2007 Product Catalog

MENLO

Power. Precision. Performance.

Get your money's worth – and more.

Power. Precision. Performance. Everything you need to make your operation more efficient, more productive and more profitable. It's all there, in every tool on every page in this catalog. Because that's what you should expect from your tool supplier.

Otherwise, what are you paying for?

POWER Special ultra-fine grain carbide gives Menlo tools 20% greater transverse rupture strength than conventional carbide tools, for the same toughness as high-speed steel tools.

PRECISION We set the quality bar higher to make sure our tools can outperform our competitors' every day. Computer-controlled processes maintain consistency and exacting design tolerances to support the strength and integrity of every Menlo tool.

PERFORMANCE Every family of tools is maximized and tested on the shop floor for cost-effective use, longer life and trouble-free performance.

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GENERAL PURPOSE END MILLS

HIGH PERFORMANCE END MILLS

These families of Menlo high-performance end mills deliver metal removal rates many times higher than those of conventional end mills.

Each milling family is designed with unique geometries ground from high-strength carbide substrates and finely tuned through years of results-based research. Chemical coatings are specially selected for maximum heat resistance, feed rates and metal removal rates in specific workpiece materials.

Results: Significantly increased production rates in machine shops around the world.

POW•R•FEED® M90

- Unique vibration dampening geometry, coated for maximum heat resistance
- For slotting, pocketing, roughing and finishing at high feed rates, wet or dry, in a wide material range – low carbon steels to titanium
- Smooth, silent machining, excellent surface finishes, multi-tasking with a single tool, longer tool life

OMEGA-6® M70

- Advanced geometry, high edge strength, high heat resistance
- For conventional or high speed milling, wet or dry, in harder, difficult to machine materials
- Increased shearing ability, higher feed rates, exceptional surface finishes in light to medium cuts, longer tool life

enDURO® M50

- Specially designed to overcome work hardening and impact resistance common to high strength materials, high heat resistance
- For high-production or high performance milling (roughing or finishing) in hard to machine materials
- Reduced harmonic stresses, longer tool life

STREAKERS® M20

- Three- or two-flute designs, advanced geometries resist clogging on low or high horsepower equipment
- For machining, finishing or roughing all types of aluminum
- Aggressive chip evacuation, chatter free machining, excellent surface finish and long tool life

The Right Tool for Every Need

Powerful Geometries for

- Stainless steel
- Carbon steel
- Inconels
- Titanium
- Cast iron
- Hardened steels

Powerful Savings through

- Shorter cycle times, lower costs per part
- Higher feed rates at normal depths of cut
- Significant cost savings even for short run manufacturing

Design Features for Every Application

End designs

- Corner radii – a wide variety to meet your part specification requirements
- Square corners for general machining and finishing
- Ball nose styles for contouring

Shank designs

- h6 tolerance styles fit all collets and conform to shrink-fit requirements
- Also standard with flats for use in end mill holders

Multiple lengths

- Long reach with stub flutes for deep cavity machining
- Long length with extra flute lengths for finishing passes
- Stub length for extra rigidity

The products in this catalog are designed for use in the materials shown below. Refer to the technical icons for each tool model and find the intended application for that product by matching it to the same icon below.

Steel materials
Low carbon steel, free machining steel, medium and high plain carbon steel, alloy and tool steel, ferritic and martensitic stainless steel.

Preferred coatings: AlTiNX, TiAlNX, AlTiN
Optional coatings: TiCN, TiN

Stainless steel materials
Austenitic stainless steel.

Preferred coatings: AlTiNX, TiAlNX, AlTiN
Optional coatings: TiCN

Cast iron materials
Ductile (nodular) and malleable cast irons. Grey cast irons.

Preferred coatings: AlTiNX, TiAlNX, AlTiN
Optional coatings: TiCN, TiN

Aluminum and Non-ferrous materials
Free machining and low silicon aluminum alloys. High silicon aluminum alloys. Other non-ferrous materials.

Optional coatings: TiCN

Heat resistant super alloys and titanium
Iron based, cobalt based, and nickel based alloys, titanium and titanium alloys.

Preferred coatings: AlTiNX, TiAlNX, AlTiN
Optional coatings: TiCN

Hardened materials
Steels and stainless steels over 50 HRc.

Preferred coating: AlTiNX, TiAlNX
Optional coatings: AlTiN

In all applications, getting the most from your tooling involves attention to all aspects of good machining practice. Be sure to use proper fixturing, pay attention to recommended speed and feed guidelines, and keep all machinery in good working order. When using coolants, ensure that an adequate coolant flow reaches the cutting edge to prevent thermal cracking of cutting tools.

POW·R·FEED® M90

Results: Smooth, silent machining at high feed rates, excellent surface finishes and significant savings achieved by extended tool life.

With 20% greater hot hardness than conventional TiAlN coatings, POW·R·FEED end mills last longer in high heat environments.

Ideal for heavy interrupted cuts and when machining stainless steel, titanium and other metals that generate high temperatures.

Durability

Unique design reduces chatter and enhances tool life. Its advanced multi-layer coating provides maximum heat protection for the carbide core at higher feed rates. With multiple coating layers, thermal cracks travel only down the affected layer, preserving the integrity of the carbide substrate.

Productivity

POW·R·FEED runs at higher feed rates, even on deeper cuts, reducing cycle time and boosting productivity.

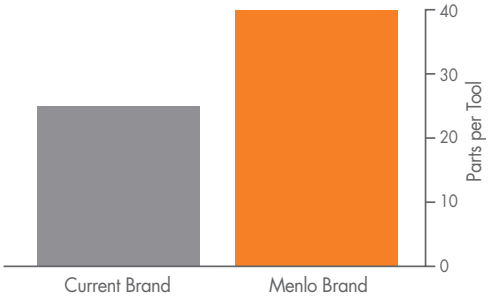
Versatility

One tool for slotting, pocketing, roughing and finishing in a wide range of materials. Run wet or dry in:

- Stainless steels
- Cast iron
- High-temp alloys
- Inconel
- Titanium
- Carbon steels

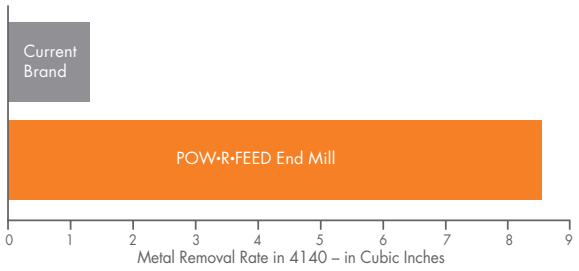
More Parts per Tool

Never underestimate the power of the coating. Tested in 6AL-4V titanium against a tool with a different coating, the POW•R•FEED M90 tool lasted 60% longer, simply due to the AlTiN-ML coating. That translates into a 60% parts per tool increase and takes a big bite out of the customer's ongoing tool costs.



Higher Metal Removal Rates

A customer achieved a feed rate more than five times higher with the 4-flute POW•R•FEED M90 than with a similar competitor's tool, as tested in the customer's operation in 1020 hot roll steel. POW•R•FEED M90 not only ran smoothly at a higher speed, it also devoured 450% more metal in the same length of time.



Application Guide • Speed & Feed

Work Material	Type of Cut	Axial DOC	Radial DOC	No. of Flutes	Speed (m /min)	Feed (mm Per Tooth) 3,0	6,0	9,0	12,0	16,0	19,0	25,0	Speed (SFM)	Feed (Inches Per Tooth) 1/8	1/4	3/8	1/2	5/8	3/4	1
Cast Iron - Gray	Slot	1 x D	1 x D	4	122	.0152	.0305	.0483	.0635	.0787	.0965	.0270	400	.0006	.0012	.0019	.0025	.0031	.0038	.0050
	Rough	1.5 x D	.5 x D	4	152	.0183	.0381	.0579	.0762	.0945	.0158	.0524	500	.0007	.0015	.0023	.0030	.0037	.0046	.0060
	Rough	1.5 x D	.5 x D	5	152	---	.0356	.0533	.0711	.0889	.0092	.0422	500	---	.0014	.0021	.0028	.0035	.0043	.0056
	Finish	1.5 x D	.01 x D	5	198	---	.0356	.0533	.0711	.0889	.0092	.0422	650	---	.0014	.0021	.0028	.0035	.0043	.0056
Cast Iron - Ductile	Slot	1 x D	1 x D	4	91	.0152	.0305	.0483	.0635	.0787	.0965	.0270	300	.0006	.0012	.0018	.0023	.0029	.0035	.0046
	Rough	1.5 x D	.5 x D	4	122	.0183	.0356	.0533	.0711	.0889	.0067	.0422	400	.0007	.0014	.0021	.0028	.0035	.0042	.0056
	Rough	1.5 x D	.5 x D	5	122	---	.0330	.0508	.0686	.0838	.0016	.0372	400	---	.0013	.0020	.0027	.0033	.0040	.0054
	Finish	1.5 x D	.01 x D	5	158	---	.0330	.0508	.0686	.0838	.0016	.0372	520	---	.0013	.0020	.0027	.0033	.0040	.0054
Cast Iron - Malleable	Slot	0.75	1 x D	4	76	.0102	.0203	.0305	.0381	.0483	.0584	.0762	250	.0004	.0008	.0012	.0015	.0019	.0023	.0030
	Rough	1 x D	.75 x D	4	99	.0127	.0279	.0406	.0559	.0686	.0838	.0118	325	.0005	.0011	.0016	.0022	.0027	.0033	.0044
	Rough	1 x D	.75 x D	5	99	---	.0254	.0381	.0533	.0660	.0813	.0067	325	---	.0010	.0015	.0021	.0026	.0032	.0042
	Finish	1.5 x D	.01 x D	5	130	---	.0254	.0381	.0533	.0660	.0813	.0067	425	---	.0010	.0015	.0021	.0026	.0032	.0042
Low Carbon Steel ≤ 38 HRc 1018, 12L14, 8620	Slot	1 x D	1 x D	4	107	.0203	.0406	.0610	.0813	.0016	.0219	.0626	350	.0008	.0016	.0024	.0032	.0040	.0048	.0064
	Rough	1.5 x D	.5 x D	4	130	.0254	.0508	.0762	.0016	.0270	.0524	0.2032	425	.0010	.0020	.0030	.0040	.0050	.0060	.0080
	Rough	1.5 x D	.5 x D	5	130	---	.0483	.0711	.0965	.0194	.0448	.0930	425	---	.0019	.0028	.0038	.0047	.0057	.0076
	Finish	1.5 x D	.01 x D	5	168	---	.0483	.0711	.0965	.0194	.0448	.0930	550	---	.0019	.0028	.0038	.0047	.0057	.0076
Medium Carbon Steels ≤ 38 HRc 4140, 4340	Slot	1 x D	1 x D	4	99	.0152	.0330	.0508	.0686	.0864	.0016	.0372	325	.0006	.0013	.0020	.0027	.0034	.0040	.0054
	Rough	1.5 x D	.5 x D	4	114	.0203	.0432	.0660	.0889	.0118	.0346	.0778	375	.0008	.0017	.0026	.0035	.0044	.0053	.0070
	Rough	1.5 x D	.5 x D	5	114	---	.0406	.0635	.0864	.0067	.0295	.0727	375	---	.0016	.0025	.0034	.0042	.0051	.0068
	Finish	1.5 x D	.01 x D	5	149	---	.0406	.0635	.0864	.0067	.0295	.0727	490	---	.0016	.0025	.0034	.0042	.0051	.0068
Tool & Die Steels ≤ 38 HRc A2, D2, H13, P20	Slot	1 x D	1 x D	4	99	.0152	.0330	.0508	.0686	.0864	.0016	.0372	325	.0006	.0013	.0020	.0027	.0034	.0040	.0054
	Rough	1.5 x D	.5 x D	4	114	.0203	.0432	.0660	.0889	.0118	.0346	.0778	375	.0008	.0017	.0026	.0035	.0044	.0053	.0070
	Rough	1.5 x D	.5 x D	5	114	---	.0406	.0635	.0864	.0067	.0295	.0727	375	---	.0016	.0025	.0034	.0042	.0051	.0068
	Finish	1.5 x D	.01 x D	5	148	---	.0406	.0635	.0864	.0067	.0295	.0727	485	---	.0016	.0025	.0034	.0042	.0051	.0068
Tool Steels - 39 HRc to 48 HRc	Slot	.75 x D	1 x D	4	69	.0127	.0254	.0381	.0508	.0635	.0762	.0016	225	.0005	.0010	.0015	.0020	.0025	.0030	.0040
	Rough	1 x D	.5 x D	4	84	.0146	.0292	.0438	.0584	.0730	.0876	.0168	275	.0006	.0012	.0017	.0023	.0029	.0035	.0046
	Rough	1 x D	.5 x D	5	84	---	.0279	.0406	.0559	.0711	.0864	.0118	275	---	.0011	.0016	.0022	.0028	.0034	.0044
	Finish	1.5 x D	.01 x D	5	108	---	.0279	.0406	.0559	.0711	.0864	.0118	355	---	.0011	.0016	.0022	.0028	.0034	.0044
Easy to Machine Stainless Steel 416, 410, 302, 303	Slot	1 x D	1 x D	4	91	.0152	.0305	.0457	.0635	.0787	.0940	.0270	300	.0006	.0012	.0018	.0025	.0031	.0037	.0050
	Rough	1.5 x D	.5 x D	4	114	.0203	.0406	.0610	.0813	.0016	.0219	.0626	375	.0008	.0016	.0024	.0032	.0040	.0048	.0064
	Rough	1.5 x D	.5 x D	5	114	---	.0381	.0559	.0762	.0940	.0143	.0524	375	---	.0015	.0022	.0030	.0037	.0045	.0060
	Finish	1.5 x D	.01 x D	5	148	---	.0381	.0559	.0762	.0940	.0143	.0524	485	---	.0015	.0022	.0030	.0037	.0045	.0060
Moderately Difficult Stainless Steel 304, 316, Invar, Kovar	Slot	.75 x D	1 x D	4	84	.0127	.0279	.0406	.0559	.0686	.0838	.0118	275	.0005	.0011	.0016	.0022	.0027	.0033	.0044
	Rough	1.5 x D	.5 x D	4	107	.0178	.0381	.0584	.0813	.0940	.0143	.0626	350	.0007	.0015	.0023	.0032	.0037	.0045	.0064
	Rough	1.5 x D	.5 x D	5	107	---	.0356	.0559	.0787	.0914	.0118	.0575	350	---	.0014	.0022	.0031	.0036	.0044	.0062
	Finish	1.5 x D	.01 x D	5	137	---	.0356	.0559	.0787	.0914	.0118	.0575	450	---	.0014	.0022	.0031	.0036	.0044	.0062
Difficult to Machine Stainless Steels 316L, 17-4 PH, 15-5 PH, 13-8 PH	Slot	.5 x D	1 x D	4	76	.0102	.0229	.0305	.0457	.0559	.0686	.0914	250	.0004	.0009	.0012	.0018	.0022	.0027	.0036
	Rough	1 x D	.5 x D	4	91	.0127	.0279	.0406	.0559	.0711	.0838	.0118	300	.0005	.0011	.0016	.0022	.0028	.0033	.0044
	Rough	1 x D	.5 x D	5	91	---	.0254	.0381	.0533	.0660	.0787	.0067	300	---	.0010	.0015	.0021	.0026	.0031	.0042
	Finish	1.5 x D	.01 x D	5	119	---	.0254	.0381	.0533	.0660	.0787	.0067	390	---	.0010	.0015	.0021	.0026	.0031	.0042
Titanium Alloys	Slot	.5 x D	1 x D	4	76	.0127	.0254	.0381	.0508	.0635	.0762	.0016	250	.0005	.0010	.0015	.0020	.0025	.0030	.0040
	Rough	1 x D	.5 x D	4	91	.0152	.0305	.0432	.0584	.0737	.0889	.0168	300	.0006	.0012	.0017	.0023	.0029	.0035	.0046
	Rough	1 x D	.5 x D	5	91	---	.0254	.0381	.0533	.0686	.0813	.0067	300	---	.0010	.0015	.0021	.0027	.0032	.0042
	Finish	1.5 x D	.01 x D	5	119	---	.0254	.0381	.0533	.0686	.0813	.0067	390	---	.0010	.0015	.0021	.0027	.0032	.0042
High Temperature Alloys	Slot	.25 x D	1 x D	4	21	.0102	.0203	.0305	.0381	.0483	.0610	.0762	70	.0004	.0008	.0012	.0015	.0019	.0024	.0030
	Rough	1 x D	.25 x D	4	29	.0127	.0229	.0356	.0457	.0559	.0711	.0914	95	.0005	.0009	.0014	.0018	.0022	.0028	.0036
	Rough	1 x D	.25 x D	5	29	---	.0229	.0356	.0457	.0559	.0711	.0914	95	---	.0009	.0014	.0018	.0022	.0028	.0036
	Finish	1.5 x D	.01 x D	5	38	---	.0229	.0356	.0457	.0559	.0711	.0914	125	---	.0009	.0014	.0018	.0022	.0028	.0036

D = tool diameter Reduce feed rates by 20% when using long length tools Starting parameters shown

M904 POW•R•FEED®

- 4 unequally spaced flutes
- Stub, standard and long lengths
- Square corner and corner radius
- Superior AlTiNX coating

Technical • Technisch • Technique • Técnico
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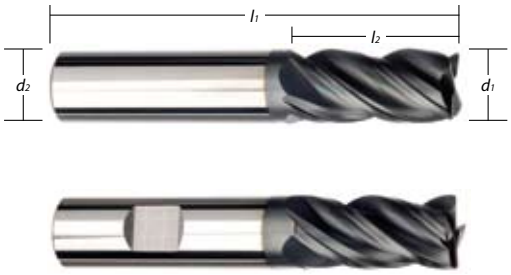
P M K S



Former List Code Reference

M904					
Length Code		**SQ**	**CR**	**SQ**	**CR**
Stub	**SL**	M979	M978		
Regular	**RL**	M971	M970	M973	M972
Regular Reach	**RR**		M974		
Long Length	**LL**		M967		
Long Reach	**LR**		M975		
X-Long	**XL**		M968		
X-Long Reach	**XR**		M976		
Deep Milling	**DM**		M969		
Deep Reach	**DR**		M977		

M904 • Metric

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	R Corner Radius	Len. Code	AlTiNX	AlTiNX
3	3	8	38	---	RL	63027	
		8	38	0,3	RL	63102	
4	4	11	50	---	RL	63028	
		11	50	0,3	RL	63103	
5	5	13	50	---	RL	63029	
		13	50	0,3	RL	63104	
6	6	10	54	---	SL	63123	
		10	54	0,3	SL	63108	
		13	57	---	RL	63030	63049
		13	57	0,3	RL	63074	63089
		13	57	0,5	RL	63434	63444
		28	75	0,5	LL	63455	
8	8	12	58	---	SL	63124	
		12	58	0,5	SL	63109	
		19	63	---	RL	63032	63050
		19	63	0,3	RL	63435	63445
		19	63	0,5	RL	63075	63090
		29	75	0,5	LL	63456	
10	10	14	66	---	SL	63125	
		14	66	0,5	SL	63110	
		22	72	---	RL	63034	63051
		22	72	0,3	RL	63436	63446
		22	72	0,5	RL	63076	63091
		36	88	0,5	LL	63457	
12	12	16	73	---	SL	63126	
		16	73	1,0	SL	63111	
		26	83	---	RL	63036	63052
		26	83	0,5	RL	63437	63447
		26	83	0,75	RL	63438	63448
		26	83	1,0	RL	63077	63092
		45	100	0,75	LL	63458	
16	16	22	82	---	SL	63128	
		22	82	1,0	SL	63113	
		32	92	---	RL	63038	63054
		32	92	0,75	RL	63439	63449
		32	92	1,0	RL	63079	63094
		57	125	1,0	LL	63459	
20	20	26	92	---	SL	63130	
		26	92	1,0	SL	63115	
		38	104	---	RL	63040	63056
		38	104	0,75	RL	63440	63450
		38	104	1,0	RL	91026	63096
		56	125	1,0	LL	63460	

d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

MOD

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Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	R Corner Radius	Len. Code	AlTiNX	AlTiNX
1/8	1/8	1/4	1-1/2	.015	RR	63248	
		1/4	2-1/4	.015	LR	63259	
		1/2	1-1/2	---	RL	63010	
		1/2	1-1/2	.015	RL	63064	
5/32	3/16	9/16	2	---	RL	63011	
		9/16	2	.015	RL	63118	
3/16	3/16	5/16	2	.015	RR	63249	
		5/16	2-1/2	.015	LR	63260	
		5/8	2	---	RL	63012	
		5/8	2	.015	RL	91027	
7/32	1/4	5/8	2-1/2	---	RL	63013	
		5/8	2-1/2	.020	RL	63119	
1/4	1/4	3/8	2	---	SL	63003	
		3/8	2	.020	SL	63058	
		3/8	2-1/2	.020	RR	63250	
		3/8	3	.020	LR	63261	
		3/8	4	.020	XR	63272	
1/4	1/4	3/4	2-1/2	---	RL	63014	
		3/4	2-1/2	.020	RL	63066	
		3/4	2-1/2	.030	RL	63466	
		1-1/8	3	.020	LL	63420	
		1-1/2	4	.020	XL	63425	
5/16	5/16	13/16	2-1/2	---	RL	63016	
		13/16	2-1/2	.020	RL	91024	
3/8	3/8	1/2	2	---	SL	63004	
		1/2	2	.020	SL	63059	
		1/2	2-1/2	.020	RR	63252	
		1/2	3	.020	LR	63263	
		1/2	4	.020	XR	63274	
		1/2	6	.020	DR	63281	
		7/8	2-1/2	---	RL	63018	63043
		7/8	2-1/2	.020	RL	63068	63083
		7/8	2-1/2	.030	RL	63390	63400
		1-1/8	3	.020	LL	63421	
		1-3/4	4	.020	XL	63426	

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

M904 • Inch • Continued

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	R Corner Radius	Len. Code	AlTiNX	AlTiNX
7/16	7/16	1	2-3/4	---	RL	63020	63044
		1	2-3/4	.020	RL	63069	63084
1/2	1/2	5/8	2-1/2	---	SL	63005	
		5/8	2-1/2	.030	SL	63060	
		5/8	3	.030	RR	63254	
		5/8	4	.030	LR	63265	
		5/8	5	.030	XR	63276	
		5/8	6	.030	DR	63283	
		1	3	---	RL	63022	63045
		1	3	.030	RL	63070	63085
		1-1/4	3	---	RL	63100	63101
		1-1/4	3	.015	RL	63467	63473
		1-1/4	3	.030	RL	63098	63099
		1-1/4	3	.060	RL	63391	63401
		1-1/4	3	.090	RL	63392	63402
		1-1/4	3	.125	RL	63393	63403
		2	4	.030	LL	63422	
		2-1/2	5	.030	XL	63427	
		3	6	.030	DM	63430	
5/8	5/8	3/4	3	---	SL	63006	
		3/4	3	.030	SL	63061	
		3/4	3-1/2	.030	RR	63255	
		3/4	5	.030	LR	63266	
		3/4	6	.030	XR	63277	
		1-1/4	3-1/2	---	RL	63024	63046
		1-1/4	3-1/2	.015	RL	63468	63474

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	R Corner Radius	Len. Code	AlTiNX	AlTiNX
5/8	5/8	1-1/4	3-1/2	.030	RL	63071	63086
		1-1/4	3-1/2	.060	RL	63394	63404
3/4	3/4	7/8	3	---	SL	63007	
		7/8	3	.030	SL	63062	
		1	4	.030	RR	63256	
		1	5	.030	LR	63267	
		1	6	.030	XR	63278	
		1	7	.030	DR	63285	
		1-1/2	4	---	RL	63025	91025
		1-1/2	4	.015	RL	63469	63475
		1-1/2	4	.030	RL	63072	63087
		1-1/2	4	.060	RL	63395	63405
		1-1/2	4	.090	RL	63396	63406
		1-1/2	4	.125	RL	63397	63407
		2-1/4	5	.030	LL	63423	
		3	6	.030	XL	63428	
		4	7	.030	DM	63431	
1	1	1-1/8	4	.030	RR	63257	
		1-1/4	5	.030	LR	63268	
		1-1/4	6	.030	XR	63279	
		1-1/4	7	.030	DR	63286	
		1-1/2	4	---	RL	63026	63048
		1-1/2	4	.030	RL	63073	63088
		1-1/2	4	.060	RL	63398	63408
		3	6	.030	XL	63429	
		4-1/8	7	.030	DM	63432	

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

M904B POW•R•FEED®

- Unequal flute spacing
- Ball end, standard length
- Superior AlTiNX coating

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P M K S

Former List Code Reference			
M904B			
Length Code		BN	BN
Regular	RL	M971B	M973B

Metric

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Len. Code	AlTiNX	AlTiNX
3	3	8	38	RL	63160	
4	4	11	50	RL	63161	
5	5	13	50	RL	63162	
6	6	13	57	RL	63163	63235
8	8	19	63	RL	63165	63237
10	10	22	72	RL	63167	63239
12	12	26	83	RL	63169	63241
16	16	32	92	RL	63171	63243
20	20	38	104	RL	63173	63245

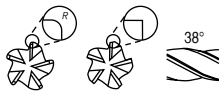
d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Len. Code	AlTiNX	AlTiNX
1/8	1/8	1/2	1-1/2	RL	63139	
5/32	3/16	9/16	2	RL	63140	
3/16	3/16	5/8	2	RL	63142	
7/32	1/4	5/8	2-1/2	RL	63143	
1/4	1/4	3/4	2-1/2	RL	63144	
5/16	5/16	13/16	2-1/2	RL	63146	
3/8	3/8	7/8	2-1/2	RL	63148	63176
7/16	7/16	1	2-3/4	RL	63150	63178
1/2	1/2	1	3	RL	63152	63180
		1-1/4	3	RL	63153	63181
5/8	5/8	1-1/4	3-1/2	RL	63155	63183
3/4	3/4	1-1/2	4	RL	63156	63184
1	1	1-1/2	4	RL	63158	63186

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

M905 POW•R•FEED®



- 5 unequally spaced flutes
- Standard length
- Square corner and corner radius
- Superior AlTiNX coating

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P M K S H

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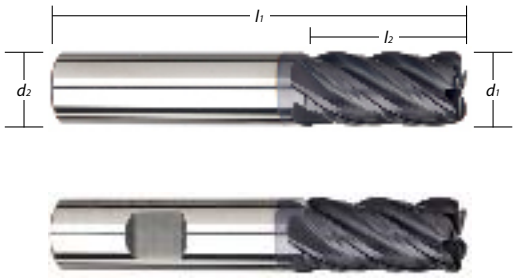

Former List Code Reference					
M905					
Length Code		**SQ**	**CR**	**SQ**	**CR**
Regular	**RL**	M981	M980	M983	M982

Metric

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	R Corner Radius	Len. Code	AlTiNX	AlTiNX
6	6	13	57	---	RL	63346	63360
		13	57	0,5	RL	63295	63326
8	8	19	63	---	RL	63347	63361
		19	63	0,5	RL	63296	63327
10	10	22	72	---	RL	63348	63362
		22	72	0,5	RL	63297	63328
12	12	26	83	---	RL	63349	63363
		26	83	0,75	RL	63298	63329
16	16	32	92	---	RL	63350	63364
		32	92	1,0	RL	63299	63330
20	20	38	104	---	RL	63351	63365
		38	104	1,0	RL	63300	63331

d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	R Corner Radius	Len. Code	AlTiNX	AlTiNX
1/4	1/4	3/4	2-1/2	---	RL	63338	
		3/4	2-1/2	.020	RL	63287	
		3/4	2-1/2	.030	RL	63462	
3/8	3/8	7/8	2-1/2	---	RL	63340	63354
		7/8	2-1/2	.020	RL	63289	62976
		7/8	2-1/2	.030	RL	63370	63380
1/2	1/2	1-1/4	3	---	RL	63342	63356
		1-1/4	3	.015	RL	63463	63470
		1-1/4	3	.030	RL	63291	62978
		1-1/4	3	.060	RL	63371	63381
		1-1/4	3	.090	RL	63372	63382
		1-1/4	3	.125	RL	63373	63383
5/8	5/8	1-1/4	3-1/2	---	RL	63343	63357
		1-1/4	3-1/2	.015	RL	63464	63471
		1-1/4	3-1/2	.030	RL	63292	62980
		1-1/4	3-1/2	.060	RL	63374	63384
3/4	3/4	1-1/2	4	---	RL	63344	63358
		1-1/2	4	.015	RL	63465	63472
		1-1/2	4	.030	RL	63293	62981
		1-1/2	4	.060	RL	63375	63385
		1-1/2	4	.090	RL	63376	63386
		1-1/2	4	.125	RL	63377	63387
1	1	1-1/2	4	---	RL	63345	63359
		1-1/2	4	.030	RL	63294	62982
		1-1/2	4	.060	RL	63378	63388

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

MOD

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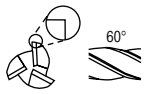
EXTREME HELIX M60

M603

Results: Excellent surface finishes at high speed and feed rates.

Extreme helix angle increases cutting edge engagement and prolongs tool life.



- 3-Flute, extreme helix
- Standard length, square corner
- High strength edge
- AlTiN, TiCN, TiN coating options

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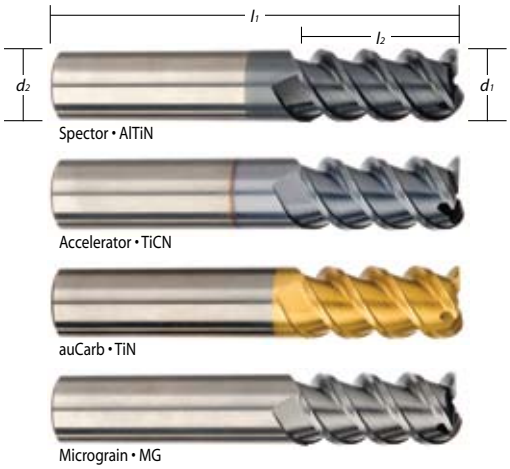
Page 5

P K M



Former List Code Reference					
M603					
Length Code		AlTiN	TiCN	TiN	MG
Regular	RL	M226	M225	M215	M210

Metric

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Len. Code	AlTiN	TiCN	TiN	MG
6	6	13	57	RL	62448	30794		30594
8	8	20	63	RL	62449	30795		38491
10	10	25	72	RL	62450	30796		38493
12	12	26	83	RL	62451	30797		38495
16	16	32	92	RL	62452	30798		38497
20	20	38	104	RL	62453	30799		38499

d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Len. Code	AlTiN	TiCN	TiN	MG
1/8	1/8	1/2	1-1/2	RL	39599		37509	36425
3/16	3/16	5/8	2	RL	39128		90559	36427
1/4	1/4	3/4	2-1/2	RL	39129	38816	90624	36429
3/8	3/8	7/8	2-1/2	RL	39130	38824	90654	36432
1/2	1/2	1	3	RL	39132	38832	37533	36434
5/8	5/8	1-1/4	3-1/2	RL	39133	38840	90701	36436
3/4	3/4	1-1/2	4	RL	97139	38848	37549	36438

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

Application Guide • Speed & Feed

Work Material	Type of Cut	Axial DOC	Radial DOC	No. of Flutes	Speed (m/min) AlTiN	TiCN	MG	Feed (mm Per Tooth) 6,0	8,0	12,0	16,0	20,0	Speed (SFM) AlTiN	TiCN	MG	Feed (Inches Per Tooth) 1/8	1/4	3/8	1/2	5/8	3/4
Cast Iron Gray and Ductile	Slot	.5 x D	1 x D	3	84	84	69	.0305	.0457	.0635	.0762	.1016	275	275	225	.0012	.0018	.0025	.0030	.0040	.0040
	Rough	1 x D	.5 x D	3	99	99	84	.0356	.0533	.0711	.0889	.1067	325	325	275	.0014	.0021	.0028	.0035	.0042	.0042
	Finish	1.5 x D	.01 x D	3	114	114	91	.0356	.0533	.0711	.0889	.1067	375	375	300	.0014	.0021	.0028	.0035	.0042	.0042
Low Carbon Steels ≤ 32 HRc 1018, 12L14, 8620	Slot	.5 x D	1 x D	3	84	76	69	.0305	.0457	.0635	.0762	.1016	275	250	225	.0012	.0018	.0025	.0030	.0040	.0040
	Rough	1 x D	.5 x D	3	99	91	84	.0356	.0533	.0711	.0889	.1067	325	300	275	.0014	.0021	.0028	.0035	.0042	.0042
	Finish	1.5 x D	.01 x D	3	114	107	99	.0356	.0533	.0711	.0889	.1067	375	350	325	.0014	.0021	.0028	.0035	.0042	.0042
Medium Carbon and Tool Steels ≤ 38 HRc	Slot	.5 x D	1 x D	3	84	76	69	.0254	.0381	.0508	.0635	.0762	275	250	225	.0010	.0015	.0020	.0025	.0030	.0030
	Rough	1 x D	.5 x D	3	99	91	84	.0305	.0457	.0584	.0737	.0889	325	300	275	.0012	.0018	.0023	.0029	.0035	.0035
	Finish	1.5 x D	.01 x D	3	114	107	99	.0305	.0457	.0635	.0787	.0940	375	350	325	.0012	.0018	.0025	.0031	.0037	.0037
Carbon and Tool Steels 39 HRc to 48 HRc	Slot	.5 x D	1 x D	3	69	61	53	.0178	.0279	.0381	.0483	.0584	225	200	175	.0007	.0011	.0015	.0019	.0023	.0023
	Rough	1 x D	.5 x D	3	84	76	69	.0213	.0335	.0457	.0579	.0701	275	250	225	.0008	.0013	.0018	.0023	.0028	.0028
	Finish	1.5 x D	.01 x D	3	99	91	84	.0213	.0335	.0457	.0579	.0701	325	300	275	.0008	.0013	.0018	.0023	.0028	.0028
Easy to Machine Stainless Steels 416, 410, 302, 303	Slot	.5 x D	1 x D	3	76	69	61	.0254	.0381	.0508	.0635	.0762	250	225	200	.0010	.0015	.0020	.0025	.0030	.0030
	Rough	1 x D	.5 x D	3	91	84	76	.0330	.0483	.0635	.0711	.0965	300	275	250	.0013	.0019	.0025	.0028	.0038	.0038
	Finish	1.5 x D	.01 x D	3	107	99	91	.0356	.0533	.0711	.0889	.1067	350	325	300	.0014	.0021	.0028	.0035	.0042	.0042
Moderately Difficult Stainless Steels 304, 316, Invar, Kovar	Slot	.5 x D	1 x D	3	76	69	61	.0178	.0279	.0381	.0483	.0584	250	225	200	.0007	.0011	.0015	.0019	.0023	.0023
	Rough	1 x D	.5 x D	3	84	76	69	.0279	.0432	.0559	.0711	.0889	275	250	225	.0011	.0017	.0022	.0028	.0035	.0035
	Finish	1.5 x D	.01 x D	3	99	91	84	.0305	.0457	.0635	.0787	.0940	325	300	275	.0012	.0018	.0025	.0031	.0037	.0037
Difficult to Machine Stainless Steels 316L, 17-4 PH, 15-5 PH, 13-8 PH	Slot	.5 x D	1 x D	3	69	61	53	.0152	.0229	.0305	.0381	.0457	225	200	175	.0006	.0009	.0012	.0015	.0018	.0018
	Rough	1 x D	.5 x D	3	84	76	69	.0178	.0279	.0381	.0483	.0584	275	250	225	.0007	.0011	.0015	.0019	.0023	.0023
	Finish	1.5 x D	.01 x D	3	99	91	84	.0279	.0432	.0559	.0711	.0838	325	300	275	.0011	.0017	.0022	.0028	.0033	.0033

ROUGHER/FINISHER M10

Results: Higher metal removal rates and smoother finishes than with traditional roughing end mills, plus more parts per cycle and longer tool life.

Our advanced chipbreaker design creates higher productivity without requiring the latest in high powered machine tools.

Recommended for use in most materials. Provides maximum performance in carbon steels, tool & die steels and cast iron.

NOTE: Not recommended for stainless steels.

Menlo roughing and finishing tools with unique chipbreaker geometry deliver higher productivity with less horsepower than other high-performance mills. Our exclusive flute design reduces cutting forces, creating smaller chips that can be removed faster and easier and eliminating the cause of most tool chatter.

Enhanced Performance

Choose Menlo rougher/finisher coated or uncoated:

- Advanced composition Spector (aluminum titanium nitride) coating for high temperature conditions
- Abrasion resistant Accelerator (titanium carbonitride) coating for exceptional performance at moderate speeds and feeds
- General purpose auCARB (titanium nitride) coating for low horsepower applications
- Submicron grain uncoated carbide for general purpose use

Application Guide • Speed & Feed

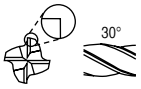
Work Material	Type of Cut	Axial DOC	Radial DOC	No. of Flutes	Speed (m/min)	Feed (mm Per Tooth) 3,0	6,0	9,0	12,0	16,0	19,0	25,0
Low Carbon Steels ≤ 38 HRc	Slot	1 x D	1 x D	4	107	.0152	.0305	.0457	.0635	.0787	.0940	.1270
1018, 12L14, 8620	Rough	1 x D	.5 x D	4	130	.0178	.0381	.0559	.0762	.0940	.1143	.1524
Medium Carbon Steels ≤ 38 HRc	Slot	.75 x D	1 x D	4	84	.0152	.0305	.0483	.0635	.0813	.0991	.1270
4140, 4340	Rough	1 x D	.5 x D	4	107	.0178	.0381	.0559	.0762	.0965	.1143	.1524
Tool and Die Steels ≤ 38 HRc	Slot	.75 x D	1 x D	4	84	.0152	.0305	.0483	.0635	.0813	.0991	.1270
A2, D2, O1, S7, P20, H13	Rough	1 x D	.5 x D	4	107	.0178	.0381	.0559	.0762	.0965	.1143	.1524
Cast Iron - Gray	Slot	1 x D	1 x D	4	107	.0152	.0305	.0457	.0584	.0737	.0889	.1168
	Rough	1 x D	.5 x D	4	137	.0178	.0356	.0533	.0711	.0889	.1067	.1422
Cast Iron - Ductile	Slot	.75 x D	1 x D	4	84	.0127	.0254	.0381	.0508	.0635	.0762	.1016
	Rough	1 x D	.5 x D	4	114	.0152	.0305	.0457	.0635	.0787	.0965	.1270
Cast Iron - Malleable	Slot	.5 x D	1 x D	4	69	.0076	.0152	.0229	.0305	.0381	.0457	.0610
	Rough	1 x D	.5 x D	4	91	.0127	.0254	.0381	.0508	.0635	.0762	.1016

Speed (SFM)	Feed (Inches Per Tooth) 1/8	1/4	3/8	1/2	5/8	3/4	1
350	.0006	.0012	.0018	.0025	.0031	.0037	.0050
425	.0007	.0015	.0022	.0030	.0037	.0045	.0060
275	.0006	.0012	.0019	.0025	.0032	.0039	.0050
350	.0007	.0015	.0022	.0030	.0038	.0045	.0060
275	.0006	.0012	.0019	.0025	.0032	.0039	.0050
350	.0007	.0015	.0022	.0030	.0038	.0045	.0060
350	.0006	.0012	.0018	.0023	.0029	.0035	.0046
450	.0007	.0014	.0021	.0028	.0035	.0042	.0056
275	.0005	.0010	.0015	.0020	.0025	.0030	.0040
375	.0006	.0012	.0018	.0025	.0031	.0038	.0050
225	.0003	.0006	.0009	.0012	.0015	.0018	.0024
300	.0005	.0010	.0015	.0020	.0025	.0030	.0040

D = tool diameter Starting parameters shown

Reduce feed rates by 20% when using long length tools Values based on TiCN- or AlTiN-coated tools Reduce speeds and feeds by 25% when using uncoated tools

M104



- 4-Flute, standard helix
- Stub, standard and long lengths
- Engineered chipbreaker geometry
- AlTiN, TiCN, TiN coating options

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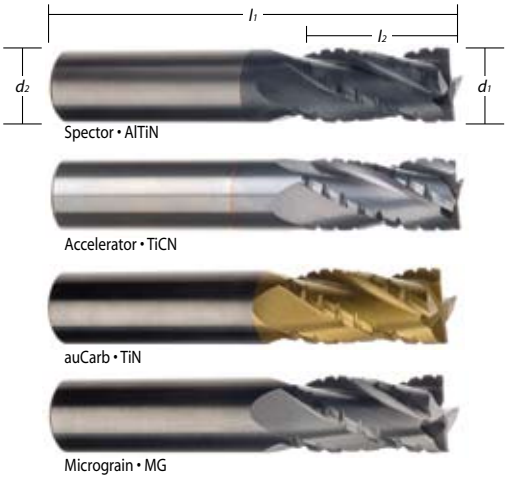

Former List Code Reference					
M104					
Length Code		AlTiN	TiCN	TiN	MG
Stub	SL	M787	M254		M256
Regular	RL	M788	M255	M250	M257
Long	LL	M789	M259		M258

Metric

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Length Code	AlTiN	TiCN	TiN	MG
6	6	13	57	RL	62464			30080
		29	75	LL	34280			34254
8	8	19	63	RL	62465			34491
		29	75	LL	34281			34255
10	10	22	72	RL	62466			30086
		40	88	LL	90109			34261
12	12	26	83	RL	62467			30089
		50	100	LL	34283			34257
16	16	32	92	RL	62468			30092
		57	125	LL	34284			34258
20	20	38	104	RL	62469			30095
		57	125	LL	34285			34259

MOD
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d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Length Code	AlTiN	TiCN	TiN	MG
1/8	1/8	1/4	1-1/2	SL	91780	33076		33060
		1/2	1-1/2	RL	33149	33130	33105	33145
		3/4	2-1/4	LL	33298	33050		33084
3/16	3/16	3/8	2	SL	33296	33077		33061
		5/8	2	RL	30462	33132	33107	31427
1/4	1/4	1/2	2	SL	91779	33078		33062
		3/4	2-1/2	RL	98991	33134	33109	31428
		1-1/8	3	LL	33299	33051		33085
5/16	5/16	1/2	2	SL	33163	33079		33063
		13/16	2-1/2	RL	33151	33136	33111	31430
		1-1/8	3	LL	33101	33052		33086
3/8	3/8	5/8	2	SL	33103	33080		33064
		1	2-1/2	RL	33153	33138	33113	33152
		1-1/8	3	LL	33300	33053		33087
1/2	1/2	5/8	2-1/2	SL	33181	33081		33065
		1	3	RL	98961	33140	33115	33154
		2	4	LL	30434	33054		33088
5/8	5/8	3/4	3	SL	33100	33082		33066
		1-1/4	3-1/2	RL	33157	33142	33117	33156
		2-1/4	5	LL	97343	33055		33089
3/4	3/4	1	3	SL	33297	33083		33067
		1-1/2	4	RL	33159	33144	33119	33158
		2-1/4	5	LL	33301	33056		33090
1	1	1-1/2	4	RL	33161	33146		33160
		2-1/4	5	LL	33302	90801		33091

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

OMEGA-6® M70

Results: Great surface finishes, significant coolant savings and increased parts per tool due to extended tool life.

With six high strength flutes, Omega-6 produces superior surface finishes in the most difficult to machine materials.

Ideal for high performance milling in hard, difficult to machine materials.

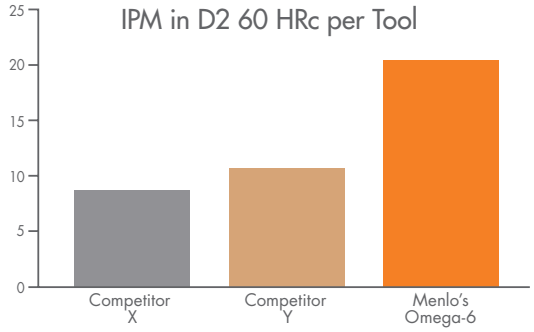
At high speeds in a variety of difficult to machine alloys, Omega-6 is the high strength tool of choice for light to medium cuts. With its high performance TiAlN coating, Omega-6 runs dry in many materials and delivers longer tool life.

Omega-6 Delivers Maximum Performance in:

- Hardened tool steels
- Heat treated steels
- Titanium
- Inconel
- Monel
- Rene-41
- Waspalloy
- Hastalloy-C

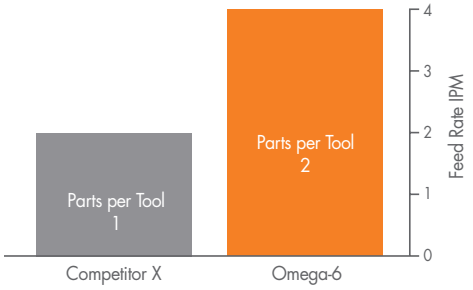
Improve Productivity and Surface Finish

One customer was having difficulty meeting surface finish and job deadlines on a milling application in D2 steel hardened to 60 HRc. Omega-6 not only outran competitors' 4- and 6-flute tools by a wide margin, it also solved the customer's finish problems. (In this application, the Omega-6 ran without coolant at 460 SFM with an axial cut of .750" and radial cut of .002".)



Decrease Cycle Time and Increase Tool Life

When working in Inconel 718, one customer was able to cut his machining time in half vs. a competitor's high performance end mill. The 1/4" Omega-6 cut the .100" deep slot at twice the feed rate as the competitor. The added bonus to cutting the cycle time was that the Omega-6 ran twice as many parts. A double savings!



Application Guide • Speed & Feed

Work Material	Type of Cut	Axial DOC	Radial DOC	No. of Flutes	Speed (m/min)	Feed (mm Per Tooth) 3,0	6,0	9,0	12,0	16,0	19,0	25,0
Titanium Alloys	Slot	.25 x D	1 x D	6	69	.0051	.0127	.0178	.0254	.0330	.0406	.0508
	Rough	1 x D	.25 x D	6	76	.0076	.0152	.0229	.0330	.0406	.0508	.0660
	Finish	1.5 x D	.01 x D	6	107	.0127	.0254	.0381	.0508	.0635	.0762	.1016
High Temperature Alloys, Inconel, Haynes, Stellite, Hastalloy, Waspalloy	Slot	.25 x D	1 x D	6	21	.0076	.0178	.0279	.0356	.0432	.0559	.0711
	Rough	1 x D	.25 x D	6	29	.0102	.0229	.0330	.0432	.0559	.0660	.0864
	Finish	1.5 x D	.01 x D	6	34	.0127	.0229	.0356	.0483	.0584	.0711	.0965
Carbon & Tool Steels ≤ 38 HRc	Slot	.5 x D	1 x D	6	84	.0076	.0178	.0254	.0381	.0483	.0610	.0762
	Rough	1 x D	.5 x D	6	99	.0127	.0254	.0381	.0508	.0635	.0762	.1016
	Finish	1.5 x D	.01 x D	6	122	.0152	.0305	.0457	.0635	.0787	.0940	.1270
	HSM	.1 x D	.1 x D	6	244	.0381	.0762	.1143	.1524	.1905	.2286	.3048
Carbon & Tool Steels 39 HRc to 48 HRc	Slot	.5 x D	1 x D	6	61	.0051	.0127	.0178	.0254	.0330	.0406	.0508
	Rough	1 x D	.5 x D	6	76	.0102	.0178	.0279	.0381	.0483	.0610	.0762
	Finish	1.5 x D	.01 x D	6	99	.0102	.0229	.0330	.0457	.0559	.0686	.0914
	HSM	.1 x D	.1 x D	6	183	.0279	.0559	.0838	.1143	.1422	.1727	.2286
Carbon & Tool Steels 49 HRc to 57 HRc	Slot	.25 x D	1 x D	6	46	.0051	.0127	.0178	.0254	.0305	.0381	.0508
	Rough	1 x D	.25 x D	6	61	.0076	.0178	.0279	.0381	.0457	.0559	.0762
	Finish	1.5 x D	.01 x D	6	84	.0076	.0178	.0279	.0381	.0457	.0559	.0762
	HSM	.1 x D	.1 x D	6	152	.0152	.0305	.0432	.0584	.0711	.0864	.1168
Carbon & Tool Steels 58 HRc to 62 HRc	Slot	.20 x D	1 x D	6	14	.0051	.0127	.0178	.0254	.0330	.0406	.0508
	Rough	1 x D	.20 x D	6	20	.0102	.0178	.0279	.0381	.0483	.0610	.0762
	Finish	1.5 x D	.01 x D	6	30	.0102	.0178	.0279	.0381	.0483	.0610	.0762
	HSM	.1 x D	.1 x D	6	122	.0127	.0254	.0381	.0508	.0635	.0762	.1016

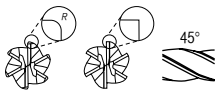
Speed (SFM)	Feed (Inches Per Tooth) 1/8	1/4	3/8	1/2	5/8	3/4	1
225	.0002	.0005	.0007	.0010	.0013	.0016	.0020
250	.0003	.0006	.0009	.0013	.0016	.0020	.0026
350	.0005	.0010	.0015	.0020	.0025	.0030	.0040
70	.0003	.0007	.0011	.0014	.0017	.0022	.0028
95	.0004	.0009	.0013	.0017	.0022	.0026	.0034
110	.0005	.0009	.0014	.0019	.0023	.0028	.0038
275	.0003	.0007	.0010	.0015	.0019	.0024	.0030
325	.0005	.0010	.0015	.0020	.0025	.0030	.0040
400	.0006	.0012	.0018	.0025	.0031	.0037	.0050
800	.0015	.0030	.0045	.0060	.0075	.0090	.0120
200	.0002	.0005	.0007	.0010	.0013	.0016	.0020
250	.0004	.0007	.0011	.0015	.0019	.0024	.0030
325	.0004	.0009	.0013	.0018	.0022	.0027	.0036
600	.0011	.0022	.0033	.0045	.0056	.0068	.0090
150	.0002	.0005	.0007	.0010	.0012	.0015	.0020
200	.0003	.0007	.0011	.0015	.0018	.0022	.0030
275	.0003	.0007	.0011	.0015	.0018	.0022	.0030
500	.0006	.0012	.0017	.0023	.0028	.0034	.0046
45	.0002	.0005	.0007	.0010	.0013	.0016	.0020
65	.0004	.0007	.0011	.0015	.0019	.0024	.0030
100	.0004	.0007	.0011	.0015	.0019	.0024	.0030
400	.0005	.0010	.0015	.0020	.0025	.0030	.0040

D = tool diameter Reduce feed rates by 20% when using long length tools Starting parameters shown

Performance Tips

- **Use tools with corner radius whenever possible for maximum tool life.**
- **Tools with flats are NOT recommended for collet or milling chucks, or for use in high speed machining applications.**
- **Our precision located holding flats are the best alternative when using side-lock end mill holders. Don't waste your valuable time grinding flats on tools – let us do it for you!**

M706 OMEGA-6®



- Stub, standard and long lengths
- Square corner and corner radius
- Superior TiAlNX coating

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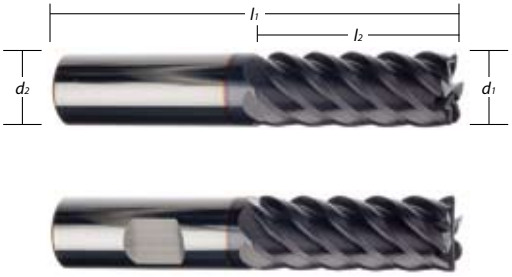


Former List Code Reference

M706					
Length Code		**SQ**	**CR**	**SQ**	**CR**
Stub	**SL**	M758	M759		
Regular	**RL**	M766	M765	M771	M770R
Long Reach	**LR**	M779	M769		

Metric

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	R Corner Radius	Len. Code	TiAlNX	TiAlNX
3	3	8	38	---	RL	62802	
	6	8	57	0,3	RL	62811	
4	4	11	50	---	RL	62803	
	6	11	57	0,3	RL	62812	
5	5	13	50	---	RL	62804	
	6	13	57	0,3	RL	62813	
6	6	10	57	---	SL	62990	
		10	57	0,5	SL	62996	
		13	57	---	RL	62805	62514
		13	57	0,5	RL	62814	30423
		15	100	---	LR	63322	
		15	100	0,5	LR	63308	
8	8	12	63	---	SL	62991	
		12	63	0,5	SL	62997	
		19	63	---	RL	62806	62515
		19	63	0,5	RL	62815	30543
		20	100	---	LR	63323	
		20	100	0,5	LR	63309	
10	10	14	72	---	SL	62992	
		14	72	0,5	SL	62998	
		22	72	---	RL	62807	62516
		22	72	0,5	RL	62816	30427
		25	100	---	LR	63324	
		25	100	0,5	LR	63310	
12	12	16	83	---	SL	62993	
		16	83	1,0	SL	62999	
		26	83	---	RL	62808	62517
		26	83	1,0	RL	62817	30545
		30	125	---	LR	63325	
		30	125	1,0	LR	63311	
16	16	22	92	---	SL	62994	
		22	92	1,0	SL	63000	
		32	92	---	RL	62809	62518
		32	92	1,0	RL	62818	30547
20	20	26	104	---	SL	62995	
		26	104	1,0	SL	63001	
		38	104	---	RL	62810	62519
		38	104	1,0	RL	62819	30549

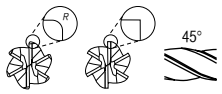
d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	R Corner Radius	Len. Code	TiAlNX	TiAlNX
1/8	1/8	1/4	1-1/2	---	SL	63190	
		1/4	1-1/2	.015	SL	62983	
		1/2	1-1/2	---	RL	62781	
		1/2	1-1/2	.015	RL	62791	
3/16	3/16	5/16	2	---	SL	63192	
		5/16	2	.015	SL	62984	
		9/16	2	---	RL	62782	
		9/16	2	.015	RL	62792	
1/4	1/4	3/8	2-1/2	---	SL	63194	
		3/8	2-1/2	.020	SL	62985	
		3/4	2-1/2	---	RL	62783	30491
		3/4	2-1/2	.020	RL	62793	30568
		3/4	2-1/2	.030	RL	62838	62847
		1	4	---	LR	63315	
		1	4	.020	LR	63301	
5/16	5/16	13/16	2-1/2	---	RL	62784	30492
		13/16	2-1/2	.020	RL	62839	62848
		13/16	2-1/2	.030	RL	62794	30569
		1	4	---	LR	63316	
		1	4	.020	LR	63302	
3/8	3/8	1/2	2-1/2	---	SL	63196	
		1/2	2-1/2	.030	SL	62986	
		1	2-1/2	---	RL	62785	30493
		1	2-1/2	.030	RL	62795	30570
		1	2-1/2	.060	RL	62840	62849
		1	4	---	LR	63317	
		1	4	.030	LR	63303	
7/16	7/16	1	2-3/4	---	RL	62786	30494
		1	2-3/4	.030	RL	62796	30571
1/2	1/2	5/8	3	---	SL	63198	
		5/8	3	.030	SL	62987	
		1	5	---	LR	63318	
		1	5	.030	LR	63304	
		1-1/4	3	---	RL	62787	30495
		1-1/4	3	.030	RL	62797	30572
		1-1/4	3	.060	RL	62841	62850
5/8	5/8	3/4	3-1/2	---	SL	63199	
		3/4	3-1/2	.030	SL	62988	
		1-5/8	3-1/2	---	RL	62788	30497
		1-5/8	3-1/2	.030	RL	62798	30574
3/4	3/4	1	4	---	SL	63200	
		1	4	.030	SL	62989	
		1-5/8	4	---	RL	62789	30498
		1-5/8	4	.030	RL	62799	30575
		1-5/8	4	.060	RL	62846	62851
1	1	2	4	---	RL	62790	30499
		2	4	.030	RL	62800	62801
		2	4	.060	RL		30576

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

M706N OMEGA-6®



- Standard length with neck relief
- Square corner and corner radius
- Superior TiAlNX coating

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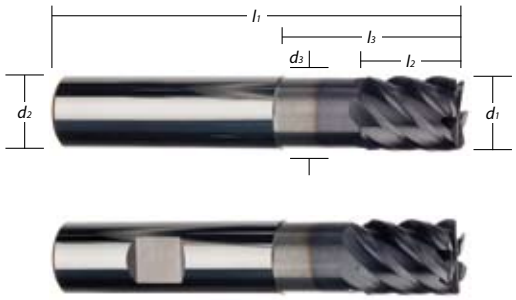

Former List Code Reference					
M706N					
Length Code		**SQ**	**CR**	**SQ**	**CR**
Regular	**RL**	M773	M783	M775	M777R

Metric

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	l_3 LBS	d_3 Neck Dia.	R Corner Radius	Length Code	TiAlNX	TiAlNX
3	3	6	38	12	2,8	---	RL	62829	
		6	38	12	2,8	0,3	RL	62918	
4	4	7	50	13	3,8	---	RL	62830	
		7	50	13	3,8	0,3	RL	62919	
5	5	8	50	14	4,7	---	RL	62831	
		8	50	14	4,7	0,3	RL	62920	
6	6	9	57	20	5,4	---	RL	62832	62505
		9	57	20	5,4	0,5	RL	62921	39453
8	8	11	63	26	7,2	---	RL	62833	62506
		11	63	26	7,2	0,5	RL	62922	39454
10	10	13	72	31	9	---	RL	62834	62507
		13	72	31	9	0,5	RL	62923	39455
12	12	15	83	37	10,8	---	RL	62835	62508
		15	83	37	10,8	1,0	RL	62924	39456
16	16	20	92	41	14,4	---	RL	62836	62509
		20	92	41	14,4	1,0	RL	62925	39457
20	20	24	104	47	18	---	RL	62837	62510
		24	104	47	18	1,0	RL	62926	39458

MOD

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d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

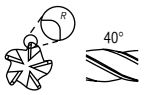
Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	l_3 LBS	d_3 Neck Dia.	R Corner Radius	Length Code	TiAlNX	TiAlNX
1/8	1/8	1/4	1-1/2	1/2	.118	---	RL	62820	
		1/4	1-1/2	1/2	.118	.015	RL	62901	
3/16	3/16	5/16	2	9/16	.176	---	RL	62821	
		5/16	2	9/16	.176	.015	RL	62902	
1/4	1/4	3/8	2-1/2	1-1/8	.235	---	RL	62822	31079
		3/8	2-1/2	1-1/8	.235	.020	RL	62903	31099
		3/8	2-1/2	1-1/8	.235	.030	RL	62904	31100
5/16	5/16	7/16	2-1/2	1-1/8	.297	---	RL	62823	31054
		7/16	2-1/2	1-1/8	.297	.020	RL	62905	31101
		7/16	2-1/2	1-1/8	.297	.030	RL	62906	31102
3/8	3/8	1/2	2-1/2	1-1/8	.355	---	RL	62824	31090
		1/2	2-1/2	1-1/8	.355	.020	RL	62907	31103
		1/2	2-1/2	1-1/8	.355	.030	RL	62908	31104
		1/2	2-1/2	1-1/8	.355	.060	RL	62909	31191
1/2	1/2	5/8	3	1-3/8	.475	---	RL	62825	31093
		5/8	3	1-3/8	.475	.020	RL	62910	31192
		5/8	3	1-3/8	.475	.030	RL	62911	31193
		5/8	3	1-3/8	.475	.060	RL	62912	31194
5/8	5/8	3/4	3-1/2	1-1/2	.590	---	RL	62826	31058
		3/4	3-1/2	1-1/2	.590	.030	RL	62913	31195
3/4	3/4	1	4	1-3/4	.715	---	RL	62827	31095
		1	4	1-3/4	.715	.030	RL	62914	31197
		1	4	1-3/4	.715	.060	RL	62915	31198
1	1	1-1/8	4	1-7/8	.960	---	RL	62828	31096
		1-1/8	4	1-7/8	.960	.030	RL	62916	31200
		1-1/8	4	1-7/8	.960	.060	RL	62917	31201

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

Results: More parts per tool in stainless steel and titanium.

M505N enDURO®



- Standard length with neck relief
- Corner radius reduces chipping
- Superior TiAlNX coating

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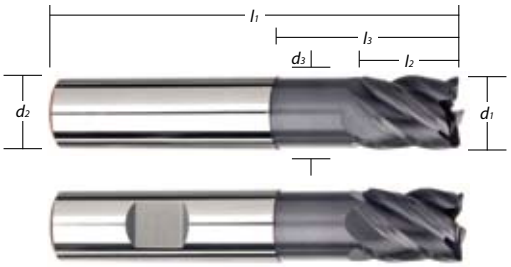
P M K S



Former List Code Reference			
M505N			
Length Code		CR	CR
Regular	RR	M674	M676

Metric

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	l_3 LBS	d_3 Neck Dia.	R Corner Radius	Length Code	TiAlNX	TiAlNX
6	6	9	57	20	5,4	0,5	RL	63208	63228
8	8	11	63	26	7,2	0,5	RL	63209	63229
10	10	13	72	31	9	0,5	RL	63210	63230
12	12	15	83	37	10,8	1,0	RL	63211	63231
16	16	20	92	41	14,4	1,0	RL	63212	63232
20	20	24	104	47	18	1,0	RL	63213	63233

d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	l_3 LBS	d_3 Neck Dia.	R Corner Radius	Length Code	TiAlNX	TiAlNX
1/4	1/4	3/8	2-1/2	1-1/8	.235	.020	RL	63201	63221
5/16	5/16	7/16	2-1/2	1-1/8	.297	.030	RL	63202	63222
3/8	3/8	1/2	2-1/2	1-1/8	.355	.030	RL	63203	63223
1/2	1/2	5/8	3	1-3/8	.475	.030	RL	63204	63224
5/8	5/8	3/4	3-1/2	1-1/2	.590	.030	RL	63205	63225
3/4	3/4	1	4	1-3/4	.715	.030	RL	63206	63226

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

MOD
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The unique five-flute enDURO geometry prolongs tool life by reducing work hardening in stainless steel, titanium, and other aerospace alloys.

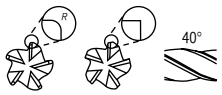
Application Guide • Speed & Feed

Work Material	Type of Cut	Axial DOC	Radial DOC	No. of Flutes	Speed (m/min)	Feed (mm Per Tooth) 3,0	6,0	9,0	12,0	16,0	19,0	25,0
Easy to Machine Stainless Steels 416, 410, 302, 303	Finish	1.5 x D	.01 x D	5	114	.0178	.0356	.0533	.0711	.0889	.1067	.1422
Medium Difficulty Stainless Steels 304, 316, Invar, Kovar	Finish	1.5 x D	.01 x D	5	107	.0152	.0305	.0457	.0635	.0787	.0940	.1270
Difficult to Machine Stainless Steels	Rough	1 x D	.5 x D	5	84	.0076	.0178	.0279	.0381	.0483	.0584	.0762
316L, 17-4 PH, 15-5 PH, 13-8 PH	Finish	1.5 x D	.01 x D	5	99	.0127	.0279	.0432	.0559	.0711	.0838	.1118
Low Carbon Steels ≤ 32 HRc, 1018, 12L14, 8620	Finish	1.5 x D	.01 x D	5	137	.0203	.0381	.0584	.0762	.0940	.1143	.1524
Carbon & Tool Steels 33 HRc to 38 HRc	Finish	1.5 x D	.01 x D	5	122	.0152	.0305	.0457	.0635	.0787	.0940	.1270
Carbon & Tool Steels	Slot	.5 x D	1 x D	5	69	.0051	.0127	.0178	.0254	.0330	.0406	.0508
39 HRc to 48 HRc	Rough	1 x D	.5 x D	5	84	.0102	.0178	.0279	.0381	.0483	.0610	.0762
	Finish	1.5 x D	.01 x D	5	99	.0102	.0229	.0330	.0457	.0559	.0686	.0914
Copper, Brass, & Bronze	Finish	1.5 x D	.01 x D	5	183	.0203	.0457	.0660	.0889	.1118	.1346	.1778
Aluminum Bronze & Beryllium Copper	Finish	1.5 x D	.01 x D	5	114	.0152	.0330	.0508	.0635	.0813	.0991	.1270
Titanium Alloys	Slot	.5 x D	1 x D	5	69	.0076	.0178	.0279	.0381	.0457	.0559	.0762
	Rough	1 x D	.5 x D	5	76	.0127	.0254	.0381	.0508	.0635	.0762	.1016
	Finish	1.5 x D	.01 x D	5	107	.0152	.0305	.0432	.0584	.0737	.0864	.1168
High Temperature Alloys, Inconel, Haynes, Stellite, Hastalloy, Waspalloy	Slot	.25 x D	1 x D	5	21	.0076	.0178	.0279	.0356	.0432	.0559	.0711
	Rough	1 x D	.25 x D	5	29	.0102	.0229	.0330	.0432	.0559	.0660	.0864
	Finish	1.5 x D	.01 x D	5	34	.0127	.0229	.0356	.0483	.0584	.0711	.0965

Speed (SFM)	Feed (Inches Per Tooth) 1/8	1/4	3/8	1/2	5/8	3/4	1
375	.0007	.0014	.0021	.0028	.0035	.0042	.0056
350	.0006	.0012	.0018	.0025	.0031	.0037	.0050
275	.0003	.0007	.0011	.0015	.0019	.0023	.0030
325	.0005	.0011	.0017	.0022	.0028	.0033	.0044
450	.0008	.0015	.0023	.0030	.0037	.0045	.0060
400	.0006	.0012	.0018	.0025	.0031	.0037	.0050
225	.0002	.0005	.0007	.0010	.0013	.0016	.0020
275	.0004	.0007	.0011	.0015	.0019	.0024	.0030
325	.0004	.0009	.0013	.0018	.0022	.0027	.0036
600	.0008	.0018	.0026	.0035	.0044	.0053	.0070
375	.0006	.0013	.0020	.0025	.0032	.0039	.0050
225	.0003	.0007	.0011	.0015	.0018	.0022	.0030
250	.0005	.0010	.0015	.0020	.0025	.0030	.0040
350	.0006	.0012	.0017	.0023	.0029	.0034	.0046
70	.0003	.0007	.0011	.0014	.0017	.0022	.0028
95	.0004	.0009	.0013	.0017	.0022	.0026	.0034
110	.0005	.0009	.0014	.0019	.0023	.0028	.0038

D = tool diameter Reduce feed rates by 20% when using long length tools Starting parameters shown

M505 enDURO®



- Stub and standard lengths
- Square corner and corner radius
- Superior TiAlNX coating

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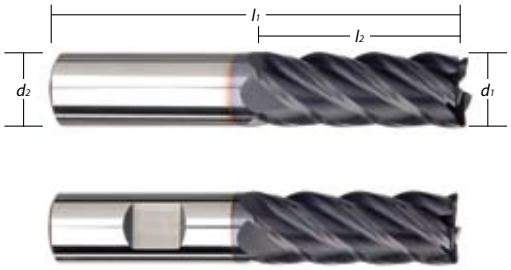


Former List Code Reference					
M505					
Length Code		**SQ**	**CR**	**SQ**	**CR**
Stub	**SL**	M679	M678		
Regular	**RL**	M671	M670	M673	M672

Metric

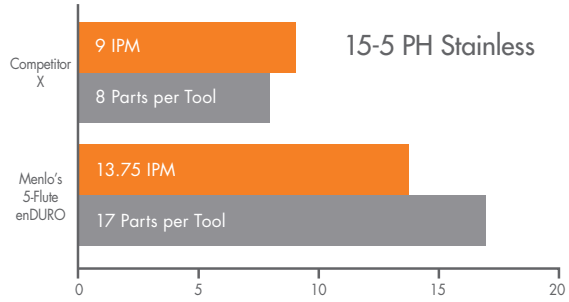
d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	R Corner Radius	Len. Code	TiAlNX	TiAlNX
3	3	8	38	---	RL	62860	
		8	38	0,3	RL	62890	
4	4	11	50	---	RL	62861	
		11	50	0,3	RL	62891	
5	5	13	50	---	RL	62862	
		13	50	0,3	RL	62892	
6	6	13	57	---	RL	62863	62769
		13	57	0,5	RL	62893	62775
8	8	19	63	---	RL	62864	62770
		19	63	0,5	RL	62894	62776
10	10	22	72	---	RL	62865	62771
		22	72	0,5	RL	62895	62777
12	12	26	83	---	RL	62866	62772
		26	83	1,0	RL	62896	62778
16	16	32	92	---	RL	62867	62773
		32	92	1,0	RL	62897	62779
20	20	38	104	---	RL	62868	62774
		38	104	1,0	RL	62898	62780

d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	R Corner Radius	Len. Code	TiAlNX	TiAlNX
1/8	1/8	1/4	1-1/2	---	SL	62960	
		1/4	1-1/2	.015	SL	62968	
		1/2	1-1/2	---	RL	62880	
		1/2	1-1/2	.015	RL	62870	
3/16	3/16	5/16	2	---	SL	62961	
		5/16	2	.015	SL	62969	
		9/16	2	---	RL	62881	
		9/16	2	.015	RL	62871	
1/4	1/4	3/8	2	---	SL	62962	
		3/8	2	.020	SL	62970	
		3/4	2-1/2	---	RL	62882	62752
		3/4	2-1/2	.020	RL	62872	62760
5/16	5/16	13/16	2-1/2	---	RL	62883	62753
		13/16	2-1/2	.030	RL	62873	62761
3/8	3/8	1/2	2	---	SL	62963	
		1/2	2	.030	SL	62971	
		1	2-1/2	---	RL	62884	62754
		1	2-1/2	.030	RL	62874	62762
1/2	1/2	5/8	2-1/2	---	SL	62964	
		5/8	2-1/2	.030	SL	62972	
		1-1/4	3	---	RL	62886	62756
		1-1/4	3	.030	RL	62876	62764
5/8	5/8	3/4	3	---	SL	62965	
		3/4	3	.030	SL	62973	
		1-5/8	3-1/2	---	RL	62887	62757
		1-5/8	3-1/2	.030	RL	62877	62765
3/4	3/4	1	3	---	SL	62966	
		1	3	.030	SL	62974	
		1-5/8	4	---	RL	62888	62758
		1-5/8	4	.030	RL	62878	62766
1	1	2	4	---	RL	62889	62759
		2	4	.030	RL	62879	62767

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004



Cut Cycle Time, Costs

The enDuro 5-flute tool increased feed rates 53% over the competitor's 5-flute end mill for a customer machining aerospace parts in 15-5 PH stainless steel. Shortened cycle times dramatically increased output, and the high-strength geometry doubled tool life. Fewer tool changes increased productivity even further. (In this application, the enDuro ran at 300 SFM and 13.75 IPM with a radial cut of .500" and an axial cut of .375".)

Results: Longer tool life and smoother cutting mean fewer tool changes and better part finishes.

The unique three-flute enDURO geometry prolongs tool life by reducing work hardening in stainless steel and titanium.

These enDURO series tools were designed for high production milling of stainless steel, but perform equally well in other metals including alloy steels, tool steels, and high silicon aluminum.

M503N enDURO®

- Standard length with neck relief
- Square corner and corner radius
- Superior AlTiN Coating

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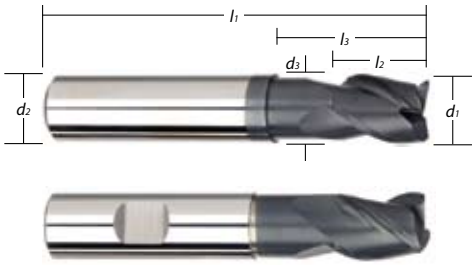


Former List Code Reference					
M503N					
Length Code		SQ	CR	SQ	CR
Regular	RR	M565	M560	M567	M562

Metric

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	l_3 LBS	d_3 Neck Dia.	R Corner Radius	Length Code	AlTiN	AlTiN
3	3	6	38	12	2,8	---	RR	62530	
		6	38	12	2,8	0,3	RR	62520	
4	4	7	50	13	3,8	---	RR	62531	
		7	50	13	3,8	0,3	RR	62521	
5	5	8	50	14	4,7	---	RR	62532	
		8	50	14	4,7	0,3	RR	62522	
6	6	9	57	20	5,4	---	RR	62533	62618
		9	57	20	5,4	0,3	RR	62131	62930
8	8	11	63	26	7,2	---	RR	62534	62619
		11	63	26	7,2	0,5	RR	62524	62933
10	10	13	72	31	9	---	RR	62535	62620
		13	72	31	9	0,5	RR	62525	62935
12	12	15	83	37	10,8	---	RR	62536	62621
		15	83	37	10,8	1,0	RR	62526	62938
16	16	20	92	41	14,4	---	RR	62537	62622
		20	92	41	14,4	1,0	RR	62527	62940
20	20	24	104	47	18	---	RR	62538	62623
		24	104	47	18	1,0	RR	62528	62941

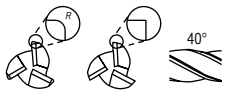
d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	l_3 LBS	d_3 Neck Dia.	R Corner Radius	Length Code	AlTiN	AlTiN
1/8	1/8	1/4	1-1/2	1/2	.118	---	RR	62108	
		1/4	1-1/2	1/2	.118	.015	RR	62008	
3/16	3/16	5/16	2	9/16	.176	---	RR	62112	
		5/16	2	9/16	.176	.015	RR	62012	
1/4	1/4	3/8	2-1/2	1-1/8	.235	---	RR	62116	62118
		3/8	2-1/2	1-1/8	.235	.020	RR	62016	62018
		3/8	2-1/2	1-1/8	.235	.030	RR	62028	62158
5/16	5/16	7/16	2-1/2	1-1/8	.297	---	RR	62120	62122
		7/16	2-1/2	1-1/8	.297	.020	RR	62029	62159
		7/16	2-1/2	1-1/8	.297	.030	RR	62020	62022
3/8	3/8	1/2	2-1/2	1-1/8	.355	---	RR	62124	62126
		1/2	2-1/2	1-1/8	.355	.020	RR	62030	62167
		1/2	2-1/2	1-1/8	.355	.030	RR	62024	62026
		1/2	2-1/2	1-1/8	.355	.060	RR	62031	62168
1/2	1/2	5/8	3	1-3/8	.475	---	RR	62132	62134
		5/8	3	1-3/8	.475	.020	RR	62044	62169
		5/8	3	1-3/8	.475	.030	RR	62032	62034
		5/8	3	1-3/8	.475	.060	RR	62128	62206
5/8	5/8	3/4	3-1/2	1-1/2	.590	---	RR	62136	62138
		3/4	3-1/2	1-1/2	.590	.030	RR	62036	62038
3/4	3/4	1	4	1-3/4	.715	---	RR	62140	62142
		1	4	1-3/4	.715	.030	RR	62040	62042
		1	4	1-3/4	.715	.060	RR	62129	62207
1	1	1-1/8	4	1-7/8	.960	---	RR	62148	62150
		1-1/8	4	1-7/8	.960	.030	RR	62048	62050

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

M503 enDURO®



- Stub and standard lengths
- Square corner and corner radius
- Superior AlTiN Coating

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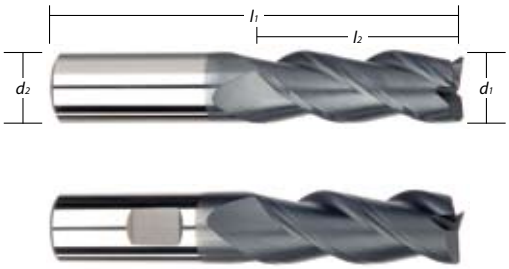

Former List Code Reference					
M503					
Length Code		**SQ**	**CR**	**SQ**	**CR**
Stub	**SL**		M564		
Regular	**RL**	M575	M570	M577	M572

Metric

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	R Corner Radius	Len. Code	AlTiN	AlTiN
3	3	5	38	0,3	SL	62950	
		8	38	---	RL	62550	
		8	38	0,3	RL	62540	
4	4	8	50	0,3	SL	62951	
		11	50	---	RL	62551	
		11	50	0,3	RL	62541	
5	5	9	50	0,3	SL	62952	
		13	50	---	RL	62552	
		13	50	0,3	RL	62542	
6	6	10	54	0,5	SL	62953	
		13	57	---	RL	62553	62740
		13	57	0,5	RL	62543	62741
8	8	12	58	0,5	SL	62954	
		19	63	---	RL	62554	62742
		19	63	0,5	RL	62544	62743
10	10	14	66	0,5	SL	62955	
		22	72	---	RL	62555	62744
		22	72	0,5	RL	62545	62745
12	12	16	73	1,0	SL	62956	
		26	83	---	RL	62556	62746
		26	83	1,0	RL	62546	62747
16	16	32	92	---	RL	62557	62748
		32	92	1,0	RL	62547	62749
20	20	38	104	---	RL	62558	62750
		38	104	1,0	RL	62548	62751

d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	R Corner Radius	Len. Code	AlTiN	AlTiN
1/8	1/8	1/4	1-1/2	.015	SL	62942	
		1/2	1-1/2	---	RL	62308	
		1/2	1-1/2	.015	RL	62208	
3/16	3/16	5/16	2	.015	SL	62943	
		9/16	2	---	RL	62312	
			2	.015	RL	62212	
1/4	1/4	3/8	2	.020	SL	62944	
		3/4	2-1/2	---	RL	62316	62318
		3/4	2-1/2	.020	RL	62216	62218
5/16	5/16	13/16	2-1/2	---	RL	62320	62322
		13/16	2-1/2	.030	RL	62220	62222
3/8	3/8	1/2	2	.030	SL	62945	
		1	2-1/2	---	RL	62324	62326
		1	2-1/2	.030	RL	62224	62226
1/2	1/2	5/8	2-1/2	.030	SL	62946	
		1-1/4	3	---	RL	62332	62334
		1-1/4	3	.030	RL	62232	62234
5/8	5/8	1-5/8	3-1/2	---	RL	62336	62338
		1-5/8	3-1/2	.030	RL	62236	62238
3/4	3/4	1-5/8	4	---	RL	62340	62342
		1-5/8	4	.030	RL	62240	62242
1	1	2	4	---	RL	62348	62350
		2	4	.030	RL	62248	62250

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

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Application Guide • Speed & Feed

Work Material	Type of Cut	Axial DOC	Radial DOC	No. of Flutes	Speed (m/min)	Feed (mm Per Tooth) 3,0	6,0	9,0	12,0	16,0	19,0	25,0
Easy to Machine Stainless Steels 416, 410, 302, 303	Slot	.5 x D	1 x D	3	84	.0127	.0254	.0381	.0508	.0635	.0762	.1016
	Rough	1 x D	.5 x D	3	107	.0152	.0330	.0483	.0635	.0813	.0965	.1270
Moderately Difficult Stainless Steels 304, 316, Invar, Kovar	Slot	.5 x D	1 x D	3	76	.0076	.0178	.0279	.0381	.0483	.0584	.0762
	Rough	1 x D	.5 x D	3	91	.0152	.0279	.0432	.0559	.0711	.0889	.1143
Difficult to Machine Stainless Steels 316L, 17-4 PH, 15-5 PH, 13-8 PH	Slot	.5 x D	1 x D	3	69	.0076	.0152	.0229	.0305	.0381	.0457	.0610
	Rough	1 x D	.5 x D	3	84	.0076	.0178	.0279	.0381	.0483	.0584	.0762
Low Carbon Steels ≤ 32 HRc 1018, 12L14, 8620	Slot	.5 x D	1 x D	3	99	.0152	.0330	.0533	.0686	.0889	.1067	.1372
	Rough	1 x D	.5 x D	3	114	.0178	.0381	.0584	.0762	.0940	.1143	.1524
Carbon & Tool Steels 33 HRc to 38 HRc	Slot	.5 x D	1 x D	3	84	.0127	.0254	.0381	.0508	.0635	.0762	.1016
	Rough	1 x D	.5 x D	3	99	.0152	.0305	.0457	.0584	.0737	.0889	.1168
Copper, Brass, & Bronze	Slot	.5 x D	1 x D	3	137	.0178	.0381	.0559	.0762	.0940	.1143	.1524
	Rough	1 x D	.5 x D	3	168	.0203	.0457	.0660	.0889	.1118	.1346	.1778
Aluminum Bronze & Beryllium Copper	Slot	.5 x D	1 x D	3	84	.0127	.0254	.0381	.0508	.0635	.0762	.1016
	Rough	1 x D	.5 x D	3	107	.0152	.0330	.0508	.0635	.0813	.0991	.1270

Speed (SFM)	Feed (Inches Per Tooth) 1/8	1/4	3/8	1/2	5/8	3/4	1
275	.0005	.0010	.0015	.0020	.0025	.0030	.0040
350	.0006	.0013	.0019	.0025	.0032	.0038	.0050
250	.0003	.0007	.0011	.0015	.0019	.0023	.0030
300	.0006	.0011	.0017	.0022	.0028	.0035	.0045
225	.0003	.0006	.0009	.0012	.0015	.0018	.0024
275	.0003	.0007	.0011	.0015	.0019	.0023	.0030
325	.0006	.0013	.0021	.0027	.0035	.0042	.0054
375	.0007	.0015	.0023	.0030	.0037	.0045	.0060
275	.0005	.0010	.0015	.0020	.0025	.0030	.0040
325	.0006	.0012	.0018	.0023	.0029	.0035	.0046
450	.0007	.0015	.0022	.0030	.0037	.0045	.0060
550	.0008	.0018	.0026	.0035	.0044	.0053	.0070
275	.0005	.0010	.0015	.0020	.0025	.0030	.0040
350	.0006	.0013	.0020	.0025	.0032	.0039	.0050

D = tool diameter Reduce feed rates by 20% when using long length tools Starting parameters shown

STREAKERS® M20

Results: Higher feed rates, faster cycle time, excellent surface finish, higher productivity, lower cost per part and longer tool life.

Three-flute STREAKERS excel at finishing operations as well as roughing on low horsepower machines.

Ideal for high performance milling in all types of aluminum including high silicon, die cast, and extruded aluminum parts.

The unique flute design of STREAKERS is engineered for aggressive chip evacuation under extremely heavy chip loads. They perform well at speeds as low as 3,000 RPM and reach their peak performance when run at speeds above 10,000 RPM.

End designs

- Corner radii – a wide variety to meet your part specification requirements
- Square corners for general machining and finishing

Shank designs

- h6 tolerance styles fit all collets and conform to shrink-fit requirements
- Also standard with flats for use in end mill holders

Multiple lengths

- Long reach with stub flutes for deep cavity machining
- Long length with extra flute lengths for finishing passes
- Stub length for extra rigidity

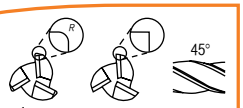
Application Guide • Speed & Feed

Work Material	Type of Cut	Axial DOC	Radial DOC	No. of Flutes	Speed (m/min)	Feed (mm Per Tooth) 3,0	6,0	9,0	12,0	16,0	19,0	25,0
Aluminum Alloys 2024, 6061, 7075	Slotting	1 x D	1 x D	2	244	.0508	.1016	.1524	.2032	.2540	.3048	.4064
	Rough	1 x D	.75 x D	3	305	.0508	.1270	.1905	.2540	.3048	.3810	.5080
	Finish	1.5 x D	.01 x D	3	366	.0762	.1524	.2286	.3048	.4064	.5080	.6350
High Silicon Aluminum A380, A390	Slotting	.5 x D	1 x D	3	122	.0254	.0508	.0762	.1016	.1270	.1524	.2032
	Rough	1 x D	.5 x D	3	183	.0381	.0762	.1143	.1524	.1905	.2286	.3048
	Finish	1.5 x D	.01 x D	3	244	.0457	.0889	.1397	.1778	.2286	.2794	.3556
Magnesium Alloys	Slotting	1 x D	1 x D	2	244	.0508	.1016	.1524	.2032	.2540	.3048	.4064
	Rough	1 x D	.75 x D	3	305	.0508	.1270	.1905	.2540	.3048	.3810	.5080
	Finish	1.5 x D	.01 x D	3	366	.0762	.1524	.2286	.3048	.4064	.5080	.6350
Copper Alloys Brass, Bronze	Slotting	.75 x D	1 x D	2	122	.0254	.0508	.0762	.1016	.1270	.1524	.2032
	Rough	1 x D	.75 x D	3	145	.0305	.0635	.0940	.1270	.1600	.1905	.2540
	Finish	1.5 x D	.01 x D	3	168	.0381	.0762	.1143	.1524	.1905	.2286	.3048
Composites Plastics, Fiberglass	Slotting	1 x D	1 x D	3	122	.0254	.0508	.0762	.1016	.1270	.1524	.2032
	Rough	1 x D	.75 x D	3	183	.0381	.0762	.1143	.1524	.1905	.2286	.3048
	Finish	1.5 x D	.01 x D	3	244	.0457	.0889	.1397	.1778	.2286	.2794	.3556

Speed (SFM)	Feed (Inches Per Tooth) 1/8	1/4	3/8	1/2	5/8	3/4	1
800	.0020	.0040	.0060	.0080	.0100	.0120	.0160
1000	.0020	.0050	.0075	.0100	.0120	.0150	.0200
1200	.0030	.0060	.0090	.0120	.0160	.0200	.0250
400	.0010	.0020	.0030	.0040	.0050	.0060	.0080
600	.0015	.0030	.0045	.0060	.0075	.0090	.0120
800	.0018	.0035	.0055	.0070	.0090	.0110	.0140
800	.0020	.0040	.0060	.0080	.0100	.0120	.0160
1000	.0020	.0050	.0075	.0100	.0120	.0150	.0200
1200	.0030	.0060	.0090	.0120	.0160	.0200	.0250
400	.0010	.0020	.0030	.0040	.0050	.0060	.0080
475	.0012	.0025	.0037	.0050	.0063	.0075	.0100
550	.0015	.0030	.0045	.0060	.0075	.0090	.0120
400	.0010	.0020	.0030	.0040	.0050	.0060	.0080
600	.0015	.0030	.0045	.0060	.0075	.0090	.0120
800	.0018	.0035	.0055	.0070	.0090	.0110	.0140

D = tool diameter Reduce feed rates by 20% when using long length tools Starting parameters shown

M203N STREAKERS®



- Neck relief for side clearance
- Standard and long lengths
- Square corner and corner radius

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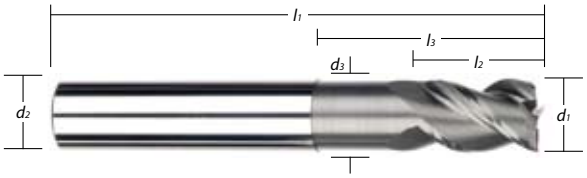

Former List Code Reference

M203N		SQ	CR
Length Code			
Regular	**RL**	M265	M265CR
Long	**LL**	M266	M266CR
X-Long	**XL**	M267	M267CR
Deep Milling	**DM**	M268	M268CR

M203N • Metric

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	l_3 LBS	d_3 Neck Dia.	R Corner Radius	Len. Code	MG
6	6	8	57	20	5,4	---	RL	33041
		8	57	20	5,4	0,3	RR	37261
		8	75	40	5,4	---	LR	37262
		8	75	40	5,4	0,3	LR	37264
8	8	10	63	26	7,2	---	RL	33042
		10	63	26	7,2	0,5	RL	37266
10	10	12	72	31	9	---	RL	33043
		12	72	31	9	0,5	RL	37268
		12	100	50	9	---	XL	33128
		12	100	50	9	0,5	XL	37274
12	12	14	83	37	10,8	---	RL	33044
		14	83	37	10,8	1,0	RL	37276
		14	125	70	10,8	---	XL	33129
		14	125	70	10,8	1,0	XL	37278
16	16	18	92	41	14,4	---	RL	33045
		18	92	41	14,4	1,0	RL	37280
		18	150	90	14,4	---	XL	33131
		18	150	90	14,4	1,0	XL	37281
20	20	24	104	47	18	---	RL	33046
		24	104	47	18	1,0	RL	37301
		24	150	90	18	---	XR	37302
		24	150	90	18	1,0	XR	37328

d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

MOD

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M203N • Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	l_3 LBS	d_3 Neck Dia.	R Corner Radius	Len. Code	MG
1/4	1/4	3/8	2-1/2	1-1/8	.235	---	RL	33034
		3/8	2-1/2	1-1/8	.235	.015	RL	34782
		3/8	2-1/2	1-1/8	.235	.030	RL	34784
		3/8	3	1-5/8	.235	---	LL	33121
		3/8	3	1-5/8	.235	.015	LL	34786
		3/8	3	1-5/8	.235	.030	LL	34788
		3/8	4	2-1/4	.235	---	XL	33110
		3/8	4	2-1/4	.235	.015	XL	34790
		3/8	4	2-1/4	.235	.030	XL	34792
3/8	3/8	1/2	2-1/2	1-1/8	.355	---	RL	33035
		1/2	2-1/2	1-1/8	.355	.015	RL	34794
		1/2	2-1/2	1-1/8	.355	.030	RL	34796
		1/2	2-1/2	1-1/8	.355	.060	RL	38111
		1/2	3	1-3/4	.355	---	LL	33122
		1/2	3	1-3/4	.355	.015	LL	34797
		1/2	3	1-3/4	.355	.030	LL	34798
		1/2	3	1-3/4	.355	.060	LL	38112
		1/2	4	2-1/4	.355	---	XL	33112
		1/2	4	2-1/4	.355	.015	XL	34799
		1/2	4	2-1/4	.355	.030	XL	34800
		1/2	4	2-1/4	.355	.060	XL	38113
1/2	1/2	5/8	3	1-3/8	.475	---	RL	33036
		5/8	3	1-3/8	.475	.015	RL	34801
		5/8	3	1-3/8	.475	.030	RL	34802
		5/8	3	1-3/8	.475	.060	RL	38114
		5/8	3	1-3/8	.475	.090	RL	38115
		5/8	3	1-3/8	.475	.125	RL	38116
		5/8	4	2-1/4	.475	---	LL	33123
		5/8	4	2-1/4	.475	.015	LL	34803
		5/8	4	2-1/4	.475	.030	LL	34804
		5/8	4	2-1/4	.475	.060	LL	38117
		5/8	4	2-1/4	.475	.090	LL	38118
		5/8	4	2-1/4	.475	.125	LL	38119
		5/8	5	2-3/8	.475	---	XL	33114
		5/8	5	2-3/8	.475	.015	XL	34805
		5/8	5	2-3/8	.475	.030	XL	34806
		5/8	5	2-3/8	.475	.060	XL	38120
		5/8	5	2-3/8	.475	.090	XL	38121
		5/8	5	2-3/8	.475	.125	XL	38122
		5/8	6	3-3/8	.475	---	DM	33048
		5/8	6	3-3/8	.475	.015	DM	34826
		5/8	6	3-3/8	.475	.030	DM	34827
		5/8	6	3-3/8	.475	.060	DM	38123
		5/8	6	3-3/8	.475	.090	DM	38124
		5/8	6	3-3/8	.475	.125	DM	38125

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

inch sizes continued on next page

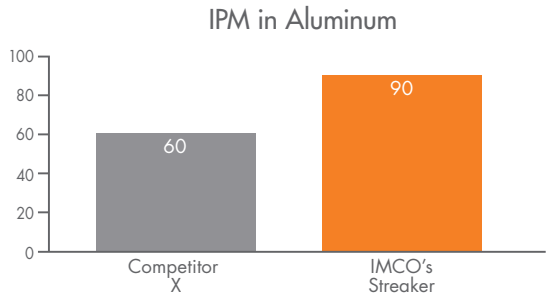
M203N • Inch • Continued

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	l_3 LBS	d_3 Neck Dia.	R Corner Radius	Len. Code	MG
5/8	5/8	3/4	3-1/2	1-1/2	.590	---	RL	33038
		3/4	3-1/2	1-1/2	.590	.030	RL	34828
		3/4	3-1/2	1-1/2	.590	.060	RL	38126
		3/4	3-1/2	1-1/2	.590	.090	RL	38127
		3/4	3-1/2	1-1/2	.590	.125	RL	38128
		3/4	5	2-1/4	.590	---	LL	33124
		3/4	5	2-1/4	.590	.030	LL	34829
		3/4	5	2-1/4	.590	.060	LL	38129
		3/4	5	2-1/4	.590	.090	LL	38130
		3/4	5	2-1/4	.590	.125	LL	38131
		3/4	6	3-3/8	.590	---	XL	33116
		3/4	6	3-3/8	.590	.030	XL	34830
		3/4	6	3-3/8	.590	.060	XL	38132
		3/4	6	3-3/8	.590	.090	XL	38133
		3/4	6	3-3/8	.590	.125	XL	38134
3/4	3/4	1	4	1-3/4	.715	---	RL	33039
		1	4	1-3/4	.715	.030	RL	34837
		1	4	1-3/4	.715	.060	RL	38135
		1	4	1-3/4	.715	.090	RL	38136
		1	4	1-3/4	.715	.125	RL	38137
		1	4	1-3/4	.715	.156	RL	38138
		1	4	1-3/4	.715	.190	RL	38139
		1	5	2-1/4	.715	---	LL	33125
		1	5	2-1/4	.715	.030	LL	34838
		1	5	2-1/4	.715	.060	LL	38140
		1	5	2-1/4	.715	.090	LL	38141
		1	5	2-1/4	.715	.125	LL	38142
		1	5	2-1/4	.715	.156	LL	38143
		1	5	2-1/4	.715	.190	LL	38144
		1	6	3-3/8	.715	---	XL	33118
		1	6	3-3/8	.715	.030	XL	34839
		1	6	3-3/8	.715	.060	XL	38145
		1	6	3-3/8	.715	.090	XL	38146
		1	6	3-3/8	.715	.125	XL	38147
		1	6	3-3/8	.715	.156	XL	38148
		1	6	3-3/8	.715	.190	XL	38149

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	l_3 LBS	d_3 Neck Dia.	R Corner Radius	Len. Code	MG
1	1	1-1/8	4	1-7/8	.960	---	RL	33040
		1-1/8	4	1-7/8	.960	.030	RL	34840
		1-1/8	4	1-7/8	.960	.060	RL	38150
		1-1/8	4	1-7/8	.960	.090	RL	38151
		1-1/8	4	1-7/8	.960	.125	RL	38152
		1-1/8	4	1-7/8	.960	.156	RL	38153
		1-1/8	4	1-7/8	.960	.190	RL	38154
		1-1/8	4	1-7/8	.960	.250	RL	38155
		1-1/4	5	2-1/4	.960	---	LL	33126
		1-1/4	5	2-1/4	.960	.030	LL	34847
		1-1/4	5	2-1/4	.960	.060	LL	38156
		1-1/4	5	2-1/4	.960	.090	LL	38157
		1-1/4	5	2-1/4	.960	.125	LL	38158
		1-1/4	5	2-1/4	.960	.156	LL	38159
		1-1/4	5	2-1/4	.960	.190	LL	38160
		1-1/4	5	2-1/4	.960	.250	LL	38161
		1-1/4	6	3-3/8	.960	---	XL	33120
		1-1/4	6	3-3/8	.960	.030	XL	34848
		1-1/4	6	3-3/8	.960	.060	XL	38162
		1-1/4	6	3-3/8	.960	.090	XL	38163
		1-1/4	6	3-3/8	.960	.125	XL	38164
		1-1/4	6	3-3/8	.960	.156	XL	38165
		1-1/4	6	3-3/8	.960	.190	XL	38166
		1-1/4	6	3-3/8	.960	.250	XL	38167
		1-1/4	7	4-3/8	.960	---	DM	33049
		1-1/4	7	4-3/8	.960	.030	DM	34849
		1-1/4	7	4-3/8	.960	.060	DM	38168
		1-1/4	7	4-3/8	.960	.090	DM	38169
		1-1/4	7	4-3/8	.960	.125	DM	38170
		1-1/4	7	4-3/8	.960	.156	DM	38171
		1-1/4	7	4-3/8	.960	.190	DM	38172
		1-1/4	7	4-3/8	.960	.250	DM	38173

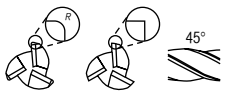
d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

Improve Productivity



Cycle time was a critical problem for a customer machining aluminum using a competitor's 3-flute end mill at 1,300 SFM and 60 IPM with an axial and radial cut of .125". Switching to a Streakers end mill at 90 IPM and increasing the axial and radial depths of cut to .265" reduced cycle time by 15 minutes per part, a 50% feed rate increase.

M203 STREAKERS®



- 3-Flute, high helix
- Standard and long lengths
- Square corner and corner radius
- Designed for maximum chip ejection

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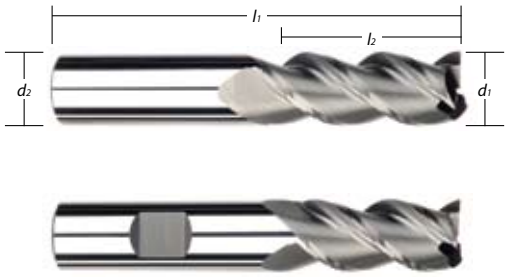


Former List Code Reference

M203					
Length Code		**SQ**	**CR**	**SQ**	**CR**
Stub	**SL**	1260	1260CR		
Regular	**RL**	1261	1261CR	1274	1274CR
Long	**LL**	1262	1262CR	1275	1275CR
X-Long	**XL**	1263	1263CR	1276	1276CR
Deep Milling	**DM**	1264	1264CR	1277	1277CR

Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	R Corner Radius	Len. Code	MG	MG
1/8	1/8	1/4	1-1/2	---	SL	32520	
		3/8	1-1/2	---	RL	33246	
		3/8	1-1/2	.015	RL	34384	
3/16	3/16	5/16	2	---	SL	32521	
		9/16	2	---	RL	33248	
		9/16	2	.015	RL	34385	
1/4	1/4	3/8	2-1/2	---	SL	32986	
		3/4	2-1/2	---	RL	32992	32634
		3/4	2-1/2	.015	RL	34386	34387
		3/4	2-1/2	.030	RL	34388	34389
		1-1/4	3	---	LL	33009	33011
		1-1/4	3	.015	LL	34435	34437
		1-1/4	3	.030	LL	34438	34447
5/16	5/16	7/16	2-1/2	---	SL	32987	
		13/16	2-1/2	---	RL	33250	32736
		13/16	2-1/2	.015	RL	34450	34451
		13/16	2-1/2	.030	RL	34452	34453
		13/16	2-1/2	.060	RL	38258	38318
		1-3/8	3	---	LL	34454	34455
		1-3/8	3	.030	LL	38031	38319
		1-3/8	3	.060	LL	38260	38056
3/8	3/8	1/2	2-1/2	---	SL	32988	
		7/8	2-1/2	---	RL		32635
		7/8	2-1/2	.015	RL		34459
		7/8	2-1/2	.030	RL		34461
		7/8	2-1/2	.060	RL		38320
		1	2-1/2	---	RL	32993	
		1	2-1/2	.015	RL	34458	
		1	2-1/2	.030	RL	34460	
		1	2-1/2	.060	RL	38261	
		1-1/2	3-1/4	---	LL	32998	32702
		1-1/2	3-1/4	.015	LL	34462	34463
		1-1/2	3-1/4	.030	LL	90020	91008
		1-1/2	3-1/4	.060	LL	38262	38321
		2	4	---	XL	33003	32716
		2	4	.015	XL	90091	90215
		2	4	.030	XL	91009	34490
		2	4	.060	XL	38263	38322
1/2	1/2	5/8	3	---	SL	32989	
		1-1/4	3	---	RL	32994	
		1-1/4	3	.015	RL	34492	
		1-1/4	3	.030	RL	90018	
		1-1/4	3	.060	RL	90019	
		1-1/4	3	.090	RL	38022	
		1-1/4	3	.125	RL	38025	
		1-1/4	3-1/4	---	RL		32637
		1-1/4	3-1/4	.015	RL		34494
		1-1/4	3-1/4	.030	RL		90175
		1-1/4	3-1/4	.060	RL		91508
		1-1/4	3-1/4	.090	RL		38050
		1-1/4	3-1/4	.125	RL		38051
		2	4	---	LL	32999	32703
		2	4	.015	LL	90021	90209
		2	4	.030	LL	90083	34535
		2	4	.060	LL	90086	34538
		2	4	.090	LL	38032	38057
1/2	1/2	2	4	.125	LL	38033	38058
		2-1/2	5	---	XL	33004	32718
		2-1/2	5	.030	XL	90102	91023
		2-1/2	5	.060	XL	38038	38063
		2-1/2	5	.090	XL	38039	38064
		2-1/2	5	.125	XL	38040	38065
		3-1/8	6	---	DM	33013	32830
		3-1/8	6	.030	DM	91037	91047
		3-1/8	6	.060	DM	38045	38070
		3-1/8	6	.090	DM	38046	38071
		3-1/8	6	.125	DM	38047	38072
		3/4	3-1/2	---	SL	32990	
		1-1/4	3-1/2	---	RL		32638
		1-1/4	3-1/2	.030	RL		91159
		1-1/4	3-1/2	.060	RL		38323
		1-1/4	3-1/2	.090	RL		38324
		1-1/4	3-1/2	.125	RL		38325
		1-5/8	3-1/2	---	RL	32995	
		1-5/8	3-1/2	.030	RL	91292	
		1-5/8	3-1/2	.060	RL	38264	
		1-5/8	3-1/2	.090	RL	38265	
5/8	5/8	1-5/8	3-1/2	.125	RL	38266	
		2-1/2	5	---	XL	33006	32720
		2-1/2	5	.030	XL	91200	91280
		2-1/2	5	.060	XL	38267	38328
		2-1/2	5	.090	XL	38268	38329
		2-1/2	5	.125	XL	38269	38330
		3-3/4	6	---	DM	33015	32835
		3-3/4	6	.030	DM	91282	91303
		3-3/4	6	.060	DM	38270	38332
		3-3/4	6	.090	DM	38271	38333
		3-3/4	6	.125	DM	38272	38335

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

continued on next page

M203 • Inch • Continued

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	R Corner Radius	Len. Code	MG	MG
		1	4	---	SL	32991	
		1-5/8	4	---	RL	32996	32639
		1-5/8	4	.030	RL	91389	34554
		1-5/8	4	.060	RL	91410	91423
		1-5/8	4	.090	RL	38027	38052
		1-5/8	4	.125	RL	38028	38053
		1-5/8	4	.156	RL	38273	38336
		1-5/8	4	.190	RL	38274	38337
		2-1/2	5	---	LL	33001	32704
		2-1/2	5	.030	LL	91433	34559
		2-1/2	5	.060	LL	38034	38059
3/4	3/4	2-1/2	5	.090	LL	38035	38060
		2-1/2	5	.125	LL	38036	38061
		2-1/2	5	.156	LL	38275	38338
		2-1/2	5	.190	LL	38276	38340
		3-1/4	6	---	XL	33005	32724
		3-1/4	6	.030	XL	34560	34561
		3-1/4	6	.060	XL	38041	38066
		3-1/4	6	.090	XL	38042	38067
		3-1/4	6	.125	XL	38043	38068
		3-1/4	6	.156	XL	38277	38341
		3-1/4	6	.190	XL	38278	38345
		4	6-1/2	---	DM	33010	32728
		1-1/4	4	---	SL	33137	
		2	4	---	RL	32997	
		2	4	.030	RL	34562	
		2	4	.060	RL	34563	
		2	4	.090	RL	38029	
		2	4	.125	RL	38030	
		2	4	.156	RL	38279	
		2	4	.190	RL	38280	
		2	4	.250	RL	38281	
		2	4-1/2	---	RL		32701
		2	4-1/2	.030	RL		38054
		2	4-1/2	.060	RL		38055
		2	4-1/2	.090	RL		38376
		2	4-1/2	.125	RL		38377
		2	4-1/2	.156	RL		38378
		2	4-1/2	.190	RL		38379
		2	4-1/2	.250	RL		38380
		2-5/8	5	---	LL	33002	32714
		2-5/8	5	.030	LL	34568	34569
		2-5/8	5	.060	LL	38037	38062
1	1	2-5/8	5	.090	LL	38282	38346
		2-5/8	5	.125	LL	38283	38347
		2-5/8	5	.156	LL	38284	38348
		2-5/8	5	.190	LL	38285	38349
		2-5/8	5	.250	LL	38286	38350
		3-1/4	6	---	XL	33008	32726
		3-1/4	6	.030	XL	34584	34586
		3-1/4	6	.060	XL	38044	38069
		3-1/4	6	.090	XL	38287	38351
		3-1/4	6	.125	XL	38288	38352
		3-1/4	6	.156	XL	38289	38353
		3-1/4	6	.190	XL	38290	38354
		3-1/4	6	.250	XL	38291	38355
		4-1/8	7	---	XL	33012	32735
		4-1/8	7	.030	XL	38048	38073
		4-1/8	7	.060	XL	38049	38074
		4-1/8	7	.090	XL	38292	38356
		4-1/8	7	.125	XL	38293	38357
		4-1/8	7	.156	XL	38294	38358
		4-1/8	7	.190	XL	38295	38359
		4-1/8	7	.250	XL	38296	38360

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

M203 • Metric

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	R Corner Radius	Len. Code	MG	MG
3	3	5	38	---	SL	32522	
		5	38	0,3	SL	34857	
4	4	6	50	---	SL	32524	
		11	50	---	RL	33167	
		11	50	0,3	RL	34858	
5	5	6	50	---	SL	32525	
		13	50	---	RL	33169	
		13	50	0,3	RL	34859	
6	6	7	54	---	SL	32526	
		16	57	---	RL	33170	62388
		16	57	0,3	RL	34860	34861
		16	57	0,5	RL	34862	34863
		29	75	---	LL	33185	33425
		29	75	0,3	LL	34864	34865
		29	75	0,5	LL	34866	34867
8	8	9	58	---	SL	32527	
		19	63	---	RL	33172	62390
		19	63	0,3	RL	34868	34869
		19	63	0,5	RL	34870	34871
		29	75	---	LL	33186	33426
		29	75	0,5	LL	34872	34873
10	10	11	66	---	SL	32528	
		22	72	---	RL	33174	62392
		22	72	0,3	RL	34874	34875
		22	72	0,5	RL	34876	34877
		40	88	---	LL	34311	33442
		40	88	0,3	LL	34878	34879
		40	88	0,5	LL	34880	34881
12	12	12	73	---	SL	32529	
		26	83	---	RL	33175	62395
		26	83	0,5	RL	34882	34883
		26	83	0,75	RL	34884	34885
		26	83	1,0	RL	34886	34887
		50	100	---	LL	33188	33428
		50	100	0,5	LL	34888	34889
		50	100	1,0	LL	34890	34891
14	14	26	83	---	RL	33176	62396
16	16	16	82	---	SL	32530	
		32	92	---	RL	33177	62397
		32	92	0,75	RL	34892	34893
		32	92	1,0	RL	34894	34895
		57	125	---	LL	33189	33429
		57	125	1,0	LL	34896	34897
20	20	20	92	---	SL	32502	
		38	104	---	RL	33179	62399
		38	104	0,75	RL	34898	34899
		38	104	1,0	RL	34900	34902
		57	125	---	LL	33190	33430
		57	125	1,0	LL	36583	36584

d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

STREAKERS® M20

Results: Higher feed rates, faster cycle time, excellent surface finish, higher productivity, lower cost per part and longer tool life.

Three-flute STREAKERS excel at finishing operations as well as roughing on low horsepower machines.

Ideal for high performance milling in all types of aluminum including high silicon, die cast, and extruded aluminum parts.

The unique flute design of STREAKERS is engineered for aggressive chip evacuation under extremely heavy chip loads. They perform well at speeds as low as 3,000 RPM and reach their peak performance when run at speeds above 10,000 RPM.

End designs

- Corner radii – a wide variety to meet your part specification requirements
- Square corners for general machining and finishing

Shank designs

- h6 tolerance styles fit all collets and conform to shrink-fit requirements
- Also standard with flats for use in end mill holders

Multiple lengths

- Long reach with stub flutes for deep cavity machining
- Long length with extra flute lengths for finishing passes
- Stub length for extra rigidity

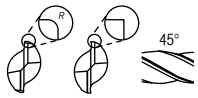
Application Guide • Speed & Feed

Work Material	Type of Cut	Axial DOC	Radial DOC	No. of Flutes	Speed (SFM)	Feed (Inches Per Tooth) 1/8	1/4	3/8	1/2	5/8	3/4	1
Aluminum Alloys 2024, 6061, 7075	Slotting	1 x D	1 x D	2	800	.0020	.0040	.0060	.0080	.0100	.0120	.0160
	Rough	1 x D	.75 x D	3	1000	.0020	.0050	.0075	.0100	.0120	.0150	.0200
	Finish	1.5 x D	.01 x D	3	1200	.0030	.0060	.0090	.0120	.0160	.0200	.0250
High Silicon Aluminum A380, A390	Slotting	.5 x D	1 x D	3	400	.0010	.0020	.0030	.0040	.0050	.0060	.0080
	Rough	1 x D	.5 x D	3	600	.0015	.0030	.0045	.0060	.0075	.0090	.0120
	Finish	1.5 x D	.01 x D	3	800	.0018	.0035	.0055	.0070	.0090	.0110	.0140
Magnesium Alloys	Slotting	1 x D	1 x D	2	800	.0020	.0040	.0060	.0080	.0100	.0120	.0160
	Rough	1 x D	.75 x D	3	1000	.0020	.0050	.0075	.0100	.0120	.0150	.0200
	Finish	1.5 x D	.01 x D	3	1200	.0030	.0060	.0090	.0120	.0160	.0200	.0250
Copper Alloys Brass, Bronze	Slotting	.75 x D	1 x D	2	400	.0010	.0020	.0030	.0040	.0050	.0060	.0080
	Rough	1 x D	.75 x D	3	475	.0012	.0025	.0037	.0050	.0063	.0075	.0100
	Finish	1.5 x D	.01 x D	3	550	.0015	.0030	.0045	.0060	.0075	.0090	.0120
Composites Plastics, Fiberglass	Slotting	1 x D	1 x D	3	400	.0010	.0020	.0030	.0040	.0050	.0060	.0080
	Rough	1 x D	.75 x D	3	600	.0015	.0030	.0045	.0060	.0075	.0090	.0120
	Finish	1.5 x D	.01 x D	3	800	.0018	.0035	.0055	.0070	.0090	.0110	.0140

Speed (m/min)	Feed (mm Per Tooth) 3,0	6,0	9,0	12,0	16,0	19,0	25,0
244	.0508	.1016	.1524	.2032	.2540	.3048	.4064
305	.0508	.1270	.1905	.2540	.3048	.3810	.5080
366	.0762	.1524	.2286	.3048	.4064	.5080	.6350
122	.0254	.0508	.0762	.1016	.1270	.1524	.2032
183	.0381	.0762	.1143	.1524	.1905	.2286	.3048
244	.0457	.0889	.1397	.1778	.2286	.2794	.3556
244	.0508	.1016	.1524	.2032	.2540	.3048	.4064
305	.0508	.1270	.1905	.2540	.3048	.3810	.5080
366	.0762	.1524	.2286	.3048	.4064	.5080	.6350
122	.0254	.0508	.0762	.1016	.1270	.1524	.2032
145	.0305	.0635	.0940	.1270	.1600	.1905	.2540
168	.0381	.0762	.1143	.1524	.1905	.2286	.3048
122	.0254	.0508	.0762	.1016	.1270	.1524	.2032
183	.0381	.0762	.1143	.1524	.1905	.2286	.3048
244	.0457	.0889	.1397	.1778	.2286	.2794	.3556

D = tool diameter Reduce feed rates by 20% when using long length tools Starting parameters shown

M202N STREAKERS®



- Neck relief for side clearance
- Standard and long lengths
- Square corner and corner radius

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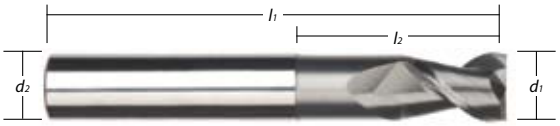


Former List Code Reference

M202N			
Length Code		**SQ**	**CR**
Regular	**RL**	1245	1245CR
Long	**LL**	1246	1246CR
X-Long	**XL**	1247	1247CR
Deep Milling	**DM**	1248	1248CR

Metric

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	l_3 LBS	d_3 Neck Dia.	R Corner Radius	Len. Code	MG
6	6	8	57	20	5,4	---	RL	32402
		8	57	20	5,4	0,3	RL	37200
		8	75	40	5,4	---	LR	37201
		8	75	40	5,4	0,3	LR	37202
8	8	10	63	26	7,2	---	RL	32404
		10	63	26	7,2	0,5	RL	37212
10	10	12	72	31	9	---	RL	32406
		12	72	31	9	0,5	RL	37214
		12	100	50	9	---	XL	33029
		12	100	50	9	0,5	XL	37216
12	12	14	83	37	10,8	---	RL	32408
		14	83	37	10,8	1,0	RL	37218
		14	125	70	10,8	---	XL	33030
		14	125	70	10,8	1,0	XL	37220
16	16	18	92	41	14,4	---	RL	32410
		18	92	41	14,4	1,0	RL	37222
		18	150	90	14,4	---	XL	33031
		18	150	90	14,4	1,0	XL	37224
20	20	24	104	47	18	---	RL	32412
		24	104	47	18	1,0	RL	37226
		24	150	90	18	---	XR	37228
		24	150	90	18	1,0	XR	37230

d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	l_3 LBS	d_3 Neck Dia.	R Corner Radius	Len. Code	MG
1/4	1/4	3/8	2-1/2	1-1/8	.235	---	RL	32935
		3/8	2-1/2	1-1/8	.235	.015	RL	34622
		3/8	2-1/2	1-1/8	.235	.030	RL	34623
		3/8	3	1-5/8	.235	---	LL	33016
		3/8	3	1-5/8	.235	.015	LL	34626
		3/8	3	1-5/8	.235	.030	LL	34627
		3/8	4	2-1/4	.235	---	XL	33023
		3/8	4	2-1/4	.235	.015	XL	34631
		3/8	4	2-1/4	.235	.030	XL	34633
3/8	3/8	1/2	2-1/2	1-1/8	.355	---	RL	32936
		1/2	2-1/2	1-1/8	.355	.015	RL	34634
		1/2	2-1/2	1-1/8	.355	.030	RL	34635
		1/2	2-1/2	1-1/8	.355	.060	RL	38194
		1/2	3	1-3/4	.355	---	LL	33018
		1/2	3	1-3/4	.355	.015	LL	34637
		1/2	3	1-3/4	.355	.030	LL	34638
		1/2	3	1-3/4	.355	.060	LL	38195
		1/2	4	2-1/4	.355	---	XL	33024
		1/2	4	2-1/4	.355	.015	XL	34639
		1/2	4	2-1/4	.355	.030	XL	34643
		1/2	4	2-1/4	.355	.060	XL	38196
1/2	1/2	5/8	3	1-3/8	.475	---	RL	32937
		5/8	3	1-3/8	.475	.015	RL	34644
		5/8	3	1-3/8	.475	.030	RL	34645
		5/8	3	1-3/8	.475	.060	RL	38197
		5/8	3	1-3/8	.475	.090	RL	38198
		5/8	3	1-3/8	.475	.125	RL	38199
		5/8	4	2-1/4	.475	---	LL	33019
		5/8	4	2-1/4	.475	.015	LL	34646
		5/8	4	2-1/4	.475	.030	LL	34647
		5/8	4	2-1/4	.475	.060	LL	38200
		5/8	4	2-1/4	.475	.090	LL	38201
		5/8	4	2-1/4	.475	.125	LL	38202
		5/8	5	2-3/8	.475	---	XL	33025
		5/8	5	2-3/8	.475	.015	XL	34649
		5/8	5	2-3/8	.475	.030	XL	34650
		5/8	5	2-3/8	.475	.060	XL	38203
		5/8	5	2-3/8	.475	.090	XL	38204
		5/8	5	2-3/8	.475	.125	XL	38205
		5/8	6	3-3/8	.475	---	DM	33032
		5/8	6	3-3/8	.475	.015	DM	34651
		5/8	6	3-3/8	.475	.030	DM	34652
		5/8	6	3-3/8	.475	.060	DM	38206
		5/8	6	3-3/8	.475	.090	DM	38207
		5/8	6	3-3/8	.475	.125	DM	38208
5/8	5/8	3/4	3-1/2	1-1/2	.590	---	RL	32938
		3/4	3-1/2	1-1/2	.590	.030	RL	34653
		3/4	3-1/2	1-1/2	.590	.060	RL	38209
		3/4	3-1/2	1-1/2	.590	.090	RL	38210
		3/4	3-1/2	1-1/2	.590	.125	RL	38211

continued on next page

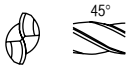
M202N • Inch • Continuted

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	l_3 LBS	d_3 Neck Dia.	R Corner Radius	Len. Code	MG
5/8	5/8	3/4	3-1/2	1-1/2	.590	.125	RL	33020
		3/4	5	2-1/4	.590	---	LL	34654
		3/4	5	2-1/4	.590	.030	LL	38212
		3/4	5	2-1/4	.590	.060	LL	38213
		3/4	5	2-1/4	.590	.090	LL	38214
		3/4	5	2-1/4	.590	.125	LL	33026
		3/4	6	3-3/8	.590	---	XL	34655
		3/4	6	3-3/8	.590	.030	XL	38215
		3/4	6	3-3/8	.590	.060	XL	38216
		3/4	6	3-3/8	.590	.090	XL	38217
		3/4	6	3-3/8	.590	.125	XL	32939
3/4	3/4	1	4	1-3/4	.715	---	RL	34657
		1	4	1-3/4	.715	.030	RL	38218
		1	4	1-3/4	.715	.060	RL	38219
		1	4	1-3/4	.715	.090	RL	38220
		1	4	1-3/4	.715	.125	RL	38221
		1	4	1-3/4	.715	.156	RL	38222
		1	4	1-3/4	.715	.190	RL	33021
		1	5	2-1/4	.715	---	LL	34658
		1	5	2-1/4	.715	.030	LL	38223
		1	5	2-1/4	.715	.060	LL	38224
		1	5	2-1/4	.715	.090	LL	38225
		1	5	2-1/4	.715	.125	LL	38226
		1	5	2-1/4	.715	.156	LL	38227
		1	5	2-1/4	.715	.190	LL	33027
		1	6	3-3/8	.715	---	XL	34659
		1	6	3-3/8	.715	.030	XL	38228
		1	6	3-3/8	.715	.060	XL	38229
		1	6	3-3/8	.715	.090	XL	38230
		1	6	3-3/8	.715	.125	XL	38231
		1	6	3-3/8	.715	.156	XL	38232
		1	6	3-3/8	.715	.190	XL	38232

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	l_3 LBS	d_3 Neck Dia.	R Corner Radius	Len. Code	MG
1	1	1-1/8	4	1-7/8	.960	---	RL	32940
		1-1/8	4	1-7/8	.960	.030	RL	34660
		1-1/8	4	1-7/8	.960	.060	RL	38233
		1-1/8	4	1-7/8	.960	.090	RL	38234
		1-1/8	4	1-7/8	.960	.125	RL	38235
		1-1/8	4	1-7/8	.960	.156	RL	38236
		1-1/8	4	1-7/8	.960	.190	RL	38237
		1-1/8	4	1-7/8	.960	.250	RL	38238
		1-1/4	5	2-1/4	.960	---	LL	33022
		1-1/4	5	2-1/4	.960	.030	LL	34661
		1-1/4	5	2-1/4	.960	.060	LL	38239
		1-1/4	5	2-1/4	.960	.090	LL	38240
		1-1/4	5	2-1/4	.960	.125	LL	38241
		1-1/4	5	2-1/4	.960	.156	LL	38242
		1-1/4	5	2-1/4	.960	.190	LL	38243
		1-1/4	5	2-1/4	.960	.250	LL	38245
		1-1/4	6	3-3/8	.960	---	XL	33028
		1-1/4	6	3-3/8	.960	.030	XL	34662
		1-1/4	6	3-3/8	.960	.060	XL	38246
		1-1/4	6	3-3/8	.960	.090	XL	38247
		1-1/4	6	3-3/8	.960	.125	XL	38248
		1-1/4	6	3-3/8	.960	.156	XL	38249
		1-1/4	6	3-3/8	.960	.190	XL	38250
		1-1/4	6	3-3/8	.960	.250	XL	38251
		1-1/4	7	4-3/8	.960	---	DM	33033
		1-1/4	7	4-3/8	.960	.030	DM	34663
		1-1/4	7	4-3/8	.960	.060	DM	38252
		1-1/4	7	4-3/8	.960	.090	DM	38253
		1-1/4	7	4-3/8	.960	.125	DM	38254
		1-1/4	7	4-3/8	.960	.156	DM	38255
		1-1/4	7	4-3/8	.960	.190	DM	38256
		1-1/4	7	4-3/8	.960	.250	DM	38257

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

M202B STREAKERS®



- 2-Flute, high helix
- Ball end, standard length
- Premium micrograin carbide
- Designed for maximum chip ejection

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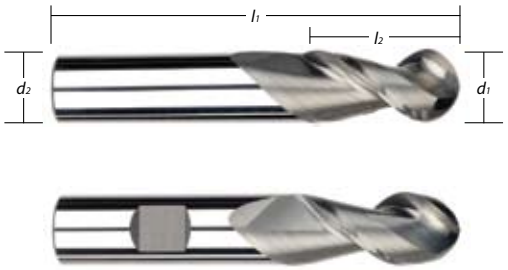


Former List Code Reference			
M202B			
Length Code		BN	BN
Regular	RL	1242B	1270B

Metric

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Len. Code	MG	MG
6	6	16	57	RL	62412	62422
8	8	19	63	RL	62413	62423
10	10	22	72	RL	62414	62424
12	12	25	76	RL	62415	
		26	83	RL		62426
16	16	32	92	RL	62418	62428
20	20	38	104	RL	62420	62430

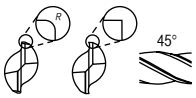
d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Len. Code	MG	MG
1/8	1/8	3/8	1-1/2	RL	33446	
3/16	3/16	9/16	2	RL	33448	
1/4	1/4	3/4	2-1/2	RL	32980	32595
5/16	5/16	13/16	2-1/2	RL	32981	32596
3/8	3/8	7/8	2-1/2	RL		32597
		1	2-1/2	RL	32982	
1/2	1/2	1-1/4	3	RL	32983	
		1-1/4	3-1/4	RL		32598
5/8	5/8	1-1/4	3-1/2	RL		32599
		1-5/8	3-1/2	RL	32984	
3/4	3/4	1-5/8	4	RL	32985	32600

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

M202 STREAKERS®



- 2-Flute, high helix
- Standard and long lengths
- Square corner and corner radius
- Designed for maximum chip ejection

Technical • Technisch • Technique • Técnico
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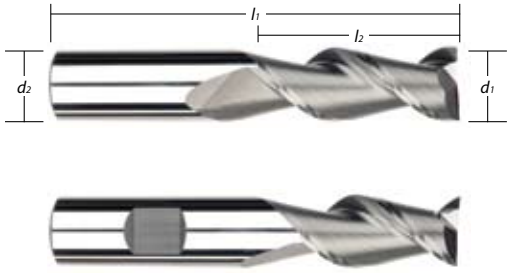


Former List Code Reference

M202					
Length Code		**SQ**	**CR**	**SQ**	**CR**
Stub	**SL**	1241	1241CR		
Regular	**RL**	1242	1242CR	1270	1270CR
Long	**LL**	1243	1243CR	1271	1271CR
X-Long	**XL**	1244	1244CR	1272	1272CR

Metric

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	R Corner Radius	Len. Code	MG	MG
3	3	5	38	---	SL	32971	
		5	38	0,3	SL	36973	
4	4	6	50	---	SL	32972	
		11	50	---	RL	36974	
		11	50	0,3	RL	36975	
5	5	6	50	---	SL	32973	
		13	50	---	RL	36976	
		13	50	0,3	RL	36977	
6	6	7	54	---	SL	32974	
		16	57	---	RL	62402	39300
		16	57	0,3	RL	36978	36979
		16	57	0,5	RL	36980	36981
8	8	9	58	---	SL	32975	
		19	63	---	RL	62403	39301
		19	63	0,3	RL	36982	36983
		19	63	0,5	RL	36984	37042
10	10	11	66	---	SL	32976	
		22	72	---	RL	62404	39302
		22	72	0,3	RL	37043	91436
		22	72	0,5	RL	91445	91448
12	12	12	73	---	SL	32977	
		26	83	---	RL	62406	39303
		26	83	0,5	RL	91453	91463
		26	83	0,75	RL	91476	37083
		26	83	1,0	RL	37084	37100
14	14	26	83	---	RL	62407	39304
16	16	16	82	---	SL	32978	
		32	92	---	RL	62408	39305
		32	92	0,75	RL	37101	37102
		32	92	1,0	RL	37161	37162
20	20	20	92	---	SL	32979	
		38	104	---	RL	62410	39307
		38	104	0,75	RL	37170	37171
		38	104	1,0	RL	37180	37181

d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	R Corner Radius	Len. Code	MG	MG
1/8	1/8	1/4	1-1/2	---	SL	32941	
		3/8	1-1/2	---	RL	32949	
		3/8	1-1/2	.015	RL	90870	
3/16	3/16	5/16	2	---	SL	32942	
		9/16	2	---	RL	32950	
		9/16	2	.015	RL	33542	
1/4	1/4	3/8	2-1/2	---	SL	32943	
		3/4	2-1/2	---	RL	32951	39322
		3/4	2-1/2	.015	RL	33544	33546
		3/4	2-1/2	.030	RL	33548	33550
		1-1/4	3	---	LL	32957	39330
		1-1/4	3	.015	LL	33552	33566
		1-1/4	3	.030	LL	34382	34383
5/16	5/16	7/16	2-1/2	---	SL	32944	
		13/16	2-1/2	---	RL	32952	39323
		13/16	2-1/2	.015	RL	33629	33630
		13/16	2-1/2	.030	RL	34362	34363
		13/16	2-1/2	.060	RL	38381	38382
		1-3/8	3	---	LL	32958	39331
		1-3/8	3	.030	LL	38079	38098
		1-3/8	3	.060	LL	38383	38384
3/8	3/8	1/2	2-1/2	---	SL	32945	
		7/8	2-1/2	---	RL		39324
		7/8	2-1/2	.015	RL		33649
		7/8	2-1/2	.030	RL		90942
		7/8	2-1/2	.060	RL		33692
		1	2-1/2	---	RL	32953	
		1	2-1/2	.015	RL	33648	
		1	2-1/2	.030	RL	90997	
		1	2-1/2	.060	RL	38385	
		1-1/2	3-1/4	---	LL	32959	39332
		1-1/2	3-1/4	.015	LL	90943	90983
		1-1/2	3-1/4	.030	LL	33886	33887
		1-1/2	3-1/4	.060	LL	38386	38387
		2	4	---	XL	32964	32510
		2	4	.015	XL	91007	90984
		2	4	.030	XL	34144	34145
		2	4	.060	XL	38388	38389
1/2	1/2	5/8	3	---	SL	32946	
		1	3	---	RL		39329
		1	3	.030	RL		34359
		1-1/4	3	---	RL	90358	
		1-1/4	3	.015	RL	34146	
		1-1/4	3	.030	RL	34161	
		1-1/4	3	.060	RL	34196	
		1-1/4	3	.090	RL	38075	
		1-1/4	3	.125	RL	38076	

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

continued on next page

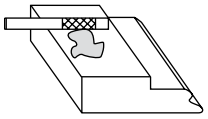
M202 • Inch • Continued

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	R Corner Radius	Len. Code	MG	MG
		1-1/4	3-1/4	---	RL		39325
		1-1/4	3-1/4	.015	RL		34147
		1-1/4	3-1/4	.030	RL		34162
		1-1/4	3-1/4	.060	RL		34197
		1-1/4	3-1/4	.090	RL		38092
		2	4	---	LL	32960	39333
		2	4	.015	LL	34198	34199
		2	4	.030	LL	34204	34205
		2	4	.060	LL	34206	34207
		2	4	.090	LL	38080	38099
1/2	1/2	2	4	.125	LL	38081	38100
		2-1/2	5	---	XL	32965	32512
		2-1/2	5	.030	XL	34235	34236
		2-1/2	5	.060	XL	38085	38104
		2-1/2	5	.090	XL	38086	38105
		2-1/2	5	.125	XL	38087	38106
		3-1/8	6	---	DM	38390	38391
		3-1/8	6	.030	DM	38392	38393
		3-1/8	6	.060	DM	38394	38395
		3-1/8	6	.090	DM	38397	38398
		3-1/8	6	.125	DM	38399	38400
		3/4	3-1/2	---	SL	32947	
		1-1/4	3-1/2	---	RL		39326
		1-1/4	3-1/2	.030	RL		34238
		1-1/4	3-1/2	.060	RL		38485
		1-1/4	3-1/2	.090	RL		38487
		1-1/4	3-1/2	.125	RL		38489
		1-5/8	3-1/2	---	RL	32954	
		1-5/8	3-1/2	.030	RL	34237	
		1-5/8	3-1/2	.060	RL	38490	
		1-5/8	3-1/2	.090	RL	38492	
5/8	5/8	1-5/8	3-1/2	.125	RL	38494	
		2-1/2	5	---	XL	32966	32514
		2-1/2	5	.030	XL	34243	34244
		2-1/2	5	.060	XL	38496	38498
		2-1/2	5	.090	XL	38500	38501
		2-1/2	5	.125	XL	38502	38503
		3-3/4	6	---	DM	38504	38505
		3-3/4	6	.030	DM	38506	38507
		3-3/4	6	.060	DM	38508	38509
		3-3/4	6	.090	DM	38510	38511
		3-3/4	6	.125	DM	38512	38513

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	R Corner Radius	Len. Code	MG	MG
		1	4	---	DM	32948	
		1-5/8	4	---	RL	32955	39327
		1-5/8	4	.030	RL	34245	34246
		1-5/8	4	.060	RL	34262	34263
		1-5/8	4	.090	RL	38077	38094
		1-5/8	4	.125	RL	38078	38095
		1-5/8	4	.156	RL	38514	38515
		1-5/8	4	.190	RL	38516	38517
		2-1/2	5	---	LL	32962	39335
		2-1/2	5	.030	LL	34343	34344
		2-1/2	5	.060	LL	38082	38101
3/4	3/4	2-1/2	5	.090	LL	38083	38102
		2-1/2	5	.125	LL	38084	38103
		2-1/2	5	.156	LL	38518	38519
		2-1/2	5	.190	LL	38520	38521
		3-1/4	6	---	XL	32968	32516
		3-1/4	6	.030	XL	34345	34346
		3-1/4	6	.060	XL	38088	38107
		3-1/4	6	.090	XL	38089	38108
		3-1/4	6	.125	XL	38090	38109
		3-1/4	6	.156	XL	38522	38523
		3-1/4	6	.190	XL	38524	38525
		1-1/4	4	---	SL	33143	
		2	4	---	RL	32956	
		2	4	.030	RL	90105	
		2	4	.060	RL	34353	
		2	4	.090	RL	38526	
		2	4	.125	RL	38528	
		2	4	.156	RL	38530	
		2	4	.190	RL	38532	
		2	4	.250	RL	38534	
		2	4-1/2	---	RL		39328
		2	4-1/2	.030	RL		38096
		2	4-1/2	.060	RL		38097
		2	4-1/2	.090	RL		38527
		2	4-1/2	.125	RL		38529
		2	4-1/2	.156	RL		38531
		2	4-1/2	.190	RL		38533
1	1	2	4-1/2	.250	RL		38535
		2-5/8	5	---	LL	32963	39336
		2-5/8	5	.030	LL	34352	34354
		2-5/8	5	.060	LL	34355	34356
		2-5/8	5	.090	LL	38536	38537
		2-5/8	5	.125	LL	38538	38539
		2-5/8	5	.156	LL	38540	38541
		2-5/8	5	.190	LL	38542	38543
		2-5/8	5	.250	LL	38544	38545
		3-1/4	6	---	XL	32969	39341
		3-1/4	6	.030	XL	34357	34358
		3-1/4	6	.060	XL	38091	38110
		3-1/4	6	.090	XL	38546	38547
		3-1/4	6	.125	XL	38548	38549
		3-1/4	6	.156	XL	38550	38551
		3-1/4	6	.190	XL	38552	38553
		3-1/4	6	.250	XL	38554	38555

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

PDT10



- Piloted Die Trimmer
- Former list code M910
- Use in hand-held equipment, utilizing bur operating parameters
- Special diameters and lengths available on request

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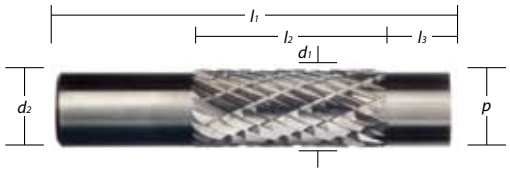
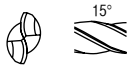


Inch

d_1 Cutter Dia.	p Pilot Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_3 Pilot Length	l_1 Overall Length	MG
1/8	1/8	1/8	1	1/2	2-1/2	05634
3/16	3/16	3/16	1	1/2	2-1/2	05647
1/4	1/4	1/4	1	1/2	2-1/2	05630
3/8	3/8	3/8	1	1/2	2-1/2	05643
1/2	1/2	1/2	1	1/2	2-1/2	05640

d_1 +0.0 / -0.005 d_2 +0.0 / -0.0005

E520B



- 2-Flute, short flute length
- Ball end, extended shank length
- Neck relief for side clearance
- Designed for hardened materials
- Former list code M520

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See below

MOD

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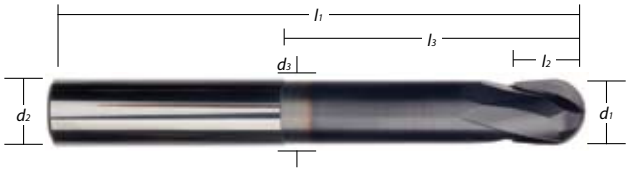


Metric

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	l_3 LBS	d_3 Neck Dia.	Len. Code	TiAlNX
2	6	2	75	6	1,9	RR	34294
3	6	3	75	9	2,8	RR	34295
4	6	4	75	12	3,8	RR	34296
5	6	5	75	15	4,7	RR	34297
6	6	6	75	40	5,4	RR	34298
8	8	8	100	55	7,2	RR	34299
10	10	10	100	55	9	RR	34300
12	12	12	100	55	10,8	RR	34301

d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	l_3 LBS	d_3 Neck Dia.	Len. Code	TiAlNX
3/32	1/4	3/32	3	9/32	.088	RR	34287
1/8	1/4	1/8	3	3/8	.118	RR	34288
3/16	1/4	3/16	3	9/16	.176	RR	34289
1/4	1/4	1/4	3	1-5/8	.235	RR	34290
5/16	5/16	5/16	4	2-1/4	.297	RR	34291
3/8	3/8	3/8	4	2-1/4	.355	RR	34292
1/2	1/2	1/2	4	2-1/4	.475	RR	34293

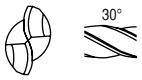
d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

Application Guide • Speed & Feed

Work Material Hardness	Type of Cut	Series Code	Axial DOC	Radial DOC	Number of Flutes	Speed (m/min)	Feed (mm Per Tooth) 3,0	6,0	9,0	12,0
Under 28 HRc	Rough	E64B	.1 x D	.2 x D	4	122	0.0254	0.0508	0.0762	0.1016
	Rough	E520B	.05 x D	.1 x D	2	229	0.0508	0.0965	0.1067	0.1270
	Finish	E520B	.02 x D	.05 x D	2	259	0.0635	0.1219	0.1346	0.1651
28 HRc to 38 HRc	Rough	E64B	.1 x D	.2 x D	4	107	0.0254	0.0508	0.0762	0.1016
	Rough	E520B	.05 x D	.1 x D	2	213	0.0508	0.0965	0.1067	0.1270
	Finish	E520B	.02 x D	.05 x D	2	244	0.0584	0.1168	0.1295	0.1422
39 HRc to 48 HRc	Rough	E64B	.1 x D	.2 x D	4	91	0.0203	0.0406	0.0610	0.0813
	Rough	E520B	.05 x D	.1 x D	2	198	0.0457	0.0914	0.0965	0.0991
	Finish	E520B	.02 x D	.05 x D	2	229	0.0533	0.1067	0.1194	0.1321
49 HRc to 57 HRc	Rough	E520B	.02 x D	.1 x D	2	152	0.0406	0.0813	0.0864	0.0914
	Finish	E520B	.02 x D	.05 x D	2	183	0.0457	0.0914	0.0991	0.1041
58 HRc to 62 HRc	Rough	E520B	.02 x D	.1 x D	2	122	0.0381	0.0762	0.0813	0.0889
	Finish	E520B	.02 x D	.05 x D	2	152	0.0432	0.0864	0.0914	0.0965

Speed (SFM)	Feed (Inches Per Tooth) 1/8	1/4	3/8	1/2
400	0.0010	0.0020	0.0030	0.0040
750	0.0020	0.0038	0.0042	0.0050
850	0.0025	0.0048	0.0053	0.0065
350	0.0010	0.0020	0.0030	0.0040
700	0.0020	0.0038	0.0042	0.0050
800	0.0023	0.0046	0.0051	0.0056
300	0.0008	0.0016	0.0024	0.0032
650	0.0018	0.0036	0.0038	0.0039
750	0.0021	0.0042	0.0047	0.0052
500	0.0016	0.0032	0.0034	0.0036
600	0.0018	0.0036	0.0039	0.0041
400	0.0015	0.0030	0.0032	0.0035
500	0.0017	0.0034	0.0036	0.0038

E62B • 2-Flute



- 2-Flute, standard helix
- Ball end, short flute length
- Standard and long shank lengths
- Designed for hardened materials

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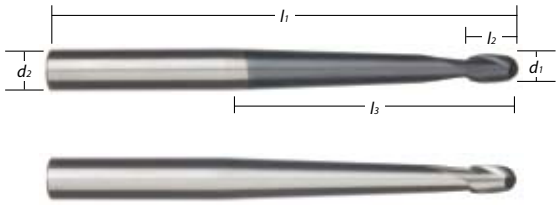
P K H



Former List Code Reference			
E62B			
Length Code		AlTiN	MG
Regular	RL	M776R	M876R
X-Long Reach	XR	M778R	M878R

Metric

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	l_3 LBS	Len. Code	AlTiN	MG
2	4	5	63	45	RL	02964	02901
3	4	6	63	45	RL	02965	02902
4	6	8	75	54	RL	02966	02903
6	10	9	100	60	RL	02967	02904
		9	150	69	XR	02985	02908
8	10	12	100	60	RL	02968	02905
		12	150	72	XR	02886	02909
10	10	16	100	60	RL	02969	02906
		16	150	76	XR	02887	02910
12	12	20	100	60	RL	02970	02907
		20	150	80	XR	02888	20911

d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	l_3 LBS	Len. Code	AlTiN	MG
3/32	3/16	3/16	2-1/2	1-3/4	RL	33271	02891
1/8	3/16	1/4	2-1/2	1-3/4	RL	33272	02892
3/16	1/4	5/16	3	2-1/8	RL	33273	02893
1/4	3/8	3/8	4	2-1/2	RL	33274	02894
		3/8	6	2-1/2	XR	33290	02899
5/16	3/8	1/2	4	2-1/2	RL	33275	02895
3/8	3/8	5/8	4	2-1/2	RL	33276	02896
		5/8	6	2-1/2	XR	33292	20901
1/2	1/2	13/16	4	2-1/2	RL	33277	02897
		13/16	6	2-1/2	XR	33293	20902

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

E64B • 4-Flute

- 4-Flute, standard helix
- Ball end, short flute length
- Standard and long shank lengths
- Designed for hardened materials

Technical • Technisch • Technique • Técnico

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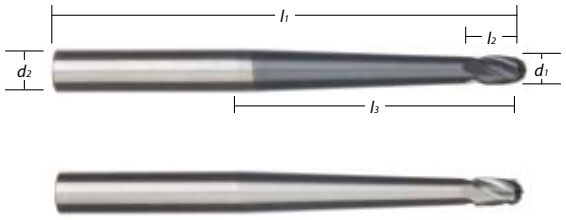
P K H



Former List Code Reference			
E64B			
Length Code		AlTiN	MG
Regular	RL	M772R	M872R
X-Long Reach	XR	M774R	M874R

Metric

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	l_3 LBS	Len. Code	AlTiN	MG
2	4	5	63	45	RL	20932	20921
3	4	6	63	45	RL	20933	20922
4	6	8	75	54	RL	20934	20923
6	10	9	100	60	RL	20935	20924
		9	150	69	XR	20939	20928
8	10	12	100	60	RL	20936	20925
		12	150	72	XR	20940	20929
10	10	16	100	60	RL	20937	20926
		16	150	76	XR	20941	20930
12	12	20	100	60	RL	20938	20927
		20	150	80	XR	20942	20931

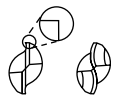
d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	l_3 LBS	Len. Code	AlTiN	MG
3/32	3/16	3/16	2-1/2	1-3/4	RL	33259	19821
1/8	3/16	1/4	2-1/2	1-3/4	RL	33260	19822
3/16	1/4	5/16	3	2-1/8	RL	33261	19823
1/4	3/8	3/8	4	2-1/2	RL	33262	19824
		3/8	6	2-1/2	XR	33266	19829
5/16	3/8	1/2	4	2-1/2	RL	33263	19825
3/8	3/8	5/8	4	2-1/2	RL	33264	19826
		5/8	6	2-1/2	XR	33268	19831
1/2	1/2	13/16	4	2-1/2	RL	33265	19827
		13/16	6	2-1/2	XR	33269	19832

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

E42 • E42B



- 2 Straight flutes
- Square and ball end
- For precision slotting & contouring

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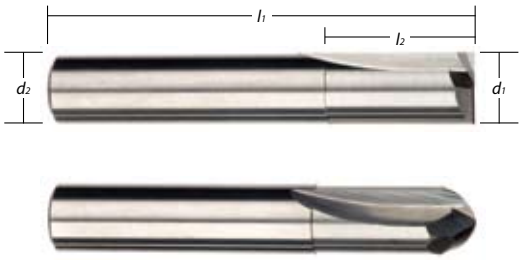

Former List Code Reference

E42 • E42B		
Length Code	**SQ**	**BN**
Regular **RL**	M700	M700R
X-Long **XL**		M710R

Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Length Code	SQ MG	BN MG
1/8	1/8	1/2	1-1/2	RL	27101	27130
1/4	1/4	3/4	2-1/2	RL	27103	27132
		1	6	XL		27133
3/8	3/8	1	2-1/2	RL	27106	27135
		1	6	XL		27136
1/2	1/2	1	3	RL	27108	27137
		1-1/4	6	XL		27138

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

MOD
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E55B

- 2 Straight flutes, radius end
- Short and long flute lengths
- For mold runner cutting

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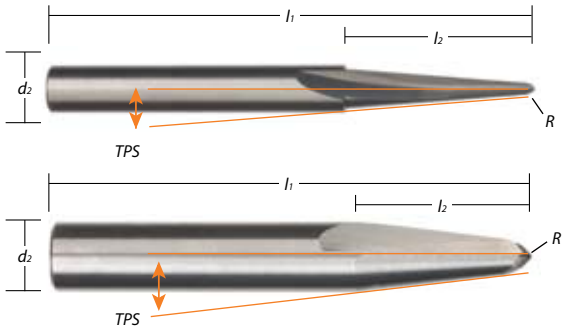


Metric *(Former list code M865R)*

TPS	R Tip Radius	d_2 Shank Dia.	l_2 Flute Length	l_1 Overall Length	Order Code
3°	0,75	3	25 max	38	02991
	1,0	3	25 max	38	02992
	1,0	6	25 max	63	02995
	2,0	6	25 max	63	02997
5°	0,75	3	25 max	38	03011
	1,0	3	25 max	38	03012
	1,0	6	25 max	63	03015
	2,0	6	25 max	63	03017
7°	0,75	3	25 max	38	03031
	1,0	3	25 max	38	03032
	1,0	6	25 max	63	03035
	2,0	6	25 max	63	03037
10°	0,75	3	25 max	38	03051
	1,0	3	25 max	38	03052
	1,0	6	25 max	63	03055
	2,0	6	25 max	63	03057

d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

Inch *(Former list code M865R)*

TPS	R Tip Radius	d_2 Shank Dia.	l_2 Flute Length	l_1 Overall Length	Order Code
3°	1/64	1/8	1 max	1-1/2	02911
	1/32	1/8	1 max	1-1/2	02912
	1/32	3/16	1 max	2	02913
	1/32	1/4	1 max	2-1/2	02915
	1/16	1/4	1 max	2-1/2	02916
5°	1/64	1/8	1 max	1-1/2	02931
	1/32	1/8	1 max	1-1/2	02932
	1/32	3/16	1 max	2	02933
	1/32	1/4	1 max	2-1/2	02935
	1/16	1/4	1 max	2-1/2	02936
7°	1/64	1/8	1 max	1-1/2	02951
	1/32	1/8	1 max	1-1/2	02952
	1/32	3/16	1 max	2	02953
	1/32	1/4	1 max	2-1/2	02955
	1/16	1/4	1 max	2-1/2	02956
10°	1/64	1/8	1 max	1-1/2	02971
	1/32	1/8	1 max	1-1/2	02972
	1/32	3/16	1 max	2	02973
	1/32	1/4	1 max	2-1/2	02975
	1/16	1/4	1 max	2-1/2	02976

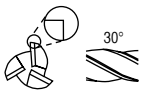
d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

Inch *(Former list code M865)*

TPS	R Tip Radius	d_2 Shank Dia.	l_2 Flute Length	l_1 Overall Length	Order Code
7°	1/32	1/8	5/16	1-1/2	30201
	3/64	3/16	3/8	2	30202
	1/16	1/4	1/2	2-1/2	30203
	3/32	3/8	3/4	2-1/2	30204
	1/8	1/2	1	3	30205

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

E53 • Square End



- 3-Flute, constant helix
- Square end, unique flute form
- For die & mold machining

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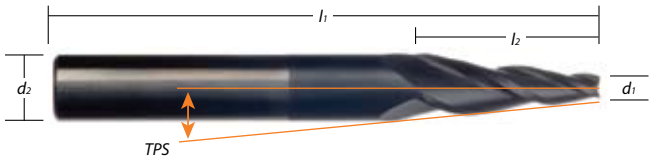
P M K N



Former List Code Reference			
E53			
Length Code		AlTiN	MG
Regular	RL	M767R	M867

Metric

TPS	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	AlTiN	MG
1/2°	3	4	20	63	37670	38402
	4	5	20	63	37671	38403
	5	6	30	75	37672	38404
	6	8	30	75	37673	38405
	8	10	30	75	37674	38406
1°	3	4	20	63	37675	38409
	4	5	20	63	37676	38410
	5	6	25	75	37677	38411
	6	8	30	75	37678	38412
	8	10	30	75	37679	38413
2°	3	5	20	63	37685	38423
	4	6	20	63	37686	38424
	5	8	30	75	37687	38425
	6	8	30	75	37688	38426
	8	10	28	75	37689	38427
3°	3	6	25	63	37690	38430
	3	8	40	75	37691	38431
	4	8	30	75	37692	38432
	5	10	40	75	37693	38433
	6	10	30	75	37694	38434
5°	3	8	30	75	37695	38439
	3	10	40	100	37697	38441
	4	10	30	75	37698	38443

d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

Inch

TPS	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	AlTiN	MG
1°	1/8	1/4	1-1/2	3	39050	38948
	3/16	3/8	1-3/4	3-1/2	39046	38954
	1/4	1/2	2	4	39047	38960
1-1/2°	1/8	1/4	1-1/2	3	39049	38924
	3/16	3/8	1-3/4	3-1/2	39045	38932
2°	1/8	1/4	1-1/4	3	39069	38950
	3/16	3/8	1-3/4	3-1/2	39048	38956
	1/4	1/2	2	4	39161	38962
3°	1/8	1/4	1	3	39070	38926
	5/32	3/8	1-3/4	3-1/2	39162	38934
	1/4	1/2	2	4	39163	38940
5°	1/8	1/4	3/4	3	39127	38928
	1/8	3/8	1-1/2	3-1/2	39023	38936
	1/4	1/2	1-1/4	4	39054	38942
7°	1/8	1/4	1/2	3	39179	38930
	1/8	3/8	1	3-1/2	39180	38938
	3/16	1/2	1-1/4	4	39181	38944
10°	3/32	1/4	1/2	3	39182	38952
	1/8	3/8	3/4	3-1/2	39183	38958
	1/8	1/2	1	4	39184	38946

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

E53B • Ball End

- 3-Flute, constant helix
- Ball end, unique flute form
- For die & mold machining

Technical • Technisch • Technique • Técnico

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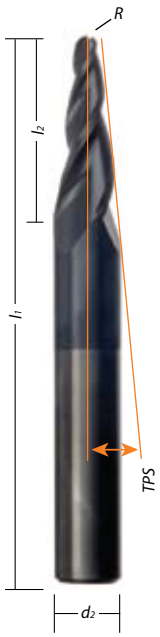
P M K N

Former List Code Reference			
E53B			
Length Code		AlTiN	MG
Regular	RL	1768	1868



Inch

TPS	R Tip Radius	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	AlTiN	MG
1°	1/16	1/4	1-1/2	3	30428	38965
	3/32	3/8	1-3/4	3-1/2	39185	38971
	1/8	1/2	2	4	39186	38977
1-1/2°	1/16	1/4	1-1/2	3	39187	30689
	3/32	3/8	1-3/4	3-1/2	39188	38909
2°	1/16	1/4	1-1/4	3	39051	38967
	3/32	3/8	1-3/4	3-1/2	39189	38973
	1/8	1/2	2	4	39190	38979
3°	1/16	1/4	1	3	39052	38903
	5/64	3/8	1-3/4	3-1/2	39191	38911
	1/8	1/2	2	4	39055	38917
5°	1/16	1/4	3/4	3	39106	38905
	1/16	3/8	1-1/2	3-1/2	39081	38913
	1/8	1/2	1-1/4	4	30690	38919
7°	1/16	1/4	1/2	3	39192	38907
	1/16	3/8	1	3-1/2	39193	38915
	3/32	1/2	1-1/4	4	30558	38921
10°	3/64	1/4	1/2	3	39194	38969
	1/16	3/8	3/4	3-1/2	39195	38975
	1/16	1/2	1	4	39196	38981

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

GENERAL-PURPOSE END MILLS

These models of general purpose end mills are manufactured on high precision CNC grinders to exacting standards from the highest quality micrograin carbide. Geometries and specifications are fine tuned through extensive real world testing in a wide range of materials.

Chemical coatings applied using the PVD coating process can significantly enhance tool life and Menlo offers a variety of coating families for maximum performance in a wide range of workpiece materials.

Results: Better performance, longer tool life, fewer tool changes and lower tool costs.

SPECTOR

- Advanced composition aluminum titanium nitride (AlTiN) coating
- Maintains hardness at high cutting temperatures
- Cutting heat oxidizes the coating to form a highly protective layer of aluminum oxide
- Enables dry machining of many materials
- Recommended for hard steels, stainless steels, carbon steels and other applications generating high cutting temperatures

ACCELERATOR

- Abrasion resistant titanium carbonitride (TiCN) coating
- Exceptional performance in most materials at moderate speeds and feeds
- Great for 300 series stainless steels

auCARB

- General purpose titanium nitride (TiN) coating
- Low coefficient of friction for improved chip flow
- Recommended for improved tool life at conventional feeds and speeds. Performs well with low horsepower machinery

MICROGRAIN

- Submicron grain carbide with 10% cobalt (MG) for even edge wear
- High transverse rupture strength for durability
- Proven performance at lower speeds and feeds in easily machined materials

4-FLUTE END MILLS

Design Features for Every Application

End designs

- Corner radii – a wide variety to meet your part specification requirements
- Square corners for general machining and finishing
- Ball nose styles for contouring

Shank designs

- Precision tolerance to fit all collets and most shrink-fit systems
- Also standard with flats for use in end mill holders

Multiple lengths

- Long reach with stub flutes for deep cavity machining
- Long length with extra flute lengths for finishing passes
- Stub length for extra rigidity

Four-flute end mills are versatile, general purpose tools for slotting, profile and contour milling in applications where chip packing is not a problem. The increased core thickness of 4-flute tools results in less tool deflection and improved size accuracy, while the reduced chip load gives improved surface finishes.

Use in general milling applications in low to medium carbon steels, cast iron, easy to machine stainless steels, composites, plastics and graphite.

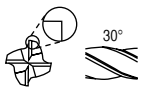
Application Guide • Speed & Feed

Work Material	Type of Cut	Axial DOC	Radial DOC	Speed (m/min) MG	TiCN	AlTiN	Feed (mm Per Tooth) 3,0	6,0	9,0	12,0	16,0	19,0	25,0
Composites, Plastics	Slot	.5 x D	1 x D	91	107	107	.0203	.0381	.0559	.0762	.0940	.1194	.1524
	Rough	1 x D	.5 x D	114	137	137	.0229	.0457	.0686	.0889	.1143	.1397	.1778
	Finish	1.5 x D	.01 x D	137	198	198	.0229	.0457	.0686	.0889	.1143	.1397	.1778
Graphite	Slot	.5 x D	1 x D	107	122	137	.0203	.0381	.0584	.0762	.0940	.1143	.1524
	Rough	1 x D	.5 x D	130	145	160	.0229	.0432	.0660	.0889	.1092	.1346	.1778
	Finish	1.5 x D	.01 x D	152	168	183	.0254	.0483	.0711	.0965	.1194	.1448	.1930
Cast Iron - Gray	Slot	.5 x D	1 x D	61	107	107	.0102	.0178	.0279	.0381	.0483	.0584	.0762
	Rough	1 x D	.5 x D	76	122	122	.0127	.0254	.0381	.0508	.0635	.0762	.1016
	Finish	1.5 x D	.01 x D	91	137	137	.0178	.0381	.0559	.0762	.0965	.1143	.1524
Cast Iron - Ductile	Slot	.5 x D	1 x D	61	76	76	.0102	.0178	.0279	.0381	.0457	.0584	.0762
	Rough	1 x D	.5 x D	76	84	84	.0127	.0254	.0381	.0508	.0635	.0762	.1016
	Finish	1.5 x D	.01 x D	84	99	99	.0152	.0305	.0457	.0584	.0711	.0864	.1168
Low Carbon Steel ≤ 38 HRc 1018, 12L14, 8620	Slot	.5 x D	1 x D	76	84	91	.0127	.0254	.0381	.0508	.0635	.0762	.1016
	Rough	1 x D	.5 x D	84	91	99	.0152	.0305	.0457	.0635	.0787	.0940	.1270
	Finish	1.5 x D	.01 x D	91	99	107	.0178	.0381	.0559	.0762	.0965	.1143	.1524
Medium Carbon Steels ≤ 38 HRc 4140, 4340	Slot	.5 x D	1 x D	69	76	84	.0127	.0254	.0381	.0508	.0635	.0762	.1016
	Rough	1 x D	.5 x D	76	84	91	.0152	.0305	.0457	.0635	.0787	.0940	.1270
	Finish	1.5 x D	.01 x D	84	91	99	.0178	.0381	.0559	.0762	.0965	.1143	.1524
Tool & Die Steels ≤ 38 HRc A2, D2, H13, P20	Slot	.5 x D	1 x D	69	76	84	.0127	.0254	.0381	.0508	.0635	.0762	.1016
	Rough	1 x D	.5 x D	76	84	91	.0152	.0305	.0457	.0635	.0787	.0940	.1270
	Finish	1.5 x D	.01 x D	84	91	99	.0178	.0381	.0559	.0762	.0965	.1143	.1524
Tool & Die Steels 39 - 48 HRc A2, D2, H13, P20	Slot	.25 x D	1 x D	53	61	69	.0051	.0127	.0178	.0254	.0305	.0381	.0508
	Rough	1 x D	.25 x D	61	69	76	.0076	.0178	.0279	.0381	.0483	.0559	.0762
	Finish	1.5 x D	.01 x D	69	76	84	.0102	.0229	.0356	.0457	.0584	.0686	.0914
Easy to Machine Stainless Steel 416, 410, 302, 303	Slot	.5 x D	1 x D	61	76	76	.0076	.0178	.0279	.0381	.0483	.0584	.0762
	Rough	1 x D	.5 x D	76	84	84	.0127	.0254	.0381	.0508	.0635	.0762	.1016
	Finish	1.5 x D	.01 x D	91	99	99	.0152	.0305	.0457	.0635	.0787	.0965	.1270
Moderate Machining Stainless Steels 304, 316, Invar, Kovar	Slot	.5 x D	1 x D	61	69	76	.0064	.0127	.0191	.0254	.0305	.0381	.0508
	Rough	1 x D	.5 x D	76	84	91	.0076	.0178	.0279	.0381	.0483	.0559	.0762
	Finish	1.5 x D	.01 x D	91	99	107	.0102	.0229	.0356	.0457	.0584	.0686	.0914

Speed (SFM) MG	TiCN	AlTiN	Feed (Inches Per Tooth) 1/8	1/4	3/8	1/2	5/8	3/4	1
300	350	350	.0008	.0015	.0022	.0030	.0037	.0047	.0060
375	450	450	.0009	.0018	.0027	.0035	.0045	.0055	.0070
450	650	650	.0009	.0018	.0027	.0035	.0045	.0055	.0070
350	400	450	.0008	.0015	.0023	.0030	.0037	.0045	.0060
425	475	525	.0009	.0017	.0026	.0035	.0043	.0053	.0070
500	550	600	.0010	.0019	.0028	.0038	.0047	.0057	.0076
200	350	350	.0004	.0007	.0011	.0015	.0019	.0023	.0030
250	400	400	.0005	.0010	.0015	.0020	.0025	.0030	.0040
300	450	450	.0007	.0015	.0022	.0030	.0038	.0045	.0060
200	250	250	.0004	.0007	.0011	.0015	.0018	.0023	.0030
250	275	275	.0005	.0010	.0015	.0020	.0025	.0030	.0040
275	325	325	.0006	.0012	.0018	.0023	.0028	.0034	.0046
250	275	300	.0005	.0010	.0015	.0020	.0025	.0030	.0040
275	300	325	.0006	.0012	.0018	.0025	.0031	.0037	.0050
300	325	350	.0007	.0015	.0022	.0030	.0038	.0045	.0060
225	250	275	.0005	.0010	.0015	.0020	.0025	.0030	.0040
250	275	300	.0006	.0012	.0018	.0025	.0031	.0037	.0050
275	300	325	.0007	.0015	.0022	.0030	.0038	.0045	.0060
225	250	275	.0005	.0010	.0015	.0020	.0025	.0030	.0040
250	275	300	.0006	.0012	.0018	.0025	.0031	.0037	.0050
275	300	325	.0007	.0015	.0022	.0030	.0038	.0045	.0060
175	200	225	.0002	.0005	.0007	.0010	.0012	.0015	.0020
200	225	250	.0003	.0007	.0011	.0015	.0019	.0022	.0030
225	250	275	.0004	.0009	.0014	.0018	.0023	.0027	.0036
200	250	250	.0003	.0007	.0011	.0015	.0019	.0023	.0030
250	275	275	.0005	.0010	.0015	.0020	.0025	.0030	.0040
300	325	325	.0006	.0012	.0018	.0025	.0031	.0038	.0050
200	225	250	.0003	.0005	.0008	.0010	.0012	.0015	.0020
250	275	300	.0003	.0007	.0011	.0015	.0019	.0022	.0030
300	325	350	.0004	.0009	.0014	.0018	.0023	.0027	.0036

D = tool diameter Reduce feed rates by 20% when using long length tools Starting parameters shown

E14



- 4-Flute, standard helix
- Stub, standard and long lengths
- Square corner and corner radius
- AlTiN, TiCN, TiN coating options

Technical • Technisch • Technique • Técnico

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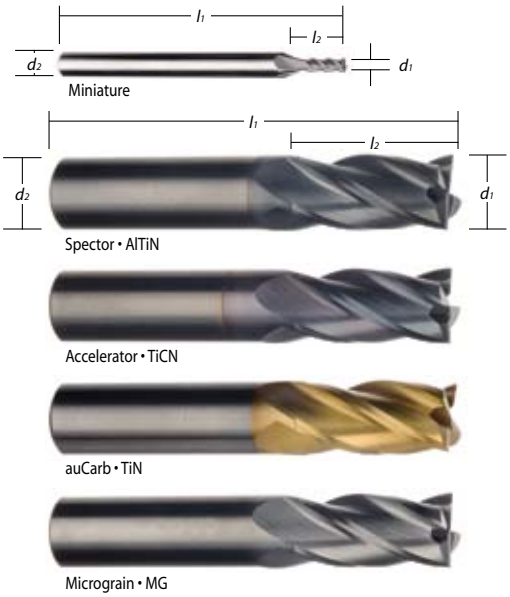

Former List Code Reference

E14						
Length Code			**AlTiN**	**TiCN**	**TiN**	**MG**
Miniature	**3X**	**SQ**				M854
Stub	**SL**	**SQ**	M735	M335	M435	M600
DIN	**DL**	**SQ**	M734	M334		M234
Regular	**RL**	**SQ**	M720	M350	M450	M850
Regular / DIN	**RL**	**CR**	M734CR	M334CR		M234CR
Long	**LL**	**SQ**	M755	M355	M455	M885
Long Reach	**LR**	**SQ**	M797			M897
X-Long	**XL**	**SQ**	M760	M360	M460	M895
X-Long Reach	**XR**	**SQ**	M798			M898
Deep Milling	**DM**	**SQ**				M896

Metric

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	R Corner Radius	Length Code	AlTiN	TiCN	TiN	MG
1	3	2	38	---	SL	39722	32175		28009
		3	38	---	3X	32202	36884		28003
1,5	3	3	38	---	SL	39723	32177		28006
		4,5	38	---	3X	32319	36885		28023
		6	38	---	RL	32204	32117		02511
2	3	4	38	---	SL	39724	32178		02161
		6,3	38	---	3X	32320	36886		28026
		9	38	---	RL	32208	32118		02512
2,5	3	5	38	---	SL	39725			02162
		9,5	38	---	RL	32212	32119		02513
3	3	6	38	---	SL	39726	32083		02163
		9	38	---	3X	99284	99183		36560
		12	38	---	RL	32214	32120		02514
		12	38	0,3	RL	37478			37418
		12	75	---	XR	33367			31302
		19	57	---	LL	39804	39752		03421
		25	75	---	XL	32301	30042		03621
3,5	4	7	50	---	SL	39728			02158
		14	50	---	RL	32216	32121		02515
4	4	8	50	---	SL	39731	32086		02165
		11	50	---	DL	36585	37138		36561
		11	50	0,4	RL	37479			37419
		14	50	---	RL	32218	32122		02516
		19	63	---	LL	39805	39753		03422
		31	75	---	XL	32302	30045		03622
4,5	5	16	50	---	RL	32061	32123		31478
5	5	10	50	---	SL	39736	32089		02167
		13	50	---	DL	36586	37139		36563
		13	50	0,5	RL	37480			37420
		16	50	---	RL	32062	32124		31479
		19	63	---	LL	39806	39755		03423
		31	100	---	XL	32304	39801		03623
6	6	12	54	---	SL	36839	36900		38834
		13	57	---	DL	36587	37140		36565
		13	57	0,3	RL	37481			37421
		13	57	0,5	RL	37482			37422
		15	100	---	LR	31889			31277
		19	63	---	RL	32063	32125		02519
		29	75	---	LL	39807	30051		03424
		38	100	---	XL	32306	39802		03624
		75	150	---	DM				77025

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d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

continued on next page

E14 • Metric • Continued

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	R Corner Radius	Length Code	AlTiN	TiCN	TiN	MG
7	7	16	60	---	DL	36588	37141		36567
	8	19	63	---	RL	32064	32126		02509
8	8	14	58	---	SL	36849	36948		38835
		19	63	---	DL	36589	37142		36569
		19	63	0,5	RL	37483			37423
		19	63	1,0	RL	37484			37424
		19	63	1,5	RL	37485			37425
		20	63	---	RL	32065	32127		02521
		20	100	---	LR	31890			31278
		29	75	---	LL	39808	30054		03425
		41	100	---	XL	32308	39803		03625
		75	200	---	DM				77027
9	9	19	67	---	DL	36590	37143		36571
	10	22	72	---	RL	32066	32128		02510
10	10	16	66	---	SL	36848	36898		38836
		22	72	---	DL	36591	37144		36573
		22	72	0,5	RL	37486			37426
		22	72	1,0	RL	37487			37427
		22	72	1,5	RL	37488			37428
		25	72	---	RL	32067	32129		02523
		25	100	---	LR	31891			31279
		25	150	---	XR	33368			31303
		40	88	---	LL	36838	36850		30079
		45	100	---	XL	32310	30057		03626
		75	150	---	DM				77028
		75	200	---	DM				77029
11	11	26	83	---	DL	36592	37147		36574
12	12	19	73	---	SL	36847	36840		38837
		25	76	---	RL	32068	32130		02525
		26	83	---	DL	36593	37148		36575
		26	83	0,5	RL	37489			37429
		26	83	1,0	RL	37490			37430
		26	83	1,5	RL	37491			37431
		35	150	---	XR	33369			31304
		50	100	---	LL	39810	30060		03427
		75	150	---	XL	32312	30063		03627
		75	200	---	DM				77031
14	14	26	83	---	DL	36594	37149		36577
		32	83	---	RL	32069	32161		34445
		57	125	---	LL	39811			03428
		75	150	---	XL	32314			03628
16	16	25	82	---	SL	39751			02176
		32	89	---	RL	32071	32132		02527
		32	92	---	DL	36595	37150		36579
		32	92	0,5	RL	37492			37432
		32	92	1,0	RL	37493			37433
		32	92	1,5	RL	37494			37434
		32	92	2,0	RL	37495			37435
		40	150	---	XR	33370			31305
		57	125	---	LL	39812			03429
		75	150	---	XL	32318			03629
		75	200	---	DM				77033
18	18	32	92	---	DL	36596			36580
		38	100	---	RL	32084			02528
		57	125	---	LL	39813			03430
		75	150	---	XL	32322			03630
20	20	38	100	---	RL	32074	32159		02529
		38	104	---	DL	36597	37152		36581
		38	104	0,5	RL	37496			37436
		38	104	1,0	RL	37497			37437
		38	104	1,5	RL	37498			37438
		38	104	2,0	RL	37499			37439
		57	125	---	LL	39814			03431
		75	150	---	XL	32324			03631

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d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

continued on next page

E14 • Metric • Continued

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	R Corner Radius	Length Code	AlTiN	TiCN	TiN	MG
22	22	38	100	---	RL	30255			02530
25	25	38	100	---	RL	32238			02531
		45	120	---	DL	36899			36582
		57	125	---	LL	39815			03432
		75	150	---	XL	32325			03632

d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

E14 • Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	R Corner Radius	Length Code	AlTiN	TiCN	TiN	MG
.030	1/8	.090	1-1/2	---	3X				28145
1/32	1/8	1/16	1-1/2	---	SL	30891	30893		34698
		3/32	1-1/2	---	RL	99345	34402		02121
.040	1/8	.120	1-1/2	---	3X				28147
3/64	1/8	3/32	1-1/2	---	SL	30892	30894		34701
		9/64	1-1/2	---	RL	36600	34403		02122
.050	1/8	.150	1-1/2	---	3X				28149
.060	1/8	.180	1-1/2	---	3X				28151
1/16	1/8	1/8	1-1/2	---	SL	30529	31530		02123
		3/16	1-1/2	---	RL	30800	34404	30706	02451
5/64	1/8	1/4	1-1/2	---	RL	30506	34405		02452
3/32	1/8	3/16	1-1/2	---	SL	31545	31531		02124
		3/8	1-1/2	---	RL	30530	34406	30710	02453
7/64	1/8	3/8	1-1/2	---	RL	30458	34407		02454
1/8	1/8	1/4	1-1/2	---	SL	97871	31532		02125
		1/2	1-1/2	---	RL	30521	34408	30714	02455
		1/2	1-1/2	.015	RL	97662	39626		39545
		1/2	1-1/2	.020	RL	90523	39627		39546
		5/8	2	---	LR	62107			62105
		3/4	2-1/4	---	LL	37792	37710	37709	03401
		1	3	---	XL	97847	34110	34109	03601
9/64	3/16	9/16	2	---	RL	30500	34409		30715
5/32	3/16	5/16	2	---	SL	39757	31533		02126
		9/16	2	---	RL	30501	34410	30718	02456
11/64	3/16	5/8	2	---	RL	30507	34411		30719
3/16	3/16	3/8	2	---	SL	31548	31534		02127
		5/8	2	---	RL	30520	34412	30722	02457
		5/8	2	.015	RL	39694	39628		39547
		5/8	2	.020	RL	39695	39629		39548
		5/8	2	.030	RL	39601	39630		39549
		3/4	2-1/2	---	LL	37793	37714	37713	03402
		1	4	---	LR	62110			98521
		1-1/8	3	---	XL	34115	34114	34113	03602
13/64	1/4	5/8	2-1/2	---	RL	30469	34413		30723
7/32	1/4	7/16	2	---	SL	39759	31535		02128
		5/8	2-1/2	---	RL	36601	34414	30726	02458
15/64	1/4	3/4	2-1/2	---	RL	30972	34415		30727
1/4	1/4	1/2	2	---	SL	31595	31536		02129
		3/4	2-1/2	---	RL	98955	34416	30730	02459
		3/4	2-1/2	.015	RL	30519	39631		39504
		3/4	2-1/2	.020	RL	39513	39632		39505
		3/4	2-1/2	.030	RL	39604	39633		39506
		3/4	2-1/2	.045	RL	39696	39634		39507
		1	4	---	LR	62111			62106
		1-1/8	3	---	LL	99336	37718	37717	03403
		1-1/2	4	---	XL	98978	34118	34117	03603
		1-1/2	6	---	XR	39772			31163
17/64	5/16	3/4	2-1/2	---	RL	30976	34417		30731
9/32	5/16	3/4	2-1/2	---	RL	96156	34418		02460
19/64	5/16	13/16	2-1/2	---	RL	30979	34439		30735

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d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

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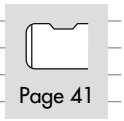
E14 • Inch • Continued

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	R Corner Radius	Length Code	AlTiN	TiCN	TiN	MG
		1/2	2	---	SL	30533	31537		02130
		13/16	2-1/2	---	RL	30898	34420	30738	02461
		13/16	2-1/2	.015	RL	39697	39635		39509
		13/16	2-1/2	.020	RL	39698	39636		39510
5/16	5/16	13/16	2-1/2	.030	RL	39700	39637		39511
		13/16	2-1/2	.045	RL	39701	39638		39512
		1	4	---	LR	62114			90696
		1-1/8	3	---	LL	30461	37722		03404
		1-5/8	4	---	XL	34123	34122	34121	03604
21/64	3/8	1	2-1/2	---	RL	31003	34419		30739
11/32	3/8	1	2-1/2	---	RL	30463	34421		90242
23/64	3/8	1	2-1/2	---	RL	31004	34422		30743
		5/8	2	---	SL	31549	31538		02131
		1	2-1/2	---	RL	98244	34424	30746	02462
		1	2-1/2	.015	RL	37443	37550		37383
		1	2-1/2	.020	RL	37444	37551		37384
		1	2-1/2	.030	RL	37445	37552		37385
3/8	3/8	1	2-1/2	.045	RL	37446	37553		37386
		1	2-1/2	.060	RL	37447	37554		37387
		1	2-1/2	.090	RL	37448	37570		37388
		1	4	---	LR	62115			90698
		1-1/8	3	---	LL	37727	37726	37725	03405
		1-1/2	6	---	XR	97850			90304
		1-3/4	4	---	XL	34136	34126	34125	03605
25/64	7/16	1	2-3/4	---	RL	90013			90269
13/32	7/16	1	2-3/4	---	RL	90016	90172		30749
27/64	7/16	1	2-3/4	---	RL	31028			90296
		5/8	2-1/2	---	SL	39768	31539		02132
7/16	7/16	1	2-3/4	---	RL	31040	34430	37754	30772
		2	4	---	LL	37731	37730		03406
		3	6	---	XL	34160	34130		03606
29/64	1/2	1	3	---	RL	30475			90297
15/32	1/2	1	3	---	RL	31030	34427		30757
31/64	1/2	1	3	---	RL	99106			30759
		5/8	2-1/2	---	SL	31546	31540		02133
		1	3	---	RL	98245	34432	30762	02464
		1	3	.015	RL	37449	37571		37389
		1	3	.020	RL	37450	37572		37390
		1	3	.030	RL	37451	37573		37391
		1	3	.045	RL	37452	37574		37392
1/2	1/2	1	3	.060	RL	37453	37575		37393
		1	3	.090	RL	37454	37576		37394
		1	3	.120	RL	37455	37577		37395
		1	4	---	LR	62160			97332
		1-1/2	6	---	XR	31150			90305
		2	4	---	LL	37735	37734	37733	03407
		3	6	---	XL	34135	34134	34133	03607
9/16	9/16	1-1/4	3-1/2	---	RL	30996	34436	30764	02465
		3/4	3	---	SL	39771	31541		02134
		1-1/4	3-1/2	---	RL	36602	34440	30766	02466
		1-1/4	3-1/2	.015	RL	37456	37578		37396
		1-1/4	3-1/2	.020	RL	37457	37579		37397
		1-1/4	3-1/2	.030	RL	37458	37580		37398
5/8	5/8	1-1/4	3-1/2	.045	RL	37459	37581		37399
		1-1/4	3-1/2	.060	RL	37460	37582		37400
		1-1/4	3-1/2	.090	RL	37461	37583		37401
		2	6	---	XR	31130			90160
		2-1/4	5	---	LL	30561	37742	37741	03408
		3	6	---	XL	34143	34142	34141	03608
11/16	3/4	1-1/2	4	---	RL	36603			02467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End Mill Sets

E14 Set Style	Order Code
AlTiN	30522
TiCN	33659
TiN	33656
MG	33651

Contains one each of:
1/8, 3/16, 1/4, 5/16, 3/8, 1/2

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

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E14 • Inch • Continued

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	R Corner Radius	Length Code	AlTiN	TiCN	TiN	MG
		1	3	---	SL	30435	31542		02135
		1-1/2	4	---	RL	98956	34448	30770	02468
		1-1/2	4	.015	RL	37462	37584		37402
		1-1/2	4	.020	RL	37463	37585		37403
		1-1/2	4	.030	RL	37464	37586		37404
		1-1/2	4	.045	RL	37465	37587		37405
3/4	3/4	1-1/2	4	.060	RL	37466	37588		37406
		1-1/2	4	.090	RL	37467	37589		37407
		1-1/2	4	.120	RL	37468	37590		37408
		1-1/2	4	.125	RL	37469	37591		37409
		2	6	---	XR	90306			31126
		2-1/4	5	---	LL	37751	37750	37749	03409
		3	6	---	XL	34151	34150	34149	03609
13/16	7/8	1-1/2	4	---	RL	90017			30771
7/8	7/8	1-1/2	4	---	RL	30523	34456	30774	02469
15/16	1	1-1/2	4	---	RL	31038			30775
		1-1/2	4	---	RL	98957	34464	30778	02470
		1-1/2	4	.015	RL	37470	37592		37410
		1-1/2	4	.020	RL	37471	37593		37411
		1-1/2	4	.030	RL	37472	37594		37412
		1-1/2	4	.045	RL	37473	37595		37413
1	1	1-1/2	4	.060	RL	37474	37596		37414
		1-1/2	4	.090	RL	37475	37597		37415
		1-1/2	4	.120	RL	37476	37598		37416
		1-1/2	4	.125	RL	37477	37599		37417
		2-1/4	5	---	LL	37767	37766		03410
		3	6	---	XL	34167	34166	34165	03610
1-1/4	1-1/4	2	4-1/2	---	RL				31178

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d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

E14W

- 4-Flute with holding flat
- Standard and long lengths
- Square corner and corner radius
- AlTiN, TiCN, TiN coating options

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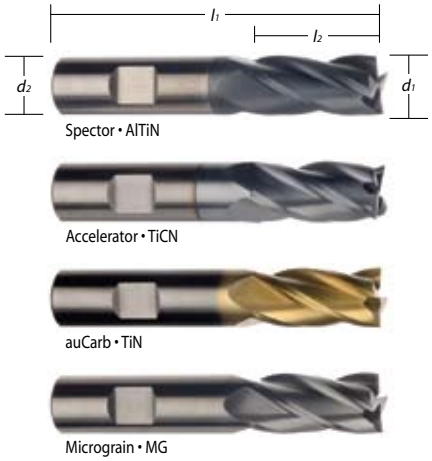
P M K



Former List Code Reference

E14W			AlTiN	TiCN	TiN	MG
Length Code						
DIN	**DL**	**SQ**	M790	M390		M290
Regular	**RL**	**SQ**	M790	M390	M490	M290
Regular	**RL**	**CR**	M785	M385		M285
Long	**LL**	**SQ**	M793		M493	M293
X-Long	**XL**	**SQ**	M794		M494	M294
Deep Milling	**DM**	**SQ**	M795		M495	M295

Metric

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	R Corner Radius	Length Code	AlTiN	TiCN	TiN	MG
6	6	13	57	---	RL	32207	34477		37110
8	8	19	63	---	RL	32210	34465		37115
10	10	22	72	---	RL	32213	34466		37119
12	12	26	83	---	RL	32215	34487		37123
14	14	26	83	---	RL	32217	34489		37125
16	16	32	92	---	RL	32278	34467		37127
18	18	32	92	---	RL	32219	34468		37129
20	20	38	104	---	RL	32220	34469		37132

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d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

inch sizes on next page

E14W • Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	R Corner Radius	Length Code	AlTiN	TiCN	TiN	MG
1/4	1/4	3/4	2-1/2	---	RL	39788	39779	39730	39729
5/16	5/16	13/16	2-1/2	---	RL	39789	39780	91803	39737
3/8	3/8	1	2-1/2	---	RL	39790	39781	39746	39745
		1	2-1/2	.015	RL	97665	39639		39514
		1	2-1/2	.020	RL	39715	39640		39515
		1	2-1/2	.030	RL	39605	39641		39516
		1	2-1/2	.045	RL	39598	39642		39517
		1	2-1/2	.060	RL	39702	39685		39614
		1	2-1/2	.090	RL	39703			39619
		1-1/8	3	---	LL	39168		39165	39164
		1-3/4	4	---	XL	39175		39174	39124
1/2	1/2	1	3	---	RL	39791	39782	39762	39761
		1	3	.015	RL	97710	39643		39518
		1	3	.020	RL	30560	39644		39519
		1	3	.030	RL	39704	39645		39520
		1	3	.045	RL	39600	39646		39521
		1	3	.060	RL	39597	39647		39522
		1	3	.090	RL	39705	39688		96599
		1	3	.120	RL	39706	98243		39621
		2	4	---	LL	39169		39733	96334
		3	6	---	XL	39176		96824	39134
		4	6	---	DM	39408		34091	39400
9/16	9/16	1-1/4	3-1/2	---	RL	39792	39783	39764	39763
5/8	5/8	1-1/4	3-1/2	---	RL	39793	39784	39766	39765
		1-1/4	3-1/2	.015	RL	39707	39648		39529
		1-1/4	3-1/2	.020	RL	39708			39523
		1-1/4	3-1/2	.030	RL	39709	39650		39524
		1-1/4	3-1/2	.045	RL	39710			39525
		1-1/4	3-1/2	.060	RL	39544	39652		39526
		1-1/4	3-1/2	.090	RL	39608			39527
		2-1/4	5	---	LL	39170		39166	39740
		3	6	---	XL	39177		39141	39173
		4	6	---	DM	39409		34092	39401
3/4	3/4	1-1/2	4	---	RL	39794	39785	39770	39769
		1-1/2	4	.015	RL	39711	39654		39533
		1-1/2	4	.020	RL	39712			39534
		1-1/2	4	.030	RL	39603	39656		39535
		1-1/2	4	.045	RL	39602			39536
		1-1/2	4	.060	RL	97575	39658		39530
		1-1/2	4	.090	RL	39713	39659		39531
		1-1/2	4	.120	RL	39714			39623
		1-1/2	4	.125	RL	39732	39660		39532
		2-1/4	5	---	LL	39171		96874	39748
		3	6	---	XL	39178		96011	39148
		4	6-1/2	---	DM	39410		34093	39402
7/8	7/8	1-1/2	4	---	RL	39795	39786	39774	39773
1	1	1-1/2	4	---	RL	39796	39787	39778	39777
		1-1/2	4	.015	RL	39716	39661		39537
		1-1/2	4	.020	RL	39717			39538
		1-1/2	4	.030	RL	39595	39671		39539
		1-1/2	4	.045	RL	39718			39540
		1-1/2	4	.060	RL	39596	39673		39541
		1-1/2	4	.090	RL	39719	39674		39542
		1-1/2	4	.120	RL	39720			39692
		1-1/2	4	.125	RL	39606	39675		39543
		2-1/4	5	---	LL	39172		39167	39964
		3	6	---	XL	39365		96623	96625
		4-1/8	7	---	DM	39411		34094	39403
1-1/8	1	2	4-1/2	---	RL	34087			39412

MOD

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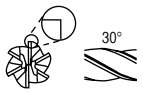
Big Max

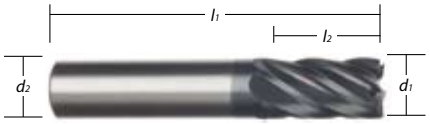
d_1>1¼

Page 42

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

E16 • 6-Flute





- 6-Flute, standard helix
- Standard length, square corner
- AlTiN, TiCN coating options
- For finishing work and hard materials

Technical • Technisch • Technique • Técnico

P K H

Page 5 & 35

Former List Code Reference					
E16					
Length Code			AlTiN	TiCN	MG
Regular	RL	SQ	M756 6FL	M856 6FL	M855 6FL

Metric

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Len. Code	AlTiN	TiCN	MG
4	4	14	50	RL	62432	39496	02841
6	6	19	63	RL	62433	39497	02844
8	8	20	63	RL	62434	39498	02846
10	10	25	72	RL	62435	39499	02848
12	12	25	76	RL	62436	39662	02850
16	16	32	89	RL	62438	39665	02860
20	20	38	100	RL	62440	39667	02861

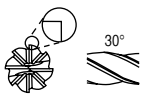
d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Len. Code	AlTiN	TiCN	MG
3/16	3/16	5/8	2	RL	37601		02821
1/4	1/4	3/4	2-1/2	RL	37602	30268	02822
5/16	5/16	13/16	2-1/2	RL	37603	30273	02823
3/8	3/8	1	2-1/2	RL	37604	30280	02824
1/2	1/2	1	3	RL	37605	30292	02826
3/4	3/4	1-1/2	4	RL	90122		02834
1	1	1-1/2	4	RL	90155		02835

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

E18 • 8-Flute



- 8-Flute, standard helix
- Standard length, square corner
- AlTiN, TiCN coating options
- For finishing work and hard materials

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P K H

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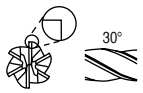
Former List Code Reference					
E18					
Length Code			AlTiN	TiCN	MG
Regular	RL	SQ	M756 8FL	M856 8FL	M855 8FL

Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Len. Code	AlTiN	TiCN	MG
5/8	5/8	1-1/4	3-1/2	RL	37606		02828
3/4	3/4	1-1/2	4	RL	37607	30311	02830

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

E16W



- 6-Flute with holding flat
- Former list code M851

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P K

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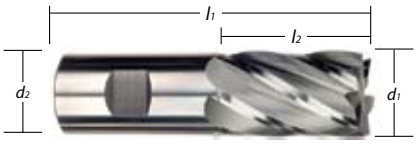
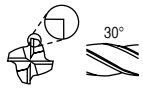


Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	MG
3/8	3/8	1	2-1/2	39280
1/2	1/2	1	3	39292
3/4	3/4	1-1/2	4	39310
1	1	1-1/2	4	39312
1-1/4	1-1/4	2	4-1/2	39413
1-3/8	1-1/4	2	4-1/2	39414
1-1/2	1-1/4	2	4-1/2	39415

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

E34



- 4-Flute, LHS/RHC
- Standard length, square corner
- Former list code M870

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P K

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Metric

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	MG
3	6	8	57	30224
4	6	11	57	30225
6	6	13	57	30236
10	10	22	72	30241
12	12	26	83	30242

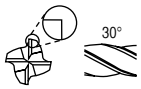
d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	MG
1/8	1/8	1/2	1-1/2	30208
1/4	1/4	3/4	2-1/2	30220
3/8	3/8	7/8	2-1/2	30232
1/2	1/2	1	3	30244
5/8	5/8	1-1/4	3-1/2	30250
3/4	3/4	1-1/2	4	30256

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

E24



- 4-Flute, double end
- Stub and standard length
- AlTiN, TiCN, TiN coating options

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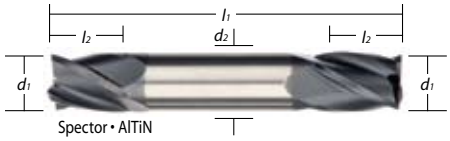
P M K



Spector • AlTiN

Accelerator • TiCN

auCarb • TiN

Micrograin • MG

Former List Code Reference

E24						
Length Code			**AlTiN**	**TiCN**	**TiN**	**MG**
Stub	**SL**	**SQ**	M724	M375	M475	M950
Regular	**RL**	**SQ**				M944

Metric

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Len. Code	AlTiN	TiCN	TiN	MG
2	3	3	38	SL	62374	30780		02321
3	3	6	38	SL	62376	30782		02323
4	4	8	50	SL	62378	30784		02325
5	5	10	50	SL	62380	30786		02327
6	6	12	63	SL	62381	30787		02328
8	8	12	63	SL	62382	30788		02330
10	10	14	72	SL	62383	30789		02332
12	12	16	76	SL	62384	30790		02334

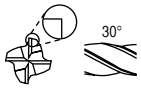
d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Len. Code	AlTiN	TiCN	TiN	MG
1/32	1/8	1/16	1-1/2	SL	31984	31962	31950	02281
3/64	1/8	3/32	1-1/2	SL	31900	31963	31951	02282
1/16	1/8	1/8	1-1/2	SL	31985	31964	31904	02283
		3/16	2	RL				33378
5/64	1/8	1/8	1-1/2	SL	31949	31965	31952	31932
3/32	1/8	3/16	1-1/2	SL	31927	31966	31906	02284
		9/32	2	RL				33379
7/64	1/8	3/16	1-1/2	SL	31957	31967	31953	31933
1/8	1/8	1/4	1-1/2	SL	99125	31968	31908	02285
		3/8	2	RL				33380
9/64	3/16	5/16	2	SL	31926	31969	31954	31934
5/32	3/16	5/16	2	SL	31995	31970	31910	02286
		7/16	2-1/2	RL				33381
11/64	3/16	5/16	2	SL	31958	31971		31935
3/16	3/16	3/8	2	SL	99331	31972	31912	02287
		1/2	2-1/2	RL				33382
7/32	1/4	1/2	2-1/2	SL	31959	31974	31914	02288
1/4	1/4	1/2	2-1/2	SL	31990	31976	31916	02289
		5/8	3	RL				33384
5/16	5/16	1/2	2-1/2	SL	31991	31980	31918	02290
		3/4	3	RL				33385
3/8	3/8	9/16	2-1/2	SL	31929	30682	31920	02291
		3/4	3-1/2	RL				33386
7/16	7/16	5/8	3	SL	31928	31988	31922	02292
1/2	1/2	5/8	3	SL	31998	31992	31924	02293
		1	4	RL				33388

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

E24W



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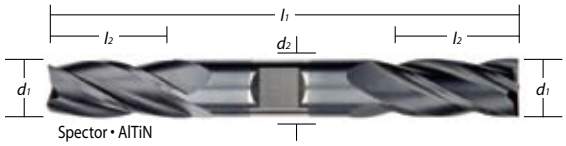
P M K



Spector • AlTiN

auCarb • TiN

Micrograin • MG

Former List Code Reference

E24W					
Length Code			**AlTiN**	**TiN**	**MG**
Regular	**RL**	**SQ**	M203	M201	M200

Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Length Code	AlTiN	TiN	MG
1/8	3/8	3/8	3-1/16	RL	36890	32706	02681
5/32	3/8	7/16	3-1/8	RL			02682
3/16	3/8	1/2	3-1/4	RL	98965	32710	02683
7/32	3/8	9/16	3-3/8	RL			02684
1/4	3/8	5/8	3-3/8	RL	33201	32740	02685
5/16	3/8	3/4	3-1/2	RL	33225	32864	02687
3/8	3/8	3/4	3-1/2	RL	33227	32722	02689
7/16	1/2	7/8	4	RL			02690
1/2	1/2	1	4	RL	33229	32895	02691
5/8	5/8	1-1/2	6	RL			02693
3/4	3/4	1-1/2	6	RL			02695

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

GENERAL PURPOSE END MILLS

Standard Vollhartmetallfräser • Usage général des fraises carbure monobloc • Fresas de metal duro de uso general

4 Precision Ground Flutes • Ball End

E14B

- 4-Flute, standard helix
- Ball end, plain shank
- Stub, standard and long lengths
- AlTiN, TiCN, TiN coating options

Technical • Technisch • Technique • Técnico

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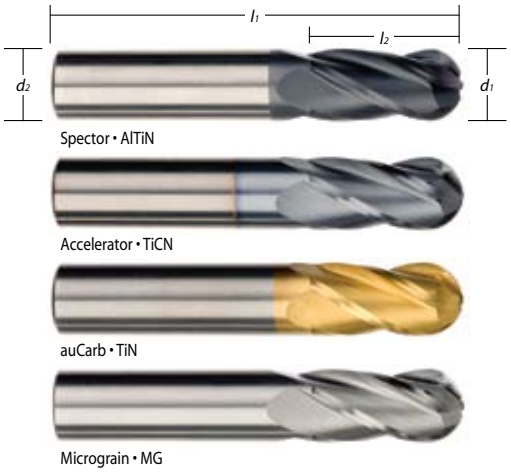
P M K



Former List Code Reference

E14B					
Length Code		**AlTiN**	**TiCN**	**TiN**	**MG**
Miniature	**3X**	M754R	M354R		M854R
Stub	**SL**	M735R	M335R	M435R	M600R
Regular	**RL**	M720R	M350R	M450R	M850R
Long	**LL**	M755R	M355R	M455R	M885R
Long Reach	**LR**	M797R			M897R
X-Long	**XL**	M760R	M360R	M460R	M895R
X-Long Reach	**XR**	M798R			M898R

E14B • Metric

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Length Code	AlTiN	MG
1	3	2	38	SL	39862	28109
		3	38	3X	39835	28103
1,5	3	3	38	SL	39863	28106
		4,5	38	3X	39845	28118
		6	38	RL	39836	02631
2	3	4	38	SL	39864	02241
		6,3	38	3X	39846	28121
		9	38	RL	39838	02632
2,5	3	5	38	SL	39867	02242
		9,5	38	RL	39839	02633
3	3	6	38	SL	39868	02243
		12	38	RL	39841	02634
		12	75	XR	37286	37233
		19	57	LL	39880	03461
		25	75	XL	39892	03661
3,5	4	14	50	RL	39842	02635
4	4	8	50	SL	39871	02245
		14	50	RL	39843	02636
		19	63	LL	39881	03462
		31	75	XL	39893	03662
4,5	5	16	50	RL	39844	32648
5	5	10	50	SL	39873	02247
		16	50	RL	39847	32649
		19	63	LL	39882	03463
		31	100	XL	39894	03663
6	6	12	54	SL	37361	39441
		15	100	LR	37294	37242
		19	63	RL	39848	02639
		29	75	LL	39883	03464
		38	100	XL	39895	03664
7	8	19	63	RL	39849	02652

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Len. Code	AlTiN	MG
8	8	14	58	SL	37362	39442
		20	63	RL	39850	02641
		20	100	LR	37295	37243
		29	75	LL	39884	03465
		41	100	XL	39896	03665
9	10	22	72	RL	39851	02653
10	10	16	66	SL	37364	39443
		25	72	RL	39852	02643
		25	100	LR	37296	37244
		25	150	XR	37287	37234
		40	88	LL	37366	39444
		45	100	XL	39897	03666
12	12	19	73	SL	37368	39445
		25	76	RL	39853	02645
		26	83	DL	37344	39446
		35	150	XR	37288	37235
		50	100	LL	39886	03467
		75	150	XL	39898	03667
14	14	32	83	RL	39854	34567
		75	150	XL	39899	03668
16	16	32	89	RL	39865	02647
		40	150	XR	37289	37236
		57	125	LL	39888	03469
		75	150	XL	39900	03669
18	18	38	100	RL	39857	02648
		75	150	XL	39901	03670
20	20	38	100	RL	39859	02649
		57	125	LL	39890	03471
		75	150	XL	39902	03671
22	22	38	100	RL	62573	02650
25	25	45	120	DL	37252	39448
		75	150	XL	39903	03672

d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Length Code	AlTiN	TiCN	TiN	MG
1/32	1/8	1/16	1-1/2	SL	31774			31699
		3/32	1-1/2	RL	30559	34501	30902	02201
3/64	1/8	3/32	1-1/2	SL	31775			31701
		9/64	1-1/2	RL	30539	34503	30904	02202
1/16	1/8	1/8	1-1/2	SL	31776	31730		02203
		3/16	1-1/2	RL	97852	34504	30906	02571
5/64	1/8	1/4	1-1/2	RL	30482	34505	30908	02572

continued on next page

E14B • Inch • Continued

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Length Code	AlTiN	TiCN	TiN	MG
3/32	1/8	3/16	1-1/2	SL	31700	31731		02204
		3/8	1-1/2	RL	30992	34506	30910	02573
7/64	1/8	3/8	1-1/2	RL	36604	34507	30912	02574
1/8	1/8	1/4	1-1/2	SL	31747	31732	31708	02205
		1/2	1-1/2	RL	30997	34508	30914	02575
		5/8	2	LR	37897			37892
		3/4	2-1/4	LL	37911	37910	37909	03441
		1	3	XL	97842	34310	34309	03641
9/64	3/16	9/16	2	RL	31050	34509		30915
5/32	3/16	5/16	2	SL	30465			02206
		9/16	2	RL	30468	34541	30918	02576
3/16	3/16	3/8	2	SL	31746	31734	31712	02207
		5/8	2	RL	30524	34542	30922	02577
		3/4	2-1/2	LL	37915	37914	37913	03442
		1	4	LR	37898			93336
		1-1/8	3	XL	37938	34314	34313	03642
7/32	1/4	5/8	2-1/2	RL	36605	34543	30926	02578
1/4	1/4	1/2	2	SL	31745	31736	31716	02209
		3/4	2-1/2	RL	30998	34544	30930	02579
		1	4	LR	37899			37893
		1-1/8	3	LL	37919	37918	37917	03443
		1-1/2	4	XL	96411	34318	34317	03643
		1-1/2	6	XR	97844			31363
9/32	5/16	3/4	2-1/2	RL	30464	34545		02580
5/16	5/16	1/2	2	SL	31751			02210
		13/16	2-1/2	RL	30525	34546	30938	02581
		1	4	LR	37900			37894
		1-1/8	3	LL	34323	37922	37921	03444
		1-5/8	4	XL	34361	34322		03644
11/32	3/8	1	2-1/2	RL	30408			30941
3/8	3/8	5/8	2	SL	31749	31738	31720	02211
		1	2-1/2	RL	98262	34547	30946	02582
		1	4	LR	37901			37895
		1-1/8	3	LL	37927	37926	37925	03445
		1-1/2	6	XR	97845			31335
		1-3/4	4	XL	34335	34326	34325	03645
13/32	7/16	1	2-3/4	RL	31000			30949
7/16	7/16	1	2-3/4	RL	31052	34549	30899	30900
		2	4	LL	30485	37930		03446
		3	6	XL	30487			03646
15/32	1/2	1	3	RL	30481			30957
1/2	1/2	5/8	2-1/2	SL	31743	31740	31724	02213
		1	3	RL	97922	34552	90300	02584
		1	4	LR	37902			37896
		1-1/2	6	XR	97846			31347
		2	4	LL	37935	37934	37933	03447
		3	6	XL	30473	34334	34333	03647
9/16	9/16	1-1/4	3-1/2	RL	30409	34555		02585
5/8	5/8	1-1/4	3-1/2	RL	30991	34557	91622	02586
		2	6	XR	37868			31350
		2-1/4	5	LL	30486	37942		03448
		3	6	XL	30488	34342		03648
11/16	3/4	1-1/2	4	RL	31051	34558		02587
3/4	3/4	1	3	SL	31773			02215
		1-1/2	4	RL	95757	34548	30970	02588
		2	6	XR	37869			31352
		2-1/4	5	LL	37937	37950		03449
		3	6	XL	30474	34350		03649
7/8	7/8	1-1/2	4	RL	30527	34556		02589
1	1	1-1/2	4	RL	30528	34564	30978	02590
		2-1/4	5	LL	37967	37966		03450
		3	6	XL	30476	34366		03650

MOD

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End Mill Sets

E14B Set Style	Order Code
AlTiN	39427
TiCN	33662
TiN	33666
MG	33661

Contains one each of:
1/8, 3/16, 1/4, 5/16, 3/8, 1/2

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

E24B

- 4-Flute, double end
- Ball end, plain shank
- Stub and standard lengths
- AlTiN, TiCN, TiN coating options

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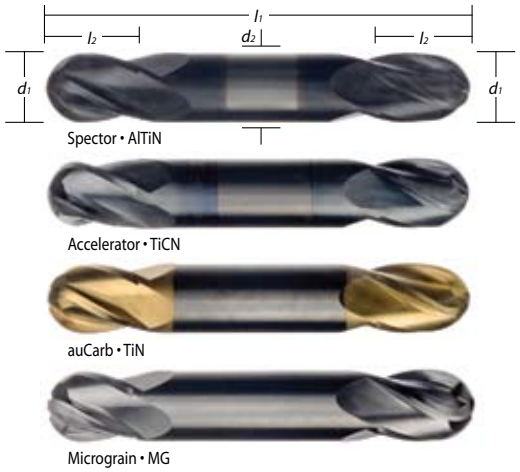


Former List Code Reference					
E24B					
Length Code		**AlTiN**	**TiCN**	**TiN**	**MG**
Stub	**SL**	M724R	M375R	M475R	M950R
Regular	**RL**				M944R

Metric

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Length Code	AlTiN	TiCN	TiN	MG
2	3	3	38	SL	62711			02401
2,5	3	4	38	SL	62712			02402
3	3	6	38	SL	62713			02403
4	4	8	50	SL	62714			02405
5	5	10	50	SL	62715			02407
6	6	12	63	SL	62716			02408
8	8	12	63	SL	62717			02410
10	10	14	72	SL	62718			02412

d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Length Code	AlTiN	TiCN	TiN	MG
1/32	1/8	1/16	1-1/2	SL	32005	37044	90489	02361
3/64	1/8	3/32	1-1/2	SL	32006	37045	90862	02362
1/16	1/8	1/8	1-1/2	SL	32007	37046	90510	02363
		3/16	2	RL				33578
5/64	1/8	1/8	1-1/2	SL	32008			31636
3/32	1/8	3/16	1-1/2	SL	32009	37048	32106	02364
		9/32	2	RL				33579
7/64	1/8	3/16	1-1/2	SL	32010			32131
1/8	1/8	1/4	1-1/2	SL	32011	37051	32108	02365
		3/8	2	RL				33580
9/64	3/16	5/16	2	SL	32012			32133
5/32	3/16	5/16	2	SL	32013	37053		02366
3/16	3/16	3/8	2	SL	32014	37054	90734	02367
		1/2	2-1/2	RL				33582
7/32	1/4	1/2	2-1/2	SL	32015			02368
1/4	1/4	1/2	2-1/2	SL	32016	37056	32116	02369
		5/8	3	RL				33584
5/16	5/16	1/2	2-1/2	SL	32017	37057		02370
3/8	3/8	9/16	2-1/2	SL	32018	37058	90522	02371
		3/4	3-1/2	RL				33586
7/16	7/16	5/8	3	SL	32019			02372
1/2	1/2	5/8	3	SL	32020	37060	90524	02373
		1	4	RL				33588

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

3-FLUTE END MILLS

Design Features for Every Application

End designs

- Corner radii – a wide variety to meet your part specification requirements
- Square corners for general machining and finishing
- Ball nose styles for contouring

Shank designs

- Precision tolerance to fit all collets and most shrink-fit systems
- Also standard with flats for use in end mill holders

Multiple lengths

- Long reach with stub flutes for deep cavity machining
- Long length with extra flute lengths for finishing passes
- Stub length for extra rigidity

Three-flute end mills are often a good compromise between the high flute volume of 2-flute tools and the greater strength and surface finishes of 4-flute tools. Use 3-flute tools when high metal removal rates are needed and surface finish is not critical.

Use in general milling applications in low to medium carbon steels, cast iron, easy to machine stainless steels, composites, plastics, graphite, aluminum alloys, copper alloys, brass and bronze.

Application Guide • Speed & Feed

Work Material	Type of Cut	Axial DOC	Radial DOC	Speed (m/min) MG	TiCN	AlTiN	Feed (mm Per Tooth) 3,0	6,0	9,0	12,0	16,0	19,0	25,0
Aluminum Alloys 2024, 6061, 7075	Slot	.5 x D	1 x D	107	168	168	.0203	.0381	.0559	.0762	.0940	.1194	.1524
	Rough	1 x D	.5 x D	137	198	198	.0254	.0508	.0762	.1016	.1270	.1524	.2032
	Finish	1.5 x D	.01 x D	168	229	229	.0254	.0508	.0762	.1016	.1270	.1524	.2032
Copper Alloys Brass & Bronze	Slot	.5 x D	1 x D	84	107	107	.0152	.0305	.0457	.0635	.0762	.0991	.1270
	Rough	1 x D	.5 x D	91	122	122	.0203	.0381	.0559	.0762	.0940	.1194	.1524
	Finish	1.5 x D	.01 x D	107	137	137	.0229	.0432	.0660	.0889	.1143	.1397	.1778
Composites, Plastics	Slot	.5 x D	1 x D	91	107	107	.0203	.0381	.0559	.0762	.0940	.1194	.1524
	Rough	1 x D	.5 x D	114	137	137	.0229	.0457	.0686	.0889	.1143	.1397	.1778
	Finish	1.5 x D	.01 x D	137	198	198	.0229	.0457	.0686	.0889	.1143	.1397	.1778
Magnesium Alloys	Slot	.5 x D	1 x D	107	168	168	.0203	.0381	.0559	.0762	.0940	.1194	.1524
	Rough	1 x D	.5 x D	137	198	198	.0254	.0508	.0762	.1016	.1270	.1524	.2032
	Finish	1.5 x D	.01 x D	168	229	229	.0254	.0508	.0762	.1016	.1270	.1524	.2032
Graphite	Slot	.5 x D	1 x D	107	122	137	.0203	.0381	.0584	.0762	.0940	.1143	.1524
	Rough	1 x D	.5 x D	130	145	160	.0229	.0432	.0660	.0889	.1092	.1346	.1778
	Finish	1.5 x D	.01 x D	152	168	183	.0254	.0483	.0711	.0965	.1194	.1448	.1930
Cast Iron - Gray	Slot	.5 x D	1 x D	61	107	107	.0102	.0178	.0279	.0381	.0483	.0584	.0762
	Rough	1 x D	.5 x D	76	122	122	.0127	.0254	.0381	.0508	.0635	.0762	.1016
	Finish	1.5 x D	.01 x D	91	137	137	.0178	.0381	.0559	.0762	.0965	.1143	.1524
Cast Iron - Ductile	Slot	.5 x D	1 x D	61	76	76	.0102	.0178	.0279	.0381	.0457	.0584	.0762
	Rough	1 x D	.5 x D	76	84	84	.0127	.0254	.0381	.0508	.0635	.0762	.1016
	Finish	1.5 x D	.01 x D	84	99	99	.0152	.0305	.0457	.0584	.0711	.0864	.1168
Low Carbon Steel ≤ 38 HRc 1018, 12L14, 8620	Slot	.5 x D	1 x D	76	84	91	.0127	.0254	.0381	.0508	.0635	.0762	.1016
	Rough	1 x D	.5 x D	84	91	99	.0152	.0305	.0457	.0635	.0787	.0940	.1270
	Finish	1.5 x D	.01 x D	91	99	107	.0178	.0381	.0559	.0762	.0965	.1143	.1524
Medium Carbon Steels ≤ 38 HRc 4140, 4340	Slot	.5 x D	1 x D	69	76	84	.0127	.0254	.0381	.0508	.0635	.0762	.1016
	Rough	1 x D	.5 x D	76	84	91	.0152	.0305	.0457	.0635	.0787	.0940	.1270
	Finish	1.5 x D	.01 x D	84	91	99	.0178	.0381	.0559	.0762	.0965	.1143	.1524
Tool & Die Steels ≤ 38 HRc A2, D2, H13, P20	Slot	.5 x D	1 x D	69	76	84	.0127	.0254	.0381	.0508	.0635	.0762	.1016
	Rough	1 x D	.5 x D	76	84	91	.0152	.0305	.0457	.0635	.0787	.0940	.1270
	Finish	1.5 x D	.01 x D	84	91	99	.0178	.0381	.0559	.0762	.0965	.1143	.1524
Easy to Machine Stainless Steel 416, 410, 302, 303	Slot	.5 x D	1 x D	61	76	76	.0076	.0178	.0279	.0381	.0483	.0584	.0762
	Rough	1 x D	.5 x D	76	84	84	.0127	.0254	.0381	.0508	.0635	.0762	.1016
	Finish	1.5 x D	.01 x D	91	99	99	.0152	.0305	.0457	.0635	.0787	.0965	.1270
Moderate Machining Stainless Steels 304, 316, Invar, Kovar	Slot	.5 x D	1 x D	61	69	76	.0064	.0127	.0191	.0254	.0305	.0381	.0508
	Rough	1 x D	.5 x D	76	84	91	.0076	.0178	.0279	.0381	.0483	.0559	.0762
	Finish	1.5 x D	.01 x D	91	99	107	.0102	.0229	.0356	.0457	.0584	.0686	.0914

Speed (SFM) MG	TiCN	AlTiN	Feed (Inches Per Tooth) 1/8	1/4	3/8	1/2	5/8	3/4	1
350	550	550	.0008	.0015	.0022	.0030	.0037	.0047	.0060
450	650	650	.0010	.0020	.0030	.0040	.0050	.0060	.0080
550	750	750	.0010	.0020	.0030	.0040	.0050	.0060	.0080
275	350	350	.0006	.0012	.0018	.0025	.0030	.0039	.0050
300	400	400	.0008	.0015	.0022	.0030	.0037	.0047	.0060
350	450	450	.0009	.0017	.0026	.0035	.0045	.0055	.0070
300	350	350	.0008	.0015	.0022	.0030	.0037	.0047	.0060
375	450	450	.0009	.0018	.0027	.0035	.0045	.0055	.0070
450	650	650	.0009	.0018	.0027	.0035	.0045	.0055	.0070
350	550	550	.0008	.0015	.0022	.0030	.0037	.0047	.0060
450	650	650	.0010	.0020	.0030	.0040	.0050	.0060	.0080
550	750	750	.0010	.0020	.0030	.0040	.0050	.0060	.0080
350	400	450	.0008	.0015	.0023	.0030	.0037	.0045	.0060
425	475	525	.0009	.0017	.0026	.0035	.0043	.0053	.0070
500	550	600	.0010	.0019	.0028	.0038	.0047	.0057	.0076
200	350	350	.0004	.0007	.0011	.0015	.0019	.0023	.0030
250	400	400	.0005	.0010	.0015	.0020	.0025	.0030	.0040
300	450	450	.0007	.0015	.0022	.0030	.0038	.0045	.0060
200	250	250	.0004	.0007	.0011	.0015	.0018	.0023	.0030
250	275	275	.0005	.0010	.0015	.0020	.0025	.0030	.0040
275	325	325	.0006	.0012	.0018	.0023	.0028	.0034	.0046
250	275	300	.0005	.0010	.0015	.0020	.0025	.0030	.0040
275	300	325	.0006	.0012	.0018	.0025	.0031	.0037	.0050
300	325	350	.0007	.0015	.0022	.0030	.0038	.0045	.0060
225	250	275	.0005	.0010	.0015	.0020	.0025	.0030	.0040
250	275	300	.0006	.0012	.0018	.0025	.0031	.0037	.0050
275	300	325	.0007	.0015	.0022	.0030	.0038	.0045	.0060
225	250	275	.0005	.0010	.0015	.0020	.0025	.0030	.0040
250	275	300	.0006	.0012	.0018	.0025	.0031	.0037	.0050
275	300	325	.0007	.0015	.0022	.0030	.0038	.0045	.0060
200	250	250	.0003	.0007	.0011	.0015	.0019	.0023	.0030
250	275	275	.0005	.0010	.0015	.0020	.0025	.0030	.0040
300	325	325	.0006	.0012	.0018	.0025	.0031	.0038	.0050
200	225	250	.0003	.0005	.0008	.0010	.0012	.0015	.0020
250	275	300	.0003	.0007	.0011	.0015	.0019	.0022	.0030
300	325	350	.0004	.0009	.0014	.0018	.0023	.0027	.0036

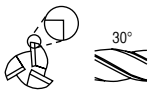
D = tool diameter Reduce feed rates by 20% when using long length tools Starting parameters shown

GENERAL PURPOSE END MILLS

Standard Vollhartmetallfräser • Usage général des fraises carbure monobloc • Fresas de metal duro de uso general

3 Precision Ground Flutes • Square End

E13



- 3-Flute, standard helix
- Stub, standard and long lengths
- Square corner and corner radius
- AlTiN coating option

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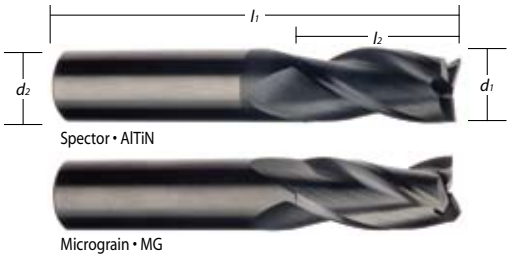
P M K N



Spector • AlTiN

Micrograin • MG

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MOD

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Former List Code Reference

E13				
Length Code			**AlTiN**	**MG**
Miniature	**3X**	**SQ**	M753	M853
Stub	**SL**	**SQ**	M745	M400
DIN	**DL**	**SQ**	M733	M233
DIN	**DL**	**CR**	M733CR	M233CR
Regular	**RL**	**SQ**	M730	M820
Long	**LL**	**SQ**	M703	M883
Long Reach	**LR**	**SQ**	M784	M884
X-Long	**XL**	**SQ**	M763	M893
X-Long Reach	**XR**	**SQ**	M786	M886
Deep Milling	**DM**	**SQ**		M894

Metric

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	R Corner Radius	Len. Code	AlTiN	MG
1	3	2	38	---	SL	30897	28008
		3	38	---	3X	62456	28002
1,5	3	3	38	---	SL	62272	28005
		4,5	38	---	3X	62457	28022
		6	38	---	RL	37012	32481
2	3	4	38	---	SL	62273	32141
		6,3	38	---	3X	62458	28025
		9	38	---	RL	37014	32482
2,5	3	5	38	---	SL	62274	32142
		9,5	38	---	RL	37016	32483
3	3	6	38	---	SL	62275	32143
		9	38	---	3X	99801	36732
		12	38	---	RL	30247	32484
		12	38	0,3	RL	36951	36785
		12	75	---	XR	33374	31280
		19	57	---	LL	62260	03321
		25	75	---	XL	62170	03521
3,5	4	14	50	---	RL	37018	32485
4	4	8	50	---	SL	62277	32145
		11	50	---	DL	36771	36734
		11	50	0,4	RL	36952	36786
		14	50	---	RL	37020	32486
		19	63	---	LL	62261	03322
		31	75	---	XL	62171	03522
4,5	5	16	50	---	RL	37022	31458
5	5	10	50	---	SL	62279	32147
		13	50	---	DL	36772	36736
		13	50	0,5	RL	36953	36787
		16	50	---	RL	37024	31459
		19	63	---	LL	62262	03323
		31	100	---	XL	62172	03523
6	6	12	54	---	SL	36949	38841
		13	57	---	DL	36773	36738
		13	57	0,3	RL	36954	36788
		13	57	0,5	RL	36955	36789
		15	100	---	LR	33371	31284
		19	63	---	RL	37026	32489
		29	75	---	LL	62263	03324
		38	100	---	XL	62173	03524
		75	150	---	DM		77013
7	7	16	60	---	DL	36774	36740
	8	19	63	---	RL	37002	32479
8	8	14	58	---	SL	37168	38842
		19	63	---	DL	36775	36742
		19	63	0,5	RL	36956	36790
		19	63	1,0	RL	36957	36791
		19	63	1,5	RL	36958	36792

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Len. of Cut	l_1 Overall Length	R Corner Radius	Len. Code	AlTiN	MG
8	8	20	63	---	RL	37028	32491
		20	100	---	LR	33372	31285
		29	75	---	LL	62264	03325
		41	100	---	XL	62174	03525
9	9	19	67	---	DL	36776	36744
	10	22	72	---	RL	37030	32480
10	10	16	66	---	SL	37172	38843
		22	72	---	DL	36777	36746
		22	72	0,5	RL	36959	36793
		22	72	1,0	RL	36960	36794
		22	72	1,5	RL	36961	36795
		25	72	---	RL	37031	32493
		25	100	---	LR	33373	31286
		25	150	---	XR	33375	31281
		40	88	---	LL	37166	31644
		45	100	---	XL	62175	03526
		75	150	---	DM		77016
		75	200	---	DM		77017
11	11	26	83	---	DL	36778	36747
12	12	19	73	---	SL	37164	38844
		25	76	---	RL	37034	32495
		26	83	---	DL	36779	36748
		26	83	0,5	RL	36962	36796
		26	83	1,0	RL	36963	36797
		26	83	1,5	RL	36964	36798
		35	150	---	XR	33376	31282
		50	100	---	LL	62266	03327
		75	150	---	XL	62176	03527
		75	200	---	DM		77019
14	14	26	83	---	DL	36780	36750
		57	125	---	LL	62267	03328
		75	150	---	XL	62177	03528
16	16	25	82	---	SL	62287	32156
		32	92	---	DL	36781	36752
		40	150	---	XR	33377	31283
		57	125	---	LL	62268	03329
		75	150	---	XL	62178	03529
		75	200	---	DM		77021
18	18	32	92	---	DL	36782	36753
		57	125	---	LL	62269	03330
		75	150	---	XL	62179	03530
20	20	38	104	---	DL	36783	36754
		57	125	---	LL	62270	03331
		75	150	---	XL	62180	03531
25	25	45	120	---	DL	36950	36755

d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

inch sizes listed on next page

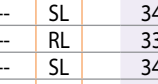
E13 • Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	R Corner Radius	Len. Code	AlTiN	MG
1/32	1/8	1/16	1-1/2	---	SL	34095	34697
		3/32	1-1/2	---	RL	33801	32101
3/64	1/8	3/32	1-1/2	---	SL	34096	34700
		9/64	1-1/2	---	RL	33819	32102
1/16	1/8	1/8	1-1/2	---	SL	34057	32103
		3/16	1-1/2	---	RL	33826	32421
5/64	1/8	1/4	1-1/2	---	RL	34102	32422
3/32	1/8	3/16	1-1/2	---	SL	34011	32104
		3/8	1-1/2	---	RL	33827	32423
7/64	1/8	3/8	1-1/2	---	RL	34103	32424
1/8	1/8	1/4	1-1/2	---	SL	33800	32105
		1/2	1-1/2	---	RL	33810	32425
		3/4	2-1/4	---	LL	33911	03301
		1	3	---	XL	34046	03501
5/32	3/16	9/16	2	---	RL	33814	32426
3/16	3/16	3/8	2	---	SL	34058	32107
		5/8	2	---	RL	33850	32427
		3/4	2-1/2	---	LL	33913	03302
		1-1/8	3	---	XL	34047	03502
7/32	1/4	5/8	2-1/2	---	RL	33851	32428

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Len. of Cut	l_1 Overall Length	R Corner Radius	Len. Code	AlTiN	MG
1/4	1/4	1/2	2	---	SL	34059	32109
		3/4	2-1/2	---	RL	33852	32429
		1-1/8	3	---	LL	33929	03303
		1-1/2	4	---	XL	34051	03503
5/16	5/16	1/2	2	---	SL	34060	32110
		13/16	2-1/2	---	RL	33853	32431
		1-5/8	4	---	XL	34097	03504
3/8	3/8	5/8	2	---	SL	34061	32111
		1	2-1/2	---	RL	33854	32432
		1-1/8	3	---	LL	33931	03305
		1-3/4	4	---	XL	34052	03505
7/16	7/16	1	2-3/4	---	RL	30422	33863
1/2	1/2	5/8	2-1/2	---	SL	34063	32113
		1	3	---	RL	90089	32434
		2	4	---	LL	33932	03307
		3	6	---	XL	34053	03507
5/8	5/8	1-1/4	3-1/2	---	RL	33855	32436
		2-1/4	5	---	LL	34068	03308
		3	6	---	XL	34054	03508
3/4	3/4	1-1/2	4	---	RL	33856	32438
		2-1/4	5	---	LL	34069	03309
		3	6	---	XL	34055	03509

E13W



- E13 geometry with holding flat

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P M K N

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Former List Code Reference				
E13W				
Length Code			AlTiN	MG
DIN / Regular	DL	SQ	M736	M236

Metric

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	AlTiN	MG
6	6	13	57	37312	36990
8	8	19	63	37314	36992
10	10	22	72	37316	36994
12	12	26	83	37318	36995
14	14	26	83	37320	36996
16	16	32	92	37322	36997
18	18	32	92	37324	36998
20	20	38	104	37326	36999

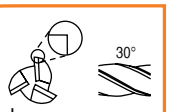
d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	AlTiN	MG
1/4	1/4	3/4	2-1/2	37330	37338
5/16	5/16	13/16	2-1/2	37331	37339
3/8	3/8	1	2-1/2	37333	37340
1/2	1/2	1	3	37334	37341
5/8	5/8	1-1/4	3-1/2	37335	37342
3/4	3/4	1-1/2	4	37336	37343

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

E23



- E13 geometry with double end

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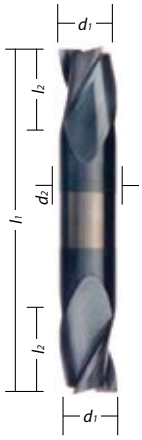

Former List Code Reference				
E23				
Length Code			AlTiN	MG
Stub	SL	SQ	M723	M930

Metric

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	AlTiN	MG
2	3	3	38	62363	31973
3	3	6	38	62365	31977
4	4	8	50	62367	31979
5	5	10	50	62369	31982
6	6	12	63	62370	31983
8	8	12	63	62371	31986
10	10	14	72	62372	31987
12	12	16	76	62373	31989

d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	AlTiN	MG
1/8	1/8	1/4	1-1/2	32076	31993
3/16	3/16	3/8	2	32075	31994
1/4	1/4	1/2	2-1/2	32077	31996
5/16	5/16	1/2	2-1/2	32078	31997
3/8	3/8	9/16	2-1/2	32079	31999
1/2	1/2	5/8	3	32081	32000

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

E13B

- 3-Flute, standard helix
- Ball end, plain shank
- Stub, standard and long lengths
- AlTiN, TiCN coating options

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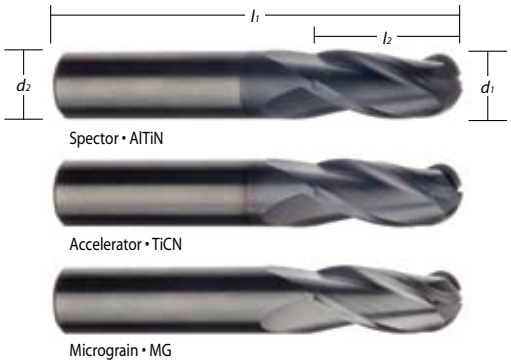
P M K N



Spector • AlTiN

Accelerator • TiCN

Micrograin • MG

Former List Code Reference

E13B				
Length Code		**AlTiN**	**TiCN**	**MG**
Miniature	**3X**	M753R		M853R
Stub	**SL**	M745R		M400R
Regular	**RL**	M730R	M320R	M820R
Long	**LL**	M703R		M883R
Long Reach	**LR**	M784R		M884R
X-Long	**XL**	M763R		M893R
X-Long Reach	**XR**	M786R		M886R

Metric

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Len. Code	AlTiN	MG
1	3	3	38	3X	62460	28102
1,5	3	3	38	SL	62689	28105
		4,5	38	3X	62461	28117
		6	38	RL	62601	32601
2	3	4	38	SL	62690	32221
		6,3	38	3X	62462	28120
		9	38	RL	62602	32602
3	3	6	38	SL	62692	32223
		12	38	RL	62604	32604
		12	75	XR	37290	37238
		19	57	LL	62637	03361
		25	75	XL	62661	03561
4	4	8	50	SL	62694	32225
		14	50	RL	62606	32606
		19	63	LL	62638	03362
		31	75	XL	62662	03562
5	5	10	50	SL	62696	32227
		16	50	RL	62608	32579
		19	63	LL	62639	03363
		31	100	XL	62663	03563
6	6	12	54	SL	37500	39459
		15	100	LR	37370	37270
		19	63	RL	32591	32609
		29	75	LL	62640	03364
		38	100	XL	62664	03564
8	8	20	63	RL	32592	32611
		20	100	LR	37371	37271
		29	75	LL	62641	03365
		41	100	XL	62665	03565
10	10	16	66	SL	37376	39461
		25	72	RL	32593	32613
		25	100	LR	37372	37272
		25	150	XR	37291	37239
		40	88	LL	37374	39462
		45	100	XL	62666	03566
12	12	19	73	SL	37378	39463
		26	83	DL	37380	39464
		35	150	XR	37292	37240
		50	100	LL	62643	03367
		75	150	XL	62667	03567
16	16	32	89	RL	62613	32617
		40	150	XR	37293	37241
		57	125	LL	62645	03369
		75	150	XL	62669	03569
20	20	38	100	RL	62615	32619
		57	125	LL	62647	03371
		75	150	XL	62671	03571
25	25	45	120	DL	37381	39465
		75	150	XL	62672	03572

d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Len. Code	AlTiN	TiCN	MG
1/32	1/8	3/32	1-1/2	RL	62053		32181
3/64	1/8	9/64	1-1/2	RL	62054		32182
1/16	1/8	1/8	1-1/2	SL	62063		32183
		3/16	1-1/2	RL	62055	33974	32541
3/32	1/8	3/16	1-1/2	SL	62064		32184
		3/8	1-1/2	RL	62056	33975	32543
1/8	1/8	1/4	1-1/2	SL	62065		32185
		1/2	1-1/2	RL	62057	33976	32545
		3/4	2-1/4	LL	62070		03341
		1	3	XL	62079		03541
3/16	3/16	3/8	2	SL	62066		32187
		5/8	2	RL	62058	33977	32547
		3/4	2-1/2	LL	62071		03342
		1-1/8	3	XL	62080		03542
1/4	1/4	1/2	2	SL	62067		32189
		3/4	2-1/2	RL	62059	33978	32549
		1-1/8	3	LL	62072		03343
		1-1/2	4	XL	62081		03543
3/8	3/8	5/8	2	SL	62068		32191
		1	2-1/2	RL	99776	33979	32552
		1-1/8	3	LL	62074		03345
		1-3/4	4	XL	62083		03545
1/2	1/2	5/8	2-1/2	SL	62069		32193
		1	3	RL	62060	33980	32554
		2	4	LL	62075		03347
		3	6	XL	62084		03547
5/8	5/8	2-1/4	5	LL	62076		03348
		3	6	XL	62085		03548
3/4	3/4	2-1/4	5	LL	62077		03349
		3	6	XL	62086		03549
1	1	2-1/4	5	LL	62078		03350
		3	6	XL	62087		03550

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

MOD

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2-FLUTE END MILLS

Design Features for Every Application

End designs

- Corner radii – a wide variety to meet your part specification requirements
- Square corners for general machining and finishing
- Ball nose styles for contouring

Shank designs

- Precision tolerance to fit all collets and most shrink-fit systems
- Also standard with flats for use in end mill holders

Multiple lengths

- Long reach with stub flutes for deep cavity machining
- Long length with extra flute lengths for finishing passes
- Stub length for extra rigidity

Two-flute end mills are designed for plunging, slotting, and increased chip clearance at higher feed rates in heavy peripheral cuts.

Use in general milling applications in low to medium carbon steels, cast iron, easy to machine stainless steels, composites, plastics, graphite, aluminum and aluminum alloys, copper alloys, brass and bronze.

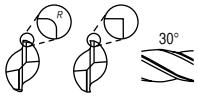
Application Guide • Speed & Feed

Work Material	Type of Cut	Axial DOC	Radial DOC	Speed (m/min) MG	TiCN	AlTiN	Feed (mm Per Tooth) 3,0	6,0	9,0	12,0	16,0	19,0	25,0
Aluminum Alloys 2024, 6061, 7075	Slot	.5 x D	1 x D	107	168	168	.0203	.0381	.0559	.0762	.0940	.1194	.1524
	Rough	1 x D	.5 x D	137	198	198	.0254	.0508	.0762	.1016	.1270	.1524	.2032
	Finish	1.5 x D	.01 x D	168	229	229	.0254	.0508	.0762	.1016	.1270	.1524	.2032
Copper Alloys Brass & Bronze	Slot	.5 x D	1 x D	84	107	107	.0152	.0305	.0457	.0635	.0762	.0991	.1270
	Rough	1 x D	.5 x D	91	122	122	.0203	.0381	.0559	.0762	.0940	.1194	.1524
	Finish	1.5 x D	.01 x D	107	137	137	.0229	.0432	.0660	.0889	.1143	.1397	.1778
Composites, Plastics	Slot	.5 x D	1 x D	91	107	107	.0203	.0381	.0559	.0762	.0940	.1194	.1524
	Rough	1 x D	.5 x D	114	137	137	.0229	.0457	.0686	.0889	.1143	.1397	.1778
	Finish	1.5 x D	.01 x D	137	198	198	.0229	.0457	.0686	.0889	.1143	.1397	.1778
Magnesium Alloys	Slot	.5 x D	1 x D	107	168	168	.0203	.0381	.0559	.0762	.0940	.1194	.1524
	Rough	1 x D	.5 x D	137	198	198	.0254	.0508	.0762	.1016	.1270	.1524	.2032
	Finish	1.5 x D	.01 x D	168	229	229	.0254	.0508	.0762	.1016	.1270	.1524	.2032
Graphite	Slot	.5 x D	1 x D	107	122	137	.0203	.0381	.0584	.0762	.0940	.1143	.1524
	Rough	1 x D	.5 x D	130	145	160	.0229	.0432	.0660	.0889	.1092	.1346	.1778
	Finish	1.5 x D	.01 x D	152	168	183	.0254	.0483	.0711	.0965	.1194	.1448	.1930
Cast Iron - Gray	Slot	.5 x D	1 x D	61	107	107	.0102	.0178	.0279	.0381	.0483	.0584	.0762
	Rough	1 x D	.5 x D	76	122	122	.0127	.0254	.0381	.0508	.0635	.0762	.1016
	Finish	1.5 x D	.01 x D	91	137	137	.0178	.0381	.0559	.0762	.0965	.1143	.1524
Cast Iron - Ductile	Slot	.5 x D	1 x D	61	76	76	.0102	.0178	.0279	.0381	.0457	.0584	.0762
	Rough	1 x D	.5 x D	76	84	84	.0127	.0254	.0381	.0508	.0635	.0762	.1016
	Finish	1.5 x D	.01 x D	84	99	99	.0152	.0305	.0457	.0584	.0711	.0864	.1168
Low Carbon Steel ≤ 38 HRc 1018, 12L14, 8620	Slot	.5 x D	1 x D	76	84	91	.0127	.0254	.0381	.0508	.0635	.0762	.1016
	Rough	1 x D	.5 x D	84	91	99	.0152	.0305	.0457	.0635	.0787	.0940	.1270
	Finish	1.5 x D	.01 x D	91	99	107	.0178	.0381	.0559	.0762	.0965	.1143	.1524
Medium Carbon Steels ≤ 38 HRc 4140, 4340	Slot	.5 x D	1 x D	69	76	84	.0127	.0254	.0381	.0508	.0635	.0762	.1016
	Rough	1 x D	.5 x D	76	84	91	.0152	.0305	.0457	.0635	.0787	.0940	.1270
	Finish	1.5 x D	.01 x D	84	91	99	.0178	.0381	.0559	.0762	.0965	.1143	.1524
Tool & Die Steels ≤ 38 HRc A2, D2, H13, P20	Slot	.5 x D	1 x D	69	76	84	.0127	.0254	.0381	.0508	.0635	.0762	.1016
	Rough	1 x D	.5 x D	76	84	91	.0152	.0305	.0457	.0635	.0787	.0940	.1270
	Finish	1.5 x D	.01 x D	84	91	99	.0178	.0381	.0559	.0762	.0965	.1143	.1524
Easy to Machine Stainless Steel 416, 410, 302, 303	Slot	.5 x D	1 x D	61	76	76	.0076	.0178	.0279	.0381	.0483	.0584	.0762
	Rough	1 x D	.5 x D	76	84	84	.0127	.0254	.0381	.0508	.0635	.0762	.1016
	Finish	1.5 x D	.01 x D	91	99	99	.0152	.0305	.0457	.0635	.0787	.0965	.1270
Moderate Machining Stainless Steels 304, 316, Invar, Kovar	Slot	.5 x D	1 x D	61	69	76	.0064	.0127	.0191	.0254	.0305	.0381	.0508
	Rough	1 x D	.5 x D	76	84	91	.0076	.0178	.0279	.0381	.0483	.0559	.0762
	Finish	1.5 x D	.01 x D	91	99	107	.0102	.0229	.0356	.0457	.0584	.0686	.0914

Speed (SFM) MG	TiCN	AlTiN	Feed (Inches Per Tooth) 1/8	1/4	3/8	1/2	5/8	3/4	1
350	550	550	.0008	.0015	.0022	.0030	.0037	.0047	.0060
450	650	650	.0010	.0020	.0030	.0040	.0050	.0060	.0080
550	750	750	.0010	.0020	.0030	.0040	.0050	.0060	.0080
275	350	350	.0006	.0012	.0018	.0025	.0030	.0039	.0050
300	400	400	.0008	.0015	.0022	.0030	.0037	.0047	.0060
350	450	450	.0009	.0017	.0026	.0035	.0045	.0055	.0070
300	350	350	.0008	.0015	.0022	.0030	.0037	.0047	.0060
375	450	450	.0009	.0018	.0027	.0035	.0045	.0055	.0070
450	650	650	.0009	.0018	.0027	.0035	.0045	.0055	.0070
350	550	550	.0008	.0015	.0022	.0030	.0037	.0047	.0060
450	650	650	.0010	.0020	.0030	.0040	.0050	.0060	.0080
550	750	750	.0010	.0020	.0030	.0040	.0050	.0060	.0080
350	400	450	.0008	.0015	.0023	.0030	.0037	.0045	.0060
425	475	525	.0009	.0017	.0026	.0035	.0043	.0053	.0070
500	550	600	.0010	.0019	.0028	.0038	.0047	.0057	.0076
200	350	350	.0004	.0007	.0011	.0015	.0019	.0023	.0030
250	400	400	.0005	.0010	.0015	.0020	.0025	.0030	.0040
300	450	450	.0007	.0015	.0022	.0030	.0038	.0045	.0060
200	250	250	.0004	.0007	.0011	.0015	.0018	.0023	.0030
250	275	275	.0005	.0010	.0015	.0020	.0025	.0030	.0040
275	325	325	.0006	.0012	.0018	.0023	.0028	.0034	.0046
250	275	300	.0005	.0010	.0015	.0020	.0025	.0030	.0040
275	300	325	.0006	.0012	.0018	.0025	.0031	.0037	.0050
300	325	350	.0007	.0015	.0022	.0030	.0038	.0045	.0060
225	250	275	.0005	.0010	.0015	.0020	.0025	.0030	.0040
250	275	300	.0006	.0012	.0018	.0025	.0031	.0037	.0050
275	300	325	.0007	.0015	.0022	.0030	.0038	.0045	.0060
225	250	275	.0005	.0010	.0015	.0020	.0025	.0030	.0040
250	275	300	.0006	.0012	.0018	.0025	.0031	.0037	.0050
275	300	325	.0007	.0015	.0022	.0030	.0038	.0045	.0060
200	250	250	.0003	.0007	.0011	.0015	.0019	.0023	.0030
250	275	275	.0005	.0010	.0015	.0020	.0025	.0030	.0040
300	325	325	.0006	.0012	.0018	.0025	.0031	.0038	.0050
200	225	250	.0003	.0005	.0008	.0010	.0012	.0015	.0020
250	275	300	.0003	.0007	.0011	.0015	.0019	.0022	.0030
300	325	350	.0004	.0009	.0014	.0018	.0023	.0027	.0036

D = tool diameter Reduce feed rates by 20% when using long length tools Starting parameters shown

E12



- 2-Flute, standard helix
- Stub, standard and long lengths
- Square corner and corner radius
- AlTiN, TiCN, TiN coating options

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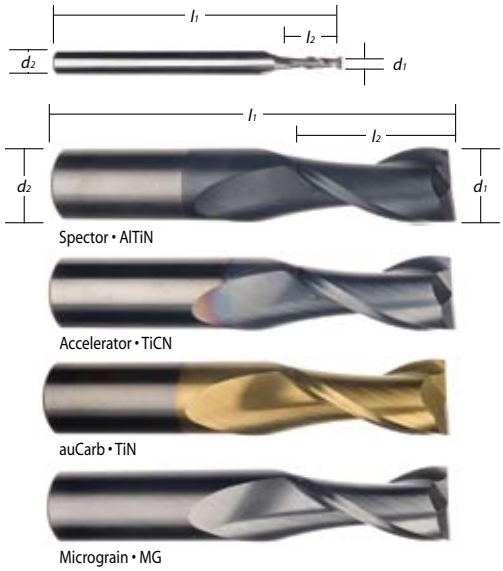

Former List Code Reference

E12						
Length Code			**AlTiN**	**TiCN**	**TiN**	**MG**
Miniature	**3X**	**SQ**				M852
Stub	**SL**	**SQ**	M740	M340		M500
DIN	**DL**	**SQ**	M732			M232
Regular	**RL**	**SQ**	M725	M300	M400	M800
Regular / DIN	**RL**	**CR**	M732CR			M232CR
Long	**LL**	**SQ**	M705	M305	M405	M880
Long Reach	**LR**	**SQ**	M791			M891
X-Long	**XL**	**SQ**	M762	M310	M410	M890
X-Long Reach	**XR**	**SQ**	M764			M864
Deep Milling	**DM**	**SQ**				M891

E12 • Metric

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	R Corner Radius	Len. Code	AlTiN	MG
0,3	3	0,9	38	---	3X		27994
0,4	3	1,2	38	---	3X		27995
0,5	3	1,5	38	---	3X		27996
0,6	3	1,8	38	---	3X		27997
0,7	3	2,1	38	---	3X		27998
0,8	3	2,4	38	---	3X		27999
0,9	3	2,7	38	---	3X		28000
1	3	2	38	---	SL	62288	28007
		3	38	---	3X	99079	28001
1,5	3	3	38	---	SL	62289	28004
		4,5	38	---	3X	62455	28021
		6	38	---	RL	37980	02481
2	3	4	38	---	SL	62290	02141
		6,3	38	---	RL	99081	28024
		9	38	---	RL	37981	02482
2,5	3	5	38	---	SL	62291	02142
		9,5	38	---	RL	37982	02483
3	3	6	38	---	SL	62292	02143
		9	38	---	RL	99093	36709
		12	38	---	RL	38005	02484
		12	38	0,3	RL	38620	37768
		12	75	---	XR	31893	30288
		19	57	---	LL	62194	03121
		25	75	---	XL	62182	03221
3,5	4	7	50	---	SL	62293	02137
		14	50	---	RL	38006	02485
4	4	8	50	---	SL	62294	02145
		11	50	---	DL	36756	36711
		11	50	0,4	RL	38621	37769
		14	50	---	RL	99357	02486
		19	63	---	LL	62195	03122
		31	75	---	XL	62183	03222
4,5	5	16	50	---	RL	37983	34480
5	5	10	50	---	SL	62296	02147
		13	50	---	DL	36757	36713
		13	50	0,5	RL	38622	37770
		16	50	---	RL	38007	34481
		19	63	---	LL	62196	03123
		31	100	---	XL	62184	03223

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Len. of Cut	l_1 Overall Length	R Corner Radius	Len. Code	AlTiN	MG
6	6	12	54	---	SL	37176	39240
		13	57	---	DL	36758	36715
		13	57	0,3	RL	38623	37771
		13	57	0,5	RL	38624	37772
		15	100	---	LR	31877	30264
		19	63	---	RL	37984	02489
		29	75	---	LL	62197	03124
		38	100	---	XL	62185	03224
		75	150	---	DM		77001
7	7	16	60	---	DL	36759	36717
	8	19	63	---	RL	37985	02479
8	8	14	58	---	SL	37183	39241
		19	63	---	DL	36760	36719
		19	63	0,5	RL	38625	37773
		19	63	1,0	RL	38626	37774
		19	63	1,5	RL	38627	37775
		20	63	---	RL	31492	02491
		20	100	---	LR	31878	30265
		29	75	---	LL	62198	03125
		41	100	---	XL	62186	03225
9	9	19	67	---	DL	36761	36721
	10	22	72	---	RL	37986	02480
10	10	16	66	---	SL	37184	39242
		22	72	---	DL	36762	36723
		22	72	0,5	RL	38628	37776
		22	72	1,0	RL	38629	37777
		22	72	1,5	RL	38630	37778
		25	72	---	RL	99358	02493
		25	100	---	LR	31879	30266
		25	150	---	XR	31894	30289
		40	88	---	LL	37174	30223
		45	100	---	XL	62187	03226
		75	150	---	DM		77004
		75	200	---	DM		77005
11	11	26	83	---	DL	36763	36724
12	12	19	73	---	SL	37251	39243
		25	76	---	RL	99359	02495
		26	83	---	DL	36764	36725
		26	83	0,5	RL	38631	37779
		26	83	1,0	RL	38632	37780
		26	83	1,5	RL	38633	37781

continued on next page

E12 • Metric • Continued

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	R Corner Radius	Len. Code	AlTiN	MG
12	12	35	150	---	XR	31895	30290
		50	100	---	LL	62200	03127
		75	150	---	XL	62188	03227
		75	200	---	DM		77007
14	14	26	83	---	DL	36765	36727
		57	125	---	LL	62201	03128
		75	150	---	XL	62189	03228
16	16	25	82	---	SL	62304	02156
		32	89	---	RL	37989	02497
		32	92	---	DL	36766	36729
		40	150	---	XR	31896	30291
		57	125	---	LL	62202	03129
		75	150	---	XL	62190	03229
		75	200	---	DM		77009
18	18	32	92	---	DL	36767	36730
		57	125	---	LL	62203	03130
		75	150	---	XL	62191	03230
20	20	38	100	---	RL	37991	02499
		38	104	---	DL	36768	36731
		57	125	---	LL	62204	03131
		75	150	---	XL	62192	03231
25	25	45	120	---	DL	37231	36769
		75	150	---	XL	62193	03232

d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	R Corner Radius	Length Code	AlTiN	TiCN	TiN	MG
.010	1/8	.030	1-1/2	---	3X				28131
.015	1/8	.045	1-1/2	---	3X				28132
.020	1/8	.060	1-1/2	---	3X				28133
.025	1/8	.075	1-1/2	---	3X				28134
.030	1/8	.090	1-1/2	---	3X				28135
1/32	1/8	1/16	1-1/2	---	SL	38923			34696
		3/32	1-1/2	---	RL	30509	35602	30602	02101
.040	1/8	.120	1-1/2	---	3X				28137
3/64	1/8	3/32	1-1/2	---	SL	39093			34699
		9/64	1-1/2	---	RL	35603	34603	30604	02102
.050	1/8	.150	1-1/2	---	3X				28139
.060	1/8	.180	1-1/2	---	3X				28141
1/16	1/8	1/8	1-1/2	---	SL	39104			02103
		3/16	1-1/2	---	RL	37994	34604	30606	02421
5/64	1/8	1/4	1-1/2	---	RL	37995	34605		02422
3/32	1/8	3/16	1-1/2	---	SL	39105			02104
		3/8	1-1/2	---	RL	30338	34606	30610	02423
7/64	1/8	3/8	1-1/2	---	RL	30339	34607		02424
1/8	1/8	1/4	1-1/2	---	SL	90088			02105
		1/2	1-1/2	---	RL	96342	34608	30614	02425
		1/2	1-1/2	.015	RL	34071			39550
		5/8	2	---	LR	62093			96483
		3/4	2-1/4	---	LL	36610	37610		03101
		1	3	---	XL	34015	34010		03201
9/64	3/16	9/16	2	---	RL	30344	34609		30615
5/32	3/16	5/16	2	---	SL	39151			02106
		9/16	2	---	RL	30503	34610	30618	02426
11/64	3/16	5/8	2	---	RL	30345			30619
3/16	3/16	3/8	2	---	SL	39152			02107
		5/8	2	---	RL	37996	34612	30622	02427
		5/8	2	.020	RL	34072			39553
		5/8	2	.030	RL	34073			39554
		3/4	2-1/2	---	LL	36619	37614		03102
		1	4	---	LR	62094			62088
		1-1/8	3	---	XL	34023	34014		03202
13/64	1/4	5/8	2-1/2	---	RL	97907			30623
7/32	1/4	7/16	2	---	SL	39153			02108
		5/8	2-1/2	---	RL	30348	34614		02428
15/64	1/4	3/4	2-1/2	---	RL	30510			30627

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

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MOD

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continued on next page

Inch • Continued

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	R Corner Radius	Length Code	AlTiN	TiCN	TiN	MG
1/4	1/4	1/2	2	---	SL	39154			02109
		3/4	2-1/2	---	RL	37997	34616	30630	02429
		3/4	2-1/2	.020	RL	34074			39556
		3/4	2-1/2	.030	RL	34075			39557
		1	4	---	LR	62095			62089
		1-1/8	3	---	LL	36645	37618		03103
		1-1/2	4	---	XL	34035	34018		03203
		1-1/2	6	---	XR	39203			31063
17/64	5/16	3/4	2-1/2	---	RL	30511			30631
9/32	5/16	3/4	2-1/2	---	RL	30504	34618		02430
19/64	5/16	13/16	2-1/2	---	RL	30512			30635
5/16	5/16	1/2	2	---	SL	39155			02110
		13/16	2-1/2	---	RL	37998	34620	30638	02431
		13/16	2-1/2	.020	RL	34076			39560
		13/16	2-1/2	.030	RL	34077			39561
		1	4	---	LR	62096			62090
		1-1/8	3	---	LL	36640			03104
		1-5/8	4	---	XL	34036			03204
11/32	3/8	1	2-1/2	---	RL	37999			30641
3/8	3/8	5/8	2	---	SL	39156			02111
		1	2-1/2	---	RL	38000	34624	30646	02432
		1	2-1/2	.020	RL	34104			36808
		1	2-1/2	.030	RL	34105			36809
		1	4	---	LR	62097			90301
		1-1/8	3	---	LL	36646	37626		03105
		1-1/2	6	---	XR	30470			90302
		1-3/4	4	---	XL	34037	34026		03205
13/32	7/16	1	2-3/4	---	RL	38001			30649
7/16	7/16	1	2-3/4	---	RL	99467	34629		30672
		2	4	---	LL	99468			03106
		3	6	---	XL	34038			03206
15/32	1/2	1	3	---	RL	38002			30657
1/2	1/2	5/8	2-1/2	---	SL	39158			02113
		1	3	---	RL	38003	34632	30662	02434
		1	3	.020	RL	34106			36810
		1	3	.030	RL	34107			36811
		1	3	.060	RL	34108			36812
		1	4	---	LR	62098			62092
		1-1/2	6	---	XR	39205			90303
		2	4	---	LL	36647	37634		03107
		3	6	---	XL	34039	34034		03207
9/16	9/16	1-1/4	3-1/2	---	RL	30505			02435
5/8	5/8	3/4	3	---	SL	39159			02114
		1-1/4	3-1/2	---	RL	38004	34640	90461	02436
		2	6	---	XR	39206			39198
		2-1/4	5	---	LL	36648			03108
		3	6	---	XL	34043			03208
11/16	3/4	1-1/2	4	---	RL	30513			02437
3/4	3/4	1	3	---	SL	39160			02115
		1-1/2	4	---	RL	30700	34648	30670	02438
		2	6	---	XR	39207			39199
		2-1/4	5	---	LL	36649			03109
		3	6	---	XL	34044			03209
7/8	7/8	1-1/2	4	---	RL	30573	34656		02439
1	1	1-1/2	4	---	RL	30679	34664	30678	02440
		2-1/4	5	---	LL	36650			03110
		3	6	---	XL	34045			03210

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MOD

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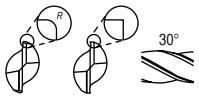
End Mill Sets

E12 Set Style	Order Code
AlTiN	33686
TiCN	33654
TiN	33655
MG	33650

Contains one each of:
1/8, 3/16, 1/4, 5/16, 3/8, 1/2

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

E12W



- 2-Flute, standard helix
- Standard length with holding flat
- Square corner and corner radius
- AlTiN coating option

Technical • Technisch • Technique • Técnico

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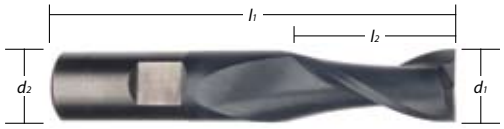
P M K N



Former List Code Reference

E12W				
Length Code			**AlTiN**	**MG**
DIN	**DL**	**SQ**	M737	M237
Regular	**RL**	**SQ**	M737	M237
Regular	**RL**	**CR**	M780	M280

Metric

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Len. of Cut	l_1 Overall Length	R Corner Radius	Len. Code	AlTiN	MG
6	6	13	57	---	RL	34678	37010
8	8	19	63	---	RL	34682	37015
10	10	22	72	---	RL	34686	37019
12	12	26	83	---	RL	34688	37023
14	14	26	83	---	RL	34690	37025
16	16	32	92	---	RL	34692	37027
18	18	32	92	---	RL	34694	37029
20	20	38	104	---	RL	34684	37032

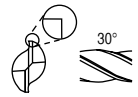
d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	R Corner Radius	Len. Code	AlTiN	MG
1/4	1/4	3/4	2-1/2	---	RL	39250	39256
5/16	5/16	13/16	2-1/2	---	RL	39251	39257
3/8	3/8	1	2-1/2	---	RL	39252	39258
		1	2-1/2	.020	RL	34078	39564
		1	2-1/2	.030	RL	34079	39565
1/2	1/2	1	3	---	RL	39253	39259
		1	3	.020	RL	34080	39568
		1	3	.030	RL	34081	39569
		1	3	.060	RL	34082	39571
5/8	5/8	1-1/4	3-1/2	---	RL	39254	39260
3/4	3/4	1-1/2	4	---	RL	39255	39261

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

E22



- 2-Flute, double end
- Stub and standard length
- AlTiN, TiCN, TiN coating options

Technical • Technisch • Technique • Técnico

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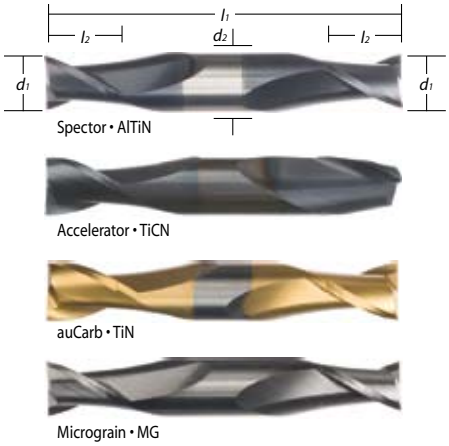
P M K N



Spector • AlTiN

Accelerator • TiCN

auCarb • TiN

Micrograin • MG

Former List Code Reference

E22						
Length Code			**AlTiN**	**TiCN**	**TiN**	**MG**
Stub	**SL**	**SQ**	M722	M325	M425	M900
Regular	**RL**	**SQ**				M942

Metric

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Len. Code	AlTiN	TiCN	TiN	MG
2	3	3	38	SL	62352			02301
3	3	6	38	SL	62354			02303
4	4	8	50	SL	62356			02305
5	5	10	50	SL	62358			02307
6	6	12	63	SL	62359			02308
8	8	12	63	SL	62360			02310
10	10	14	72	SL	62361			02312
12	12	16	76	SL	62362			02314

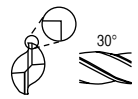
d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Len. Code	AlTiN	TiCN	TiN	MG
1/32	1/8	1/16	1-1/2	SL	31802			02261
3/64	1/8	3/32	1-1/2	SL	31826			02262
1/16	1/8	1/8	1-1/2	SL	31827	31864	31804	02263
		3/16	2	---				33278
5/64	1/8	1/8	1-1/2	SL	31828			31832
3/32	1/8	3/16	1-1/2	SL	31829	31866	31806	02264
		9/32	2	---				33279
7/64	1/8	3/16	1-1/2	SL	31849			31833
1/8	1/8	1/4	1-1/2	SL	31857	31868	31808	02265
		3/8	2	---				33280
9/64	3/16	5/16	2	SL	31856			31834
5/32	3/16	5/16	2	SL	31858	31870	31810	02266
		7/16	2-1/2	---				33281
11/64	3/16	5/16	2	SL	31859			31835
3/16	3/16	3/8	2	SL	31860	31872	31812	02267
		1/2	2-1/2	---				33282
7/32	1/4	1/2	2-1/2	SL	31861			02268
1/4	1/4	1/2	2-1/2	SL	31873	31876	31816	02269
		5/8	3	---				33284
5/16	5/16	1/2	2-1/2	SL	31882			02270
		3/4	3	---				33285
3/8	3/8	9/16	2-1/2	SL	31881	31884	31820	02271
		3/4	3-1/2	---				33286
7/16	7/16	5/8	3	SL	31883			02272
1/2	1/2	5/8	3	SL	31885	31892	31824	02273
		1	4	---				33288

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

E22W



- 2-Flute, double end
- Standard length with holding flat

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P M K N

Former List Code Reference

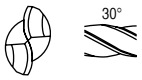
E22W				
Length Code			**AlTiN**	**MG**
Regular	**RL**	**SQ**		M100

Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Len. Code	AlTiN	MG
1/8	3/8	3/8	3-1/16	RL		02661
5/32	3/8	7/16	3-1/8	RL		02662
3/16	3/8	1/2	3-1/4	RL		02663
7/32	3/8	9/16	3-3/8	RL		02664
1/4	3/8	5/8	3-3/8	RL		02665
5/16	3/8	3/4	3-1/2	RL		02667
3/8	3/8	3/4	3-1/2	RL		02669
7/16	1/2	7/8	4	RL		02670
1/2	1/2	1	4	RL		02671

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

E12B



- 2-Flute, standard helix
- Ball end, plain shank
- Stub, standard and long lengths
- AlTiN, TiCN, TiN coating options

Technical • Technisch • Technique • Técnico

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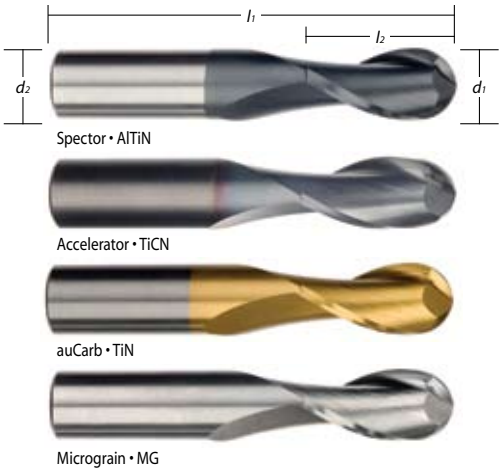
P M K N



Former List Code Reference

E12B					
Length Code		**AlTiN**	**TiCN**	**TiN**	**MG**
Miniature	**3X**	M752R			M852R
Stub	**SL**	M740R	M340R		M500R
Regular	**RL**	M725R	M300R	M400R	M800R
Long	**LL**	M705R	M305R		M880R
Long Reach	**LR**	M761R			M861R
X-Long	**XL**	M762R	M310R		M890R
X-Long Reach	**XR**	M792R			M864R

Metric

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Len. Code	AlTiN	MG
1	3	2	38	SL	62673	28107
		3	38	3X	99080	28101
1,5	3	3	38	SL	62674	28104
		4,5	38	3X	62459	28116
		6	38	RL	62579	02601
2	3	4	38	SL	62675	02221
		6,3	38	3X	99082	28119
		9	38	RL	62580	02602
2,5	3	9,5	38	RL	62581	02603
3	3	6	38	SL	62677	02223
		12	38	RL	30377	02604
		12	75	XR	37297	37247
		19	57	LL	62625	03161
		25	75	XL	62649	03261
3,5	4	14	50	RL	62582	02605
4	4	8	50	SL	62679	02225
		14	50	RL	30372	02606
		19	63	LL	62626	03162
		31	75	XL	62650	03262
4,5	5	16	50	RL	62583	34485
5	5	10	50	SL	62681	02227
		16	50	RL	99083	34486
		19	63	LL	62627	03163
		31	100	XL	62651	03263
6	6	12	54	SL	37501	39466
		15	100	LR	37440	37283
		19	63	RL	62584	02609
		29	75	LL	62628	03164
		38	100	XL	62652	03264
7	8	19	63	RL	62585	02622

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Len. Code	AlTiN	MG
8	8	14	58	SL	37502	39467
		20	63	RL	99085	02611
		20	100	LR	37441	37284
		29	75	LL	62629	03165
		41	100	XL	62653	03265
9	10	22	72	RL	62586	02623
10	10	16	66	SL	37503	39468
		25	72	RL	62587	02613
		25	100	LR	37442	37285
		25	150	XR	37298	37248
		40	88	LL	37504	39469
		45	100	XL	62654	03266
12	12	19	73	SL	37505	39470
		25	76	RL	99356	02615
		26	83	DL	37507	39471
		35	150	XR	37299	37249
		50	100	LL	62631	03167
		75	150	XL	62655	03267
14	14	32	83	RL	62589	34565
		75	150	XL	62656	03268
16	16	32	89	RL	62590	02617
		40	150	XR	37300	37250
		57	127	LL	62633	03169
		75	150	XL	62657	03269
18	18	75	150	XL	62658	03270
20	20	38	100	RL	62592	02619
		57	127	LL	62635	03171
		75	150	XL	62659	03271
25	25	45	120	DL	91486	39472
		75	150	XL	62660	03272

d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

E12B • Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Len. Code	AlTiN	TiCN	TiN	MG
1/32	1/8	1/16	1-1/2	SL	30385			31601
		3/32	1-1/2	RL	30303			02181
3/64	1/8	3/32	1-1/2	SL	30373			31602
		9/64	1-1/2	RL	30302			02182
1/16	1/8	1/8	1-1/2	SL	30374	31936		02183
		3/16	1-1/2	RL	30433	34704	90389	02541
5/64	1/8	1/4	1-1/2	RL	30349			02542
3/32	1/8	3/16	1-1/2	SL	30375	31937		02184
		3/8	1-1/2	RL	30350	34706	30810	02543

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

continued on next page

E12B • Inch • Continued

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Length Code	AlTiN	TiCN	TiN	MG
7/64	1/8	3/8	1-1/2	RL	30351			02544
1/8	1/8	1/4	1-1/2	SL	31956	31938		02185
		1/2	1-1/2	RL	30993	34708	30814	02545
		5/8	2	LR	37880			37876
		3/4	2-1/4	LL	30395	37810		03141
		1	3	XL	31290	34210		03241
9/64	3/16	9/16	2	RL	90177			30815
5/32	3/16	5/16	2	SL	30386			02186
		9/16	2	RL	30354	34710	30818	02546
3/16	3/16	3/8	2	SL	30378	31940		02187
		5/8	2	RL	90087	34712	30822	02547
		3/4	2-1/2	LL	30398	37814		03142
		1	4	LR	37881			94365
		1-1/8	3	XL	90081	34214		03242
7/32	1/4	5/8	2-1/2	RL	30355			02548
1/4	1/4	1/2	2	SL	30563			02189
		3/4	2-1/2	RL	30994	34716	30830	02549
		1	4	LR	37882			37877
		1-1/8	3	LL	30399	37818		03143
		1-1/2	4	XL	90082	34218		03243
		1-1/2	6	XR	34168			31263
9/32	5/16	3/4	2-1/2	RL	30356			02550
5/16	5/16	1/2	2	SL	30380			02190
		13/16	2-1/2	RL	30562	34720	30838	02551
		1	4	LR	37883			37878
		1-1/8	3	LL	20561			03144
		1-5/8	4	XL	31292			03244
11/32	3/8	1	2-1/2	RL	30357			30841
3/8	3/8	5/8	2	SL	30564			02191
		1	2-1/2	RL	30995	34724	30846	02552
		1	4	LR	37884			37879
		1-1/8	3	LL	30390	37826		03145
		1-1/2	6	XR	34170			31235
		1-3/4	4	XL	31293	34226		03245
13/32	7/16	1	2-3/4	RL	30361			30849
7/16	7/16	1	2-3/4	RL	30362			30879
		2	4	LL	30391			03146
		3	6	XL	31294			03246
1/2	1/2	5/8	2-1/2	SL	31630	31946		02193
		1	3	RL	97921	34732	30862	02554
		1	4	LR	37885			90503
		1-1/2	6	XR	34172			31247
		2	4	LL	30392	37834		03147
		3	6	XL	31295	34234		03247
9/16	9/16	1-1/4	3-1/2	RL	30248			02555
5/8	5/8	1-1/4	3-1/2	RL	30366			02556
		2	6	XR	34173			31226
		2-1/4	5	LL	30393			03148
		3	6	XL	31296			03248
3/4	3-4	1-1/2	4	RL	30371			02558
		2	6	XR	34174			31228
		2-1/4	5	LL	30396			03149
		3	6	XL	31297			03249
7/8	7/8	1-1/2	4	RL	30368			02559
1	1	1-1/2	4	RL	30369			02560
		2-1/4	5	LL	30397			03150
		3	6	XL	31298			03250

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MOD

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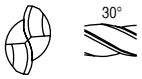
End Mill Sets

E12B Set Style	Order Code
AlTiN	33687
TiCN	33667
TiN	33665
MG	33660

Contains one each of:
1/8, 3/16, 1/4, 5/16, 3/8, 1/2

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

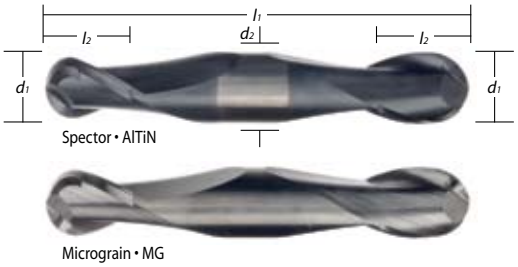
E22B



- 2-Flute, double end
- Ball end, plain shank
- Stub and standard lengths
- AlTiN coating option

Technical • Technisch • Technique • Técnico
Page 5 & 51

P M K N



Spector • AlTiN

Micrograin • MG

Former List Code Reference			
E22B			
Length Code		AlTiN	MG
Stub	SL	M722R	M900R
Regular	RL		M942R

Metric

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Len. Code	AlTiN	MG
2	3	3	38	SL	62725	02381
3	3	6	38	SL	62727	02383
4	4	8	50	SL	62728	02385
5	5	10	50	SL	62729	02387
6	6	12	63	SL	62730	02388

d_1 +0,000 / -0,050 d_2 -0,0025 to -0,0100

Inch

d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Len. Code	AlTiN	MG
1/32	1/8	1/16	1-1/2	SL	32001	02341
3/64	1/8	3/32	1-1/2	SL	32002	02342
1/16	1/8	1/8	1-1/2	SL	32037	02343
		3/16	2	RL		33478
3/32	1/8	3/16	1-1/2	SL	30480	02344
		9/32	2	RL		33479
1/8	1/8	1/4	1-1/2	SL	30579	02345
		3/8	2	RL		33480
5/32	3/16	5/16	2	SL	30578	02346
3/16	3/16	3/8	2	SL	30577	02347
		1/2	2-1/2	RL		33482
7/32	1/4	1/2	2-1/2	SL	30586	02348
1/4	1/4	1/2	2-1/2	SL	32082	02349
		5/8	3	RL		33484
3/8	3/8	9/16	2-1/2	SL	30589	02351
		3/4	3-1/2	RL		33486
1/2	1/2	5/8	3	SL	30590	02353
		1	4	RL		33488

d_1 +0.000 / -0.002 d_2 -0.0001 to -0.0004

DRILLS

These styles of drills perform better and last longer because they are CNC manufactured to exacting standards.

Our commitment to quality begins by selecting only the best quality micrograin carbide which is then machined on high precision grinders utilizing the knowledge and experience of our seasoned craftsmen. We employ a wide range of point geometries and flute designs for drilling workpieces of almost any material. An exhaustive variety of drill diameters and lengths are available.

Results: Significantly increased production rates in machine shops around the world.

TWIST DRILLS

Most effective in drilling cast iron, aluminum and other abrasive but easily machined materials. Precision ground to produce true, accurate holes with an excellent surface finish. Available in a wide range of solid carbide and carbide-tipped styles and sizes.

STRAIGHT FLUTE DRILLS

For drilling hardened steels, stainless steels and other hard and abrasive high-strength materials up to 65 HRc. Precision ground to produce close-tolerance holes with a superior finish, often eliminating secondary reaming operations. Available in solid carbide and carbide-tipped styles in many sizes.

HARD METAL DRILLS

For shallow hole drilling not to exceed two times the drill diameter. This style drill has an extremely strong core design for high strength drilling of hardened materials.

Troubleshooting Guide

Situation	Causes	Solution
Outer corners break down	Speed (rpm) is too high	Reduce feed and speed
	Incorrect lip relief	Check lip relief
Cutting lips chip	Feed too high	Reduce feed and speed
	High lip relief	Check lip relief
	Running too hot	Make sure adequate coolant is reaching the drill point.
Cracks in cutting lips	Running too hot	Repoint drill
		Check feeds and speeds
		Make sure adequate coolant is reaching the drill point
Drill breaks	Improper point	Repoint drill
	Flutes clogging	Check feed
	Excessive pressure	Feed with steady and uniform pressure
Drill splits up center	Feed too high	Reduce feed
	Incorrect lip relief	Correct relief
Rough hole	Dull point	Repoint drill
	No lubricant	Use lubricant
Oversize hole	Unequal length of cutting lips	Repoint drill
Chips change shape / color	Dull point	Repoint drill
Margins chip	Oversize bushing	Change bushing
Premature dullness	Allowing drill to dwell in the hole without cutting	Drills should be fed with steady and uniform pressure

Application Guide • Speed & Feed

Work Material	Drill Series Number	Speed (m/min)	Feed Per Revolution (mm/rev) 1,5-3,0	>3,0-6,0	>6,0-9,0	>9,0-12,0	>12,0-20,0	Speed (SFM)	Feed Per Revolution (IPR) 1/16-1/8	>1/8-1/4	>1/4-3/8	>3/8-1/2	>1/2-3/4
Aluminum Alloys	D20	61-122	.0508-.0762	.0762-.1524	.1524-.2032	.2032-.2540	.2540-.3048	200-400	.002-.003	.003-.006	.006-.008	.008-.010	.010-.012
	D21	61-122	.0508-.0762	.0762-.1524	.1524-.2032	.2032-.2540	---	200-400	.002-.003	.003-.006	.006-.008	.008-.010	---
	DT20, DT22, DT21	46-107	---	.0508-.1016	.1016-.1524	.1524-.2032	.2032-.3048	150-350	---	.002-.004	.004-.006	.006-.008	.008-.012
	D10	61-122	.0508-.0762	.0762-.1524	.1524-.2032	.2032-.2540	---	200-400	.002-.003	.003-.006	.006-.008	.008-.010	---
Copper Alloys	D20	61-84	.0508-.0762	.0762-.1524	.1524-.2032	.2032-.2540	.2540-.3048	200-275	.002-.003	.003-.006	.006-.008	.008-.010	.010-.012
	D21	61-84	.0508-.0762	.0762-.1524	.1524-.2032	.2032-.2540	---	200-275	.002-.003	.003-.006	.006-.008	.008-.010	---
	DT20, DT22, DT21	46-91	---	.0508-.1016	.1016-.1524	.1524-.2032	.2032-.3048	150-300	---	.002-.004	.004-.006	.006-.008	.008-.012
	D10	61-122	.0508-.0762	.0762-.1524	.1524-.2032	.2032-.2540	---	200-400	.002-.003	.003-.006	.006-.008	.008-.010	---
Brass & Bronze	D20	61-84	.0508-.0762	.0762-.1524	.1524-.2032	.2032-.2540	.2540-.3048	200-275	.002-.003	.003-.006	.006-.008	.008-.010	.010-.012
	D21	61-84	.0508-.0762	.0762-.1524	.1524-.2032	.2032-.2540	---	200-275	.002-.003	.003-.006	.006-.008	.008-.010	---
	DT20, DT22, DT21	46-91	---	.0508-.1016	.1016-.1524	.1524-.2032	.2032-.3048	150-300	---	.002-.004	.004-.006	.006-.008	.008-.012
	D10	61-122	.0508-.0762	.0762-.1524	.1524-.2032	.2032-.2540	---	200-400	.002-.003	.003-.006	.006-.008	.008-.010	---
Composites, Plastics	D20	61-91	.0508-.0762	.0762-.1524	.1524-.2032	.2032-.2540	.2540-.3048	200-300	.002-.003	.003-.006	.006-.008	.008-.010	.010-.012
	D21	61-91	.0508-.0762	.0762-.1524	.1524-.2032	.2032-.2540	---	200-300	.002-.003	.003-.006	.006-.008	.008-.010	---
	DT20, DT22, DT21	30-61	---	.0381-.0762	.0762-.1143	.1143-.1524	.1524-.2286	100-200	---	.0015-.003	.003-.0045	.0045-.006	.006-.009
	D10	61-91	.0508-.0762	.0762-.1524	.1524-.2032	.2032-.2540	---	200-300	.002-.003	.003-.006	.006-.008	.008-.010	---
Magnesium Alloys	D20	61-122	.0508-.0762	.0762-.1524	.1524-.2032	.2032-.2540	.2540-.3048	200-400	.002-.003	.003-.006	.006-.008	.008-.010	.010-.012
	D21	61-122	.0508-.0762	.0762-.1524	.1524-.2032	.2032-.2540	---	200-400	.002-.003	.003-.006	.006-.008	.008-.010	---
	DT20, DT22, DT21	46-107	---	.0508-.1016	.1016-.1524	.1524-.2032	.2032-.3048	150-350	---	.002-.004	.004-.006	.006-.008	.008-.012
	D10	61-122	.0508-.0762	.0762-.1524	.1524-.2032	.2032-.2540	---	200-400	.002-.003	.003-.006	.006-.008	.008-.010	---
Cast Iron Gray	D30	91-122	.0381-.0762	.0762-.1524	.1524-.2286	.2286-.3048	.3048-.4318	300-400	.0015-.003	.003-.006	.006-.009	.009-.012	.012-.017
	D40	61-84	.0305-.0609	.0406-.1016	.1016-.1524	.1524-.2032	---	200-275	.0012-.0024	.0016-.004	.004-.006	.006-.008	---
	D20	69-91	.0508-.0762	.0762-.1524	.1524-.2032	.2032-.2540	.2540-.3048	225-300	.002-.003	.003-.006	.006-.008	.008-.010	.010-.012
	D21	69-91	.0508-.0762	.0762-.1524	.1524-.2032	.2032-.2540	---	225-300	.002-.003	.003-.006	.006-.008	.008-.010	---
	DT20, DT22, DT21	46-91	---	.0508-.1016	.1016-.1524	.1524-.2032	.2032-.3048	150-300	---	.002-.004	.004-.006	.006-.008	.008-.012
	D10	69-91	.0508-.0762	.0762-.1524	.1524-.2032	.2032-.2540	---	225-300	.002-.003	.003-.006	.006-.008	.008-.010	---
Cast Iron Ductile / Malleable	D30	61-84	.0381-.0762	.0762-.1524	.1524-.2286	.2286-.3048	.3048-.4318	200-275	.0015-.003	.003-.006	.006-.009	.009-.012	.012-.017
	D40	53-69	.0305-.0609	.0406-.1016	.1016-.1524	.1524-.2032	---	175-225	.0012-.0024	.0016-.004	.004-.006	.006-.008	---
	D20	46-76	.0508-.0762	.0762-.1524	.1524-.2032	.2032-.2540	.2540-.3048	150-250	.002-.003	.003-.006	.006-.008	.008-.010	.010-.012
	D21	46-76	.0508-.0762	.0762-.1524	.1524-.2032	.2032-.2540	---	150-250	.002-.003	.003-.006	.006-.008	.008-.010	---
	DT20, DT22, DT21	46-76	---	.0457-.0914	.0914-.1270	.1270-.1828	.1828-.2794	150-250	---	.0018-.0036	.0036-.005	.005-.0072	.0072-.011
	D10	46-76	.0508-.0762	.0762-.1524	.1524-.2032	.2032-.2540	---	150-250	.002-.003	.003-.006	.006-.008	.008-.010	---
Low Carbon Steel ≤ 38HRc 1018, 12L14, 8620	D30	76-122	.0305-.0635	.0635-.1270	.1270-.1778	.1778-.2540	.2540-.3048	250-400	.0012-.0025	.0025-.005	.005-.007	.007-.010	.010-.012
	D20	30-53	.0508-.0762	.0762-.1524	.1524-.2032	.2032-.2540	.2540-.3048	100-175	.002-.003	.003-.006	.006-.008	.008-.010	.010-.012
	D21	30-53	.0508-.0762	.0762-.1524	.1524-.2032	.2032-.2540	---	100-175	.002-.003	.003-.006	.006-.008	.008-.010	---
	D40	30-53	.0127-.0508	.0508-.1016	.1016-.1270	.1270-.1524	---	100-175	.0005-.002	.002-.004	.004-.005	.005-.006	---
	D10	30-53	.0508-.0762	.0762-.1524	.1524-.2032	.2032-.2540	---	100-175	.002-.003	.003-.006	.006-.008	.008-.010	---
Medium Carbon Steels ≤ 38HRc 4140, 4340	D30	79-100	.0305-.0635	.0635-.1270	.1270-.1778	.1778-.2540	.2540-.3048	260-330	.0012-.0025	.0025-.005	.005-.007	.007-.010	.010-.012
	D40	30-53	.0127-.0508	.0508-.1016	.1016-.1270	.1270-.1524	---	100-175	.0005-.002	.002-.004	.004-.005	.005-.006	---
	D20	23-46	.0254-.0381	.0381-.0762	.0762-.1016	.1016-.1524	.1270-.1524	75-150	.001-.0015	.0015-.003	.003-.004	.004-.006	.005-.006
	D21	23-46	.0254-.0381	.0381-.0762	.0762-.1016	.1016-.1524	---	75-150	.001-.0015	.0015-.003	.003-.004	.004-.006	---
	D10	30-53	.0508-.0762	.0762-.1524	.1524-.2032	.2032-.2540	---	100-175	.002-.003	.003-.006	.006-.008	.008-.010	---
Tool & Die Steels ≤ 38HRc A2, D2, H13, P20	D30	79-100	.0305-.0635	.0635-.1270	.1270-.1778	.1778-.2540	.2540-.3048	260-330	.0012-.0025	.0025-.005	.005-.007	.007-.010	.010-.012
	D40	30-53	.0127-.0508	.0508-.1016	.1016-.1270	.1270-.1524	---	100-175	.0005-.002	.002-.004	.004-.005	.005-.006	---
	DT40	18-37	.0101-.0203	.0203-.0406	.0406-.0558	.0558-.0914	.0914-.1143	60-125	.0004-.0008	.0008-.0016	.0016-.0022	.0022-.0036	.0036-.0045
	D10	30-53	.0508-.0762	.0762-.1524	.1524-.2032	.2032-.2540	---	100-175	.002-.003	.003-.006	.006-.008	.008-.010	---
Tool & Die Steels 39-48 HRc A2, D2, H13, P20	D30	61-91	.0178-.0381	.0381-.0762	.0762-.1016	.1016-.1524	.1524-.2032	200-300	.0007-.0015	.0015-.003	.003-.004	.004-.006	.006-.008
	D40	23-37	.0127-.0508	.0508-.1016	.1016-.1270	.1270-.1524	---	75-125	.0005-.002	.002-.004	.004-.005	.005-.006	---
	DT40	18-37	.0101-.0203	.0203-.0406	.0406-.0558	.0558-.0914	.0914-.1143	60-125	.0004-.0008	.0008-.0016	.0016-.0022	.0022-.0036	.0036-.0045
Tool Steels > 48 HRc A2, D2	D40	12-23	.0203-.0254	.0254-.0381	.0381-.0508	.0508-.0762	---	40-75	.0008-.001	.001-.0015	.0015-.002	.002-.003	---
	DT40	8-18	.0101-.0203	.0203-.0406	.0406-.0558	.0558-.0914	.0914-.1143	25-60	.0004-.0008	.0008-.0016	.0016-.0022	.0022-.0036	.0036-.0045
Easy to Machine Stainless Steel 416, 410, 302, 303	D20	24-53	.0508-.0762	.0762-.1524	.1524-.2032	.2032-.2540	.2540-.3048	80-180	.002-.003	.003-.006	.006-.008	.008-.010	.010-.012
	D21	24-53	.0508-.0762	.0762-.1524	.1524-.2032	.2032-.2540	---	80-180	.002-.003	.003-.006	.006-.008	.008-.010	---
	DT20, DT22, DT21	24-53	---	.0305-.0635	.0635-.1270	.1270-.1524	---	80-180	---	.0012-.0025	.0025-.005	.005-.006	---
	D10	24-53	.0508-.0762	.0762-.1524	.1524-.2032	.2032-.2540	---	80-180	.002-.003	.003-.006	.006-.008	.008-.010	---
Moderate Machining Stainless Steels 304, 316, Invar, Kovar	D40	23-42	.0127-.0254	.0254-.0508	.0508-.0762	.0762-.1016	---	75-140	.0005-.001	.001-.002	.002-.003	.003-.004	---
	D20	18-37	.0076-.0381	.0381-.0762	.0762-.1143	.1143-.1524	.1524-.2286	60-125	.0003-.0015	.0015-.003	.003-.0045	.0045-.006	.006-.009
	D21	18-37	.0076-.0381	.0381-.0762	.0762-.1143	.1143-.1524	---	60-125	.0003-.0015	.0015-.003	.003-.0045	.0045-.006	---
	D10	18-37	.0076-.0381	.0381-.0762	.0762-.1143	.1143-.1524	---	60-125	.0003-.0015	.0015-.003	.003-.0045	.0045-.006	---
Difficult Stainless Steels 316L, 17-4, 15-5, 13-8	D40	15-30	.0254-.0508	.0508-.1016	.1016-.1270	.1270-.1524	---	50-100	.001-.002	.002-.004	.004-.005	.005-.006	---
Titanium	D30	30-50	.0178-.0381	.0381-.0762	.0762-.1270	.1270-.1778	.1778-.2540	100-165	.0007-.0015	.0015-.003	.003-.005	.005-.007	.007-.010
	D40	15-30	.0254-.0508	.0508-.1016	.1016-.1270	.1270-.1524	---	50-100	.001-.002	.002-.004	.004-.005	.005-.006	---
High Temp Alloys, Inconel, Hastalloy	D40	15-30	.0254-.0508	.0508-.1016	.1016-.1270	.1270-.1524	---	50-100	.001-.002	.002-.004	.004-.005	.005-.006	---
	DT40	8-18	.0101-.0203	.0203-.0406	.0406-.0558	.0558-.0914	.0914-.1143	25-60	.0004-.0008	.0008-.0016	.0016-.0022	.0022-.0036	.0036-.0045

D20

- 2-Flute
- Jobbers length
- Solid carbide construction
- Former list code D810

Technical • Technisch • Technique • Técnico
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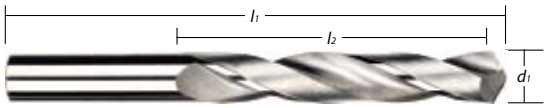
P K N



Precision ground jobber length twist drills are designed for high feed rates with good chip disposal. Solid carbide construction allows extra rigidity and is especially useful under high drilling temperatures and where greater torsional stresses are encountered.

Hardlube
coating for improved productivity is available. *See page 96.*

Metric • Inch

d_1 Cutter Diameter Metric	d_1 Cutter Diameter Fract.	Dec. Equiv.	l_2 Flute Length	l_1 Overall Length	Order Code
1		.0394	19	38	04181
	#60	.0400	3/4	1-1/2	04110
	#59	.0410	3/4	1-1/2	04109
1,05		.0413	19	38	04182
	#58	.0420	3/4	1-1/2	04108
	#57	.0430	3/4	1-1/2	04107
1,1		.0433	19	38	04183
1,15		.0453	19	38	04184
	#56	.0465	3/4	1-1/2	04106
	3/64	.0469	3/4	1-1/2	04001
1,2		.0472	19	38	04185
1,25		.0492	19	38	04186
1,3		.0512	19	38	04187
	#55	.0520	3/4	1-1/2	04105
1,35		.0531	19	38	04188
	#54	.0550	3/4	1-1/2	04104
1,4		.0551	19	38	04189
1,45		.0571	19	38	04190
1,5		.0591	19	38	04191
	#53	.0595	3/4	1-1/2	04103
1,55		.0610	19	38	04192
	1/16	.0625	3/4	1-1/2	04002
1,6		.0630	19	38	04193
	#52	.0635	3/4	1-1/2	04102
1,65		.0650	19	38	04194
1,7		.0669	19	38	04195
	#51	.0670	3/4	1-1/2	04101
1,75		.0689	19	38	04196
	#50	.0700	7/8	1-3/4	04100
1,8		.0709	22	44	04197
1,85		.0728	22	44	04198
	#49	.0730	7/8	1-3/4	04099
1,9		.0748	22	44	04199
	#48	.0760	7/8	1-3/4	04098
1,95		.0768	22	44	04200
	5/64	.0781	7/8	1-3/4	04003
	#47	.0785	7/8	1-3/4	04097
2		.0787	22	44	04201
2,05		.0807	22	44	04202
	#46	.0810	7/8	1-3/4	04096
	#45	.0820	7/8	1-3/4	04095
2,1		.0827	22	44	04203
2,15		.0846	25	50	04204
	#44	.0860	1	2	04094
2,2		.0866	25	50	04205
2,25		.0886	25	50	04206
	#43	.0890	1	2	04093
2,3		.0906	25	50	04207
2,35		.0925	25	50	04208
	#42	.0935	1	2	04092
	3/32	.0938	1	2	04004
2,4		.0945	25	50	04209
	#41	.0960	1	2	04091
2,45		.0965	25	50	04210
	#40	.0980	1	2	04090
2,5		.0984	25	50	04211
	#39	.0995	1-1/4	2-1/4	04089
	#38	.1015	1-1/4	2-1/4	04088
2,6		.1024	31	57	04212
	#37	.1040	1-1/4	2-1/4	04087
2,7		.1063	31	57	04213
	#36	.1065	1-1/4	2-1/4	04086
2,75		.1083	31	57	04214
	7/64	.1094	1-1/4	2-1/4	04005
	#35	.1100	1-1/4	2-1/4	04085
2,8		.1102	31	57	04215
	#34	.1110	1-1/4	2-1/4	04084
	#33	.1130	1-1/4	2-1/4	04083
2,9		.1142	31	57	04216
	#32	.1160	1-1/4	2-1/4	04082
3		.1181	31	57	04217
	#31	.1200	1-1/4	2-1/4	04081
3,1		.1220	31	57	04218
	1/8	.1250	1-1/4	2-1/4	04006
3,2		.1260	31	57	04219
3,25		.1280	31	57	04220
	#30	.1285	1-1/4	2-1/4	04080
3,3		.1299	31	57	04221
3,4		.1339	34	63	04222
	#29	.1360	1-3/8	2-1/2	04079
3,5		.1378	34	63	04223
	#28	.1405	1-3/8	2-1/2	04078
	9/64	.1406	1-3/8	2-1/2	04007
3,6		.1417	34	63	04224
	#27	.1440	1-3/8	2-1/2	04077
3,7		.1457	34	63	04225
	#26	.1470	1-3/8	2-1/2	04076
3,75		.1476	34	63	04226
	#25	.1495	1-3/8	2-1/2	04075
3,8		.1496	34	63	04227
	#24	.1520	1-3/8	2-1/2	04074
3,9		.1535	34	63	04228
	#23	.1540	1-3/8	2-1/2	04073
	5/32	.1562	1-3/8	2-1/2	04008
	#22	.1570	1-3/8	2-1/2	04072
4		.1575	34	63	04229
	#21	.1590	1-3/8	2-1/2	04071
	#20	.1610	1-3/8	2-1/2	04070
4,1		.1614	34	63	04230
4,2		.1654	41	70	04231
	#19	.1660	1-5/8	2-3/4	04069
4,25		.1673	41	70	04232
4,3		.1693	41	70	04233
	#18	.1695	1-5/8	2-3/4	04068
	11/64	.1719	1-5/8	2-3/4	04009
	#17	.1730	1-5/8	2-3/4	04067
4,4		.1732	41	70	04234
	#16	.1770	1-5/8	2-3/4	04066
4,5		.1772	41	70	04235
	#15	.1800	1-5/8	2-3/4	04065
4,6		.1811	41	70	04236
	#14	.1820	1-5/8	2-3/4	04064
4,7		.1850	41	70	04237
	#13	.1850	1-5/8	2-3/4	04063
4,75		.1870	41	70	04238
	3/16	.1875	1-5/8	2-3/4	04010
4,8		.1890	41	70	04239
	#12	.1890	1-5/8	2-3/4	04062
	#11	.1910	1-5/8	2-3/4	04061
4,9		.1929	41	70	04240
	#10	.1935	1-5/8	2-3/4	04060
	#9	.1960	1-3/4	3	04059
5		.1969	44	76	04241
	#8	.1990	1-3/4	3	04058
5,1		.2008	44	76	04242
	#7	.2010	1-3/4	3	04057
	13/64	.2031	1-3/4	3	04011
	#6	.2040	1-3/4	3	04056
5,2		.2047	44	76	04243

d_1 (mm) h7

d_1 (in) +0.0 / -0.0005

continued on next page

D20 • Metric • Inch • Continued

d_1 Cutter Diameter Metric	d_1 Cutter Diameter Fract.	Dec. Equiv.	l_2 Flute Length	l_1 Overall Length	Order Code
	#5	.2055	1-3/4	3	04055
5,25		.2067	44	76	04244
5,3		.2087	44	76	04245
	#4	.2090	1-3/4	3	04054
5,4		.2126	44	76	04246
	#3	.2130	1-3/4	3	04053
5,5		.2165	44	76	04247
	7/32	.2188	1-3/4	3	04012
5,6		.2205	44	76	04248
	#2	.2210	1-3/4	3	04052
5,7		.2244	44	76	04249
5,75		.2264	44	76	04250
	#1	.2280	1-3/4	3	04051
5,8		.2283	44	76	04251
5,9		.2323	51	82	04252
	A	.2340	2	3-1/4	04151
	15/64	.2344	2	3-1/4	04013
6		.2362	51	82	04253
	B	.2380	2	3-1/4	04152
6,1		.2402	51	82	04254
	C	.2420	2	3-1/4	04153
6,2		.2441	51	82	04255
	D	.2460	2	3-1/4	04154
6,25		.2461	51	82	04256
6,3		.2480	51	82	04257
	1/4	.2500	2	3-1/4	04014
6,4		.2520	51	82	04258
6,5		.2559	51	82	04259
	F	.2570	2	3-1/4	04156
6,6		.2598	54	89	04260
	G	.2610	2-1/8	3-1/2	04157
6,7		.2638	54	89	04261
	17/64	.2656	2-1/8	3-1/2	04015
6,75		.2657	54	89	04262
	H	.2660	2-1/8	3-1/2	04158
6,8		.2677	54	89	04263
6,9		.2717	54	89	04264
	I	.2720	2-1/8	3-1/2	04159
7		.2756	54	89	04265
	J	.2770	2-1/8	3-1/2	04160
7,1		.2795	54	89	04266
	K	.2810	2-1/8	3-1/2	04161
	9/32	.2812	2-1/8	3-1/2	04016
7,2		.2835	54	89	04267
7,25		.2854	54	89	04268
7,3		.2874	54	89	04269
	L	.2900	2-1/8	3-1/2	04162
7,4		.2913	60	95	04270
	M	.2950	2-3/8	3-3/4	04163
7,5		.2953	60	95	04271
	19/64	.2969	2-3/8	3-3/4	04017
7,6		.2992	60	95	04272
	N	.3020	2-3/8	3-3/4	04164
7,7		.3031	60	95	04273
7,75		.3051	60	95	04274
7,8		.3071	60	95	04275
7,9		.3110	60	95	04276
	5/16	.3125	2-3/8	3-3/4	04018
8		.3150	60	95	04277
	O	.3160	2-3/8	3-3/4	04165
8,1		.3189	60	95	04278
8,2		.3228	60	95	04279
	P	.3230	2-3/8	3-3/4	04166
8,25		.3248	63	101	04280
8,3		.3268	63	101	04281
	21/64	.3281	2-1/2	4	04019
8,4		.3307	63	101	04282
	Q	.3320	2-1/2	4	04167
8,5		.3346	63	101	04283
8,6		.3386	63	101	04284
	R	.3390	2-1/2	4	04168
8,7		.3425	63	101	04285
	11/32	.3438	2-1/2	4	04020
8,75		.3445	63	101	04286
8,8		.3465	63	101	04287
	S	.3480	2-1/2	4	04169
8,9		.3504	63	101	04288
9		.3543	70	108	04289
	T	.3580	2-3/4	4-1/4	04170
9,1		.3583	70	108	04290
	23/64	.3594	2-3/4	4-1/4	04021
9,2		.3622	70	108	04291
9,25		.3642	70	108	04292
9,3		.3661	70	108	04293
	U	.3680	2-3/4	4-1/4	04171
9,4		.3701	70	108	04294
9,5		.3740	70	108	04295
	3/8	.3750	2-3/4	4-1/4	04022
	V	.3770	2-3/4	4-1/4	04172
9,6		.3780	70	108	04296
9,7		.3819	70	108	04297
9,75		.3839	70	108	04298
9,8		.3858	70	108	04299
	W	.3860	2-7/8	4-1/2	04173
9,9		.3898	73	114	04300
	25/64	.3906	2-7/8	4-1/2	04023
10		.3937	73	114	04301
	X	.3970	2-7/8	4-1/2	04174
10,1		.3976	73	114	04302
10,2		.4016	73	114	04303
10,25		.4035	73	114	04304
	Y	.4040	2-7/8	4-1/2	04175
10,3		.4055	73	114	04305
	13/32	.4062	2-7/8	4-1/2	04024
10,4		.4094	73	114	04306
	Z	.4130	2-7/8	4-1/2	04176
10,5		.4134	73	114	04307
10,6		.4173	73	114	04308
10,7		.4213	73	114	04309
	27/64	.4219	2-7/8	4-1/2	04025
10,75		.4232	73	114	04310
10,8		.4252	73	114	04311
10,9		.4291	73	114	04312
11		.4331	73	114	04313
11,1		.4370	73	114	04314
	7/16	.4375	2-7/8	4-1/2	04026
11,2		.4409	76	120	04315
11,25		.4429	76	120	04316
11,3		.4449	76	120	04317
11,4		.4488	76	120	04318
11,5		.4528	76	120	04319
	29/64	.4531	3	4-3/4	04027
11,6		.4567	76	120	04320
11,7		.4606	76	120	04321
11,75		.4626	76	120	04322
11,8		.4646	76	120	04323
11,9		.4685	76	120	04324
	15/32	.4688	3	4-3/4	04028
12		.4724	76	120	04325
12,1		.4764	76	120	04326
12,2		.4803	76	120	04327
12,25		.4823	76	120	04328
12,3		.4843	76	120	04329
	31/64	.4844	3	4-3/4	04029
12,4		.4882	76	120	04330
12,5		.4921	76	120	04331
12,6		.4961	76	120	04332
12,7		.5000	76	120	04333
	1/2	.5000	3	4-3/4	04030
13		.5118	82	127	04334
	17/32	.5312	3-1/4	5	91010
13,5		.5315	82	127	04335
14		.5512	82	127	04336
	9/16	.5625	3-1/4	5	91020
14,5		.5709	82	127	04337
15		.5906	82	127	04338
	19/32	.5937	3-1/4	5	91030
15,5		.6102	82	127	04339
	5/8	.6250	3-1/4	5	91040
16		.6299	82	127	04340
16,5		.6496	89	140	04341
	21/32	.6562	3-1/2	5-1/2	91050
17		.6693	89	140	04342
	11/16	.6875	3-1/2	5-1/2	91060
17,5		.6890	89	140	04343
18		.7087	89	140	04344
	23/32	.7187	3-1/2	5-1/2	91070
18,5		.7283	89	140	04345
19		.7480	95	152	04346
	3/4	.7500	3-3/4	6	91071
19,5		.7677	95	152	04347
	25/32	.7812	3-3/4	6	91072
20		.7874	95	152	04348

d_1 (mm) h7

d_1 (in) +0.0 / -0.0005

Drill Sets

Style	Order Code	Style	Order Code
DS-1	41590	DS-2	41591
Drill set contains 13 pieces 1/16 to 1/4 by 64ths		Drill set contains 29 pieces 1/16 to 1/2 by 64ths	

DT20

- 2-Flute, jobbers length, carbide tipped
- Former list code D285

Technical • Technisch • Technique • Técnico
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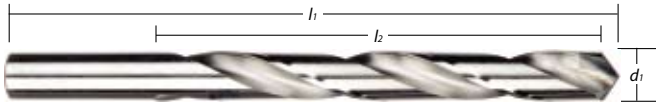
K N



Jobber length twist drills are designed for production drilling of cast iron, non-ferrous metals, composites, plastics and non-metals. Carbide tips are high-temperature brazed to hardened HSS bodies. This style of drill is not normally recommended for drilling steels.

Metric • Inch

d_1 Cutter Diameter Metric	Fract.	Dec. Equiv.	l_2 Flute Length	l_1 Overall Length	Order Code
	#32	.1160	1-5/8	2-3/4	40898
3		.1181	41	70	41901
	#31	.1200	1-5/8	2-3/4	40897
	1/8	.1250	1-5/8	2-3/4	40801
	#30	.1285	1-5/8	2-3/4	40896
	#29	.1360	2	3-1/8	40895
3,5		.1378	44	73	41906
	#28	.1405	2	3-1/8	40894
	9/64	.1406	2	3-1/8	40802
	#27	.1440	2	3-1/8	40893
	#26	.1470	2	3-1/8	40892
	#25	.1495	2	3-1/8	40891
	#24	.1520	2	3-1/8	40890
	#23	.1540	2	3-1/8	40889
	5/32	.1562	2	3-1/8	40803
	#22	.1570	2	3-1/8	40888
4		.1575	54	83	41911
	#21	.1590	2	3-1/8	40887
	#20	.1610	2-5/16	3-1/2	40886
	#19	.1660	2-5/16	3-1/2	40885
	#18	.1695	2-5/16	3-1/2	40884
	11/64	.1719	2-5/16	3-1/2	40804
	#17	.1730	2-5/16	3-1/2	40883
	#16	.1770	2-5/16	3-1/2	40882
4,5		.1772	56	86	41916
	#15	.1800	2-5/16	3-1/2	40881
	#14	.1820	2-5/16	3-1/2	40880
	#13	.1850	2-5/16	3-1/2	40879
	3/16	.1875	2-5/16	3-1/2	40805
	#12	.1890	2-5/16	3-1/2	40878
	#11	.1910	2-5/16	3-1/2	40877
	#10	.1935	2-1/2	3-3/4	40876
	#9	.1960	2-1/2	3-3/4	40875
5		.1969	62	92	41919
	#8	.1990	2-1/2	3-3/4	40874
	#7	.2010	2-1/2	3-3/4	40873
	13/64	.2031	2-1/2	3-3/4	40806
	#6	.2040	2-1/2	3-3/4	40872
	#5	.2055	2-1/2	3-3/4	40871
	#4	.2090	2-1/2	3-3/4	40870
	#3	.2130	2-1/2	3-3/4	40869
5,5		.2165	64	95	41924
	7/32	.2188	2-1/2	3-3/4	40807
	#2	.2210	2-1/2	3-3/4	40868
	#1	.2280	2-3/4	4	40867
	A	.2340	2-3/4	4	40841
	15/64	.2344	2-3/4	4	40808
6		.2362	70	102	41929
	B	.2380	2-3/4	4	40842
	C	.2420	2-3/4	4	40843
	D	.2460	2-3/4	4	40844

d_1 (mm) ≤ 6,35 +0.0 / -0,018 > 6,35 +0.0 / -0,025

d_1 Cutter Diameter Metric	Fract.	Dec. Equiv.	l_2 Flute Length	l_1 Overall Length	Order Code
	1/4 (E)	.2500	2-3/4	4	40809
6,5		.2559	73	105	41934
	F	.2570	2-15/16	4-1/4	40846
	G	.2610	2-15/16	4-1/4	40847
	17/64	.2656	2-15/16	4-1/4	40810
	H	.2660	2-15/16	4-1/4	40848
	I	.2720	2-15/16	4-1/4	40849
7		.2756	73	105	41939
	J	.2770	2-15/16	4-1/4	40850
	K	.2810	2-15/16	4-1/4	40851
	9/32	.2812	2-15/16	4-1/4	40811
	L	.2900	3-3/16	4-1/2	40852
	M	.2950	3-3/16	4-1/2	40853
7,5		.2953	78	111	41944
	19/64	.2969	3-3/16	4-1/2	40812
	N	.3020	3-3/16	4-1/2	40854
	5/16	.3125	3-3/16	4-1/2	40813
8		.3150	81	114	41949
	O	.3160	3-3/16	4-1/2	40855
	P	.3230	3-7/16	4-3/4	40856
	21/64	.3281	3-7/16	4-3/4	40814
	Q	.3320	3-7/16	4-3/4	40857
8,5		.3346	87	121	41954
	R	.3390	3-7/16	4-3/4	40858
	11/32	.3438	3-7/16	4-3/4	40815
	S	.3480	3-5/8	5	40859
9		.3543	89	124	41959
	T	.3580	3-5/8	5	40860
	23/64	.3594	3-5/8	5	40816
	U	.3680	3-5/8	5	40861
9,5		.3740	92	127	41964
	3/8	.3750	3-5/8	5	40817
	V	.3770	3-5/8	5	40862
	W	.3860	3-7/8	5-1/4	40863
	25/64	.3906	3-7/8	5-1/4	40818
10		.3937	95	130	41969
	X	.3970	3-7/8	5-1/4	40864
	Y	.4040	3-7/8	5-1/4	40865
	13/32	.4062	3-7/8	5-1/4	40819
	Z	.4130	4-1/16	5-1/2	40866
10,5		.4134	98	133	41974
	27/64	.4219	4-1/16	5-1/2	40820
11		.4331	103	140	41979
	7/16	.4375	4-1/16	5-1/2	40821
11,5		.4528	106	143	41984
	29/64	.4531	4-5/16	5-3/4	40822
	15/32	.4688	4-5/16	5-3/4	40823
12		.4724	111	149	41989
	31/64	.4844	4-1/2	6	40824
12,5		.4921	114	152	41994
	1/2	.5000	4-1/2	6	40825

d_1 (in) ≤ 1/4 +0.0 / -0.0007 > 1/4 +0.0 / -0.0010

DT22

- 2-Flute
- Taper length with tang
- Carbide tipped construction
- Former list code D385

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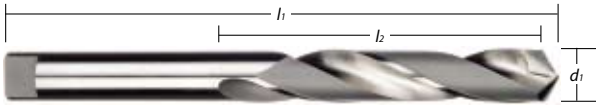
K N



Taper length twist drills are designed for production drilling of cast iron, non-ferrous metals, composites, plastics and non-metals. Carbide tips are high-temperature brazed to hardened HSS bodies. This style of drill is not normally recommended for drilling steels.

Metric • Inch

d_1 Cutter Diameter Metric	d_1 Cutter Diameter Fract.	Dec. Equiv.	l_2 Flute Length	l_1 Overall Length	Order Code
	1/8	.1250	2-3/4	5-1/8	40910
	9/64	.1406	3	5-3/8	40911
	5/32	.1562	3	5-3/8	40912
	11/64	.1719	3-3/8	5-3/4	40913
	3/16	.1875	3-3/8	5-3/4	40914
5		.1969	92	152	41240
	13/64	.2031	3-5/8	6	40915
5,5		.2165	92	152	41242
	7/32	.2188	3-5/8	6	40916
	15/64	.2344	3-3/4	6-1/8	40917
6		.2362	95	156	41244
	1/4	.2500	3-3/4	6-1/8	40918
6,5		.2559	98	159	41246
	17/64	.2656	3-7/8	6-1/4	40919
7		.2756	98	159	41248
	9/32	.2812	3-7/8	6-1/4	40920
7,5		.2953	102	162	41250
	19/64	.2969	4	6-3/8	40921
	5/16	.3125	4	6-3/8	40922
8		.3150	105	165	41252
	21/64	.3281	4-1/8	6-1/2	40923
8,5		.3346	105	165	41254
	11/32	.3438	4-1/8	6-1/2	40924
9		.3543	108	171	41256
	23/64	.3594	4-1/4	6-3/4	40925
9,5		.3740	108	181	41258
	3/8	.3750	4-1/4	6-3/4	40926
	25/64	.3906	4-3/8	7	40927
10		.3937	111	178	41260
	13/32	.4062	4-3/8	7	40928
10,5		.4134	117	184	41262
	27/64	.4219	4-5/8	7-1/4	40929
11		.4331	117	184	41264
	7/16	.4375	4-5/8	7-1/4	40930
11,5		.4528	121	190	41266
	29/64	.4531	4-3/4	7-1/2	40931
	15/32	.4688	4-3/4	7-1/2	40932

d_1 (mm) ≤ 6,35 +0.0 / -0,018 > 6,35 +0.0 / -0,025

d_1 Cutter Diameter Metric	d_1 Cutter Diameter Fract.	Dec. Equiv.	l_2 Flute Length	l_1 Overall Length	Order Code
12		.4724	121	197	41268
	31/64	.4844	4-3/4	7-3/4	40933
12,5		.4921	121	197	41270
	1/2	.5000	4-3/4	7-3/4	40934
13		.5118	121	203	41272
	33/64	.5156	4-3/4	8	40935
	17/32	.5312	4-3/4	8	40936
13,5		.5315	121	203	41274
	35/64	.5469	4-7/8	8-1/4	40937
14		.5512	124	210	41276
	9/16	.5625	4-7/8	8-1/4	40938
14,5		.5709	124	222	41278
	37/64	.5781	4-7/8	8-3/4	40939
15		.5906	124	222	41280
	19/32	.5937	4-7/8	8-3/4	40940
	39/64	.6094	4-7/8	8-3/4	40941
15,5		.6102	124	222	41282
	5/8	.6250	4-7/8	8-3/4	40942
16		.6299	130	229	41284
	41/64	.6406	5-1/8	9	40943
16,5		.6496	130	229	41286
	21/32	.6562	5-1/8	9	40944
17		.6693	137	235	41288
	43/64	.6719	5-3/8	9-1/4	40945
	11/16	.6875	5-3/8	9-1/4	40946
17,5		.6890	143	241	41290
	45/64	.7031	5-5/8	9-1/2	40947
18		.7087	143	241	41292
	23/32	.7187	5-5/8	9-1/2	40948
18,5		.7283	149	248	41294
	47/64	.7344	5-7/8	9-3/4	40949
19		.7480	149	248	41296
	3/4	.7500	5-7/8	9-3/4	40950
	13/16	.8125	6-1/8	10	40954
	7/8	.8750	6-1/8	10	40958
	15/16	.9375	6-1/8	10-3/4	40962
	1	1.0000	6-3/8	11	40966

d_1 (in) ≤ 1/4 +0.0 / -0.0007 > 1/4 +0.0 / -0.0010

D30

- 3-Flute, self-centering point
- Jobbers and DIN lengths
- Solid carbide construction
- Former list codes D817 and D817D

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P K

Precision ground three-flute twist drills are designed to reduce chip load per flute for longer tool life. The self-centering drill point geometry allows easy penetration of the work piece with minimal deflection and wandering. Three-flute drills also improve the finished hole roundness and offer tighter controls on hole tolerance.

When drilling aluminum, a point modification is recommended. Drill point modification charges are found on page 97, or contact a customer service agent for a quotation.

Metric • Inch

d_1 Cutter Diameter Metric	Fract.	Dec. Equiv.	l_2 Flute Length	l_1 Overall Length	Order Code
3		.1181	16	46	44380
3		.1181	31	57	44217
3,1		.1220	18	49	44381
3,1		.1220	31	57	44218
	1/8	.1250	1-1/4	2-1/4	44006
3,2		.1260	18	49	44382
3,2		.1260	31	57	44219
3,25		.1280	18	49	44383
3,25		.1280	31	57	44220
3,3		.1299	18	49	63047
3,3		.1299	31	57	44221
3,4		.1339	20	52	44384
3,4		.1339	34	63	44222
	#29	.1360	1-3/8	2-1/2	44079
3,5		.1378	20	52	44385
3,5		.1378	34	63	44223
	9/64	.1406	1-3/8	2-1/2	44007
3,6		.1417	20	52	44386
3,6		.1417	34	63	44224
3,7		.1457	20	52	44387
3,7		.1457	34	63	44225
	#26	.1470	1-3/8	2-1/2	44076
	#25	.1495	1-3/8	2-1/2	44075
3,8		.1496	22	55	44388
3,8		.1496	34	63	44227
	#24	.1520	1-3/8	2-1/2	44074
3,9		.1535	22	55	44389
3,9		.1535	34	63	44228
	5/32	.1562	1-3/8	2-1/2	44008
4		.1575	22	55	44390
4		.1575	34	63	44229
	#21	.1590	1-3/8	2-1/2	44071
	#20	.1610	1-3/8	2-1/2	44070
4,1		.1614	22	55	44391
4,1		.1614	34	63	44230
4,2		.1654	22	55	44392
4,2		.1654	41	70	44231
	#19	.1660	1-5/8	2-3/4	44069
4,3		.1693	24	58	44393
4,3		.1693	41	70	44233
	11/64	.1719	1-5/8	2-3/4	44009
4,4		.1732	24	58	44394
4,4		.1732	41	70	44234
4,5		.1772	24	58	44395
4,5		.1772	41	70	44235

d_1 Cutter Diameter Metric	Fract.	Dec. Equiv.	l_2 Flute Length	l_1 Overall Length	Order Code
4,6		.1811	24	58	44396
4,6		.1811	41	70	44236
4,7		.1850	24	58	44397
4,7		.1850	41	70	44237
	3/16	.1875	1-5/8	2-3/4	44010
4,8		.1890	26	62	44398
4,8		.1890	41	70	44239
	#11	.1910	1-5/8	2-3/4	44061
4,9		.1929	26	62	44399
4,9		.1929	41	70	44240
5		.1969	26	62	44400
5		.1969	44	76	44241
5,1		.2008	26	62	44401
5,1		.2008	44	76	44242
	#7	.2010	1-3/4	3	44057
	13/64	.2031	1-3/4	3	44011
5,2		.2047	26	62	44402
5,2		.2047	44	76	44243
5,3		.2087	26	62	44403
5,3		.2087	44	76	44245
	#3	.2130	1-3/4	3	44053
5,5		.2165	28	66	44404
5,5		.2165	44	76	44247
	7/32	.2188	1-3/4	3	44012
5,6		.2205	28	66	44405
5,6		.2205	44	76	44248
5,8		.2283	28	66	44406
5,8		.2283	44	76	44251
	15/64	.2344	2	3-1/4	44013
6		.2362	28	66	44407
6		.2362	51	82	44253
6,1		.2402	31	70	44408
6,1		.2402	51	82	44254
6,2		.2441	31	70	44409
6,2		.2441	51	82	44255
6,3		.2480	31	70	44410
6,3		.2480	51	82	44257
	1/4	.2500	2	3-1/4	44014
6,4		.2520	31	70	44411
6,4		.2520	51	82	44258
6,5		.2559	31	70	44412
6,5		.2559	51	82	44259
	F	.2570	2	3-1/4	44156
6,6		.2598	31	70	44413
6,6		.2598	54	89	44260

d_1 (mm) h7

d_1 (in) +0.0 / -0.0005

continued on next page

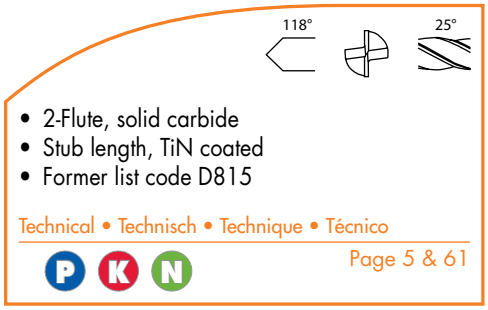
D30 • Metric • Inch • Continued

d_1 Cutter Diameter Metric	Fract.	Dec. Equiv.	l_2 Flute Length	l_1 Overall Length	Order Code
6,7		.2638	31	70	44414
6,7		.2638	54	89	44261
	17/64	.2656	2-1/8	3-1/2	44015
6,8		.2677	34	74	44415
6,8		.2677	54	89	44263
6,9		.2717	34	74	44416
6,9		.2717	54	89	44264
	I	.2720	2-1/8	3-1/2	44159
7		.2756	34	74	44417
7		.2756	54	89	44265
	9/32	.2812	2-1/8	3-1/2	44016
7,2		.2835	34	74	44418
7,2		.2835	54	89	44267
7,3		.2874	34	74	44419
7,3		.2874	54	89	44269
7,4		.2913	34	74	44420
7,4		.2913	60	95	44270
7,5		.2953	34	74	44421
7,5		.2953	60	95	44271
	19/64	.2969	2-3/8	3-3/4	44017
7,6		.2992	37	79	44422
7,6		.2992	60	95	44272
7,8		.3071	37	79	44423
7,8		.3071	60	95	44275
	5/16	.3125	2-3/8	3-3/4	44018
8		.3150	37	79	63141
8		.3150	60	95	44277
8,1		.3189	37	79	44424
8,1		.3189	60	95	44278
8,2		.3228	37	79	44425
8,2		.3228	63	101	44279
8,3		.3268	37	79	44426
8,3		.3268	63	101	44281
	21/64	.3281	2-1/2	4	44019
8,4		.3307	37	79	44427
8,4		.3307	63	101	44282
	Q	.3320	2-1/2	4	44167
8,5		.3346	37	79	44428
8,5		.3346	63	101	44283
8,6		.3386	40	84	44429
8,6		.3386	63	101	44284
8,7		.3425	40	84	44430
8,7		.3425	63	101	44285
	11/32	.3438	2-1/2	4	44020
8,8		.3465	40	84	44431
8,8		.3465	63	101	44287
9		.3543	40	84	44432
9		.3543	70	108	44289
9,1		.3583	40	84	44433
9,1		.3583	70	108	44290
	23/64	.3594	2-3/4	4-1/4	44021
9,2		.3622	40	84	44434
9,2		.3622	70	108	44291
	U	.3680	2-3/4	4-1/4	44171
9,5		.3740	40	84	44435
9,5		.3740	70	108	44295
	3/8	.3750	2-3/4	4-1/4	44022
9,6		.3780	43	89	44436
9,6		.3780	70	108	44296
9,7		.3819	43	89	44437
9,7		.3819	70	108	44297
	25/64	.3906	2-7/8	4-1/2	44023
10		.3937	43	89	44438
10		.3937	73	114	44301
10,1		.3976	43	89	44439
10,1		.3976	73	114	44302
10,2		.4016	43	89	44440
10,2		.4016	73	114	44303
10,3		.4055	43	89	44441
10,3		.4055	73	114	44305
	13/32	.4062	2-7/8	4-1/2	44024
10,4		.4094	43	89	44442
10,4		.4094	73	114	44306
10,5		.4134	43	89	44443
10,5		.4134	73	114	44307
10,7		.4213	47	95	44444
10,7		.4213	73	114	44309
	27/64	.4219	2-7/8	4-1/2	44025
10,8		.4252	47	95	44445
10,8		.4252	73	114	44311
11		.4331	47	95	44446
11		.4331	73	114	44313
	7/16	.4375	2-7/8	4-1/2	44026
11,3		.4449	47	95	44447
11,3		.4449	76	120	44317
11,5		.4528	47	95	44448
11,5		.4528	76	120	44319
	29/64	.4531	3	4-3/4	44027
11,7		.4606	47	95	44449
11,7		.4606	76	120	44321
12		.4724	51	102	44450
12		.4724	76	120	44325
12,5		.4921	51	102	44451
12,5		.4921	76	120	44331
	1/2	.5000	3	4-3/4	44030
13		.5118	51	102	44452
13		.5118	82	127	44336
	17/32	.5312	3-1/4	5	41010
13,5		.5315	54	107	44453
13,5		.5315	82	127	44337
14		.5512	54	107	44454
14		.5512	82	127	44338
	9/16	.5625	3-1/4	5	41020
14,5		.5709	56	111	44455
14,5		.5709	82	127	44339
15		.5906	56	111	44456
15		.5906	82	127	44340
15,5		.6102	58	115	44457
15,5		.6102	82	127	44341
	5/8	.6250	3-1/4	5	41040
16		.6299	58	115	44458
16		.6299	82	127	44342
	21/32	.6562	3-1/2	5-1/2	41050
17,5		.6890	62	123	44459
17,5		.6890	89	140	44345
19,5		.7677	66	131	44460
19,5		.7677	95	152	44349
20		.7874	66	131	44461
20		.7874	95	152	44350

d_1 (mm) h7

d_1 (in) +0.0 / -0.0005

D21 • Stub Length



- 2-Flute, solid carbide
- Stub length, TiN coated
- Former list code D815

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P K N

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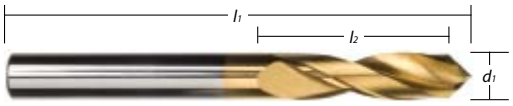
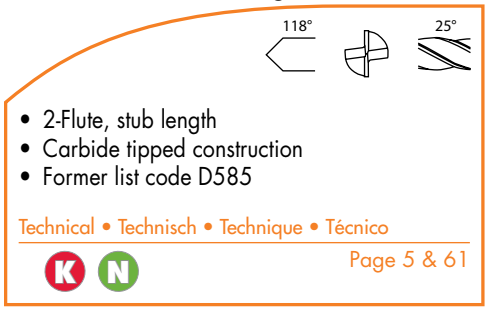


Inch

d_1 Cutting Diameter	Dec. Equiv.	l_2 Flute Length	l_1 Overall Length	Order Code
1/8	.1250	5/8	2	41408
9/64	.1406	5/8	2	41409
5/32	.1562	3/4	2-1/2	41410
11/64	.1719	3/4	2-1/2	41411
3/16	.1875	3/4	2-1/2	41412
13/64	.2031	3/4	2-1/2	41413
7/32	.2188	1	2-1/2	41414
15/64	.2344	1	2-1/2	41415
1/4	.2500	1	2-1/2	41416
17/64	.2656	1	2-1/2	41417
9/32	.2812	1	2-1/2	41418
19/64	.2969	1-1/4	2-3/4	41419
5/16	.3125	1-1/4	2-3/4	41420
21/64	.3281	1-1/4	2-3/4	41421
11/32	.3438	1-1/4	3	41422
23/64	.3594	1-1/4	3	41423
3/8	.3750	1-1/4	3	41424
25/64	.3906	1-1/4	3	41425
13/32	.4062	1-1/4	3	41426
27/64	.4219	1-1/4	3	41427
7/16	.4375	1-1/4	3	41428
29/64	.4531	1-1/4	3	41429
15/32	.4688	1-1/4	3	41430
31/64	.4844	1-1/4	3	41431
1/2	.5000	1-1/4	3	41432

d_1 (in) +0.0 / -0.0005

DT21 • Stub Length



- 2-Flute, stub length
- Carbide tipped construction
- Former list code D585

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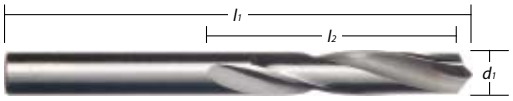

Inch

d_1 Cutting Diameter	Dec. Equiv.	l_2 Flute Length	l_1 Overall Length	Order Code
1/8	.1250	7/8	1-7/8	41308
9/64	.1406	1	2-1/16	41309
5/32	.1562	1	2-1/16	41310
11/64	.1719	1-1/8	2-3/16	41311
3/16	.1875	1-1/8	2-3/16	41312
13/64	.2031	1-1/4	2-3/8	41313
7/32	.2188	1-1/4	2-3/8	41314
15/64	.2344	1-3/8	2-1/2	41315
1/4	.2500	1-3/8	2-1/2	41316
17/64	.2656	1-1/2	2-11/16	41317
9/32	.2812	1-1/2	2-11/16	41318
19/64	.2969	1-5/8	2-13/16	41319
5/16	.3125	1-5/8	2-13/16	41320
21/64	.3281	1-11/16	3	41321
11/32	.3438	1-11/16	3	41322
23/64	.3594	1-13/16	3-1/8	41323
3/8	.3750	1-13/16	3-1/8	41324
25/64	.3906	1-15/16	3-5/16	41325
13/32	.4062	1-15/16	3-5/16	41326
27/64	.4219	2-1/16	3-7/16	41327
7/16	.4375	2-1/16	3-7/16	41328
15/32	.4688	2-1/8	3-5/8	41329
1/2	.5000	2-1/4	3-3/4	41330

d_1 (in) +0.0 / -0.0010

D23 • Spot Drill

- 2-Flute, solid carbide
- Spotting & centering style
- Regular and long lengths

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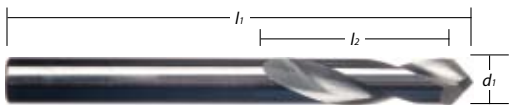


Metric • Inch

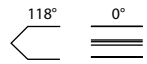
d_1 Cutter Diameter Metric	d_1 Cutter Diameter Fract.	Dec. Equiv.	l_2 Flute Length	l_1 Overall Length	90° Order Code	120° Order Code
3		.1181	10	50	42020	42120
	1/8	.1250	9/16	1-1/2	42001	42101
	3/16	.1875	3/4	2	42003	42103
5		.1969	19	63	42022	42122
6		.2362	25	63	42023	42123
6		.2362	25	150	42025	42125
	1/4	.2500	1	2-1/2	42005	42105
	1/4	.2500	1	6	42007	42107
	5/16	.3125	1	2-1/2	42008	42108
	5/16	.3125	1	6	42010	42110
8		.3150	25	63	42026	42126
8		.3150	25	150	42028	42128
	3/8	.3750	1	2-1/2	42011	42111
	3/8	.3750	1	6	42013	42113
10		.3937	25	70	42029	42129
10		.3937	25	150	42031	42131
12		.4724	31	76	42032	42132
12		.4724	31	150	42033	42133
	1/2	.5000	1-1/2	3	42014	42114
	1/2	.5000	1-1/2	6	42015	42115
	5/8	.6250	1-1/2	6	42016	42116
16		.6299	38	150	42035	42135
	3/4	.7500	1-1/2	6	42017	42117
20		.7874	38	150	42036	42136

d_1 (mm) h7 d_1 (in) +0.0 / -0.0005

Former List Code Reference

D23 Length	90°	120°
Regular	D818	D819
Long	D818L	D819L

D10 • Spade Drill



- 2-Flute, solid carbide
- For shallow hole drilling
- Former list code D400

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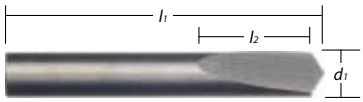
P M K H



Metric

d_1 Cutting Diameter	Dec. Equiv.	l_2 Flute Length	l_1 Overall Length	Order Code
2	.0787	10	38	04772
3	.1181	12	38	04773
4	.1575	13	50	04774
5	.1969	17	50	04775
6	.2362	17	50	04776
7	.2756	20	50	04777
8	.3150	22	55	04778
9	.3543	28	55	04779
10	.3937	28	55	04780
11	.4331	30	55	04781
12	.4724	30	55	04782

d_1 (mm) h7

Inch

d_1 Cutting Diameter	Dec. Equiv.	l_2 Flute Length	l_1 Overall Length	Order Code
1/32	.0312	3/16	1-1/4	41552
1/16	.0625	5/16	1-1/2	04751
3/32	.0938	3/8	1-1/2	04752
1/8	.1250	7/16	1-1/2	04753
5/32	.1562	15/32	2	04754
3/16	.1875	9/16	2	04755
7/32	.2188	19/32	2	04756
1/4	.2500	11/16	2	04757
9/32	.2812	3/4	2-1/2	04758
5/16	.3125	7/8	2-1/2	04759
11/32	.3438	15/16	2-1/2	04760
3/8	.3750	1	2-1/2	04761
13/32	.4062	1	2-1/2	04762
7/16	.4375	1-1/16	2-1/2	04763
15/32	.4688	1-1/8	2-1/2	04764
1/2	.5000	1-1/8	2-1/2	04765

d_1 (in) +0.0 / -0.0005

Recommended for use in drilling thin sheet metals or general shallow hole drilling in most materials. Maximum hole depth is twice the drill diameter. Spade drills can also be used as spotting drills.

D11 • Tap Drill

- 2-Flute, solid carbide
- Commonly used to remove broken taps
- Former list code D405

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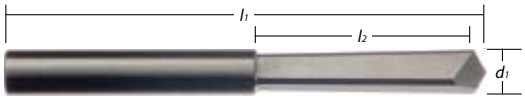


Metric

d_1 Cutting Diameter	Dec. Equiv.	l_2 Flute Length	l_1 Overall Length	Order Code
2	.0787	10	38	36372
3	.1181	15	38	36373
4	.1575	20	50	36374
5	.1969	25	50	36375
6	.2362	30	63	36376

d_1 (mm) h7

Drill Set

Style	Order Code
D11	36377

Contains one each of:
2, 3, 4, 5, 6

Using hard metal drills for broken tap removal

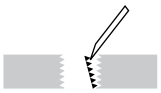
Step 1: Select drill size

Use Drill Size	For Tap Range
2,0	3mm, 6BA-4BA
3,0	4mm, 5mm, 3BA, 2BA
4,0	6mm, 1BA, 0BA, 1/4, 5/16
5,0	8mm-10mm, 5/16-3/8
6,0	10mm-12mm, 3/8-1/2

Step 2: Firmly secure the work piece. Center hard metal drill in broken tap.

Step 3: Using a spindle speed of 1500-3500 RPM and no coolant or lubricant, machine the tap away. Apply constant pressure, releasing occasionally to clear the chips. Expect vibration as chips are freed from the hole side.

Step 4: Using a sharp, hard pointed tool, pick away the remaining tap material.



D40 • AccuHole Drill

- 2 straight flutes
- Solid carbide, stub length
- Thick web for added strength
- Former list code D805

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AccuHole drills are commonly used in hardened steels, stainless steels, aerospace alloys and other exotic materials. The point geometry allows easy penetration of the work piece with minimal deflection, reducing heat generation and producing accurate hole sizes without annealing the work material. The extra web thickness of straight flute design gives added toughness needed when drilling hard materials.

Metric • Inch

d_1 Cutter Diameter Metric	d_1 Cutter Diameter Fract.	Dec. Equiv.	l_2 Flute Length	l_1 Overall Length	Order Code
1		.0394	9	32	04581
	#60	.0400	1/2	1-1/2	04510
	#59	.0410	1/2	1-1/2	04509
	#58	.0420	1/2	1-1/2	04508
	#57	.0430	1/2	1-1/2	04507
1,1		.0433	9	32	04583
	#56	.0465	1/2	1-1/2	04506
	3/64	.0469	1/2	1-1/2	04401
1,2		.0472	9	32	04585
1,25		.0492	9	32	04586
1,3		.0512	9	32	04587
	#55	.0520	1/2	1-5/8	04505
	#54	.0550	1/2	1-5/8	04504
1,4		.0551	9	32	04589
1,5		.0591	9	32	04591
	#53	.0595	1/2	1-5/8	04503
	1/16	.0625	5/8	1-5/8	04402
1,6		.0630	10	34	04593
	#52	.0635	11/16	1-11/16	04502
1,7		.0669	10	34	04595
	#51	.0670	11/16	1-11/16	04501
1,75		.0689	11	36	04596
	#50	.0700	11/16	1-11/16	04500
1,8		.0709	11	36	04597
	#49	.0730	11/16	1-11/16	04499
1,9		.0748	11	36	04599
	5/64	.0781	11/16	1-11/16	04403
	#47	.0785	3/4	1-3/4	04497
2		.0787	12	38	04601
	#46	.0810	3/4	1-3/4	04496
	#45	.0820	3/4	1-3/4	04495
2,1		.0827	12	38	04603
	#44	.0860	3/4	1-3/4	04494
2,2		.0866	13	40	04605
	#43	.0890	3/4	1-3/4	04493
2,3		.0906	13	40	04607
	#42	.0935	3/4	1-3/4	04492
	3/32	.0938	3/4	1-3/4	04404
2,4		.0945	14	43	04609
	#41	.0960	13/16	1-13/16	04491
	#40	.0980	13/16	1-13/16	04490
2,5		.0984	14	43	04611
	#39	.0995	13/16	1-13/16	04489
	#38	.1015	13/16	1-13/16	04488
2,6		.1024	14	43	04612
	#37	.1040	13/16	1-13/16	04487
2,7		.1063	16	46	04613
	#36	.1065	13/16	1-13/16	04486
	7/64	.1094	13/16	1-13/16	04405
2,8		.1102	16	46	04615
	#34	.1110	7/8	1-7/8	04484
	#33	.1130	7/8	1-7/8	04483
2,9		.1142	16	46	04616
	#32	.1160	7/8	1-7/8	04482
3		.1181	16	46	04617
	#31	.1200	7/8	1-7/8	04481
3,1		.1220	18	49	04618
	1/8	.1250	7/8	1-7/8	04406
3,2		.1260	18	49	04619
	#30	.1285	15/16	1-15/16	04480
3,3		.1299	18	49	04621
3,4		.1339	20	52	04622
	#29	.1360	15/16	1-15/16	04479
3,5		.1378	20	52	04623
	9/64	.1406	15/16	1-15/16	04407
3,6		.1417	20	52	04624
	#27	.1440	1	2-1/16	04477
3,7		.1457	20	52	04625
	#26	.1470	1	2-1/16	04476
	#25	.1495	1	2-1/16	04475
3,8		.1496	22	55	04627
	5/32	.1562	1	2-1/16	04408
4		.1575	22	55	04629
	#21	.1590	1-1/16	2-1/8	04471
	#20	.1610	1-1/16	2-1/8	04470
4,1		.1614	22	55	04630
4,2		.1654	22	55	04631
4,3		.1693	24	58	04633
	11/64	.1719	1-1/16	2-1/8	04409
	#16	.1770	1-1/8	2-3/16	04466
4,5		.1772	24	58	04635
4,6		.1811	24	58	04636
	#14	.1820	1-1/8	2-3/16	04464
	#13	.1850	1-1/8	2-3/16	04463
	3/16	.1875	1-1/8	2-3/16	04410
4,8		.1890	26	62	04639
	#12	.1890	1-1/8	2-3/16	04462
	#11	.1910	1-1/8	2-3/16	04461
	#10	.1935	1-1/8	2-3/16	04460
	#9	.1960	1-3/16	2-1/4	04459

d_1 (mm) h7

d_1 (in) +0.0 / -0.0005

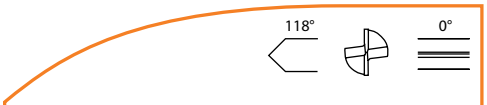
continued on next page

D40 • Metric • Inch • Continued

d_1 Cutter Diameter Metric	Fract.	Dec. Equiv.	l_2 Flute Length	l_1 Overall Length	Order Code
5		.1969	26	62	04641
5,1		.2008	26	62	04642
	#7	.2010	1-3/16	2-1/4	04457
	13/64	.2031	1-3/16	2-1/4	04411
5,2		.2047	26	62	04643
5,3		.2087	26	62	04645
	#4	.2090	1-1/4	2-3/8	04454
5,4		.2126	26	62	04646
	#3	.2130	1-1/4	2-3/8	04453
5,5		.2165	28	66	04647
	7/32	.2188	1-1/4	2-3/8	04412
5,6		.2205	28	66	04648
5,7		.2244	28	66	04649
	#1	.2280	1-5/16	2-7/16	04451
5,8		.2283	28	66	04651
5,9		.2323	28	66	04652
	15/64	.2344	1-5/16	2-7/16	04413
6		.2362	28	66	04653
6,1		.2402	31	70	04654
6,2		.2441	31	70	04655
6,3		.2480	31	70	04657
	1/4 (E)	.2500	1-3/8	2-1/2	04414
6,4		.2520	31	70	04658
6,5		.2559	31	70	04659
	F	.2570	1-7/16	2-5/8	04556
	17/64	.2656	1-7/16	2-5/8	04415
6,8		.2677	34	74	04663
6,9		.2717	34	74	04664
	I	.2720	1-1/2	2-11/16	04559
7		.2756	34	74	04665
7,1		.2795	34	74	04666
	9/32	.2812	1-1/2	2-11/16	04416
7,2		.2835	34	74	04667
7,3		.2874	34	74	04669
7,4		.2913	34	74	04670
7,5		.2953	34	74	04671
	19/64	.2969	1-9/16	2-3/4	04417
7,8		.3071	37	79	04675
7,9		.3110	37	79	04676
	5/16	.3125	1-5/8	2-13/16	04418
8		.3150	37	79	04677
8,1		.3189	37	79	04678
8,3		.3268	37	79	04681
	21/64	.3281	1-11/16	2-15/16	04419
	Q	.3320	1-11/16	3	04567
8,5		.3346	37	79	04683
	11/32	.3438	1-11/16	3	04420
8,8		.3465	40	84	04687
9		.3543	40	84	04689
	23/64	.3594	1-3/4	3-1/16	04421
9,3		.3661	40	84	04693
	U	.3680	1-13/16	3-1/8	04571
9,5		.3740	40	84	04695
	3/8	.3750	1-13/16	3-1/8	04422
9,7		.3819	43	89	04697
9,9		.3898	43	89	04700
	25/64	.3906	1-7/8	3-1/4	04423
10		.3937	43	89	04701
10,2		.4016	43	89	04703
	13/32	.4062	1-15/16	3-5/16	04424
10,5		.4134	43	89	04707
	27/64	.4219	2	3-3/8	04425
10,8		.4252	47	95	04711
11		.4331	47	95	04713
	7/16	.4375	2-1/16	3-7/16	04426
11,5		.4528	47	95	04719
	15/32	.4688	2-1/8	3-5/8	04428
12		.4724	51	102	04725
12,5		.4921	51	102	04731
	1/2	.5000	2-1/4	3-3/4	04430

d_1 (mm) h7 — d_1 (in) +0.0 / -0.0005

DT40



- 2-Flute, carbide tipped
- Designed for hardened steels
- Former list code D485

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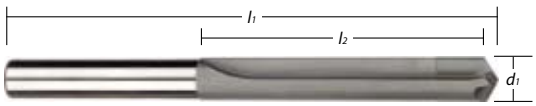

Inch

d_1 Cutting Diameter	Dec. Equiv.	l_2 Flute Length	l_1 Overall Length	Order Code
3/16	.1875	1-1/2	3-1/2	41003
13/64	.2031	1-3/4	3-3/4	41004
7/32	.2188	1-3/4	3-3/4	41005
15/64	.2344	2	4	41006
1/4	.2500	2	4	41007
17/64	.2656	2-1/4	4-1/4	41008
9/32	.2812	2-1/4	4-1/4	41009
19/64	.2969	2-1/2	4-1/2	41346
5/16	.3125	2-1/2	4-1/2	41011
21/64	.3281	2-3/4	4-3/4	41012
11/32	.3438	2-3/4	4-3/4	41013
23/64	.3594	3	5	41014
3/8	.3750	3	5	41015
25/64	.3906	3	5-1/4	41016
13/32	.4062	3	5-1/4	41017
27/64	.4219	3	5-1/2	41018
7/16	.4375	3	5-1/2	41019
29/64	.4531	3-1/4	5-3/4	41348
15/32	.4688	3-1/4	5-3/4	41021
31/64	.4844	3-1/2	6	41022
1/2	.5000	3-1/2	6	41023
17/32	.5312	3-1/2	6	41025
9/16	.5625	3-1/2	6	41027
19/32	.5937	4	7	41029
5/8	.6250	4	7	41031
21/32	.6562	4-1/2	7-1/2	41033
11/16	.6875	4-1/2	7-1/2	41035
23/32	.7187	4-3/4	8	41037
3/4	.7500	4-3/4	8	41039
13/16	.8125	4-3/4	8	41041
7/8	.8750	4-3/4	8	41043
15/16	.9375	4-3/4	8	41045
1	1.0000	4-3/4	8	41047

d_1 (in) ≤ 1/4 +0.0 / -0.0010 > 1/4 +0.0 / -0.0015

Die drills are primarily designed for drilling hard materials in the 48-65 HRc range. This drill series will produce a close tolerance, smooth and straight hole and can often eliminate a reaming operation. The carbide tips are longer than normal for added resharpening life and are high-temperature brazed to HSS bodies. When drilling deep holes, the drill should be withdrawn frequently to clear the chips.

Results: Reliably high performance, longer life per tool, cost and time savings for you.

For best results, leave the correct amount of stock in a hole to be reamed. Approximately 3% of the reamer diameter should be left in the hole. Too little stock will cause the reamer to wear prematurely, while too much stock will clog the flutes and reduce size accuracy and finish.

R10

0°

- Straight flutes
- Solid carbide construction
- Former list code R900

Technical • Technisch • Technique • Técnico

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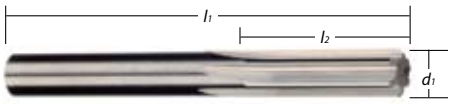
Page 5 & below



Dec. Range .0469 - .2544

z=4

Dec. Range .2545 - .5054

z=6

Metric • Inch • Decimal

d_1 Cutter Diameter Metric	d_1 Cutter Diameter Fract.	Dec. Equiv.	l_2 Flute Length	l_1 Overall Length	Order Code
	1/32	.0312	5/16	1-3/8	06450
	#67	.0320	5/16	1-3/8	06451
	#66	.0330	5/16	1-3/8	06452
	#65	.0350	5/16	1-3/8	06453
	#64	.0360	5/16	1-3/8	06454
	#63	.0370	5/16	1-3/8	06455
	#62	.0380	5/16	1-3/8	06456
	#61	.0390	5/16	1-3/8	06457
1		.0394	8	35	06314
	#60	.0400	5/16	1-3/8	06459
	#59	.0410	5/16	1-3/8	06460
	#58	.0420	5/16	1-3/8	06461
	#57	.0430	5/16	1-3/8	06462
	#56	.0465	5/16	1-3/8	06463
	3/64	.0469	5/16	1-3/8	06464
1,2		.0472	8	35	06318
1,25		.0492	10	38	06319
1,3		.0512	10	38	06320
	#55	.0520	3/8	1-1/2	06465
1,35		.0531	10	38	06321
	#54	.0550	3/8	1-1/2	06466
1,4		.0551	10	38	06322
1,45		.0571	10	38	06323
1,5		.0591	10	38	06324
	#53	.0595	3/8	1-1/2	06468
1,55		.0610	10	38	06325
	1/16	.0625	3/8	1-1/2	06469

d_1 Cutter Diameter Metric	d_1 Cutter Diameter Fract.	Dec. Equiv.	l_2 Flute Length	l_1 Overall Length	Order Code
1,6		.0630	10	38	06326
	#52	.0635	3/8	1-1/2	06470
1,65		.0650	10	38	06327
1,7		.0669	11	44	06328
	#51	.0670	7/16	1-3/4	06471
1,75		.0689	11	44	06329
	#50	.0700	7/16	1-3/4	06472
1,8		.0709	11	44	06330
1,85		.0728	11	44	06331
	#49	.0730	7/16	1-3/4	06473
1,9		.0748	11	44	06332
	#48	.0760	7/16	1-3/4	06474
1,95		.0768	11	44	06333
	5/64	.0781	7/16	1-3/4	06475
	#47	.0785	7/16	1-3/4	06476
2		.0787	11	44	06334
2,05		.0807	13	51	06335
	#46	.0810	1/2	2	06478
	#45	.0820	1/2	2	06479
2,1		.0827	13	51	06336
2,15		.0846	13	51	06337
	#44	.0860	1/2	2	06480
2,2		.0866	13	51	06338
2,25		.0886	13	51	06339
	#43	.0890	1/2	2	06481
2,3		.0906	13	51	06340
2,35		.0925	13	51	06341

continued on next page

Application Guide • Speed & Feed

Work Material	Speed (m/min)	Feed Per Revolution (mm/rev) 1,0-1,5	1,5-3,0	3,0-6,0	6,0-9,0	9,0-12,0
Aluminum Alloys	61-122	.051-.101	.101-.152	.152-.203	.203-.254	.254-.305
Copper, Brass & Bronze	35-75	.025-.051	.051-.076	.076-.127	.127-.203	.203-.254
Composites, Plastics	61-122	.051-.101	.101-.152	.152-.203	.203-.254	.254-.305
Magnesium Alloys	61-122	.051-.101	.101-.152	.152-.203	.203-.254	.254-.305
Cast Iron - Gray	38-61	.025-.051	.051-.101	.101-.152	.152-.229	.229-.305
Cast Iron - Ductile & Malleable	23-53	.025-.051	.051-.101	.101-.152	.152-.229	.229-.305
Low Carbon Steel ≤ 38 HRc 1018, 12L14, 8620	38-61	.025-.051	.051-.076	.076-.127	.127-.203	.203-.254
Medium Carbon Steels ≤ 38 HRc 4140, 4340	30-53	.025-.051	.051-.076	.076-.127	.127-.203	.203-.254
Tool & Die Steels ≤ 38 HRc A2, D2, H13, P20	18-30	.025-.051	.051-.076	.076-.127	.127-.203	.203-.254
Tool & Die Steels 39 - 48 HRc A2, D2, H13, P20	12-23	.025-.051	.051-.076	.076-.101	.101-.152	.152-.203
Tool Steels 49 - 52 HRc A2, D2	9-20	.013-.025	.025-.051	.051-.076	.076-.101	.101-.152
Easy to Machine Stainless Steel 416, 410, 302, 303	21-46	.025-.051	.051-.076	.076-.127	.127-.203	.203-.254
Moderate Machining Stainless Steels 304, 316, Invar, Kovar	20-33	.025-.051	.051-.076	.076-.127	.127-.203	.203-.254
Difficult to Machine Stainless Steels 316L, 17-4 PH, 15-5 PH, 13-8 PH	15-30	.013-.025	.025-.051	.051-.076	.076-.101	.101-.152
Titanium	9-20	.025-.051	.051-.076	.076-.127	.127-.203	.203-.254
High Temp Alloys, Inconel, Stellite, Hastalloy, Waspalloy	6-15	.013-.025	.025-.051	.051-.101	.101-.152	.152-.203

Speed (SFM)	Feed Per Revolution (IPR) 1/32-1/16	>1/16-1/8	>1/8-1/4	>1/4-3/8	>3/8-1/2
200-400	.002-.004	.004-.006	.006-.008	.008-.010	.010-.012
120-250	.001-.002	.002-.003	.003-.005	.005-.008	.008-.010
200-400	.002-.004	.004-.006	.006-.008	.008-.010	.010-.012
200-400	.002-.004	.004-.006	.006-.008	.008-.010	.010-.012
125-200	.001-.002	.002-.004	.004-.006	.006-.009	.009-.012
75-175	.001-.002	.002-.003	.003-.005	.005-.007	.009-.012
125-200	.001-.002	.002-.003	.003-.005	.005-.008	.008-.010
100-175	.001-.002	.002-.003	.003-.005	.005-.008	.008-.010
60-100	.001-.002	.002-.003	.003-.005	.005-.008	.008-.010
40-75	.001-.002	.002-.003	.003-.004	.004-.006	.006-.008
30-65	.0005-.001	.001-.002	.002-.003	.003-.004	.004-.006
70-150	.001-.002	.002-.003	.003-.005	.005-.008	.008-.010
65-110	.001-.002	.002-.003	.003-.005	.005-.008	.008-.010
50-100	.0005-.001	.001-.002	.002-.003	.003-.004	.004-.006
30-65	.001-.002	.002-.003	.003-.005	.005-.008	.008-.010
20-50	.0005-.001	.001-.002	.002 -.004	.004-.006	.006-.008

All recommendations should be considered as a starting point, due to material properties, machinery capabilities and application variations.

R10 • Metic • Inch • Decimal • Continued

d_1 Cutter Diameter Metric	Fract.	Dec. Equiv.	l_2 Flute Length	l_1 Overall Length	Order Code
	#42	.0935	1/2	2	06482
	3/32	.0938	1/2	2	06483
2,4		.0945	13	51	06342
	#41	.0960	5/8	2-1/4	06484
2,45		.0965	16	57	06343
	#40	.0980	5/8	2-1/4	06485
2,5		.0984	16	57	06344
	#39	.0995	5/8	2-1/4	06487
	#38	.1015	5/8	2-1/4	06488
2,6		.1024	16	57	06345
	#37	.1040	5/8	2-1/4	06489
2,7		.1063	16	57	06346
	#36	.1065	5/8	2-1/4	06490
2,75		.1083	16	57	06347
	7/64	.1094	5/8	2-1/4	06491
	#35	.1100	5/8	2-1/4	06492
2,8		.1102	16	57	06348
	#34	.1110	5/8	2-1/4	06493
	#33	.1130	5/8	2-1/4	06494
2,9		.1142	16	57	06349
	#32	.1160	5/8	2-1/4	06495
3		.1181	16	57	06350
	#31	.1200	5/8	2-1/4	06497
3,1		.1220	16	57	06351
	.124	.1240	5/8	2-1/4	43625
	.1245	.1245	5/8	2-1/4	43626
	1/8	.1250	5/8	2-1/4	06500
	.126	.1260	5/8	2-1/4	43627
3,2		.1260	16	57	06352
3,25		.1280	16	57	06353
	#30	.1285	3/4	2-1/4	06502
3,3		.1299	19	57	06354
3,35		.1319	19	57	06355
3,4		.1339	19	57	06356
3,45		.1358	19	57	06357
	#29	.1360	3/4	2-1/4	06503
3,5		.1378	19	57	06358
3,55		.1398	19	57	06359
	#28	.1405	3/4	2-1/4	06505
	9/64	.1406	3/4	2-1/4	06506
3,6		.1417	19	57	06360
3,65		.1437	19	57	06361
	#27	.1440	3/4	2-1/4	06507
3,7		.1457	19	64	06362
	#26	.1470	3/4	2-1/2	06508
3,75		.1476	19	64	06363
	#25	.1495	3/4	2-1/2	06509
3,8		.1496	19	64	06364
	#24	.1520	3/4	2-1/2	06510
3,9		.1535	19	64	06365
	#23	.1540	3/4	2-1/2	06511
3,95		.1555	19	64	06366
	5/32	.1562	3/4	2-1/2	06512
	#22	.1570	3/4	2-1/2	06513
4		.1575	19	64	06367
	#21	.1590	3/4	2-1/2	06515
4,05		.1594	19	64	06368
	#20	.1610	7/8	2-3/4	06516
4,1		.1614	22	70	06369
4,15		.1634	22	70	06370
4,2		.1654	22	70	06371
	#19	.1660	7/8	2-3/4	06517
4,25		.1673	22	70	06372
4,3		.1693	22	70	06373
	#18	.1695	7/8	2-3/4	06518
4,35		.1713	22	70	06374
	11/64	.1719	7/8	2-3/4	06519
	#17	.1730	7/8	2-3/4	06520
4,4		.1732	22	70	06375
4,45		.1752	22	70	06376
	#16	.1770	7/8	2-3/4	06521
4,5		.1772	22	70	06377
4,55		.1791	22	70	06378
	#15	.1800	7/8	2-3/4	06523
4,6		.1811	22	70	06379
	#14	.1820	7/8	2-3/4	06524
4,65		.1831	22	70	06380
4,7		.1850	22	70	06381
	#13	.1850	7/8	2-3/4	06525
4,75		.1870	22	70	06382
	.187	.1870	7/8	2-3/4	43628
	3/16	.1875	7/8	2-3/4	06527
	.1885	.1885	7/8	2-3/4	43629
4,8		.1890	22	70	06383
	#12	.1890	7/8	2-3/4	06529
4,85		.1909	22	70	06384
	#11	.1910	7/8	2-3/4	06530
4,9		.1929	25	76	06385
	#10	.1935	1	3	06531
4,95		.1949	25	76	06386
	#9	.1960	1	3	06532
5		.1969	25	76	06387
5,05		.1988	25	76	06388
	#8	.1990	1	3	06534
5,1		.2008	25	76	06389
	#7	.2010	1	3	06535
5,15		.2028	25	76	06390
	13/64	.2031	1	3	06536
	#6	.2040	1	3	06537
5,2		.2047	25	76	06391
	#5	.2055	1	3	06538
5,25		.2067	25	76	06392
5,3		.2087	25	76	06393
	#4	.2090	1	3	06539
5,35		.2106	25	76	06394
5,4		.2126	25	76	06395
	#3	.2130	1	3	06540
5,45		.2146	25	76	06396
5,5		.2165	25	76	06397
5,55		.2185	25	76	06398
	7/32	.2188	1	3	06542
5,6		.2205	25	76	06399
	#2	.2210	1	3	06543
5,65		.2224	25	76	06400
5,7		.2244	25	76	06401
5,75		.2264	25	76	06402
	#1	.2280	1	3	06544
5,8		.2283	25	76	06403
5,85		.2303	25	76	06404
5,9		.2323	25	76	06405
	A	.2340	1	3	06545
5,95		.2343	25	76	06406
	15/64	.2344	1	3	06546
6		.2362	25	76	06407
	B	.2380	1	3	06548
6,1		.2402	25	76	06408
	C	.2420	1	3	06549
6,2		.2441	25	76	06409
	D	.2460	1	3	06550
6,25		.2461	25	76	06410
6,3		.2480	25	76	06411
	.2495	.2495	1	3	43630
	1/4	.2500	1	3	06412
	.251	.2510	1	3	43631
6,4		.2520	25	76	06413
6,5		.2559	29	83	06414
	F	.2570	1-1/8	3-1/4	06554
	G	.2610	1-1/8	3-1/4	06555
	17/64	.2656	1-1/8	3-1/4	06556
	H	.2660	1-1/8	3-1/4	06557
	I	.2720	1-1/8	3-1/4	06558
7		.2756	29	83	06415
	J	.2770	1-1/8	3-1/4	06560
	K	.2810	1-1/8	3-1/4	06561
	9/32	.2812	1-1/8	3-1/4	06562
	L	.2900	1-1/8	3-1/4	06563
	M	.2950	1-1/8	3-1/4	06564
7,5		.2953	29	83	06416
	19/64	.2969	1-1/8	3-1/4	06565
	N	.3020	1-1/8	3-1/4	06566
	5/16	.3125	1-1/8	3-1/4	06567
	.3135	.3135	1-1/8	3-1/4	43632
8		.3150	29	83	06417
	O	.3160	1-1/8	3-1/4	06570
	P	.3230	1-1/4	3-1/2	06571
	21/64	.3281	1-1/4	3-1/2	06572
	Q	.3320	1-1/4	3-1/2	06573
8,5		.3346	32	89	06418
	R	.3390	1-1/4	3-1/2	06574
	11/32	.3438	1-1/4	3-1/2	06575
	S	.3480	1-1/4	3-1/2	06576
9		.3543	32	89	06419
	T	.3580	1-1/4	3-1/2	06578
	23/64	.3594	1-1/4	3-1/2	06579
	U	.3680	1-1/4	3-1/2	06580
9,5		.3740	32	89	06420
	3/8	.3750	1-1/4	3-1/2	06582
	.376	.3760	1-1/4	3-1/2	43633
	V	.3770	1-1/4	3-1/2	06584
	W	.3860	1-1/2	4	06585
	25/64	.3906	1-1/2	4	06594
10		.3937	38	102	06421
	X	.3970	1-1/2	4	06587
	Y	.4040	1-1/2	4	06588
	13/32	.4062	1-1/2	4	06589
	Z	.4130	1-1/2	4	06590
10,5		.4134	38	102	06422
	27/64	.4219	1-1/2	4	06595
11		.4331	38	102	06423
	7/16	.4375	1-1/2	4	06591
11,5		.4528	38	102	06424
	29/64	.4531	1-1/2	4	09596
	15/32	.4688	1-1/2	4	06592
12		.4724	38	102	06425
	31/64	.4844	1-1/2	4	06597
	1/2	.5000	1-1/2	4	06593

d_1 (mm) *H7*

d_1 (.0469 - .2500 in) + 0.0003/-0.0 d_1 (.2501 - .5054 in) + 0.0004/-0.0

Made to Order Reamers

Straight flute reamers are used in general purpose reaming applications in ferrous metals and most nonferrous metals. The reamers are precision ground with straight flutes to produce smooth, accurate holes while delivering long tool life.

How to order.

Follow these easy instructions to specify order codes for made to order reamers. The example provided is based on a .2530 diameter reamer with right-hand spiral flutes and precision (.0001) tolerance.

1. Find the part number/order code.

In the chart, find the size range for the reamer diameter you want in the far left column. In the shaded column to the right you will find the five-digit part number/order code. (For example, the part number/order code for a .2530 diameter reamer would be 43766.)

2. Specify a flute style and add the set-up charge.

Append the part number/order code with one of the following flute style codes. (Example: 43766-RHS). Straight flute style will be supplied unless otherwise specified.

3. Specify a tolerance.

Append the part number/order code with a tolerance code from the list below. (Example: 43766-RHS-T1) Standard tolerance will be supplied unless otherwise specified.

4. Specify the finished diameter and calculate the price.

After the tolerance code, note in parentheses the exact size of the reamer you require. Example: 43766-RHS-T1 (.2530)

Additional examples:

- The complete order code for the .2530 diameter reamer with straight flutes and standard tolerance would be 43766 (.2530).
- The complete order code for the .2530 diameter reamer with straight flutes and precision (.0001) tolerance would be 43766-T1 (.2530).
- The complete order code for the .2530 diameter reamer with right-hand spiral flutes and standard tolerance would be 43766-RHS (.2530).

R10 • Metric • Made to order

d_1 Cutter Diameter Min. - Max. Range	l_2 Length of Cut	l_1 Overall Length	Order Code
0,76 - 0,89	8	35	43851
0,891 - 1,04	8	35	43852
1,041 - 1,22	8	35	43853
1,221 - 1,65	10	38	43854
1,651 - 2,03	11	44	43855
2,031 - 2,41	13	51	43856
2,411 - 2,84	16	57	43857
2,841 - 3,26	16	57	43858
3,261 - 3,67	19	57	43859
3,671 - 4,05	19	64	43860
4,051 - 4,43	22	70	43861
4,431 - 4,86	22	70	43862
4,861 - 5,27	25	76	43863
5,271 - 5,67	25	76	43864
5,671 - 6,08	25	76	43865
6,081 - 6,46	25	76	43866
6,461 - 6,84	29	83	43867
6,841 - 7,22	29	83	43868
7,221 - 7,63	29	83	43869
7,631 - 8,04	29	83	43870
8,041 - 8,44	32	89	43871
8,441 - 8,85	32	89	43872
8,851 - 9,23	32	89	43873
9,231 - 9,64	32	89	43874
9,641 - 10,02	38	102	43875
10,021 - 10,42	38	102	43876
10,421 - 10,81	38	102	43877
10,811 - 11,21	38	102	43878
11,211 - 11,59	38	102	43879
11,591 - 12,00	38	102	43880
12,001 - 12,21	38	102	43881
12,211 - 12,84	38	102	43882

R10 • Inch • Made to order

d_1 Cutter Diameter Min. - Max. Range	l_2 Length of Cut	l_1 Overall Length	Order Code
.0300 - .0350	5/16	1-3/8	43751
.0351 - .0410	5/16	1-3/8	43752
.0411 - .0479	5/16	1-3/8	43753
.0480 - .0650	3/8	1-1/2	43754
.0651 - .0800	7/16	1-3/4	43755
.0801 - .0950	1/2	2	43756
.0951 - .1120	5/8	2-1/4	43757
.1121 - .1284	5/8	2-1/4	43758
.1285 - .1444	3/4	2-1/4	43759
.1445 - .1594	3/4	2-1/2	43760
.1595 - .1744	7/8	2-3/4	43761
.1745 - .1914	7/8	2-3/4	43762
.1915 - .2074	1	3	43763
.2075 - .2234	1	3	43764
.2235 - .2394	1	3	43765
.2395 - .2544	1	3	43766
.2545 - .2694	1-1/8	3-1/4	43767
.2695 - .2844	1-1/8	3-1/4	43768
.2845 - .3004	1-1/8	3-1/4	43769
.3005 - .3164	1-1/8	3-1/4	43770
.3165 - .3324	1-1/4	3-1/2	43771
.3325 - .3484	1-1/4	3-1/2	43772
.3485 - .3634	1-1/4	3-1/2	43773
.3635 - .3794	1-1/4	3-1/2	43774
.3795 - .3944	1-1/2	4	43775
.3945 - .4104	1-1/2	4	43776
.4105 - .4254	1-1/2	4	43777
.4255 - .4414	1-1/2	4	43778
.4415 - .4564	1-1/2	4	43779
.4565 - .4724	1-1/2	4	43780
.4725 - .4884	1-1/2	4	43781
.4885 - .5054	1-1/2	4	43782

RT10

0°

- Straight flutes
- Carbide tipped construction
- Former list code R800 and R800D

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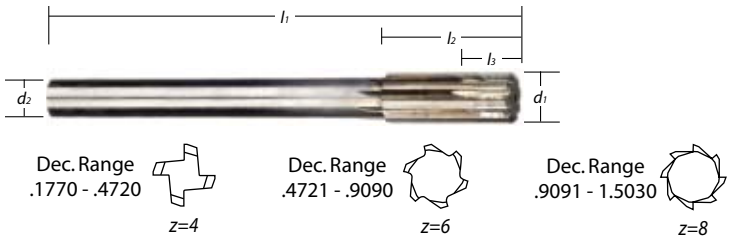


For all general purpose reaming of steels, cast irons, non-ferrous materials, plastics, and non-metals. These reamers are precision ground with polished flutes for easy chip flow, and will produce smooth, accurate holes in most materials. Reamers are used to finish a previously existing hole to an exact diameter with a smooth finish. Do not use to significantly enlarge a hole - i.e., enlarging the hole by more than 5% of its diameter.

Fractional sizes

Dimensions

Made to order sizes

d_1 Cutter Dia.	Decimal Equiv.	Order Code	d_2 Shank Dia.	l_2 Flute Length	l_3 Tip Length	l_1 Overall Length	d_1 Range Min - Max	Order Code
3/16	.1875	41201	11/64	1-1/8	1/2	4-1/2	.1770 - .2040	42401
7/32	.2188	41202	13/64	1-1/4	1/2	5	.2041 - .2210	42402
15/64	.2344	41203	7/32	1-1/2	1/2	6	.2211 - .2380	42403
1/4	.2500	41204	15/64	1-1/2	1/2	6	.2381 - .2530	42404
9/32	.2812	41205	15/64	1-1/2	1/2	6	.2531 - .2840	42405
5/16	.3125	41206	9/32	1-1/2	1/2	6	.2841 - .3150	42406
11/32	.3438	41207	9/32	1-1/2	5/8	6	.3151 - .3470	42407
3/8	.3750	41208	5/16	1-3/4	5/8	7	.3471 - .3780	42408
13/32	.4062	41209	5/16	1-3/4	5/8	7	.3781 - .4090	42409
7/16	.4375	41210	3/8	1-3/4	5/8	7	.4091 - .4410	42410
15/32	.4688	41211	3/8	1-3/4	5/8	7	.4411 - .4720	42411
1/2	.5000	41212	7/16	2	5/8	8	.4721 - .5030	42412
17/32	.5312	41213	7/16	2	5/8	8	.5031 - .5340	42413
9/16	.5625	41214	7/16	2	5/8	8	.5341 - .5660	42414
19/32	.5937	41215	7/16	2	5/8	8	.5661 - .5970	42415
5/8	.6250	41216	9/16	2-1/4	5/8	9	.5971 - .6280	42416
21/32	.6562	41217	9/16	2-1/4	5/8	9	.6281 - .6590	42417
11/16	.6875	41218	9/16	2-1/4	5/8	9	.6591 - .6910	42418
23/32	.7187	41219	9/16	2-1/4	5/8	9	.6911 - .7220	42419
3/4	.7500	41220	5/8	2-1/2	3/4	9-1/2	.7221 - .7530	42420
25/32	.7812	41221	5/8	2-1/2	3/4	9-1/2	.7531 - .7840	42421
13/16	.8125	41222	5/8	2-1/2	3/4	9-1/2	.7841 - .8160	42422
27/32	.8438	41223	5/8	2-1/2	3/4	9-1/2	.8161 - .8470	42423
7/8	.8750	41224	3/4	2-5/8	3/4	10	.8471 - .8780	42424
29/32	.9062	41225	3/4	2-5/8	3/4	10	.8781 - .9090	42425
15/16	.9375	41226	3/4	2-5/8	3/4	10	.9091 - .9410	42426
31/32	.9688	41227	3/4	2-5/8	3/4	10	.9411 - .9720	42427
1	1.0000	41228	7/8	2-3/4	3/4	10-1/2	.9721 - 1.0030	42428
1-1/16	1.0625	41229	7/8	2-3/4	3/4	10-1/2	1.0031 - 1.0660	42429
1-1/8	1.1250	41230	7/8	2-7/8	7/8	11	1.0661 - 1.1280	42430
1-3/16	1.1875	41231	1	2-7/8	7/8	11	1.1281 - 1.1905	42431
1-1/4	1.2500	41232	1	3	7/8	11-1/2	1.1906 - 1.2530	42432
1-5/16	1.3125	41233	1	3	7/8	11-1/2	1.2531 - 1.3155	42433
1-3/8	1.3750	41234	1	3-1/4	7/8	12	1.3156 - 1.3780	42434
1-7/16	1.4375	41235	1-1/4	3-1/4	7/8	12	1.3781 - 1.4405	42435
1-1/2	1.5000	41236	1-1/4	3-1/2	7/8	12-1/2	1.4406 - 1.5030	42436

d_1 +0.0003 / -0.0000 d_2 -0.0005 / -0.0015

72 HOUR SHIP Express Service

Express 72-hour service is offered for made to order tool diameters in .0005 inch increments, up to a maximum reamer diameter of .7555 inches, with a standard tolerance of +0.0003/ -0.0. To order, specify the five-digit part number/order code, followed by the finished reamer size as shown in the examples to the right.

For this finished reamer size	*The order code is:*
.2505	42404 (.2505)
.2700	42405 (.2700)

BURS AND ROUTERS

Menlo carbide burs are offered in an array of shapes, fluting patterns and lengths suitable for all types of deburring applications. Precision flute grinding assures chatterless operation and long tool life.

Results: Smooth deburring operations using fewer tools produce exceptional savings and lower part costs.

DOUBLE CUT

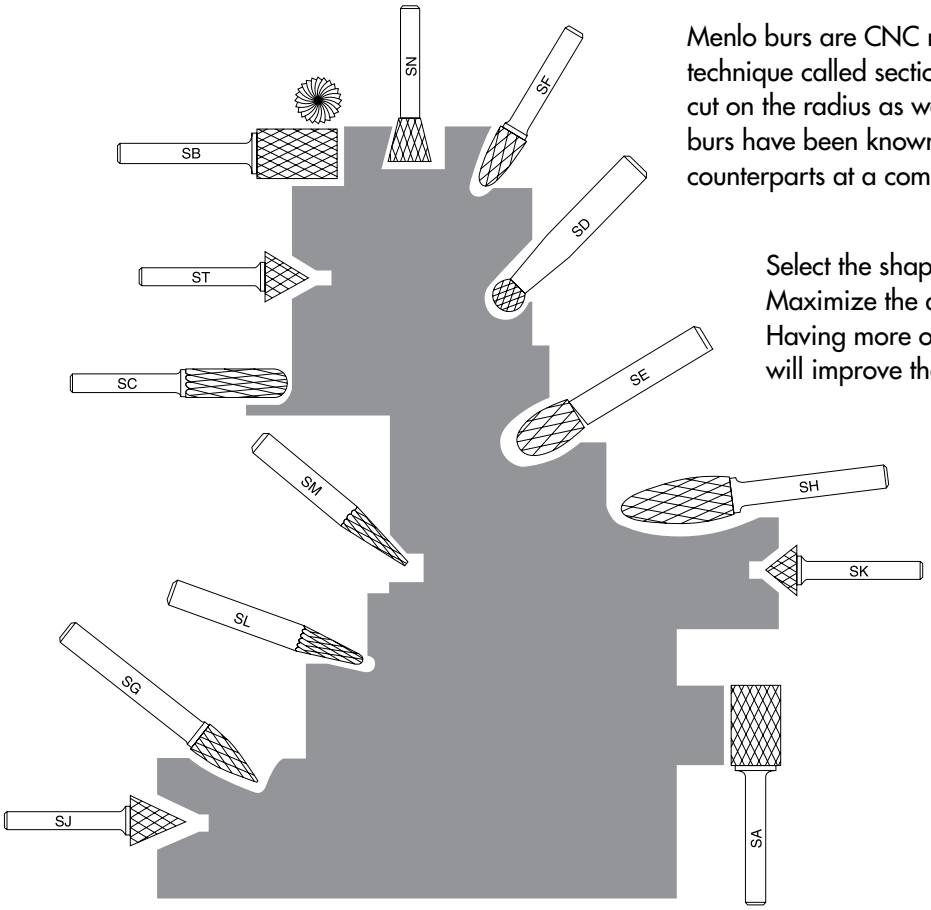
Right- and left-hand flutes combine to produce a chisel-type cutting edge. Permits faster penetration and stock removal. Reduced pull improves control and reduces operator fatigue.

STANDARD CUT

Features only right-hand spiral flutes. Good stock removal and excellent surface finishes. For general-purpose use on cast iron, steel, copper alloys, brass alloys and other ferrous materials.

ALUMA CUT

Features wide flutes for easy chip removal and an advanced relief design for added strength and longer tool life. For rapid stock removal in aluminum, brass, zinc alloys, most plastics and soft, nonferrous materials.



Menlo burs are CNC manufactured to exacting standards using a technique called sectional fluting. This method allows the burs to cut on the radius as well as the body of the tool. Menlo carbide burs have been known to last many times longer than their HSS counterparts at a comparable cost.

Select the shape which conforms to your workpiece. Maximize the area of contact between the tool and material. Having more of the cutting edge engaged in the material will improve the part finish.

Starting Parameters

Bur Diameter		
Metric	Inch	RPM
1,5	1/16	60,000 - 90,000
3	1/8	40,000 - 70,000
4,7	3/16	35,000 - 60,000
6,3	1/4	30,000 - 50,000
8	5/16	20,000 - 40,000
9,5	3/8	20,000 - 40,000
11	7/16	15,000 - 40,000
12,7	1/2	15,000 - 40,000
16	5/8	12,000 - 25,000
19	3/4	10,000 - 20,000
25,4	1	7,500 - 20,000

SA

- Cylindrical shape, no end cut
- Standard, long and extra long lengths
- Standard, double and aluma cut flute options

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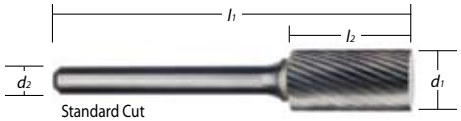
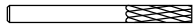
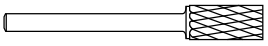


Standard Cut


Double Cut


Aluma Cut


Type A - Solid Carbide


Type C - Brazed Steel Shank

Chip Breaker Cut
Coarse Cut
Fine Cut
Diamond Cut

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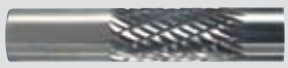
Piloted Style



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Metric

Tool Code	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Shk. Type	Standard Cut	Double Cut	Aluma Cut
SA-41M	1,5	3	6	38	A	30101	30104	
SA-42M	2,5	3	11	38	A	30111	30114	
SA-43M	3	3	14	38	A	30121	30124	
SA-43ML2	3	3	14	50	A	43011	43014	
SA-43ML3	3	3	14	76	A	43021	43024	
SA-11M	3	6	12	50	A	60131	60134	
SA-52M	4	3	12,7	38	A	20101	20104	
SA-53M	4,7	3	12,7	38	A	20111	20114	
SA-14M	4,7	6	16	50	A	60141	60144	
SA-1M	6	6	16	50	A	60161	60164	
SA-1M	6	6	19	50	A			61216
SA-1ML4	6	6	12,7	114	C	46031	46034	
SA-1ML6	6	6	12,7	163	C	46041	46044	
SA-51M	6,3	3	12,7	50	C	30171	30174	
SA-2M	8	6	19	63	C	60191	60194	
SA-3M	9,5	6	19	63	C	60201	60204	61217
SA-3ML4	9,5	6	19	120	C	46051	46054	
SA-3ML6	9,5	6	19	171	C	46061	46064	
SA-4M	11	6	25	68	C	60211	60214	
SA-5M	12,7	6	25	68	C	60221	60224	61218
SA-5ML4	12,7	6	25	127	C	46071	46074	
SA-5ML6	12,7	6	25	177	C	46081	46084	
SA-6M	16	6	25	68	C	60231	60234	61219
SA-7M	19	6	25	68	C	60251	60254	61220
SA-9M	25,4	6	25	68	C	60261	60264	

Inch

Tool Code	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Shk. Type	Standard Cut	Double Cut	Aluma Cut
SA-41	1/16	1/8	1/4	1-1/2	A	00101	00104	
SA-42	3/32	1/8	7/16	1-1/2	A	00111	00114	
SA-43	1/8	1/8	9/16	1-1/2	A	00121	00124	
SA-43L2	1/8	1/8	9/16	2	A	40011	40014	
SA-43L3	1/8	1/8	9/16	3	A	40021	40024	
SA-11	1/8	1/4	1/2	2	A	00131	00134	
SA-52	5/32	1/8	1/2	1-1/2	A	20221	20224	
SA-53	3/16	1/8	1/2	1-1/2	A	20231	20234	
SA-14	3/16	1/4	5/8	2	A	00141	00144	
SA-50	1/4	1/8	3/16	1-11/16	C	20771	20774	
SA-51	1/4	1/8	1/2	2	C	00171	00174	
SA-1	1/4	1/4	5/8	2	A	00161	00164	
SA-1	1/4	1/4	3/4	2	A			01216
SA-1A	1/4	1/4	1	2	A	00181	00184	
SA-1L4	1/4	1/4	1/2	4-1/2	C	40031	40034	
SA-1L6	1/4	1/4	1/2	6-1/2	C	40041	40044	
SA-2	5/16	1/4	3/4	2-3/4	C	00191	00194	
SA-3	3/8	1/4	3/4	2-3/4	C	00201	00204	01217
SA-3A	3/8	1/4	1	3	C	05201	05204	
SA-3L4	3/8	1/4	3/4	4-3/4	C	40051	40054	
SA-3L6	3/8	1/4	3/4	6-3/4	C	40061	40064	
SA-4	7/16	1/4	1	3	C	00211	00214	
SA-5	1/2	1/4	1	3	C	00221	00224	01218
SA-5L4	1/2	1/4	1	5	C	40071	40074	
SA-5L6	1/2	1/4	1	7	C	40081	40084	
SA-6	5/8	1/4	1	3	C	00231	00234	01219
SA-7	3/4	1/4	1	3	C	00251	00254	01220
SA-9	1	1/4	1	3	C	00261	00264	

SB

- Cylindrical shape, end cut
- Standard, long and extra long lengths
- Standard, double and aluma cut flute options

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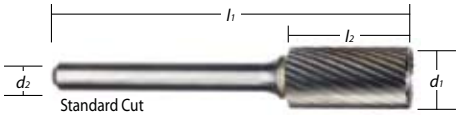
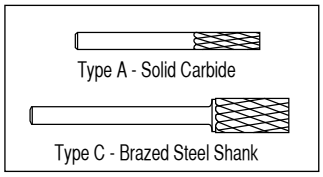


Standard Cut


Double Cut


Aluma Cut



Chip Breaker Cut
Coarse Cut
Fine Cut
Diamond Cut

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Metric

Tool Code	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Shk. Type	Standard Cut	Double Cut	Aluma Cut
SB-41M	1,5	3	6	38	A	93101	93104	
SB-42M	2,5	3	11	38	A	93111	93114	
SB-40M	3	3	---	38	A	93001		
SB-43M	3	3	14	38	A	93121	93124	
SB-43ML2	3	3	14	50	A	83011	83014	
SB-43ML3	3	3	14	76	A	83021	83024	
SB-11M	3	6	12	50	A	96131	96134	
SB-52M	4	3	12,7	38	A	29101	29104	
SB-53M	4,7	3	12,7	38	A	29111	29114	
SB-14M	4,7	6	16	50	A	96141	96144	
SB-1M	6	6	16	50	A	96161	96164	
SB-1M	6	6	19	50	A			61211
SB-1ML4	6	6	12,7	114	C	86031	86034	
SB-1ML6	6	6	12,7	163	C	86041	86044	
SB-50M	6,3	3	5	43	C	93181	93184	
SB-51M	6,3	3	12,7	50	C	93171	93174	
SB-2M	8	6	19	63	C	96191	96194	
SB-3M	9,5	6	19	63	C	96201	96204	61212
SB-3ML4	9,5	6	19	120	C	86051	86054	
SB-3ML6	9,5	6	19	171	C	86061	86064	
SB-4M	11	6	25	68	C	96211	96214	
SB-5M	12,7	6	25	68	C	96221	96224	61213
SB-5ML4	12,7	6	25	127	C	86071	86074	
SB-5ML6	12,7	6	25	177	C	86081	86084	
SB-6M	16	6	25	68	C	96231	96234	61214
SB-7M	19	6	25	68	C	96251	96254	61215

Inch

Tool Code	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Shk. Type	Standard Cut	Double Cut	Aluma Cut
SB-41	1/16	1/8	1/4	1-1/2	A	90101	90104	
SB-42	3/32	1/8	7/16	1-1/2	A	90111	90114	
SB-40	1/8	1/8	---	1-1/2	A	90001		
SB-43	1/8	1/8	9/16	1-1/2	A	90121	90124	
SB-43L2	1/8	1/8	9/16	2	A	70011	70014	
SB-43L3	1/8	1/8	9/16	3	A	70021	70024	
SB-11	1/8	1/4	1/2	2	A	90131	90134	
SB-52	5/32	1/8	1/2	1-1/2	A	29221	29224	
SB-53	3/16	1/8	1/2	1-1/2	A	29231	29234	
SB-14	3/16	1/4	5/8	2	A	90141	90144	
SB-50	1/4	1/8	3/16	1-11/16	C	90181	90184	
SB-51	1/4	1/8	1/2	2	C	90171	90174	
SB-0	1/4	1/4	---	2	A	90002		
SB-1	1/4	1/4	5/8	2	A	90161	90164	
SB-1	1/4	1/4	3/4	2	A			01211
SB-1A	1/4	1/4	1	2	A	35156	91104	
SB-1L4	1/4	1/4	1/2	4-1/2	C	70031	70034	
SB-1L6	1/4	1/4	1/2	6-1/2	C	70041	70044	
SB-2	5/16	1/4	3/4	2-3/4	C	90191	90194	
SB-3	3/8	1/4	3/4	2-3/4	C	90201	90204	01212
SB-3A	3/8	1/4	1	3	C	35206	91114	
SB-3L4	3/8	1/4	3/4	4-3/4	C	70051	70054	
SB-3L6	3/8	1/4	3/4	6-3/4	C	70061	70064	
SB-4	7/16	1/4	1	3	C	90211	90214	
SB-5	1/2	1/4	1	3	C	90221	90224	01213
SB-5L4	1/2	1/4	1	5	C	70071	70074	
SB-5L6	1/2	1/4	1	7	C	70081	70084	
SB-6	5/8	1/4	1	3	C	90231	90234	01214
SB-7	3/4	1/4	1	3	C	90251	90254	01215

SC

- Cylindrical shape, radius end
- Standard, long and extra long lengths
- Standard, double and aluma cut flute options

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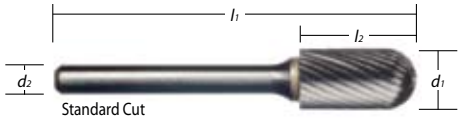
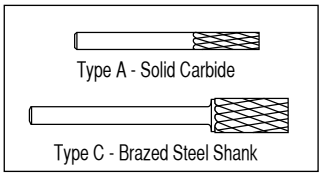


Standard Cut


Double Cut


Aluma Cut



Chip Breaker Cut
Coarse Cut
Fine Cut
Diamond Cut

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Metric

Tool Code	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Shk. Type	Standard Cut	Double Cut	Aluma Cut
SC-41M	2,5	3	11	38	A	30271	30274	
SC-42M	3	3	14	38	A	30281	30284	
SC-42ML2	3	3	14	50	A	43111	43114	
SC-42ML3	3	3	14	76	A	43121	43124	
SC-11M	3	6	12	50	A	60291	60294	
SC-52M	4	3	12,7	38	A	20121	20124	
SC-53M	4,7	3	12,7	38	A	20131	20134	
SC-14M	4,7	6	16	50	A	60301	60304	
SC-1M	6	6	16	50	A	60321	60324	
SC-1M	6	6	19	50	A			61221
SC-1ML4	6	6	12,7	114	C	46131	46134	
SC-1ML6	6	6	12,7	163	C	46141	46144	
SC-51M	6,3	3	12,7	50	C	30331	30334	
SC-2M	8	6	19	63	C	60341	60344	
SC-3M	9,5	6	19	63	C	60351	60354	61222
SC-3ML4	9,5	6	19	120	C	46151	46154	
SC-3ML6	9,5	6	19	171	C	46161	46164	
SC-4M	11	6	25	68	C	60361	60364	
SC-5M	12,7	6	25	68	C	60371	60374	61223
SC-5ML4	12,7	6	25	127	C	46171	46174	
SC-5ML6	12,7	6	25	177	C	46181	46184	
SC-6M	16	6	25	68	C	60381	60384	61224
SC-7M	19	6	25	68	C	60391	60394	61225

Inch

Tool Code	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Shk. Type	Standard Cut	Double Cut	Aluma Cut
SC-41	3/32	1/8	7/16	1-1/2	A	00271	00274	
SC-42	1/8	1/8	9/16	1-1/2	A	00281	00284	
SC-42L2	1/8	1/8	9/16	2	A	40111	40114	
SC-42L3	1/8	1/8	9/16	3	A	40121	40124	
SC-11	1/8	1/4	1/2	2	A	00291	00294	
SC-52	5/32	1/8	1/2	1-1/2	A	20241	20244	
SC-53	3/16	1/8	1/2	1-1/2	A	20251	20254	
SC-14	3/16	1/4	5/8	2	A	00301	00304	
SC-51	1/4	1/8	1/2	2	C	00331	00334	
SC-1	1/4	1/4	5/8	2	A	00321	00324	
SC-1	1/4	1/4	3/4	2	A			01221
SC-1A	1/4	1/4	1	2	A	05321	05324	
SC-1L4	1/4	1/4	1/2	4-1/2	C	40131	40134	
SC-1L6	1/4	1/4	1/2	6-1/2	C	40141	40144	
SC-2	5/16	1/4	3/4	2-3/4	C	00341	00344	
SC-3	3/8	1/4	3/4	2-3/4	C	00351	00354	01222
SC-3A	3/8	1/4	1	3	C	35336	05354	
SC-3L4	3/8	1/4	3/4	4-3/4	C	40151	40154	
SC-3L6	3/8	1/4	3/4	6-3/4	C	40161	40164	
SC-4	7/16	1/4	1	3	C	00361	00364	
SC-5	1/2	1/4	1	3	C	00371	00374	01223
SC-5L4	1/2	1/4	1	5	C	40171	40174	
SC-5L6	1/2	1/4	1	7	C	40181	40184	
SC-6	5/8	1/4	1	3	C	00381	00384	01224
SC-7	3/4	1/4	1	3	C	00391	00394	01225

SD

- Ball shape
- Standard, long and extra long lengths
- Standard, double and aluma cut flute options

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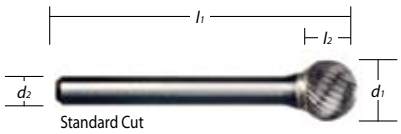
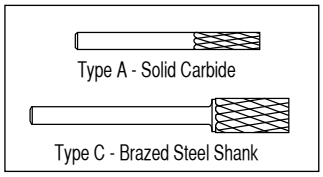


Standard Cut


Double Cut


Aluma Cut



Chip Breaker Cut
Coarse Cut
Fine Cut
Diamond Cut

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Metric

Tool Code	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Shk. Type	Standard Cut	Double Cut	Aluma Cut
SD-41M	2,3	3	2,1	38	A	30741	30744	
SD-42M	3	3	2,4	38	A	30751	30754	
SD-42ML2	3	3	2,4	50	A	43511	43514	
SD-42ML3	3	3	2,4	76	A	43521	43524	
SD-11M	3	6	2,4	50	A	60761	60764	
SD-53M	4,7	3	4,5	38	A	20141	20144	
SD-14M	4,7	6	4,5	50	A	60771	60774	
SD-1M	6	6	5,5	50	A	60791	60794	61261
SD-51M	6,3	3	5,5	43	C	30801	30804	
SD-1ML4	6,3	6	5,5	107	C	46531	46534	
SD-1ML6	6,3	6	5,5	157	C	46541	46544	
SD-2M	8	6	6	50	C	60811	60814	
SD-3M	9,5	6	8	52	C	60821	60824	61262
SD-3ML4	9,5	6	8	108	C	46551	46554	
SD-3ML6	9,5	6	8	161	C	46561	46564	
SD-4M	11	6	9,5	52	C	76831	76834	
SD-5M	12,7	6	11	54	C	60831	60834	61263
SD-5ML4	12,7	6	11	111	C	46571	46574	
SD-5ML6	12,7	6	11	164	C	46581	46584	
SD-6M	16	6	14	58	C	60841	60844	61264
SD-7M	19	6	16	60	C	60851	60854	61265
SD-9M	25,4	6	24	68	C	60861	60864	

Inch

Tool Code	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Shk. Type	Standard Cut	Double Cut	Aluma Cut
SD-41	3/32	1/8	1/16	1-1/2	A	00741	00744	
SD-42	1/8	1/8	3/32	1-1/2	A	00751	00754	
SD-42L2	1/8	1/8	3/32	2	A	40511	40514	
SD-42L3	1/8	1/8	3/32	3	A	40521	40524	
SD-11	1/8	1/4	3/32	2	A	00761	00764	
SD-53	3/16	1/8	1/8	1-1/2	A	20261	20264	
SD-14	3/16	1/4	5/32	2	A	00771	00774	
SD-51	1/4	1/8	7/32	1-11/16	C	00801	00804	
SD-1	1/4	1/4	7/32	2	A	00791	00794	01261
SD-1L4	1/4	1/4	7/32	4-1/8	C	40531	40534	
SD-1L6	1/4	1/4	7/32	6-1/8	C	40541	40544	
SD-2	5/16	1/4	1/4	2-1/4	C	00811	00814	
SD-3	3/8	1/4	5/16	2-5/16	C	00821	00824	01262
SD-3L4	3/8	1/4	5/16	4-1/4	C	40551	40554	
SD-3L6	3/8	1/4	5/16	6-1/4	C	40561	40564	
SD-4	7/16	1/4	3/8	2-3/8	C	70831	70834	
SD-5	1/2	1/4	7/16	2-7/16	C	00831	00834	01263
SD-5L4	1/2	1/4	7/16	4-3/8	C	40571	40574	
SD-5L6	1/2	1/4	7/16	6-3/8	C	40581	40584	
SD-6	5/8	1/4	9/16	2-9/16	C	00841	00844	01264
SD-7	3/4	1/4	11/16	2-11/16	C	00851	00854	01265
SD-9	1	1/4	15/16	2-15/16	C	00861	00864	

SE

- Oval shape
- Standard, long and extra long lengths
- Standard, double and aluma cut flute options

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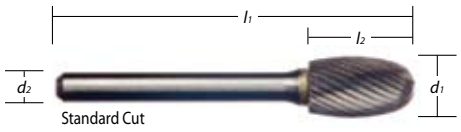
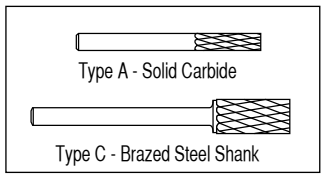


Standard Cut


Double Cut


Aluma Cut



Chip Breaker Cut
Coarse Cut
Fine Cut
Diamond Cut

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Metric

Tool Code	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Shk. Type	Standard Cut	Double Cut	Aluma Cut
SE-41M	3	3	5,5	38	A	30661	30664	
SE-41ML2	3	3	5,5	50	A	43411	43414	
SE-41ML3	3	3	5,5	76	A	43421	43424	
SE-53M	4,7	3	7,1	38	A	20151	20154	
SE-1M	6	6	9,5	50	A	60681	60684	61241
SE-51M	6,3	3	9,5	47	C	30691	30694	
SE-1ML4	6,3	6	9,5	111	C	46431	46434	
SE-1ML6	6,3	6	9,5	163	C	46441	46444	
SE-3M	9,5	6	16	60	C	60701	60704	61242
SE-3ML4	9,5	6	16	117	C	46451	46454	
SE-3ML6	9,5	6	16	168	C	46461	46464	
SE-5M	12,7	6	22	66	C	60711	60714	61243
SE-5ML4	12,7	6	22	123	C	46471	46474	
SE-5ML6	12,7	6	22	177	C	46481	46484	
SE-6M	16	6	25	68	C	60721	60724	61244
SE-7M	19	6	25	68	C	60731	60734	61245

Inch

Tool Code	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Shk. Type	Standard Cut	Double Cut	Aluma Cut
SE-41	1/8	1/8	7/32	1-1/2	A	00661	00664	
SE-41L2	1/8	1/8	7/32	2	A	40411	40414	
SE-41L3	1/8	1/8	7/32	3	A	40421	40424	
SE-53	3/16	1/8	9/32	1-1/2	A	20271	20274	
SE-51	1/4	1/8	3/8	1-7/8	C	00691	00694	
SE-1	1/4	1/4	3/8	2	A	00681	00684	01241
SE-1L4	1/4	1/4	3/8	4-3/8	C	40431	40434	
SE-1L6	1/4	1/4	3/8	6-3/8	C	40441	40444	
SE-3	3/8	1/4	5/8	2-5/8	C	00701	00704	01242
SE-3L4	3/8	1/4	5/8	4-5/8	C	40451	40454	
SE-3L6	3/8	1/4	5/8	6-5/8	C	40461	40464	
SE-5	1/2	1/4	7/8	2-7/8	C	00711	00714	01243
SE-5L4	1/2	1/4	7/8	4-7/8	C	40471	40474	
SE-5L6	1/2	1/4	7/8	6-7/8	C	40481	40484	
SE-6	5/8	1/4	1	3	C	00721	00724	01244
SE-7	3/4	1/4	1	3	C	00731	00734	01245

SF

- Tree shape, radius end
- Standard, long and extra long lengths
- Standard, double and aluma cut flute options

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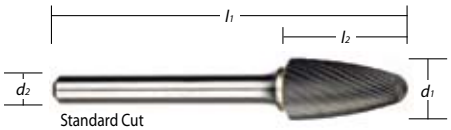
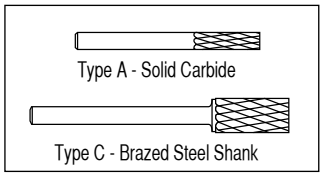


Standard Cut


Double Cut


Aluma Cut



Chip Breaker Cut
Coarse Cut
Fine Cut
Diamond Cut

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Metric

Tool Code	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Shk. Type	Standard Cut	Double Cut	Aluma Cut
SF-41M	3	3	6,3	38	A	30411	30414	
SF-42M	3	3	12,7	38	A	30401	30404	
SF-42ML2	3	3	12,7	50	A	43211	43214	
SF-42ML3	3	3	12,7	76	A	43221	43224	
SF-11M	3	6	12,7	50	A	60421	60424	
SF-53M	4,7	3	12,7	38	A	20161	20164	
SF-1M	6	6	19	50	A	60441	60444	61231
SF-1ML4	6	6	12,7	114	C	46231	46234	
SF-1ML6	6	6	12,7	163	C	46241	46244	
SF-51M	6,3	3	12,7	50	C	30451	30454	
SF-3M	9,5	6	19	63	C	60461	60464	61232
SF-3ML4	9,5	6	19	120	C	46251	46254	
SF-3ML6	9,5	6	19	171	C	46261	46264	
SF-4M	11	6	25	68	C	60471	60474	
SF-13M	12,7	6	19	63	C	76481	76484	
SF-5M	12,7	6	25	68	C	60481	60484	61233
SF-5ML4	12,7	6	25	127	C	46271	46274	
SF-5ML6	12,7	6	25	177	C	46281	46284	
SF-6M	16	6	25	68	C	60491	60494	61234
SF-7M	19	6	25	68	C	60501	60504	
SF-14M	19	6	32	76	C	60511	60514	61235
SF-15M	19	6	38	82	C	60521	60524	

Inch

Tool Code	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Shk. Type	Standard Cut	Double Cut	Aluma Cut
SF-41	1/8	1/8	1/4	1-1/2	A	00411	00414	
SF-42	1/8	1/8	1/2	1-1/2	A	00401	00404	
SF-42L2	1/8	1/8	1/2	2	A	40211	40214	
SF-42L3	1/8	1/8	1/2	3	A	40221	40224	
SF-11	1/8	1/4	1/2	2	A	00421	00424	
SF-53	3/16	1/8	1/2	1-1/2	A	20281	20284	
SF-51	1/4	1/8	1/2	2	C	00451	00454	
SF-1	1/4	1/4	3/4	2	A	00441	00444	01231
SF-1L4	1/4	1/4	1/2	4-1/2	C	40231	40234	
SF-1L6	1/4	1/4	1/2	6-1/2	C	40241	40244	
SF-3	3/8	1/4	3/4	2-3/4	C	00461	00464	01232
SF-3L4	3/8	1/4	3/4	4-3/4	C	40251	40254	
SF-3L6	3/8	1/4	3/4	6-3/4	C	40261	40264	
SF-4	7/16	1/4	1	3	C	00471	00474	
SF-13	1/2	1/4	3/4	2-3/4	C	70481	70484	
SF-5	1/2	1/4	1	3	C	00481	00484	01233
SF-5L4	1/2	1/4	1	5	C	40271	40274	
SF-5L6	1/2	1/4	1	7	C	40281	40284	
SF-6	5/8	1/4	1	3	C	00491	00494	01234
SF-7	3/4	1/4	1	3	C	00501	00504	
SF-14	3/4	1/4	1-1/4	3-1/4	C	00511	00514	01235
SF-15	3/4	1/4	1-1/2	3-1/2	C	00521	00524	

SG

- Tree shape, pointed end
- Standard, long and extra long lengths
- Standard and double cut flute options

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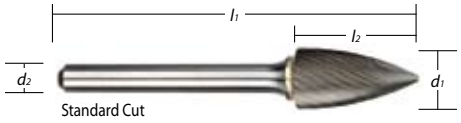
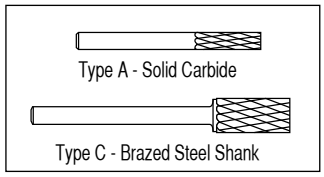


Standard Cut

Double Cut



Chip Breaker Cut
Coarse Cut
Fine Cut
Diamond Cut

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Metric

Tool Code	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Shk. Type	Standard Cut	Double Cut	Aluma Cut
SG-41M	3	3	6,3	38	A	30531	30534	
SG-43M	3	3	9,5	38	A	30541	30544	
SG-44M	3	3	12,7	38	A	30551	30554	
SG-44ML2	3	3	12,7	50	A	43311	43314	
SG-44ML3	3	3	12,7	76	A	43321	43324	
SG-53M	4,7	3	12,7	38	A	20171	20174	
SG-1M	6	6	19	50	A	60571	60574	
SG-1ML4	6	6	12,7	114	C	46331	46334	
SG-1ML6	6	6	12,7	163	C	46341	46344	
SG-51M	6,3	3	12,7	50	C	30581	30584	
SG-2M	8	6	19	63	C	60591	60594	
SG-3M	9,5	6	19	63	C	60601	60604	
SG-3ML4	9,5	6	19	120	C	46351	46354	
SG-3ML6	9,5	6	19	171	C	46361	46364	
SG-13M	12,7	6	19	63	C	60611	60614	
SG-5M	12,7	6	25	68	C	60621	60624	
SG-5ML4	12,7	6	25	127	C	46371	46374	
SG-5ML6	12,7	6	25	177	C	46381	46384	
SG-6M	16	6	25	68	C	60631	60634	
SG-7M	19	6	25	68	C	60641	60644	
SG-15M	19	6	38	82	C	60651	60654	

Inch

Tool Code	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Shk. Type	Standard Cut	Double Cut	Aluma Cut
SG-41	1/8	1/8	1/4	1-1/2	A	00531	00534	
SG-42	1/8	1/8	5/16	1-1/2	A	35706	35707	
SG-43	1/8	1/8	3/8	1-1/2	A	00541	00544	
SG-44	1/8	1/8	1/2	1-1/2	A	00551	00554	
SG-44L2	1/8	1/8	1/2	2	A	40311	40314	
SG-44L3	1/8	1/8	1/2	3	A	40321	40324	
SG-53	3/16	1/8	1/2	1-1/2	A	20291	20294	
SG-51	1/4	1/8	1/2	2	C	00581	00584	
SG-1	1/4	1/4	3/4	2	A	00571	00574	
SG-1L4	1/4	1/4	1/2	4-1/2	C	40331	40334	
SG-1L6	1/4	1/4	1/2	6-1/2	C	40341	40344	
SG-2	5/16	1/4	3/4	2-3/4	C	00591	00594	
SG-3	3/8	1/4	3/4	2-3/4	C	00601	00604	
SG-3L4	3/8	1/4	3/4	4-3/4	C	40351	40354	
SG-3L6	3/8	1/4	3/4	6-3/4	C	40361	40364	
SG-13	1/2	1/4	3/4	2-3/4	C	00611	00614	
SG-5	1/2	1/4	1	3	C	00621	00624	
SG-5L4	1/2	1/4	1	5	C	40371	40374	
SG-5L6	1/2	1/4	1	7	C	40381	40384	
SG-6	5/8	1/4	1	3	C	00631	00634	
SG-7	3/4	1/4	1	3	C	00641	00644	
SG-15	3/4	1/4	1-1/2	3-1/2	C	00651	00654	

SH

- Flame shape
- Standard, long and extra long lengths
- Standard and double cut flute options

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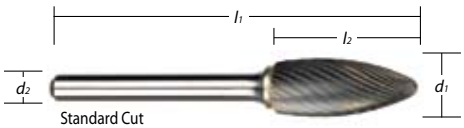
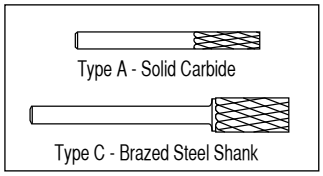


Standard Cut


Double Cut



Chip Breaker Cut
Coarse Cut
Fine Cut
Diamond Cut

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Metric

Tool Code	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Shk. Type	Standard Cut	Double Cut	Aluma Cut
SH-41M	3	3	6,3	38	A	30961	30964	
SH-41ML2	3	3	6,3	50	A	43611	43614	
SH-41ML3	3	3	6,3	76	A	43621	43624	
SH-53M	4,7	3	9,5	38	A	20181	20184	
SH-1M	6	6	16	50	A	76981	76984	
SH-2M	8	6	19	63	C	60981	60984	
SH-2ML4	8	6	19	120	C	46631	46634	
SH-2ML6	8	6	19	171	C	46641	46644	
SH-5M	12,7	6	31	75	C	60991	60994	
SH-5ML4	12,7	6	31	132	C	46651	46654	
SH-5ML6	12,7	6	31	183	C	46661	46664	
SH-6M	16	6	36	79	C	61001	61004	
SH-7M	19	6	41	84	C	61011	61014	

Inch

Tool Code	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Shk. Type	Standard Cut	Double Cut	Aluma Cut
SH-41	1/8	1/8	1/4	1-1/2	A	00961	00964	
SH-41L2	1/8	1/8	1/4	2	A	40611	40614	
SH-41L3	1/8	1/8	1/4	3	A	40621	40624	
SH-53	3/16	1/8	3/8	1-1/2	A	20301	20304	
SH-1	1/4	1/4	5/8	2	A	70981	70984	
SH-2	5/16	1/4	3/4	2-3/4	C	00981	00984	
SH-2L4	5/16	1/4	3/4	4-3/4	C	40631	40634	
SH-2L6	5/16	1/4	3/4	6-3/4	C	40641	40644	
SH-5	1/2	1/4	1-1/4	3-1/4	C	00991	00994	
SH-5L4	1/2	1/4	1-1/4	5-1/4	C	40651	40654	
SH-5L6	1/2	1/4	1-1/4	7-1/4	C	40661	40664	
SH-6	5/8	1/4	1-7/16	3-7/16	C	01001	01004	
SH-7	3/4	1/4	1-5/8	3-5/8	C	01011	01014	

Bur Sets • Inch

Bur Set No.	d_2 Shank Size	No. of Pieces	Bur Set Contains	Standard Cut	Double Cut
Set #1	1/8	12	SA-42, SA-43, SC-41, SC-42, SD-42, SE-41, SF-42, SG-43, SH-41, SL-42, SM-43, SN-42	01451	01454
Set #2	1/8	9	SA-51, SA-50, SC-51, SD-51, SE-51, SF-51, SG-51, SM-51, SN-51	36201	36202
Set #4	1/4	12	SA-1, SA-14, SC-14, SC-1, SD-14, SD-1, SE-1, SF-1, SG-1, SM-2, SN-1	36211	36212
Set #5	1/4	8	SA-1, SC-1, SD-1, SE-1, SF-1, SG-1, SL-1, SM-2	01481	01484
Set #6	1/4	8	SA-5, SC-3, SC-5, SD-5, SF-3, SF-5, SG-3, SL4	01461	01464
Set #7	1/4	9	SA-1, SA-3, SA-5, SC-1, SC-3, SC-5, SF-1, SF-3, SF-5	36216	36217
Set #9	1/8	9	SA-43, SC-42, SD-42, SE-41, SF-42, SH-41, SL-42, SM-43, SN-42	36221	36222

Bur Sets • Metric

Bur Set No.	d_2 Shank Size	No. of Pieces	Bur Set Contains	Standard Cut	Double Cut
Set #1M	3	12	SA-42M, SA-43M, SC-41M, SC-42M, SD-42M, SE-41M, SF-42M, SG-44M, SH-41M, SL-42M, SM-42M, SN-42M	01411	01414
Set #6M	6	8	SA-5M, SC-3M, SC-5M, SD-5M, SF-3M, SF-5M, SG-3M, SL-4M	01421	01424

SL

- Taper shape, radius end
- Standard, long and extra long lengths
- Standard, double and aluma cut flute options

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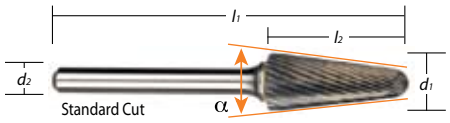

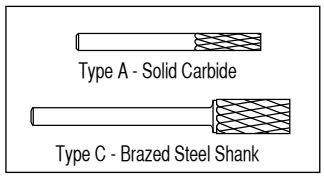

Chip Breaker Cut
Coarse Cut
Fine Cut
Diamond Cut

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Metric

Tool Code	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	α Incl. Angle	Shk. Type	Standard Cut	Double Cut	Aluma Cut
SL-41M	3	3	9,5	38	10°	A	30871	30874	
SL-42M	3	3	12,7	38	8°	A	30881	30884	
SL-42ML2	3	3	12,7	50	8°	A	43711	43714	
SL-42ML3	3	3	12,7	76	8°	A	43721	43724	
SL-53M	4,7	3	12,7	38	14°	A	20191	20194	
SL-1M	6	6	16	50	14°	A	60901	60904	61251
SL-1ML4	6	6	16	117	14°	C	46731	46734	
SL-1ML6	6	6	16	168	14°	C	46741	46744	
SL-2M	8	6	22	66	14°	C	60911	60914	
SL-3M	9,5	6	27	71	14°	C	60921	60924	61252
SL-3ML4	9,5	6	27	127	14°	C	46751	46754	
SL-3ML6	9,5	6	27	179	14°	C	46761	46764	
SL-4M	12,7	6	28	72	14°	C	60931	60934	61253
SL-4ML4	12,7	6	28	129	14°	C	46771	46774	
SL-4ML6	12,7	6	28	180	14°	C	46781	46784	
SL-6M	16	6	33	76	14°	C	60941	60944	61254
SL-7M	19	6	38	82	14°	C	60951	60954	61255

Inch

Tool Code	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	α Incl. Angle	Shk. Type	Standard Cut	Double Cut	Aluma Cut
SL-41	1/8	1/8	3/8	1-1/2	10°	A	00871	00874	
SL-42	1/8	1/8	1/2	1-1/2	8°	A	00881	00884	
SL-42L2	1/8	1/8	1/2	2	8°	A	40711	40714	
SL-42L3	1/8	1/8	1/2	3	8°	A	40721	40724	
SL-53	3/16	1/8	1/2	1-1/2	14°	A	20311	20314	
SL-1	1/4	1/4	5/8	2	14°	A	00901	00904	01251
SL-1L4	1/4	1/4	5/8	4-5/8	14°	C	40731	40734	
SL-1L6	1/4	1/4	5/8	6-5/8	14°	C	40741	40744	
SL-2	5/16	1/4	7/8	2-7/8	14°	C	00911	00914	
SL-3	3/8	1/4	1-1/16	3-1/16	14°	C	00921	00924	01252
SL-3L4	3/8	1/4	1-1/16	5	14°	C	40751	40754	
SL-3L6	3/8	1/4	1-1/16	7	14°	C	40761	40764	
SL-4	1/2	1/4	1-1/8	3-1/8	14°	C	00931	00934	01253
SL-4L4	1/2	1/4	1-1/8	5-1/8	14°	C	40771	40774	
SL-4L6	1/2	1/4	1-1/8	7-1/8	14°	C	40781	40784	
SL-6	5/8	1/4	1-5/16	3-5/16	14°	C	00941	00944	01254
SL-7	3/4	1/4	1-1/2	3-1/2	14°	C	00951	00954	01255

SM

- Cone shape
- Standard length
- Standard and double cut flute options

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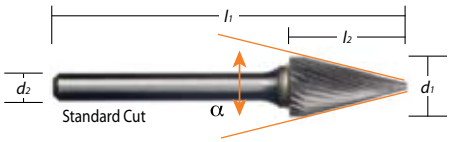

Metric

Tool Code	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	α Incl. Angle	Shk. Type	Standard Cut	Double Cut
SM-41M	3	3	8,7	38	12°	A	31021	31024
SM-42M	3	3	11	38	14°	A	31031	31034
SM-43M	3	3	16	38	7°	A	31041	31044
SM-53M	4,7	3	12,7	38	16°	A	20201	20204
SM-1M	6	6	12,7	50	22°	A	61061	61064
SM-2M	6	6	19	50	14°	A	61071	61074
SM-3M	6	6	25	50	10°	A	61081	61084
SM-51M	6,3	3	12,7	50	22°	C	31091	31094
SM-4M	9,5	6	16	60	28°	C	61101	61104
SM-5M	12,7	6	22	66	28°	C	61111	61114
SM-6M	16	6	25	68	31°	C	61121	61124

Inch

Tool Code	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	α Incl. Angle	Shk. Type	Standard Cut	Double Cut
SM-41	1/8	1/8	11/32	1-1/2	12°	A	01021	01024
SM-42	1/8	1/8	7/16	1-1/2	14°	A	01031	01034
SM-43	1/8	1/8	5/8	1-1/2	7°	A	01041	01044
SM-53	3/16	1/8	1/2	1-1/2	16°	A	20321	20324
SM-51	1/4	1/8	1/2	2	22°	C	01091	01094
SM-1	1/4	1/4	1/2	2	22°	A	01061	01064
SM-2	1/4	1/4	3/4	2	14°	A	01071	01074
SM-3	1/4	1/4	1	2	10°	A	01081	01084
SM-4	3/8	1/4	5/8	2-5/8	28°	C	01101	01104
SM-5	1/2	1/4	7/8	2-7/8	28°	C	01111	01114
SM-6	5/8	1/4	1	3	31°	C	01121	01124

SN

- Inverted cone shape
- Standard length
- Standard and double cut flute options

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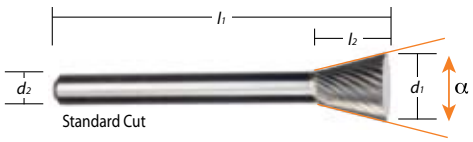

Metric

Tool Code	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	α Incl. Angle	Shk. Type	Standard Cut	Double Cut
SN-41M	2,3	3	3	38	10°	A	31131	31134
SN-42M	3	3	4,7	38	10°	A	31141	31144
SN-53M	4,7	3	6,3	38	10°	A	20211	20214
SN-1M	6	6	8	50	10°	A	61161	61164
SN-51M	6,3	3	6,3	44	10°	C	31171	31174
SN-2M	9,5	6	9,5	52	13°	C	76181	76184
SN-3M	12,7	6	12,7	56	16°	C	61181	61184
SN-4M	12,7	6	12,7	56	28°	C	61131	61134
SN-5M	16	6	16	60	19°	C	61191	61194
SN-6M	16	6	19	63	18°	C	61171	61174
SN-8M	19	6	19	63	21°	C	61201	61204

Inch

Tool Code	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	α Incl. Angle	Shk. Type	Standard Cut	Double Cut
SN-41	3/32	1/8	1/8	1-1/2	10°	A	01131	01134
SN-42	1/8	1/8	3/16	1-1/2	10°	A	01141	01144
SN-53	3/16	1/8	1/4	1-1/2	10°	A	20331	20334
SN-51	1/4	1/8	1/4	1-3/4	10°	C	01171	01174
SN-1	1/4	1/4	5/16	2	10°	A	01161	01164
SN-2	3/8	1/4	3/8	2-3/8	13°	C	71181	71184
SN-3	1/2	1/4	1/2	2-1/2	16°	C	01181	01184
SN-4	1/2	1/4	1/2	2-1/2	28°	C	72181	72184
SN-5	5/8	1/4	5/8	2-5/8	19°	C	01191	01194
SN-6	5/8	1/4	3/4	2-3/4	18°	C	72191	72194
SN-8	3/4	1/4	3/4	2-3/4	21°	C	01201	01204

SJ • SK • ST

- 60°, 90° and 82° Cone shapes
- Also known as multi-flute countersinks
- Standard length
- Standard and double cut flute options

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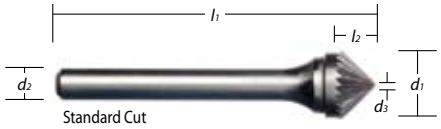
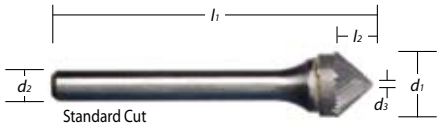
Standard Cut


Double Cut



Standard Cut


Double Cut



Standard Cut


Double Cut

SJ • 60° Cone Shape • Metric

Tool Code	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	d_3 Max. Tip	Shk. Type	Standard Cut	Double Cut
SJ-42M	3	3	2,3	38	To Point	A	31331	34331
SJ-1M	6	6	5	50	To Point	A	61333	64333
SJ-3M	9,5	6	8	55	1	C	61334	64334
SJ-5M	12,7	6	11	58	1	C	61335	64335
SJ-6M	16	6	14	60	1,5	C	61336	64336
SJ-7M	19	6	16	64	1,5	C	61337	64337
SJ-9M	25,4	6	23	68	3	C	61338	64338

SJ • 60° Cone Shape • Inch

Tool Code	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	d_3 Max. Tip	Shk. Type	Standard Cut	Double Cut
SJ-42	1/8	1/8	3/32	1-1/2	To Point	A	01331	41331
SJ-1	1/4	1/4	3/16	2	To Point	A	01333	41333
SJ-3	3/8	1/4	5/16	2-7/16	1/32	C	01334	41334
SJ-5	1/2	1/4	7/16	2-9/16	1/32	C	01335	41335
SJ-6	5/8	1/4	9/16	2-11/16	1/16	C	01336	41336
SJ-7	3/4	1/4	11/16	2-13/16	1/16	C	01337	41337
SJ-9	1	1/4	15/16	2-15/16	1/8	C	01338	41338

SK • 90° Cone Shape • Metric

Tool Code	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	d_3 Max. Tip	Shk. Type	Standard Cut	Double Cut
SK-42M	3	3	1,5	38	To Point	A	31351	34351
SK-1M	6	6	3	50	To Point	A	61353	65353
SK-3M	9,5	6	4,7	52	1	C	61354	65354
SK-5M	12,7	6	6,3	52	1	C	61355	65355
SK-6M	16	6	8	56	1,5	C	61356	65356
SK-7M	19	6	9	58	1,5	C	61357	65357
SK-9M	25,4	6	12,7	60	3	C	61358	65358

SK • 90° Cone Shape • Inch

Tool Code	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	d_3 Max. Tip	Shk. Type	Standard Cut	Double Cut
SK-42	1/8	1/8	1/16	1-1/2	To Point	A	01351	64351
SK-1	1/4	1/4	1/8	2	To Point	A	01353	64353
SK-3	3/8	1/4	3/16	2-5/16	1/32	C	01354	64354
SK-5	1/2	1/4	1/4	2-3/8	1/32	C	01355	64355
SK-6	5/8	1/4	5/16	2-1/2	1/16	C	01356	64356
SK-7	3/4	1/4	3/8	2-9/16	1/16	C	01357	64357
SK-9	1	1/4	1/2	2-11/16	1/8	C	01358	64358

ST • 82° Cone Shape • Metric

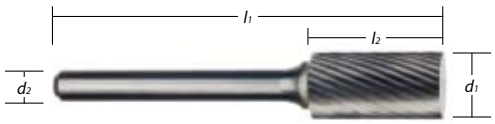
Tool Code	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	d_3 Max. Tip	Shk. Type	Standard Cut	Double Cut
ST-42M	3	3	1,5	38	To Point	A	31341	01651
ST-1M	6	6	3	50	To Point	A	61343	01653
ST-3M	9,5	6	4,7	52	1	C	61344	01654
ST-5M	12,7	6	6,3	52	1	C	61345	01655
ST-6M	16	6	8	56	1,5	C	61346	01656
ST-7M	19	6	9	58	1,5	C	61347	01657
ST-9M	25,4	6	12,7	60	3	C	61348	01658

ST • 82° Cone Shape • Inch

Tool Code	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	d_3 Max. Tip	Shk. Type	Standard Cut	Double Cut
ST-42	1/8	1/8	1/16	1-1/2	To Point	A	01341	01641
ST-1	1/4	1/4	1/8	2	To Point	A	01343	01643
ST-3	3/8	1/4	3/16	2-5/16	1/32	C	01344	01644
ST-5	1/2	1/4	1/4	2-3/8	1/32	C	01345	01645
ST-6	5/8	1/4	5/16	2-1/2	1/16	C	01346	01646
ST-7	3/4	1/4	3/8	2-9/16	1/16	C	01347	01647
ST-9	1	1/4	1/2	2-11/16	1/8	C	01348	01648

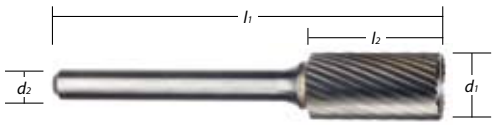
A / ZYA • Metric

ISO	DIN	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Shk. Type	Standard Cut	Double Cut
A031403	ZYA031403	3	3	14	38	A	64001	64101
A061606	ZYA061606	6	6	16	50	A	64002	64102
A082006	ZYA082006	8	6	20	64	C	64003	64103
A102006	ZYA102006	10	6	20	64	C	64004	64104
A122506	ZYA122506	12	6	25	68	C	64005	64105
A162506	ZYA162506	16	6	25	68	C	64006	64106



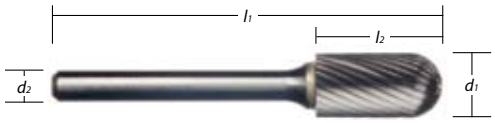
B / ZYB • Metric

ISO	DIN	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Shk. Type	Standard Cut	Double Cut
B031403	ZYB031403	3	3	14	38	A	64009	64109
B061606	ZYB061606	6	6	16	50	A	64010	64110
B082006	ZYB082006	8	6	20	64	C	64011	64111
B102006	ZYB102006	10	6	20	64	C	64012	64112
B122506	ZYB122506	12	6	25	68	C	64013	64113
B162506	ZYB162506	16	6	25	68	C	64014	64114



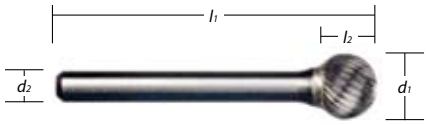
C / WRC • Metric

ISO	DIN	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Shk. Type	Standard Cut	Double Cut
C031403	WRC031403	3	3	14	38	A	64017	64117
C061606	WRC061606	6	6	16	50	A	64018	64118
C082006	WRC082006	8	6	20	64	C	64019	64119
C102006	WRC102006	10	6	20	64	C	64020	64120
C122506	WRC122506	12	6	25	68	C	64021	64121
C162506	WRC162506	16	6	25	68	C	64022	64122



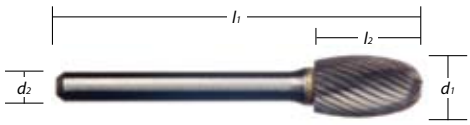
D / KUD • Metric

ISO	DIN	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Shk. Type	Standard Cut	Double Cut
D030203	KUD030203	3	3	2	38	A	64044	64144
D060506	KUD060506	6	6	5	50	A	64045	64145
D080706	KUD080706	8	6	7	51	C	64046	64146
D100906	KUD100906	10	6	9	52	C	64047	64147
D121006	KUD121006	12	6	10	54	C	64048	64148
D161406	KUD161406	16	6	14	58	C	64049	64149



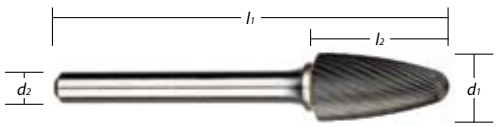
E / TRE • Metric

ISO	DIN	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Shk. Type	Standard Cut	Double Cut
E030503	TRE030503	3	3	5	38	A	64038	64138
E061006	TRE061006	6	6	10	50	A	64039	64139
E122006	TRE122006	12	6	20	64	C	64040	64140
E162506	TRE162506	16	6	25	68	C	64041	64141



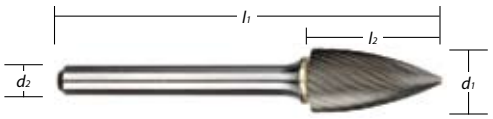
F / RBF • Metric

ISO	DIN	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Shk. Type	Standard Cut	Double Cut
F031303	RBF031303	3	3	13	38	A	64025	64125
F061906	RBF061906	6	6	19	50	A	64026	64126
F122506	RBF122506	12	6	25	68	C	64027	64127
F162506	RBF162506	16	6	25	68	C	64028	64128



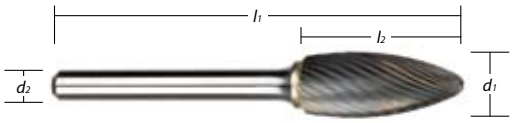
G / SPG • Metric

ISO	DIN	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	d_3 Max. Tip	Shk. Type	Standard Cut	Double Cut
G031303	SPG031303	3	3	13	38	---	A	64031	64131
G061906	SPG061906	6	6	19	50	---	A	64032	64132
G081906	SPG081906	8	6	19	63	---	C	64030	64130
G102006	SPG102006	10	6	20	64	---	C	64033	64133
G122506	SPG122506	12	6	25	68	---	C	64034	64134
G162506	SPG162506	16	6	25	68	---	C	64035	64135



H • Metric

ISO	DIN	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	d_3 Max. Tip	Shk. Type	Standard Cut	Double Cut
H030603	---	3	3	6	38	---	A	64059	64159
H061606	---	6	6	16	50	---	A	64060	64160
H081906	---	8	6	19	52	---	C	64061	64161
H163606	---	16	6	36	79	---	C	64062	64162

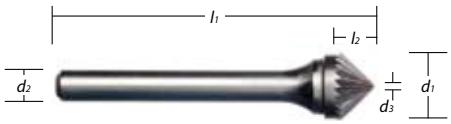


J / KSJ • Metric

ISO	DIN	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	d_3 Max. Tip	Shk. Type	Standard Cut	Double Cut
J030203	KSJ030203	3	3	2	38	Point	A	64077	64177
J060506	KSJ060506	6	6	5	50	Point	A	64078	64178
J161306	KSJ161306	16	6	13	60	1,5	C	64079	64179

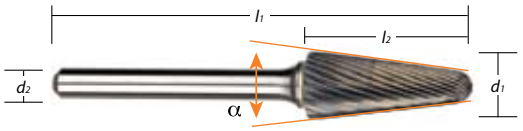
K / KSK • Metric

ISO	DIN	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	d_3 Max. Tip	Shk. Type	Standard Cut	Double Cut
K030103	KSK030103	3	3	1	38	Point	A	64082	64182
K060306	KSK060306	6	6	3	50	Point	A	64083	64183
K160806	KSK160806	16	6	8	56	1,5	C	64084	64184



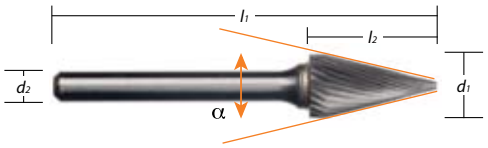
L / KEL • Metric

ISO	DIN	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	α Incl. Angle	Shk. Type	Standard Cut	Double Cut
L031203	KEL031203	3	3	12	38	8°	A	64052	64152
L061606	KEL061606	6	6	16	50	14°	A	64053	64153
L082206	KEL082206	8	6	22	66	14°	C	64054	64154
L123006	KEL123006	12	6	30	74	14°	C	64055	64155
L163006	KEL163006	16	6	30	74	14°	C	64056	64156



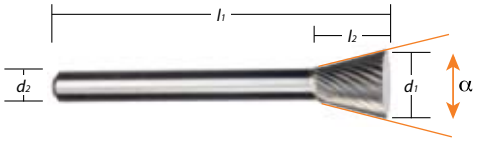
M / SKM • Metric

ISO	DIN	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	α Incl. Angle	Shk. Type	Standard Cut	Double Cut
M031103	SKM031103	3	3	11	38	14°	A	64065	64165
M061806	SKM061806	6	6	18	50	14°	A	64066	64166
M102006	SKM102006	10	6	20	64	28°	C	64067	64167
M122506	SKM122506	12	6	25	68	28°	C	64068	64168
M162506	SKM162506	16	6	25	68	31°	C	64069	64169



N / WKN • Metric

ISO	DIN	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	α Incl. Angle	Shk. Type	Standard Cut	Double Cut
N030503	WKN030503	3	3	5	38	10°	A	64072	64172
N060806	WKN060806	6	6	8	50	10°	A	64073	64173
N161606	WKN161606	16	6	16	60	19°	C	64074	64174



GT10 • Internal Grinding Tool

- Cylindrical shape
- Diamond cut, end cut
- Solid carbide construction
- Former list code G901

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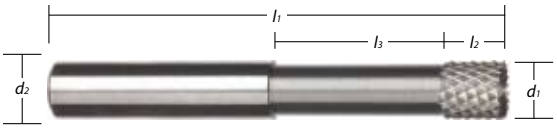
P M K N S

See adjacent



Starting Parameters

Tool Dia. Metric	Speed (m/min)	Tool Dia. Inch	Speed SFM
1	152-213	1/16	500-700
2	152-213	3/32	500-700
3	152-213	1/8	500-700
4	213-274	5/32	700-900
5	213-274	3/16	700-900
6	274-335	7/32	900-1100
8	335-396	1/4	900-1100
10	335-396	5/16	1100-1300
11	396-457	3/8	1100-1300
12	396-457	7/16	1300-1500
		1/2	1300-1500

Metric

d_1 Head Dia.	d_2 Shank Dia	l_2 Head Length	l_3 Neck Length	l_1 Overall Length	Order Code
1	3	3	9,5	38	05521
2	3	3	12,7	38	05522
3	3	3	12,7	38	05523
4	6	4	19	50	05524
5	6	5	19	50	05525
6	6	6	19	50	05526
8	6	8	---	63	05528
10	6	10	---	63	05530
11	6	11	---	63	05531
12	6	12	---	63	05532

Inch

d_1 Head Dia.	d_2 Shank Dia	l_2 Head Length	l_3 Neck Length	l_1 Overall Length	Order Code
1/16	1/8	1/8	3/8	1-1/2	05501
3/32	1/8	1/8	1/2	1-1/2	05502
1/8	1/8	5/32	1/2	1-1/2	05503
5/32	3/16	1/4	3/4	2	05504
3/16	3/16	1/4	3/4	2	05505
7/32	1/4	1/4	3/4	2	05506
1/4	1/4	1/4	3/4	2	05507
5/16	1/4	5/16	---	2-1/2	05508
3/8	1/4	3/8	---	2-1/2	05509
7/16	1/4	7/16	---	2-1/2	05510
1/2	1/4	1/2	---	2-1/2	05511

SCL • Center Lap

z=5

- 5-Flute, single end
- 60° included angle
- Solid carbide construction
- Former list code C835

Technical • Technisch • Technique • Técnico

H

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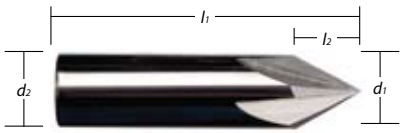

Inch

Code	Head Size	d_2 Shank Dia	l_2 Length of Cut	l_1 Overall Length	Order Code
SCL-4	1/4	1/4	3/16	1-1/2	36340
SCL-6	3/8	3/8	5/16	1-1/2	36343
SCL-8	1/2	1/2	7/16	1-1/2	36346

FR10

- Diamond cut flute pattern
- Multiple end cut styles
- Upcut style
- Solid carbide construction

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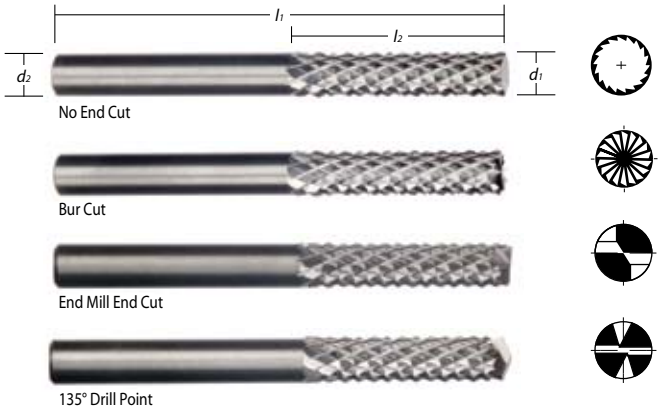
For phenolic-epoxy, graphite laminate and fiberglass materials.



Former List Code Reference

FR10				
Regular	F547	F548	F549	F550

Metric

Tool Code	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Order Code	Order Code	Order Code	Order Code
MFR-1	2	3	6	38	05011	05031	05051	05071
MFR-2	3	3	12	38	05012	05032	05052	05072
MFR-3	4	4	16	50	05013	05033	05053	05073
MFR-6	6	6	25	63	05014	05034	05054	05074
MFR-6-1	6	6	25	76	05087	05088	05089	05090
MFR-7	8	8	25	63	05015	05035	05055	05075
MFR-8	10	10	25	70	05016	05036	05056	05076
MFR-9	12	12	25	76	05017	05037	05057	05077

Inch

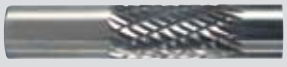
Tool Code	d_1 Cutter Dia.	d_2 Shank Dia.	l_2 Length of Cut	l_1 Overall Length	Order Code	Order Code	Order Code	Order Code
FR-1	1/16	1/8	1/4	1-1/2	05001	05021	05041	05061
FR-2	1/8	1/8	1/2	1-1/2	05002	05022	05042	05062
FR-3	3/16	3/16	5/8	2	05003	05023	05043	05063
FR-5	1/4	1/4	3/4	2	36641	36642	36643	36644
FR-6	1/4	1/4	1	2-1/2	05004	05024	05044	05064
FR-6-1	1/4	1/4	1	3	05083	05084	05085	05086
FR-7	5/16	5/16	1	2-1/2	05005	05025	05045	05065
FR-8	3/8	3/8	1	2-1/2	05006	05026	05046	05066
FR-9	1/2	1/2	1	3	05007	05027	05047	05067

Application Guide • Speed & Feed

Tool Dia. Metric	Speed (m/min) Min.	Max.	Feed Rate mm/rev.
2	183	274	0.051
3	183	274	0.051
4	183	274	0.051
6	183	274	0.051
8	183	274	0.051
10	183	274	0.051
12	183	274	0.051

Tool Dia. Inch	Speed (SFM) Min.	Max.	Feed Rate IPR
1/16	600	900	0.002
1/8	600	900	0.002
3/16	600	900	0.002
1/4	600	900	0.002
5/16	600	900	0.002
3/8	600	900	0.002
1/2	600	900	0.002

Piloted Style



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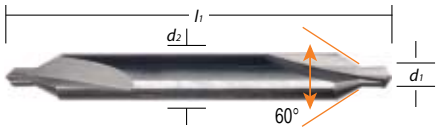
CD10 • Drill & Countersink



- 2-Flute, double end
- Solid carbide construction

Technical • Technisch • Technique • Técnico
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P M K N S

Former List Code Reference	
CD10	118°
Length	
Regular	C830
Long	C831

Metric

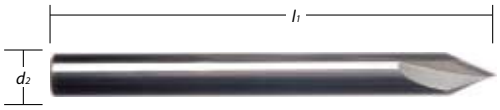
Tool Code	d1 Drill Diameter	d2 Shank Diameter	l1 Overall Length	Order Code
125	1,25	3,15	38	04811
160	1,6	4	50	04812
200	2	5	50	04813
250	2,5	6,3	50	04814
315	3,15	8	50	04815
400	4	10	60	04816
500	5	12,5	75	04817
630	6,3	16	82	04818

Set	
Style	Order Code
CD10	04809
Contains one each of: Nos. 1-6 with case	

Inch

Tool Code	d1 Drill Diameter	d2 Shank Diameter	l1 Overall Length	Order Code
No. 0	1/32	1/8	1-1/2	04800
No. 1	3/64	1/8	1-1/2	04801
No. 1 x 4	3/64	1/8	4	64809
No. 1 x 6	3/64	1/8	6	64801
No. 2	5/64	3/16	1-7/8	04802
No. 2 x 4	5/64	3/16	4	64810
No. 2 x 6	5/64	3/16	6	64802
No. 3	7/64	1/4	2	04803
No. 3 x 4	7/64	1/4	4	64811
No. 3 x 6	7/64	1/4	6	64803
No. 4	1/8	5/16	2-1/8	04804
No. 4 x 4	1/8	5/16	4	64812
No. 4 x 6	1/8	5/16	6	64804
No. 5	3/16	7/16	2-3/4	04805
No. 5 x 6	3/16	7/16	6	64805
No. 6	7/32	1/2	3	04806
No. 6 x 6	7/32	1/2	6	64806
No. 7	1/4	5/8	3	04807
No. 8	5/16	3/4	3	04808

CT12 • Chamfer Tool



- 2-Flute, single end
- Solid carbide construction

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P K N

Former List Code Reference			
CT12	60°	90°	120°
Length			
Regular	M837	M838	M839

Metric

α Included Angle	d2 Shank Diameter	l1 Overall Length	Order Code
60°	6	57	36667
	8	63	36668
	10	72	36669
	12	83	36670
90°	6	57	36320
	8	63	36321
	10	72	36322
	12	83	36323
120°	6	57	36815
	8	63	36816
	10	72	36817
	12	83	36818

Inch

α Included Angle	d2 Shank Diameter	l1 Overall Length	Order Code
60°	1/4	2-1/2	36300
	3/8	2-1/2	36301
	1/2	3	36302
90°	1/8	1-1/2	36303
	3/16	2	36304
	1/4	2-1/2	36305
	3/8	2-1/2	36306
	1/2	3	36307
	3/4	4	36308
120°	1/4	2-1/2	36309
	3/8	2-1/2	36310
	1/2	3	36311

CS10 • Single Flute Countersink

- Single end, single flute, positive rake
- 60°, 82° or 90° included angle
- Not suitable for hardened steels

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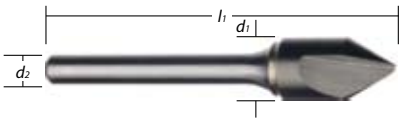
P K N



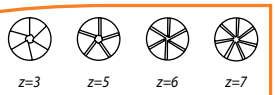
Metric

α Included Angle	d1 Body Diameter	d2 Shank Diameter	l1 Overall Length	Order Code
60°	3	3	38	31271
	5	5	50	51272
	6	6	50	61273
	9,5	6	64	61274
	12,7	6	66	61275
	16	10	75	61276
	19	12	75	61277
	25	12	81	61278
90°	3	3	38	31291
	5	5	50	51292
	6	6	50	61293
	9,5	6	51	61294
	12,7	6	63	61295
	16	10	72	61296
	19	12	72	61297
	25	12	75	61298

Inch

α Included Angle	d1 Body Diameter	d2 Shank Diameter	l1 Overall Length	Order Code
60°	1/8	1/8	1-1/2	01271
	3/16	3/16	2	01272
	1/4	1/4	2	01273
	3/8	1/4	2-13/16	01274
	1/2	1/4	2-7/8	01275
	5/8	3/8	3	01276
	3/4	1/2	3	01277
	1	1/2	3-1/4	01278
82°	1/8	1/8	1-1/2	01281
	3/16	3/16	2	01282
	1/4	1/4	2	01283
	3/8	1/4	2-11/16	01284
	1/2	1/4	2-3/4	01285
	5/8	3/8	2-7/8	01286
	3/4	1/2	2-7/8	01287
	1	1/2	3	01288
90°	1/8	1/8	1-1/2	01291
	3/16	3/16	2	01292
	1/4	1/4	2	01293
	3/8	1/4	2-11/16	01294
	1/2	1/4	2-3/4	01295
	5/8	3/8	2-7/8	01296
	3/4	1/2	2-7/8	01297
	1	1/2	3	01298

CS20 • Multi-flute Countersink



- Single end, chatterless design
- 3, 5, 6 and 7-Flute designs
- 60°, 82° or 90° included angle

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P M K N S H

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Former List Code Reference

CS10 • CS20 / No. of Flutes	60°	82°	90°
Single	C840	C841	C842
3-Flute	C843	C844	C845
5-Flute	C849	C851	C850
6-Flute	C846	C847	C848
7-Flute	C852	C853	C854

Multi-flute Style

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Metric

z Number of Flutes	α Incl. Angle	d1 Body Dia.	d2 Shank Dia.	d3 Tip Dia.	l1 Overall Length	Order Code
3 FL	60°	3,0	3	Point	38	31301
		5,0	5	Point	50	51302
		6,0	6	Point	50	61303
		9,5	6	1,0	64	61304
	90°	3,0	3	Point	38	31321
		5,0	5	Point	50	51322
		6,0	6	Point	50	61323
		9,5	6	1,0	51	61324
5 FL	60°	12,7	6	1,0	66	61305
		16,0	10	1,5	75	61306
	90°	12,7	6	1,0	63	61325
		16,0	10	1,5	72	61326
7 FL	60°	19,0	12	1,5	75	61307
		25,0	12	1,5	81	61308
	90°	19,0	12	1,5	72	61327
		25,0	12	1,5	75	61328

Inch

z Number of Flutes	α Incl. Angle	d1 Body Dia.	d2 Shank Dia.	d3 Tip Dia.	l1 Overall Length	Order Code
3 FL	60°	1/8	1/8	Point	1-1/2	01301
		3/16	3/16	Point	2	01302
		1/4	1/4	Point	2	01303
		3/8	1/4	1/32	2-13/16	01304
		1/2	1/4	1/32	2-7/8	36420
		5/8	3/8	1/16	3	36426
		3/4	1/2	1/16	3	01309
		1	1/2	1/16	3-1/4	01310
	82°	1/8	1/8	Point	1-1/2	01311
		3/16	3/16	Point	2	01312
		1/4	1/4	Point	2	01313
		3/8	1/4	1/32	2-11/16	01314
		1/2	1/4	1/32	2-3/4	36421
		5/8	3/8	1/16	2-7/8	01319
		3/4	1/2	1/16	2-7/8	01320
		1	1/2	1/16	3	01329
	90°	1/8	1/8	Point	1-1/2	01321
		3/16	3/16	Point	2	01322
		1/4	1/4	Point	2	01323
		3/8	1/4	1/32	2-11/16	01324
		1/2	1/4	1/32	2-3/4	36422
		5/8	3/8	1/16	2-7/8	01330
		3/4	1/2	1/16	2-7/8	01339
		1	1/2	1/16	3	01340
5 FL	60°	1/2	1/4	1/32	2-7/8	01305
		5/8	3/8	1/16	3	01306
	82°	1/2	1/4	1/32	2-3/4	01315
		5/8	3/8	1/16	2-7/8	01316
	90°	1/2	1/4	1/32	2-3/4	01325
		5/8	3/8	1/16	2-7/8	01326
6 FL	60°	1/8	1/8	Point	1-1/2	61280
		3/16	3/16	Point	2	61281
		1/4	1/4	Point	2	61282
		3/8	1/4	1/32	2-13/16	61283
		1/2	1/4	1/32	2-7/8	61284
		5/8	3/8	1/16	3	61285
		3/4	1/2	1/16	3	61286
		1	1/2	1/16	3-1/4	61287
	82°	1/8	1/8	Point	1-1/2	61310
		3/16	3/16	Point	2	61311
		1/4	1/4	Point	2	61312
		3/8	1/4	1/32	2-11/16	61313
		1/2	1/4	1/32	2-3/4	61314
		5/8	3/8	1/16	2-7/8	61315
		3/4	1/2	1/16	2-7/8	61316
		1	1/2	1/16	3	61317
	90°	1/8	1/8	Point	1-1/2	61360
		3/16	3/16	Point	2	61361
		1/4	1/4	Point	2	61362
		3/8	1/4	1/32	2-11/16	61363
		1/2	1/4	1/32	2-3/4	61364
		5/8	3/8	1/16	2-7/8	61365
		3/4	1/2	1/16	2-7/8	61366
		1	1/2	1/16	3	61367
7 FL	60°	3/4	1/2	1/16	3	01307
		1	1/2	1/16	3-1/4	01308
	82°	3/4	1/2	1/16	2-7/8	01317
		1	1/2	1/16	3	01318
	90°	3/4	1/2	1/16	2-7/8	01327
		1	1/2	1/16	3	01328

Application Guide • Speed & Feed

Work Material	Speed (m/min)	Speed (SFM)
Aluminum / Aluminum Alloys	91 - 152	300 - 500
Brass / Bronze	46 - 76	150 - 250
Composites / Plastics	76 - 122	250 - 400
Magnesium / Magnesium Alloys	76 - 122	250 - 400
Cast Iron - Gray	38 - 69	125 - 225
Cast Iron - Ductile	30 - 53	100 - 175
Cast Iron - Malleable	27 - 46	90 - 150
Low Carbon Steel ≤ 38 HRc 1018, 12L14, 8620	38 - 53	125 - 175
Medium Carbon Steels ≤ 38 HRc 4140, 4340	24 - 46	80 - 150
Tool & Die Steels ≤ 38 HRc A2, D2, H13, P20	12 - 18	40 - 60
Tool & Die Steels 39 - 48 HRc A2, D2, H13, P20	11 - 17	35 - 55
Tool Steels 49 - 52 HRc A2, D2	4 - 6	15 - 20
Easy to Machine Stainless Steel 416, 410, 302, 303	24 - 46	80 - 150
Moderate Machining Stainless Steels 304, 316, Invar, Kovar	18 - 27	60 - 90
Difficult to Machine Stainless 316L, 17-4 PH, 15-5 PH, 13-8 PH	15 - 23	50 - 75
Titanium	18 - 27	60 - 90
High Temp Alloys, Inconel, Haynes, Stellite, Hastalloy, Waspalloy	8 - 11	25 - 35

Feed Rate • Single Flute = .005 IPT Max • Multiple Flutes = .005 - .008 IPT

BT10 • Boring Tool

- Single end
- Former list code B200

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P M K N S

Metric

Tool Code	Min. Bore	d_2 Shank Dia.	l_2 Max Hole Depth	l_1 Overall Length	Order Code
IB-1M	1,5	3	5	38	85104
IB-2M	2	3	9	38	85105
IB-3M	2,5	3	12	38	85106
IB-4M	3	3	16	38	85107
IB-5M	4	4	19	50	85108
IB-6M	5	6	25	50	85109
IB-7M	6	6	31	50	85110
IB-8M	7	8	31	63	85111
IB-9M	8	8	31	63	85112
IB-10M	9	10	38	70	85113
IB-11M	10	10	38	70	85114

Inch

Tool Code	Min. Bore	d_2 Shank Dia.	l_2 Max Hole Depth	l_1 Overall Length	Order Code
IB-1	.060	1/8	3/16	1-1/2	85005
IB-2	.090	1/8	1/2	1-1/2	85008
IB-3	.120	1/8	5/8	1-1/2	85009
IB-4	.150	3/16	3/4	2	85010
IB-5	.180	3/16	1	2	85011
IB-6	.210	1/4	1-1/4	2	85012
IB-7	.240	1/4	1-1/4	2	85013
IB-8	.270	5/16	1-1/4	2-1/2	85014
IB-9	.300	5/16	1-1/4	2-1/2	85015
IB-10	.330	3/8	1-1/2	2-1/2	85016
IB-11	.360	3/8	1-1/2	2-1/2	85017

CRC10 • Corner Rounding Cutter

- 4-Flute, single end
- Former list code M288R

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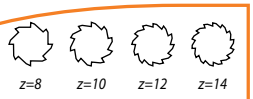
Page 5

P M K H

Metric

R Radius	d_1 Head Dia.	d_2 Shank Dia.	d_3 Pilot Dia.	l_1 Overall Length	Order Code
1,0	8	8	5	63	24001
1,25	8	8	5	63	24003
1,5	10	10	5,5	70	24005
2,0	12	12	6	76	24009
2,5	12	12	6	76	24013
3,0	14	12	7	76	24015
3,5	16	12	7	76	24017
4,0	16	12	7	76	24019
4,5	18	12	8	76	24021
5,0	20	16	9	76	24023
6,0	22	16	9	76	24025
8,0	25	20	8	76	24027

KC10 • Keyseat Cutter



- Solid carbide head, steel shank
- Former list code K100

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P M K H

Inch

d_1 Cutter Dia.	Tool Code	l_2 Face Width	d_2 Shank Dia.	l_1 Overall Length	z Number of Flutes	Order Code
3/8	No. 203	1/16	1/2	2-1/16	8	30314
	No. 303	3/32	1/2	2-3/32	8	30316
	No. 403	1/8	1/2	2-1/8	8	30322
1/2	No. 204	1/16	1/2	2-1/16	10	30328
	No. 304	3/32	1/2	2-3/32	10	30333
	No. 404	1/8	1/2	2-1/8	10	30340
5/8	No. 305	3/32	1/2	2-3/32	10	30346
	No. 405	1/8	1/2	2-1/8	10	30352
	No. 505	5/32	1/2	2-5/32	10	30358
	No. 605	3/16	1/2	2-3/16	10	30364
3/4	No. 406	1/8	1/2	2-1/8	10	30370
	No. 506	5/32	1/2	2-5/32	10	30376
	No. 606	3/16	1/2	2-3/16	10	30382
	No. 806	1/4	1/2	2-1/4	10	30388
7/8	No. 507	5/32	1/2	2-5/32	12	30394
	No. 607	3/16	1/2	2-3/16	12	30400
	No. 707	7/32	1/2	2-7/32	12	30410
	No. 807	1/4	1/2	2-1/4	12	30413
1	No. 608	3/16	1/2	2-3/16	12	30418
	No. 708	7/32	1/2	2-7/32	12	30424
	No. 808	1/4	1/2	2-1/4	12	30430
1-1/4	No. 610	3/16	1/2	2-3/16	14	30436
	No. 710	7/32	1/2	2-7/32	14	30442
	No. 810	1/4	1/2	2-1/4	14	30448

SET • DET • Engraving Tool Blank

- Single and double end styles
- Micrograin carbide
- Precision ground
- Blanks for engraving tools

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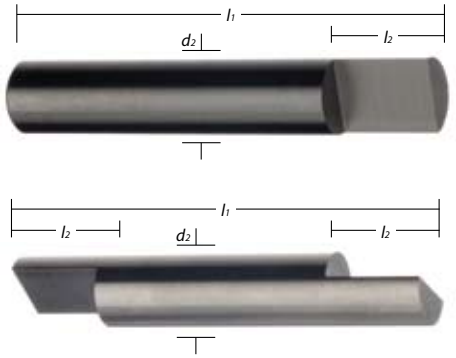

Metric

d_2 Rod Dia.	l_2 Split Length	l_1 Overall Length	Order Code	Order Code
3	9	38	92050	92060
6	12	50	92053	92063
8	16	63	92054	92064
10	16	70	92055	92065
12	19	76	92056	92066

Inch

d_2 Rod Dia.	l_2 Split Length	l_1 Overall Length	Order Code	Order Code
1/8	3/8	1-1/2	92003	92023
1/8	3/8	2	92002	92022
1/8	3/8	4	92013	92123
3/16	1/2	2	92005	92025
3/16	1/2	3	92004	92024
3/16	1/2	4	92015	92125
1/4	1/2	2	92006	92026
1/4	1/2	2-1/2	92012	92032
1/4	1/2	3	92014	92034
1/4	1/2	4	92016	92126
5/16	1/2	2-1/2	92011	92036
5/16	5/8	2-1/2	92007	92027
5/16	1/2	3	92009	92029
3/8	1/2	2-1/2	92017	92038
3/8	5/8	2-1/2	92008	92028
3/8	1/2	3	92019	92021
3/8	5/8	6	92018	92128
1/2	5/8	3	92020	92039
1/2	3/4	3	92010	92030
1/2	3/4	6	92110	92130

GM • Ground Rod

- Micrograin carbide
- Precision ground
- Chamfered one end

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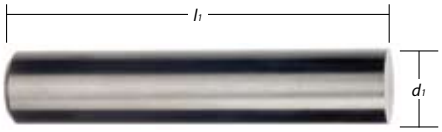


Metric

d_1 Rod Dia.	l_1 Overall Length	Order Code
3	38	80046
3	75	80024
3	100	80025
4	50	80026
4	75	80027
4	100	80028
5	50	80029
5	63	80047
5	100	80031
6	50	80032
6	63	80071
6	75	80033
6	100	80034
6	150	80072
8	63	80035
8	75	80036
8	100	80037
8	150	80073
10	70	80038
10	72	80048
10	75	80049
10	100	80039
10	150	80074
12	76	80040
12	100	80041
12	150	80075
14	83	80050
16	89	80042
16	150	80076
18	100	80043
18	150	80077
20	100	80044
20	150	80078
25	100	80045
25	150	80079

Inch

d_1 Rod Dia.	l_1 Overall Length	Order Code
1/8	1-1/2	80001
1/8	2	80002
1/8	2-1/2	80063
1/8	3	80003
1/8	4	80004
3/16	2	80005
3/16	2-1/2	80064
3/16	3	80006
3/16	4	80007
1/4	2	80008
1/4	2-1/2	80009
1/4	3	80010
1/4	4	80011
1/4	6	80055
5/16	2	80065
5/16	2-1/2	80012
5/16	3	80013
5/16	4	80014
5/16	6	80056
3/8	2	80066
3/8	2-1/2	80015
3/8	3	80016
3/8	4	80017
3/8	6	80057
1/2	2-1/2	80067
1/2	3	80018
1/2	4	80019
1/2	6	80058
5/8	3-1/2	80020
5/8	6	80060
3/4	4	80021
3/4	6	80061
1	4	80022
1	6	80062

TOOL MODIFICATIONS

Special tooling requirements can often be met through one or more simple modifications of standard, off-the-shelf products. Modifications include coating, adding corner radius or chamfer, flats, and more.

You can order more than one modification for the same tool as long as the modifications do not depend on or conflict with each other. (For example, you cannot choose both a corner radius and a corner chamfer.)

IMPORTANT: Modified products are non-returnable. Modifications are not available for miniature tools (less than 1/16 in. or 1.5 mm).

Calculating Costs

Modification prices in these charts apply to single-ended tools only. To calculate your costs:

1. Find the price for the standard tool you want us to modify.
2. Add the cost for modification from the following charts. Multiply the price shown by 2 for double-ended tools. (Remember: your cost for a modified tool depends on how many of that individual tool you order, not the quantity of your entire order.)
3. Subtract your standard discount, if applicable.

Delivery

Orders of up to 25 pieces

Uncoated – Allow 3 working days to rework tools available from stock.

Coated – Allow 7-10 days for coating of finished tools.

Orders of 26 pieces or more (coated or uncoated)

Allow at least two to three weeks for order shipment (assuming the standard tool is in stock).

Performance and Standards

Product modifications may affect tool performance. Tolerances for dimensions altered are detailed in the charts. Dimensions that are not altered or are incidental to your order will conform to our specifications for the original product.

Special Information about Coatings

Coating thickness is not a controlled manufacturing characteristic and may increase the cutting diameter of the tool. Reamer tolerances shown in the catalog apply only to uncoated tools.

Thin film diamond coating (DLC) is recommended for machining graphite, aluminum, composites and plastics. DLC is not recommended for general-purpose machining. DLC cannot be applied over other coatings.

Micran is a super thin layer of TiAlN coating designed for use on miniature tools and reamers, or other products where diameter change resulting from the coating process can be a problem.

PVD Tool Coating

• Multiply by 2 for double ended tools

Decimal Range	Metric Range	Inch Range	AlTiNX	TiAlNX AlTiN HardLube	TiCN TiAlN Micran	TiN
Up to .1250	Up to 3,1 (3,0)	Up to 1/8 (1/8)				
.1251 - .1969	3,2 to 5,0 (5,0)	9/64 to 3/16 (3/16)				
.1970 - .2500	5,1 to 6,3 (6,0)	13/64 to 1/4 (1/4)				
.2501 - .3150	6,4 to 8,0 (8,0)	17/64 to 5/16 (5/16)				
.3151 - .3937	8,1 to 10,0 (10,0)	21/64 to 3/8 (3/8)				
.3938 - .4750	10,1 to 11,0 (11,0)	25/64 to 7/16 (7/16)				
.4751 - .5000	11,1 to 12,7 (12,0)	29/64 to 1/2 (1/2)				
.5001 - .6300	12,8 to 16,0 (16,0)	33/64 to 5/8 (5/8)				
.6301 - .7874	16,1 to 20,0 (20,0)	41/64 to 3/4 (3/4)				
.7875 - .8750	20,1 to 22,0 (22,0)	49/64 to 7/8 (7/8)				
.8751 - 1.000	22,1 to 25,4 (25,0)	57/64 to 1 (1)				
1.001 - 1.260	25,5 to 32,0 (32,0)	1-1/64 to 1-1/4 (1-1/4)				
1.261 - 1.500	32,1 to 38,0 (38,0)	1-17/64 to 1-1/2 (1-1/2)				

REFER TO CURRENT PRICE LIST

Thin Film Diamond Coating (DLC)

• Prices only apply within OAL range shown
• Add 15% for longer overall lengths

Metric Tools Diameter Range	Metric Tools OAL Range	Inch Tools Diameter Range	Inch Tools OAL Range	1-50	51-100	101-500	501-1000	1000+
Up to 3,1 (3,0)	0 - 38	Up to 1/8 (1/8)	0 - 1.5					
3,2 to 5,0 (5,0)	0 - 101	9/64 to 3/16 (3/16)	0 - 4.0					
5,1 to 6,3 (6,0)	0 - 101	13/64 to 1/4 (1/4)	0 - 4.0					
6,4 to 8,0 (8,0)	0 - 114	17/64 to 5/16 (5/16)	0 - 4.5					
8,1 to 10,0 (10,0)	0 - 114	21/64 to 3/8 (3/8)	0 - 4.5					
10,1 to 11,0 (11,0)	0 - 127	25/64 to 7/16 (7/16)	0 - 5					
11,1 to 12,7 (12,0)	0 - 127	29/64 to 1/2 (1/2)	0 - 5					
12,8 to 16,0 (16,0)	0 - 152	33/64 to 5/8 (5/8)	0 - 6					
16,1 to 20,0 (20,0)	0 - 152	41/64 to 3/4 (3/4)	0 - 6					
20,1 to 22,0 (22,0)	0 - 152	49/64 to 7/8 (7/8)	0 - 6					
22,1 to 25,4 (25,0)	0 - 152	57/64 to 1 (1)	0 - 6					
25,5 to 32,0 (32,0)	0 - 152	1-1/64 to 1-1/4 (1-1/4)	0 - 6					
32,1 to 38,0 (38,0)	0 - 152	1-17/64 to 1-1/2 (1-1/2)	0 - 6					

REFER TO CURRENT PRICE LIST

Add Corner Radius

• Prices only apply within radius range shown
• Maximum radius is 25% of tool diameter
• Add 50% for radii less than .015 inches
• Prices are for 2-4 flute tools. Add 50% for 5 or 6 flute

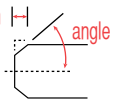
Metric Tools Radius Range	Metric Tools Dia. Restriction	Inch Tools Radius Range	Inch Tools Dia. Restriction	Price by quantity ordered 1	2-5	6-11	12-23	24+
0,30 - 0,75	3,0 & up	.015 - .031	1/8 & up					
0,76 - 1,25	5,0 & up	.032 - .047	3/16 & up					
1,26 - 1,5	6,0 & up	.048 - .063	1/4 & up					
1,51 - 2,0	8,0 & up	.064 - .078	5/16 & up					
2,01 - 2,5	10,0 & up	.079 - .094	3/8 & up					
2,51 - 3,0	12,0 & up	.095 - .125	1/2 & up					
3,01 - 4,0	16,0 & up	.126 - .156	5/8 & up					
4,01 - 5,0	20,0 & up	.157 - .190	3/4 & up					
5,01 - 6,25	25,0 & up	.191 - .250	1 & up					

REFER TO CURRENT PRICE LIST

Radius Tolerance ± .005 • Tangency ± .002

Add Corner Chamfer

Specify angle and length



• Prices only apply within chamfer length range shown
• Maximum chamfer is 25% of tool diameter
• Add 50% for chamfer less than .015
• Prices are for 2-4 flute tools. Add 50% for 5 or 6 flute

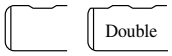
Metric Tools Length Range	Metric Tools Dia. Restriction	Inch Tools Length Range	Inch Tools Dia. Restriction	Price by quantity ordered 1	2-5	6-11	12-23	24+
0,30 - 0,75	3,0 & up	.015 - .031	1/8 & up					
0,76 - 1,25	5,0 & up	.032 - .047	3/16 & up					
1,26 - 1,5	6,0 & up	.048 - .063	1/4 & up					
1,51 - 2,0	8,0 & up	.064 - .078	5/16 & up					
2,01 - 2,5	10,0 & up	.079 - .094	3/8 & up					
2,51 - 3,0	12,0 & up	.095 - .125	1/2 & up					
3,01 - 4,0	16,0 & up	.126 - .156	5/8 & up					
4,01 - 5,0	20,0 & up	.157 - .190	3/4 & up					
5,01 - 6,25	25,0 & up	.191 - .250	1 & up					

REFER TO CURRENT PRICE LIST

Chamfer Tolerance ± .005

TOOL MODIFICATIONS
End Mills & Drills

Add Weldon® Flat to Shank

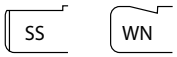


Diameter Range		Price by Quantity (Per Item Ordered)				
Metric Tools	Inch Tools	1	2-5	6-11	12-23	24+
Up to 6,0	Up to 1/4					
6,1 - 12,0	17/64 - 1/2					
12,1 - 16,0	33/64 - 5/8					
16,1 - 20,0	41/64 - 3/4					
20,1 - 32,0 (Single Flat)	49/64 - 1-1/4 (Single Flat)					
20,1 - 32,0 (Double Flat)	49/64 - 1-1/4 (Double Flat)					

REFER TO CURRENT PRICE LIST

*Optional double flat available for this diameter range only

Add Set-screw Flat or Whistle Notch



Diameter Range		Price by Quantity (Per Item Ordered)				
Metric Tools	Inch Tools	1	2-5	6-11	12-23	24+
Up to 6,3 (6,0)	Up to 1/4 (1/4)					
6,1 - 12,7 (12,0)	17/64 - 1/2 (1/2)					
12,1 - 16,0 (16,0)	33/64 - 5/8 (5/8)					
16,1 - 20,0 (20,0)	41/64 - 3/4 (3/4)					
20,1 - 25,4 (25,0)	49/64 - 1 (1)					

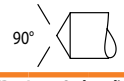
REFER TO CURRENT PRICE LIST

Remove End Dish and Resharpen

Diameter Range		Price by Quantity (Per Item Ordered)				
Metric Tools	Inch Tools	1	2-5	6-11	12-23	24+
Up to 6,3 (6,0)	Up to 1/4 (1/4)					
6,1 - 12,7 (12,0)	17/64 - 1/2 (1/2)					
12,1 - 16,0 (16,0)	33/64 - 5/8 (5/8)					
16,1 - 20,0 (20,0)	41/64 - 3/4 (3/4)					
20,1 - 25,4 (25,0)	49/64 - 1 (1)					

REFER TO CURRENT PRICE LIST

Add Drill Point to 2-, 3-, 4-Flute End E/Mills



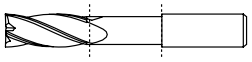
Diameter Range		Price by Quantity (Per Item Ordered)				
Metric Tools	Inch Tools	1	2-5	6-11	12-23	24+
Up to 6,3 (6,0)	Up to 1/4 (1/4)					
6,1 - 12,7 (12,0)	17/64 - 1/2 (1/2)					
12,1 - 16,0 (16,0)	33/64 - 5/8 (5/8)					
16,1 - 20,0 (20,0)	41/64 - 3/4 (3/4)					
20,1 - 25,4 (25,0)	49/64 - 1 (1)					

REFER TO CURRENT PRICE LIST

• 60° and 118° points available at same price • 90° point supplied unless otherwise specified

Add Neck Relief

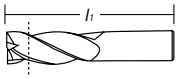
Add 20% for longer neck relief lengths



Metric Tools			Inch Tools			Price by Quantity (Per Item Ordered)				
Diameter Range	Depth of Relief	Length of Relief	Diameter Range	Depth of Relief	Length of Relief	1	2-5	6-11	12-23	24+
1,5 to 3,0 (3,0)	0,2	6,0	1/16 to 1/8 (1/8)	.007	1/4					
3,01 to 5,0 (5,0)	0,3	10,0	9/64 to 3/16 (3/16)	.012	3/8					
5,01 to 6,0 (6,0)	0,4	19,0	13/64 to 1/4 (1/4)	.015	3/4					
6,01 to 8,0 (8,0)	0,4	19,0	17/64 to 5/16 (5/16)	.015	3/4					
8,01 to 10,0 (10,0)	0,5	19,0	21/64 to 3/8 (3/8)	.020	3/4					
10,01 to 12,0 (12,0)	0,6	19,0	25/64 to 1/2 (1/2)	.025	3/4					
12,01 to 16,0 (16,0)	0,9	19,0	33/64 to 5/8 (5/8)	.035	3/4					
16,01 to 20,0 (20,0)	0,9	19,0	41/64 to 3/4 (3/4)	.035	3/4					
20,01 to 25,0 (25,0)	1,0	19,0	49/64 to 1 (1)	.040	3/4					

REFER TO CURRENT PRICE LIST

Shorten Flute Length* Cut Off End & Resharpen



Diameter Range		Price by Quantity (Per Item Ordered)				
Metric Tools	Inch Tools	1	2-5	6-11	12-23	24+
Up to 6,3 (6,0)	Up to 1/4 (1/4)					
6,1 - 12,7 (12,0)	17/64 - 1/2 (1/2)					
12,1 - 16,0 (16,0)	33/64 - 5/8 (5/8)					
16,1 - 20,0 (20,0)	41/64 - 3/4 (3/4)					
20,1 - 25,4 (25,0)	49/64 - 1 (1)					

REFER TO CURRENT PRICE LIST

• Applies to end mills, drills and reamers only

l_1 <1/4 +0.062 / -0.0 l_1 ≥1/4 +0.125 / -0.0

Shorten Overall Length Cut Off Shank & Add Chamfer

Diameter Range		Price by Quantity (Per Item Ordered)				
Metric Tools	Inch Tools	1	2-5	6-11	12-23	24+
Up to 6,3 (6,0)	Up to 1/4 (1/4)					
6,1 - 12,7 (12,0)	17/64 - 1/2 (1/2)					
12,1 - 16,0 (16,0)	33/64 - 5/8 (5/8)					
16,1 - 20,0 (20,0)	41/64 - 3/4 (3/4)					
20,1 - 25,4 (25,0)	49/64 - 1 (1)					

REFER TO CURRENT PRICE LIST

Change Drill Point or Reamer Chamfer

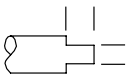
Diameter Range		Price by Quantity (Per Item Ordered)				
Metric Tools	Inch Tools	1	2-5	6-11	12-23	24+
Up to 6,3 (6,0)	Up to 1/4 (1/4)					
6,1 - 12,7 (12,0)	17/64 - 1/2 (1/2)					
12,1 - 16,0 (16,0)	33/64 - 5/8 (5/8)					
16,1 - 20,0 (20,0)	41/64 - 3/4 (3/4)					
20,1 - 25,4 (25,0)	49/64 - 1 (1)					

REFER TO CURRENT PRICE LIST

• Also use to modify tri-flute drills for use in aluminum

Add Tang to Shank

Specify tang thickness and length



Diameter Range		Price by Quantity (Per Item Ordered)				
Metric Tools	Inch Tools	1	2-5	6-11	12-23	24+
Up to 10,0 (10,0)	Up to 25/64 (3/8)					
10,1 to 16,0 (16,0)	13/32 to 5/8 (5/8)					
16,1 to 25,4 (25,0)	41/64 to 1 (1)					

REFER TO CURRENT PRICE LIST

• Solid carbide tools only

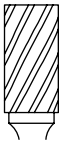
TOOL MODIFICATIONS

FLUTE STYLES

Standard Cut
Provides good stock removal and excellent surface finishes on relatively hard materials which will not load the flutes.

Aluma Cut
Wide flute design for rapid stock removal in soft or nonferrous materials: aluminum, magnesium, brass, zinc alloys, lead, hard rubber and most plastics.

Fine Cut*
Choose when better surface finish is required. Recommended for use on materials with a 55-60 Rockwell C hardness.



Coarse Cut*
Offers rapid stock removal in materials such as copper, brass, plastics and rubber. If loading is excessive, the aluminum cut is recommended.

FLUTE PATTERNS

Chip Breaker* (C/B)
Increases tool control when added to any standard cut, coarse cut or fine cut bur. Finish quality will be slightly reduced due to flute pattern.

Diamond Cut*
For use on heat-treated and tough alloy steels. Balanced cutting action provides better operator control. Stock removal is increased; finish is sacrificed.

Double Cut
Permits faster penetration and stock removal rates, due to the chisel edge. Reduced pull improves control and reduces operator fatigue.

* Indicates made to order flute styles and patterns.

BURS WITH SPECIAL FLUTE PATTERNS

How To Calculate Prices

1. Locate a bur in this catalog with the shape, diameter and length of cut needed and note the price.
2. Increase the price by the percentage provided in the chart.
3. Add the set-up charge. (Burs requiring a chip-breaker cut and orders exceeding 23 pieces are excluded from set-up charges.)

The total is your cost.

Set-up Charge

Typically, only one set-up charge is applied to each tool. For example, if you are adding a 8mm or 3/8" shank to a bur that is already subject to a set-up charge, an additional set-up charge would not apply.

Shipment

Turnaround time for burs with special flute patterns depends on the flute pattern ordered. In general, allow 2 - 4 weeks for shipment.

Bur Fluting Patterns & Shank Alterations

Bur Style	Add to List Price	Set-up charge per item 1	2-5	6-11	12-23	24+
Chipbreaker						
Diamond						
Fine, Fine Double, Fine Chipbreaker						
Fine Diamond						
Coarse, Coarse Double, Coarse Chipbreaker						
Coarse Diamond						
Add 3/8 or 8mm Shank (2" OAL)						
Add 3/8 or 8mm Shank (4" OAL)						
Add 3/8 or 8mm Shank (6" OAL)						
Cut-off Shank						

REFER TO CURRENT PRICE LIST

Restoring Burs Saves Money

We will resharpen or recondition any carbide bur that still shows some tool life. NOTE: Reconditioning is recommended for burs requiring more than simple resharpening. Send us your burs for an evaluation today.

Resharpen and Recondition Burs

Bur Diameter Metric	Bur Diameter Inch	Standard Cut Double Cut Chipbreaker Cut Sharpen	Condition	Coarse Cut Coarse Double Coarse Chipbreaker Sharpen	Condition	Fine Cut Fine Double Fine Chipbreaker Sharpen	Condition	Diamond Cut Fine Diamond Coarse Diamond Sharpen	Condition	Aluma Cut Sharpen	Condition
3,0	1/8										
4,7 - 5,0	3/16										
6,0	1/4										
8,0	5/16										
9,5 - 10,0	3/8										
11,0	7/16										
12,0 - 12,7	1/2										
16,0	5/8										
19,0	3/4										
25,4	1										
32,0	1-1/4										

REFER TO CURRENT PRICE LIST

PRODUCT WARRANTY

Menlo will repair or replace any of our products that are found, in our judgment, to be defective in materials or workmanship. All claims must be made in writing within thirty (30) days of receipt of product. No claims for labor or damages will be allowed. In no event will we be liable for consequential or special damages of any kind. The foregoing shall constitute the sole and exclusive remedies of the customer and are in lieu of all other warranties, expressed, implied or statutory, including but not limited to any implied warranty of merchantability or fitness.

WARNING

Cemented carbide may chip or fragment when used in interrupted cuts or placed under high chip loads in machine operations. Always use machine guards, protective clothing and safety glasses to prevent burns or other injury to body or eyes from flying particles or chips. Grinding produces potentially hazardous dust. To avoid adverse health effects, always use adequate ventilation and read the Material Safety Data Sheet for the application material first.

TERMS & CONDITIONS

Individual Packaging Standard

For your ordering convenience, most tools in this catalog are packaged and sold individually. Exceptions are noted.

Special Tools

Special items or tools manufactured to specifications other than those provided in this catalog are subject to quotation. Dimensions and tolerances not detailed will be furnished to our standard manufacturing specifications. Quotations are valid for 30 days unless otherwise stated and agreed to in writing. As a safeguard, all orders for special tooling must be confirmed in writing before manufacturing can begin. Special items cannot be canceled or returned for exchange or credit.

Over/Under Shipments for Special Tools

For planning purposes, unless otherwise specified and agreed to in writing, over/under quantity allowances will be made as stated in the following chart. If you need an exact quantity or nonstandard allowance, we will be happy to review your request. Your quotation will contain any special arrangements offered.

Use this chart to determine the Over and Under allowance applied

Order Quantity	1-9	10-24	25-49	50-99	100+
Over / Under Allowance	1	2	3	4	5%

Transportation Terms

All products are shipped Transportation Charged, FOB Factory. UPS and FedEx are our primary carriers; however, other providers are available.

Product Damaged In Transit

If you receive a package that has been damaged during transit, please keep the shipment container and contact Customer Service immediately. (The original shipment container must be kept until carrier personnel views the damage and validates the insurance claim.) We will send order replacements and start claim proceedings with the carrier.

Customer Service will need the following information:

- Purchase order number
- Description of damage
- Quantity/item evaluation

To ensure fast tool replacements, all shipment discrepancies must be reported within seven (7) days.

DECIMAL EQUIVALENT CHART

Tool Size	Decimal Equiv.
80	.0135
0.35	.0138
79	.0145
1/64	.0156
0.40	.0158
78	.0160
0.45	.0177
77	.0180
0.50	.0197
76	.0200
75	.0210
0.55	.0217
74	.0225
0.60	.0236
73	.0240
72	.0250
0.65	.0256
71	.0260
0.70	.0276
70	.0280
69	.0292
0.75	.0295
68	.0310
1/32	.0312
0.80	.0315
67	.0320
66	.0330
0.85	.0335
65	.0350
0.90	.0354
64	.0360
63	.0370
0.95	.0374
62	.0380
61	.0390
1.00	.0394
60	.0400
59	.0410
1.05	.0413
58	.0420
57	.0430
1.10	.0433
1.15	.0453
56	.0465
3/64	.0469
1.20	.0472
1.25	.0492
1.30	.0512
55	.0520
1.35	.0531
54	.0550
1.40	.0551
1.45	.0571
1.50	.0591
53	.0595
1.55	.0610
1/16	.0625
1.60	.0630
52	.0635
1.65	.0650
1.70	.0669
51	.0670
1.75	.0689
50	.0700
1.80	.0709
1.85	.0728
49	.0730

Tool Size	Decimal Equiv.
1.90	.0748
48	.0760
1.95	.0768
5/64	.0781
47	.0785
2.00	.0787
2.05	.0807
46	.0810
45	.0820
2.10	.0827
2.15	.0846
44	.0860
2.20	.0866
2.25	.0886
43	.0890
2.30	.0906
2.35	.0925
42	.0935
3/32	.0938
2.40	.0945
41	.0960
2.45	.0965
40	.0980
2.50	.0984
39	.0995
38	.1015
2.60	.1024
37	.1040
2.70	.1063
36	.1065
2.75	.1083
7/64	.1094
35	.1100
2.80	.1102
34	.1110
33	.1130
2.90	.1142
.32	.1160
3.00	.1181
31	.1200
3.10	.1220
1/8	.1250
3.20	.1260
3.25	.1280
30	.1285
3.30	.1299
3.40	.1339
29	.1360
3.50	.1378
28	.1405
9/64	.1406
3.60	.1417
27	.1440
3.70	.1457
26	.1470
3.75	.1476
25	.1495
3.80	.1496
24	.1520
3.90	.1535
23	.1540
5/32	.1562
22	.1570
4.00	.1575
21	.1590
20	.1610
4.10	.1614

Tool Size	Decimal Equiv.
4.20	.1654
19	.1660
4.25	.1673
4.30	.1693
18	.1695
11/64	.1719
17	.1730
4.40	.1732
16	.1770
4.50	.1772
15	.1800
4.60	.1811
14	.1820
13	.1850
4.70	.1850
4.75	.1870
3/16	.1875
4.80	.1890
12	.1890
11	.1910
4.90	.1929
10	.1935
9	.1960
5.00	.1969
8	.1990
5.10	.2008
7	.2010
13/64	.2031
6	.2040
5.20	.2047
5	.2055
5.25	.2067
5.30	.2087
4	.2090
5.40	.2126
3	.2130
5.50	.2165
7/32	.2188
5.60	.2205
2	.2210
5.70	.2244
5.75	.2264
1	2280
5.80	.2283
5.90	.2323
A	.2340
15/64	.2344
6.00	.2362
B	.2380
6.10	.2402
C	.2420
6.20	.2441
D	.2460
6.25	.2461
6.30	.2480
1/4	.2500
E	.2500
6.40	.2520
6.50	.2559
F	.2570
6.60	.2598
G	.2610
6.70	.2638
17/64	.2656
6.75	.2657
H	.2660
6.80	.2677

Tool Size	Decimal Equiv.
6.90	.2717
I	.2720
7.00	.2756
J	.2770
7.10	.2795
K	.2810
9/32	.2812
7.20	.2835
7.25	.2854
7.30	.2874
L	.2900
7.40	.2913
M	.2950
7.50	.2953
19/64	.2969
7.60	.2992
N	.3020
7.70	.3031
7.75	.3051
7.80	.3071
7.90	.3110
5/16	.3125
8.00	.3150
O	.3160
8.10	.3189
8.20	.3228
P	.3230
8.25	.3248
8.30	.3268
21/64	.3281
8.40	.3307
Q	.3320
8.50	.3346
8.60	.3386
R	.3390
8.70	.3425
11/32	.3438
8.75	.3445
8.80	.3465
S	.3480
8.90	.3504
9.00	.3543
T	.3580
9.10	.3583
23/64	.3594
9.20	.3622
9.25	.3642
9.30	.3661
U	.3680
9.40	.3701
9.50	.3740
3/8	.3750
V	.3770
9.60	.3780
9.70	.3819
9.75	.3839
9.80	.3858
W	.3860
9.90	.3898
25/64	.3906
10.00	.3937
X	.3970
Y	.4040
13/32	.4062
Z	.4130
10.50	.4134
27/64	.4219

Tool Size	Decimal Equiv.
11.00	.4331
7/16	.4375
11.50	.4528
29/64	.4531
15/32	.4688
12.00	.4724
31/64	.4844
12.50	.4921
1/2	.5000
13.00	.5118
33/64	.5156
17/32	.5312
13.50	.5315
35/64	.5469
14.00	.5512
9/16	.5625
14.50	.5709
37/64	.5781
15.00	.5906
19/32	.5938
39/64	.6094
15.50	.6102
5/8	.6250
16.00	.6299
41/64	.6406
16.50	.6496
21/32	.6562
17.00	.6693
43/64	.6719
11/16	.6875
17.50	.6890
45/64	.7031
18.00	.7087
23/32	.7188
18.50	.7283
47/64	.7344
19.00	.7480
3/4	.7500
49/64	.7656
19.50	.7677
25/32	.7812
20.00	.7874
51/64	.7969
20.50	.8071
13/16	.8125
21.00	.8268
53/64	.8281
27/32	.8438
21.50	.8465
55/64	.8594
22.00	.8661
7/8	.8750
22.50	.8858
57/64	.8906
23.00	.9055
29/32	.9062
59/64	.9219
23.50	.9252
15/16	.9375
24.00	.9449
61/64	.9531
24.50	.9646
31/32	.9688
25.00	.9843
63/64	.9844
1	1.000

SERIES CROSS REFERENCE

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C831	CD10	92
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C841	CS10	92
C842	CS10	92
C843	CS20	93
C844	CS20	93
C845	CS20	93
C846	CS20	93
C847	CS20	93
C848	CS20	93
C849	CS20	93
C850	CS20	93
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C852	CS20	93
C853	CS20	93
C854	CS20	93
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D385	DT22	65
D400	D10	69
D405	D11	69
D485	DT40	71
D585	DT21	68
D805	D40	70
D810	D20	62
D815	D21	68
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D817D	D30	66
D818	D23	68
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D819L	D23	68
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F548	FR10	91
F549	FR10	91
F550	FR10	91
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G110	SET	95
G210	DET	95
G901	GT10	90
H	H	89
J / KSJ	J / KSJ	89
K / KSK	K / KSK	89
K100	KC10	94
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M / SKM	M / SKM	89
M100	E22W	56
M200	E24W	43
M201	E24W	43
M203	E24W	43
M210	M603	11
M225	M603	11
M226	M603	11
M232	E12	52
M232CR	E12	52
M233	E13	48
M233CR	E13	48
M234	E14	36
M234CR	E14	36
M236	E13W	49
M237	E12W	55
M241	M202	28
M241CR	M202	28
M242	M202	28
M242CR	M202	28
M242R	M202B	29
M243	M202	28
M243CR	M202	28
M244	M202	28
M244CR	M202	28
M245	M202N	27
M245CR	M202N	27
M246	M202N	27
M246CR	M202N	27
M247	M202N	27
M247CR	M202N	27
M248	M202N	27
M248CR	M202N	27
M254	M104	13
M255	M104	13
M256	M104	13
M257	M104	13
M258	M104	13
M259	M104	13
M260	M203	24
M260CR	M203	24
M261	M203	24
M261CR	M203	24
M262	M203	24
M262CR	M203	24
M263	M203	24
M263CR	M203	24
M264	M203	24
M264CR	M203	24
M265	M203N	23
M265CR	M203N	23
M266	M203N	23
M266CR	M203N	23
M267	M203N	23
M267CR	M203N	23
M268	M203N	23
M268CR	M203N	23
M270	M202	28
M270CR	M202	28
M270R	M202B	29
M271	M202	28
M271CR	M202	28
M272	M202	28
M272CR	M202	28
M274	M203	24
M274CR	M203	24
M275	M203	24
M275CR	M203	24
M276	M203	24
M276CR	M203	24
M277	M203	24
M277CR	M203	24
M280	E12W	55
M285	E14W	40
M288R	CRC10	94
M290	E14W	40
M293	E14W	40
M294	E14W	40
M295	E14W	40
M300	E12	52
M300R	E12B	57
M305	E12	52
M305R	E12B	57
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M310R	E12B	57
M320R	E13B	50
M325	E22	56
M334	E14	36
M334CR	E14	36
M335	E14	36
M335R	E14B	44
M340	E12	52
M340R	E12B	57
M350	E14	36
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M354R	E14B	44
M355R	E14B	44
M360	E14	36
M360R	E14B	44
M375	E24	43
M375R	E24B	46
M385	E14W	40
M390	E14W	40
M400	E13	48
M400R	E13B	50
M500	E12	52
M500R	E12B	57
M520	E520B	30
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M577	M503	21
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M600R	E14B	44
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M673	M505	19
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M676	M505N	18
M678	M505	19
M679	M505	19
M700	E42	32
M700R	E42B	32
M703	E13	48
M703R	E13B	50
M705	E12	52
M705R	E12B	57
M710R	E42B	32
M720	E14	36
M720R	E14B	44
M722	E22	56
M722R	E22B	59
M723	E23	49
M724	E24	43
M724R	E24B	46
M725	E12	52
M725R	E12B	57
M730	E13	48
M730R	E13B	50
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M732CR	E12	52
M733	E13	48
M733CR	E13	48
M734	E14	36
M734CR	E14	36
M735	E14	36
M735R	E14B	44
M736	E13W	49
M737	E12W	55
M740	E12	52
M740R	E12B	57
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M753	E13	48
M753R	E13B	50
M754R	E14B	44
M755	E14	36
M755R	E14B	44
M756-6FL	E16	42
M756-8FL	E18	42
M758	M706	16
M759	M706	16
M760	E14	36
M760R	E14B	44
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M761R	E12B	57
M762	E12	52
M762R	E12B	57
M763	E13	48
M763R	E13B	50
M764	E12	52
M764R	E12B	57
M765	M706	16
M766	M706	16
M767	E53	33
M768	E53B	33
M769	M706	16
M770R	M706	16
M771	M706	16
M772R	E64B	31
M773	M706N	17
M774R	E64B	31
M775	M706N	17
M776R	E62B	31
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M779	M706	16
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M783	M706N	17
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M853R	E13B	50
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M854R	E14B	44
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M855-8FL	E18	42
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M864R	E12B	57
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M893R	E13B	50
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M895R	E14B	44
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M910	PDT10	30
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M942R	E22B	59
M944	E24	43
M944R	E24B	46
M950	E24	43
M950R	E24B	46
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M983	M905	10
N / WKN	N / WKN	89
R800	RT10	75
R900	R10	72
SA / CP	SA	77
SB / CP-EC	SB	78
SC / CR	SC	79
SD / B	SD	80
SE / OV	SE	81
SF / TR	SF	82
SG / TP	SG	83
SH / F	SH	84
SJ / J	SJ	87
SK / K	SK	87
SL / T	SL	85
SM / CO	SM	86
SN / IC	SN	86
ST / I	ST	87

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