increase t-land size

When workpiece material is hard.

When cutting edge strength is required, such as in an uncut surface or interrupted cutting.

When the machine has high rigidity.

Material	High % PCBN		Low % PCBN	
	Rough	Finish	Rough	Finish
Hardened Steel	20°X.008-.010 (0.2-0.25MM)		-	25°X.004 (0.1MM)
Hard Faced Alloys	20°X.008 (0.2MM)	20°X.008 (0.2MM)	-	25°X.004 (0.1MM)
Soft Gray Cast Iron	20°X.008 (0.2MM)	20°X.008 (0.2MM)/0.010(.25MM) HONE	-	-
Superalloy	20°X.008 (0.2MM)	20°X.008 (0.2MM)/0.010(.25MM) HONE	-	-

According To Depth Of Cut		
Material	Roughing >0.020" DOC (0.5MM DOC)	Finish <0.020" DOC (0.5MM DOC)
Hardened Steel	20°X.008-.010 (0.2-0.25MM)	25°X.004 (0.1MM)
Power Metal	20°X.008 (0.2MM)	20°X.008 (0.2MM)
Soft Gray Cast Iron	20°X.008 (0.2MM)	20°X.008-.010 (0.2-0.25MM)
Superalloy	20°X.008-.010 (0.2-0.25MM)	20°X.008 (0.2MM)

Grade	Type	CBN (Vol.%)	Grain Size	Major Binder	Application
CBN 45	Carbide Backed	45	<1	Titanium Nitride	Low thermal conductivity, strong edge due to low edge compressiveness
CBN 50	Carbide Backed	50	2	Titanium Carbide	Good thermal stability and crater resistance, high-speed continuous machining of hardened steel
CBN 60	Carbide Backed	60	2	Titanium Nitride	Combination of wear resistance and impact strength, general usage in continuous and interrupted cutting of hardened steel
CBN 70	Carbide Backed	70	2	Titanium Carbonitride	High degree of toughness due to fine microstructure of CBN and ceramic binder, rough and interrupted machining of hardened steel
CBN 80	Carbide Backed	80	3	Titanium Nitride	Combination of wear resistance and thermal properties, superior to other grades in machining superalloy
CBN 90	Carbide Backed	90	3	Titanium Nitride	Higher toughness and heat resistance as an alternative to CBN 95, machining non-homogenous cast iron and power metal alloys
CBN 95	Carbide Backed	95	3	Titanium Alloy	Extreme wear resistance due to high content CBN and metal binder, excellent at machining various cast irons
CBN 100	Solid Form	93	10	Aluminum Nitride	Extreme wear resistance due to coarser CBN and high content, rough machining of cast iron and power metal alloys

PCD

Grain Size	Particle	GWS Tool Group	GE	E6	Sumitomo	Tomei	Megadiamond	
Coarse	50				DA90			
	30	PCD 3		CTM302		TDC-E	C30X	
	25		COMPAX1800	CTH025				
			COMPAX1500	CTB025				
Medium	12					TDC-H		
	10	PCD		CTB010			M10	
	8							
	7					TDC-S		
	5		COMPAX1300			DA150		F05/HM20
Fine	4	PCD-F	COMPAX1600					
	3					TDC-G		
	2	PCD-UF		CTB002				
				CTC002				
	1					TDC-F		
	0.5	PCD-XUF				DA200	98FIIM	
PCD-XUF					DA2200			

PCBN

Tool Maker													
-	GWS Tool Group	Sumitomo	Mega	Mitsubishi	Toshiba	Seco	Dijet	Kyocera	Kennametal	SPK	DI	E6	Showa Denko
Cast Iron/Ni-hard/Superalloy													
Solid Type	CBN100	BNS800	N100	MB940	-	CBN300	JBN10	KBN900	-	WBN100	BZN7000S	AMB90	-
General Machining	CBN95	BN600	N90	MB710	BX950	CBN300, CBN20	JBN500	KBN60G	KD120	WBN100	BZN6000	DBA80	KT10
-	CBN80, CBN80D	BN600, BN100	N90	MB710, MB730	BX950, BX850	CBN300, CBN20	JBN500	KBN60G	KD200	WBN750	BZN6000	DBA80	KT10, KT10C
Hard Machining	CBN95, CBN90	BN500	N90	MB730	BX950, BX930, BX450	CBN300	JBN500	KBN60G	KD200	WBN700	BZN6000	DBA80	KT20C
Hardened Steel													
Interrupted Cutting	CBN45	BN300		MB835	BX380	CBN150	-	-	KD200	WBN500	-	-	-
-	CBN60, CBN70	BN250, BNX25	N50	MB835, MB825	BX380, BX360	CBN150	JBN300	KBN25B	KD200	WBN550	BZN8100, BZN8200	DBN45	KT30X, KT25
-	CBN60, CBN70	BN250, BNX20	N50	MB825, MB820, MB8025	BX360, BX330	CBN10, CBN100	JBN300, JBN330	KBN25B, KBN10B	KD05	WBN600	BZN8100, BZN8200	DBN45	KT30N, KT30
Continuous Cutting	CBN50	BNX10, BNC80	NT50	MB810, MB8025	BX310	CBN10, CBN100	JBN330	KBN10B	KD05	WBN650	HTC2000	DBC50	-

INTRO
MILLING
SPECIALTY
HOLEMAKING
THREADING
INSERTS

TERMS AND CONDITIONS

Acceptance of Terms

By purchasing products from GWS Tool Group, you agree that you have read, understand and agree to be bound by all the provisions set forth herein and below (collectively, the "Terms and Conditions"), all of which constitute an agreement between you and GWS Tool Group. The unenforceability of any one of the Terms and Conditions shall not affect the enforceability of any other of the Terms and Conditions. The terms and conditions on any proposal, quotation, order acknowledgement, invoice or other form you receive from GWS Tool Group are incorporated under these Terms and Conditions. These Terms and Conditions constitute the exclusive agreement between you and GWS Tool Group, except as otherwise agreed by a mutually signed document. Our failure to assert a right or insist upon compliance with any term and condition shall not constitute a waiver of that right or justify any subsequent noncompliance. GWS Tool Group reserves the right to change these terms and conditions by posting a revision on our website or by mailing, faxing or emailing said notification.

Distributor Discount

See current price supplemental for list pricing and reference GWS master Preferred Partner Agreement and individual preferred partner notices for discount schedule, terms & conditions.

Ordering Information

All items in the GWS Tool Group catalog carry unique item numbers. Using these numbers will keep ordering errors to a minimum and assure that you will receive exactly what you order. Orders will be accepted by phone, fax, EDI, and email.

Drop Shipping

All drop ship orders must be faxed or emailed to GWS Tool Group. GWS Tool Group will not assume responsibility for any incorrect shipping information. GWS Tool Group will assess a \$20 fee to any drop ship order that is either returned or re-routed by the shipping company. Failure to provide proper and complete information that results in any additional shipping penalties or fees from the freight provider will be billed to the distributor.

Shipping / Freight Collect – Discrepancies / Late or Lost Delivery

Same day shipping is available for stocked items ordered before 3:00pm Eastern Time Monday through Friday. UPS is the preferred method of shipping for same day shipping. FEDEX or USPS could be delayed up to one business day from date of order. We accept freight collect numbers or can prepay and add the freight charges to any order. Any freight collect charges that are non-collectable by UPS, or any penalties or fees incurred for errant billing information or wrong address that are re-billed to GWS Tool Group will be billed back to customer issuing the purchase order. If the freight carrier does not deliver your order on time or loses the order, GWS Tool Group will file a claim on your behalf. Claims can take up to 30 days to be processed and refunded by the freight carrier, which is at their full discretion. GWS cannot be held accountable for any late or lost orders. All prepay and add freight services are billed with insurance for this reason and any freight collect accounts assume full responsibility at the time a tracking number is issued by freight carrier. Any lost package that was insured by GWS through our prepay and add freight services will be immediately replaced. Claims for shortages must be made within 3 days of receipt of tools.

UPS Expedited Freight Program

GWS offers a variety expedited shipping options including flat rate 2nd day shipping. For more details, please contact GWS Tool Group.

Product Warranty

GWS Tool Group assures that all products sold shall be free from manufacturing and material defects. GWS Tool Group will repair, replace, or issue credit on any product that does not conform with this warranty. Any product that has been altered, used, marked or damaged voids this warranty. This warranty is in lieu of all other warranties, expressed or implied including any warranty of merchantability or fitness for a particular purpose and is also in lieu of all other obligations or liabilities, including any obligation or liability arising from contract, or otherwise for damages whether direct, indirect or consequential. There are no other warranties except the warranty against defects in material and workmanship set forth above, and we neither assume nor authorize any other person or firm to assume for it any other obligation or liability in connection with our products.

Product Return Policy

Prior to acceptance of any returned products, a Returned Material Authorization (RMA) number must be issued from our Returns Department by calling 877-497-8665 or emailing sales@gwstoolgroup.com. A list of returned products accompanied with purchase order numbers is required for review and approval prior to issuance of an RMA. Only current EDP numbers are considered for return, any discontinued products are non-returnable. All specials, modified tooling, or altered tools cannot be returned for credit unless tools were manufactured incorrectly per the customer's specifications provided. Only tools purchased within 6 months from date of order will be eligible for return. Returned products for credit will be valued at purchase price regardless of current price. All returned products must pass Quality Assurance inspection, be undamaged, unaltered, unused, resalable, manufactured according to current tooling specifications, and in original packaging. No credit will be issued if tools do not pass QA inspection or meet the aforementioned criteria. All products must be received within 21-days of RMA issuance. A restocking charge of 20% will apply or an offsetting order of two times (200%) the value of the returned product will apply to all products returned for any reason other than a manufacturer error or defect. Freight charges will be assumed by the customer unless the return is due to manufacturer error or defect. The RMA number must be clearly visible on the outside of the box and on the enclosed packing list. Any items shipped and not approved for return will either be returned to the customer or scrapped at the customer's expense. No returns after 1 year period. Please return product with approved RMA number to the address specified by GWS.

GWS Blanket Order Policy

Blanket orders are extremely beneficial for high volume consumers of cutting tools. This order option enables all parties to maximize their logistical planning increasing efficiencies, price security and cost savings for all parties. All blanket orders must be taken within the agreed upon term not to exceed 12-months from date of order. Blanket order releases can be released on a scheduled timely basis or released as needed. No cancellations or returns will be allowed on blanket orders regardless of the products sold are standard catalog items or specials.

Technical Assistance

Any technical assistance or application suggestions made by GWS Tool Group personnel or website tech data information is only to assist the customer and in all cases use of such information is solely the customer's responsibility.

Safety Precautions when using Cutting Tools

GWS Tool Group is committed to manufacturing products that can be used safely as directed under recommended machining parameters. Cutting tools can break or shatter when in use due to the extreme forces of the machining environment. Cutting tools will generate chips while engaged in the work piece and can produce dust, swarf, gases and potentially sparks or fire. Caution and safety must be considered at all times to include the use of protective eye wear, machine safety guard barriers, proper ventilation, quick access to fire suppression equipment and other safeguards. In no way shall GWS Tool Group be held accountable or liable for any costs, machine down time, injuries, or deaths resulting from cutting tool breakage or emissions.

Limitation of Liability

Under no circumstance shall GWS Tool Group be held liable in contract, warranty, tort or otherwise for any special, exemplary or consequential damages that result from your purchase or use of any GWS Tool Group products. In no event shall our liability exceed the purchase price of the products from GWS Tool Group. It is the customer's responsibility to inspect all products to determine if they are suitable and per specification required by the end user.

Revisions to Marketing Avenues

GWS Tool Group reserves the right to revise listings and specifications in our catalog and website without notice. GWS Tool Group is not responsible for any typographical errors. Please verify the current data at the time of your order.

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