Solid Carbide Coolant Fed Drills

HIGH PERFORMANCE KOOLTWIST®


Style 294 — High performance, short length. For steel, stainless steels, titanium, high temperature alloys, aluminum, bronze, cast and ductile iron. Available in TiN and TiAlN coating. **Page. 62**


Style 293 — High performance, jobber length. For steel, stainless steels, titanium, high temperature alloys, aluminum, bronze, cast and ductile iron. Available in TiN and TiAlN coating. **Page. 64**


Style 292 — High performance, jobber length. For steel, stainless steels, titanium, high temperature alloys, aluminum, bronze, cast and ductile iron. Available in TiN and TiAlN coating. **Page. 66**

STRAIGHT FLUTE KOOLCARB®


Style 174 — Straight flute, intermediate length. For high carbon and tool steels, titanium, cast aluminum, bronze, cast iron, plastics and other abrasive materials **Page. 67**


Style 175 — Straight flute, extra length. For high carbon and tool steels, titanium, cast aluminum, bronze, cast iron, plastics and other abrasive materials **Page. 68**

Style 294(TiN) / 294A(TiAlN)

Available in TiN or TiAlN coating

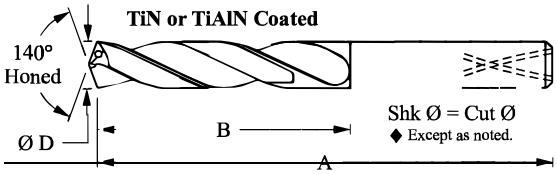
Submicron carbide grade provides maximum wear resistance when cutting steels, stainless steels, titanium, high temperature alloys, aluminum, bronze, cast and ductile iron.

- Coolant feeding S.C. Kooltwist® high performance drills yield higher penetration compared to non-coolant fed high performance drills when drilling deep holes.
- Stub length and 140° double split point eliminate spot drilling and reaming in many instances.
- High helix, right hand cut.
- Tool life is increased and peck drilling can be eliminated when used with high pressure coolant.
- Coating adds lubricity, enhances wear resistance and prevents edge build-up. **TiN** coating is recommended for long chipping, low-carbon, ductile and gummy materials. **TiAlN** coating is recommended for short chipping, abrasive and high temperature materials.
- Allow 1.5 x Ø of flute for chip exit up to 7/16" (11.1mm) and 1 x Ø over 7/16".

Depth ≅ 4 x Ø

Diameter Tolerances				
Nominal Size	Cutting Ø		Shank Ø	
	Inch	mm	Inch	mm
All	+.0000 -.0010	+0.000 -0.025	+.0000 -.0005	+0.000 -0.013

Important Note: Some tool holders and stop screws with a single, central coolant hole may require a coolant groove be added to the shank end of the drill.



EDP # For TiAlN coating add the letter (A) after EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"	
	Inch/ *Wire*	mm	Inch	Inch	mm	Inch	mm
29401250	1/8	3.175	.1250	2-13/16	71.	13/16	23.
29401260		3.2	.1260				
29401285	*30*	3.264	.1285				
29401299		3.3	.1299	3	76.	15/16	24.
29401339		3.4	.1339				
29401360	*29*	3.454	.1360				
29401378		3.5	.1378				
29401405	*28*	3.569	.1405				
29401406	9/64	3.572	.1406				
29401417		3.6	.1417				
29401440	*27*	3.658	.1440				
29401470	*26*	3.734	.1470				
29401495	*25*	3.797	.1495				
29401520	*24*	3.861	.1520				
29401540	*23*	3.912	.1540				
29401562	5/32	3.967	.1562				
29401570	*22*	3.988	.1570				
29401575		4.	.1575				
29401590	*21*	4.039	.1590	3	76.	1	25.
29401610	*20*	4.089	.1610				
29401614		4.1	.1614				
29401624		4.125	.1624				
29401654		4.2	.1654				
29401660	*19*	4.216	.1660	3	76.	1-1/8	29.
29401673		4.25	.1673				
29401695	*18*	4.305	.1695				
29401719	11/64	4.366	.1719				
29401730	*17*	4.394	.1730				
29401770	*16*	4.496	.1770				
29401772		4.5	.1772				
29401800	*15*	4.572	.1800				
29401820	*14*	4.623	.1820				
29401850	*13*	4.7	.1850				

EDP # For TiAlN coating add the letter (A) after EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"	
	Inch/ *Wire*	mm	Inch	Inch	mm	Inch	mm
29401875	3/16	4.763	.1875	3	76.	1-1/8	29.
29401890	*12*	4.8	.1890				
29401910	*11*	4.851	.1910				
29401929		4.9	.1929				
29401935	*10*	4.915	.1935				
29401960	*9*	4.978	.1960				
29401969		5.	.1969				
29401990	*8*	5.055	.1990				
29402010	*7*	5.105	.2010				
29402031	13/64	5.159	.2031				
29402040	*6*	5.182	.2040				
29402055	*5*	5.22	.2055				
29402067		5.25	.2067				
29402090	*4*	5.309	.2090				
29402130	*3*	5.41	.2130	3-1/4	83.	1-5/16	33.
29402165		5.5	.2165				
29402188	7/32	5.558	.2188				
29402205		5.6	.2205				
29402210	*2*	5.613	.2210				
29402280	*1*	5.791	.2280				
29402340	*A*	5.944	.2340				
29402344	15/64	5.954	.2344				
29402362		6.	.2362				
29402380	*B*	6.045	.2380				
29402402		6.1	.2402	3-5/8	92.	1-5/8	41.
29402420	*C*	6.147	.2420				
29402460	*D*	6.248	.2460				
29402480		6.3	.2480				
29402500	1/4	6.35	.2500				
29402520		6.4	.2520				
29402559		6.5	.2559				
29402570	*F*	6.528	.2570	3-3/4	95.	1-3/4	44.
29402598		6.6	.2598				

Shk Ø = Cut Ø

Style 294(TiN) / 294A(TiAlN)

Available in TiN or TiAlN coating

EDP # For TiAlN coating add the letter (A) after EDP #	Cutting Ø "D" Inch/ *Wire*	Cutting Ø "D" mm	Dec. Equiv. Inch	Overall Length "A" Inch	Overall Length "A" mm	Flute Length "B" Inch	Flute Length "B" mm
29402610	*G*	6.629	.2610				
29402630		6.68	.2630				
29402656	17/64	6.746	.2656				
29402660	*H*	6.756	.2660				
29402697		6.85	.2697				
29402720	*I*	6.909	.2720	3-3/4	95.	1-3/4	44.
29402756		7.	.2756				
29402770	*J*	7.036	.2770				
29402795		7.1	.2795				
29402810	*K*	7.137	.2810				
29402812	9/32	7.142	.2812				
29402835		7.2	.2835				
29402900	*L*	7.366	.2900				
29402950	*M*	7.493	.2950				
29402953		7.5	.2953				
29402969	19/64	7.541	.2969				
29402992		7.6	.2992	3-3/4	95.	1-3/4	44.
29403020	*N*	7.671	.3020				
29403071		7.8	.3071				
29403125	5/16	7.938	.3125				
29403150		8.	.3150				
29403160	*O*	8.026	.3160				
29403189		8.1	.3189				
29403230	*P*	8.204	.3230				
29403281	21/64	8.334	.3281	4	102.	1-7/8	48.
29403320	*Q*	8.433	.3320				
29403346		8.5	.3346				
29403370		8.56	.3370				
29403390	*R*	8.611	.3390				
29403438	11/32	8.733	.3438	4-1/8	105.	2	51.
29403480	*S*	8.839	.3480				
29403543		9.	.3543				
29403580	*T*	9.093	.3580				
29403594	23/64	9.129	.3594				
29403680	*U*	9.347	.3680	4-1/4	108.	2-1/8	54.
29403740		9.5	.3740				
29403750	3/8	9.525	.3750				
29403770	*V*	9.576	.3770				
29403819		9.7	.3819				
29403860	*W*	9.804	.3860				
29403906	25/64	9.921	.3906				
29403937		10.	.3937	4-3/8	111.	2-1/4	57.
29403970	*X*	10.084	.3970				
29404040	*Y*	10.262	.4040				
29404062	13/32	10.317	.4062				
29404094		10.4	.4094				
29404130	*Z*	10.49	.4130				
29404134		10.5	.4134	4-1/2	114.	2-3/8	60.
29404173		10.6	.4173				
29404219	27/64	10.716	.4219				
29404252		10.8	.4252				
29404311		10.95	.4311	4-5/8	117.	2-1/2	64.
29404331		11.	.4331				
29404375	7/16	11.113	.4375				

Shk Ø = Cut Ø

EDP # For TiAlN coating add the letter (A) after EDP #	Cutting Ø "D" Inch/ *Wire*	Cutting Ø "D" mm	Dec. Equiv. Inch	Overall Length "A" Inch	Overall Length "A" mm	Flute Length "B" Inch	Flute Length "B" mm
29404488		11.4	.4488				
29404528		11.5	.4528				
29404531	29/64	11.509	.4531	4-3/4	121.	2-5/8	67.
29404567		11.6	.4567				
29404688	15/32	11.908	.4688				
29404724		12.	.4724				
29404764		12.1	.4764				
29404844	31/64	12.304	.4844	5	127.	2-3/4	70.
29404862		12.35	.4862				
29404882		12.4	.4882				
29404921		12.5	.4921				
29404961		12.6	.4961	5-1/4	133.	3	76.
29405000	1/2	12.7	.5000				
29405079		12.9	.5079				
29405118		13.	.5118				
29405156	33/64	13.096	.5156				
29405312	17/32	13.492	.5312				
29405315		13.5	.5315				
29405354		13.6	.5354	5-5/16	135.	3	76.
29405433		13.8	.5433				
29405469	35/64	13.891	.5469				
29405512		14.	.5512				
29405551		14.1	.5551				
29405571		14.15	.5571				
29405625	9/16	14.288	.5625				
29405709		14.5	.5709				
29405748		14.6	.5748				
29405781	37/64	14.684	.5781	5-5/8	143.	3-1/4	83.
29405906		15.	.5906				
29405938	19/32	15.083	.5938				
29406094	39/64	15.479	.6094				
29406102		15.5	.6102				
29406250	5/8	15.875	.6250	5-5/8	143.	3-3/8	86.
29406299		16.	.6299				
29406331	♦	16.08	.6331				
29406345		16.116	.6345				
29406406	41/64	16.271	.6406				
29406496		16.5	.6496	5-7/8	149.	3-1/2	89.
29406562	21/32	16.667	.6562				
29406594		16.75	.6594				
29406693		17.	.6693				
29406719	43/64	17.066	.6719	5-7/8	149.	3-5/8	92.
29406875	11/16	17.463	.6875				
29406890		17.5	.6890				
29406929		17.6	.6929				
29407031	45/64	17.859	.7031				
29407087		18.	.7087	6	152.	3-3/4	95.
29407188	23/32	18.258	.7188				
29407283		18.5	.7283				
29407344	47/64	18.654	.7344				
29407480		19.	.7480	6-5/32	156.	3-7/8	98.
29407500	3/4	19.05	.7500				
29407579	♦♦	19.25	.7579	6-5/32	156.	4	102.
29407590		19.279	.7590				

♦ 16.08 mm Ø has 16.0 shank ♦♦ 19.25 mm Ø has 20.0 mm shank

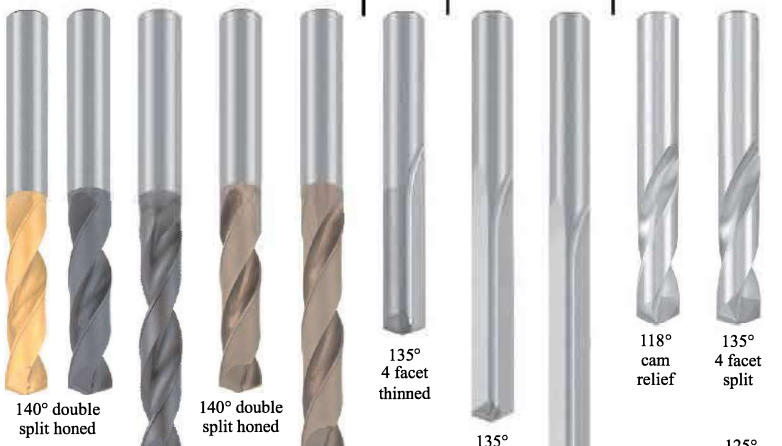
Shk Ø = Cut Ø

Standard Product Index

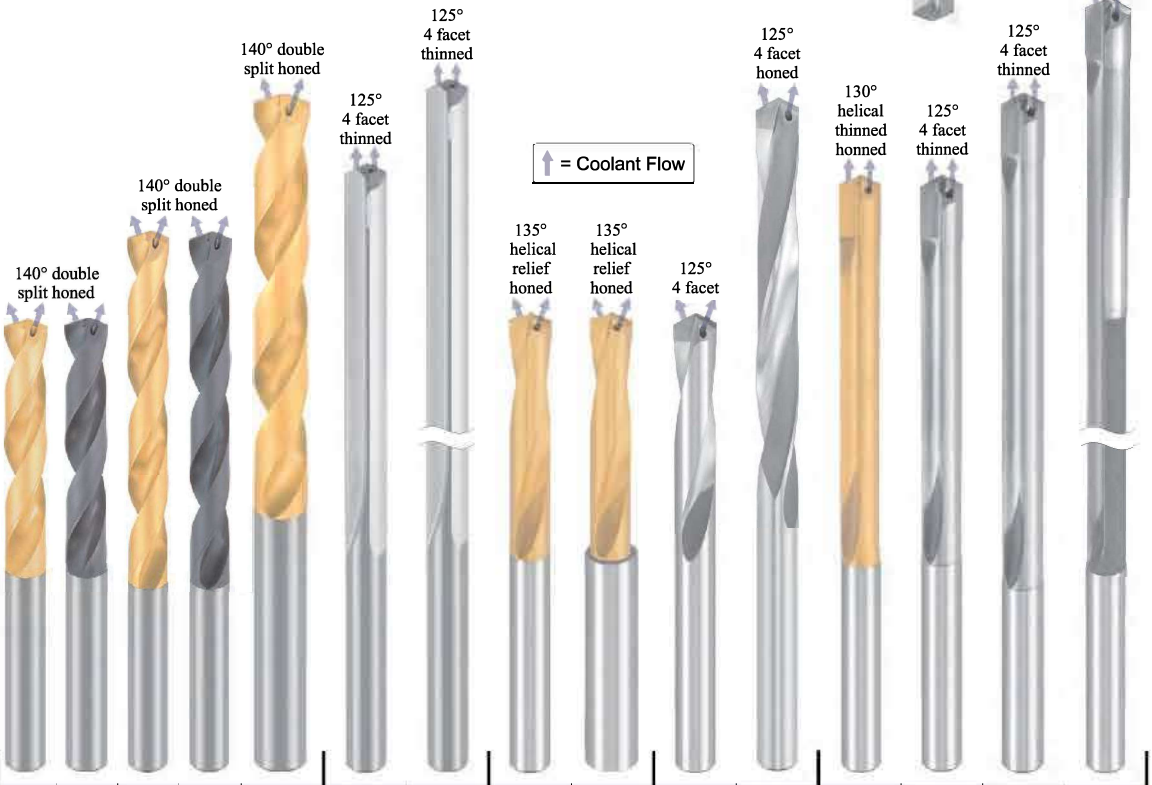
NON-COOLANT FED PRODUCTS

	Solid Carbide							Carbide Tipped	
	High Performance				Heavy Duty	Bore Drill/ Burnisher		Standard Helix	
Inch Dia. Max.	0.75″	0.75″	0.75″	0.75″	0.5″	0.6875″	0.6875″	1.25″	1.25″
Inch Stocked Dia. Min.	0.098″	0.125″	0.125″	0.125″	0.0469″	0.0938″	0.0938″	0.125″	0.125″
Metric Dia. Max.	19.0	19.0	19.0	19.0	—	16.0	16.0	14.0	14.0
Metric Stocked Dia. Min.	2.5	3.5	3.2	3.5	—	2.5	2.5	3.5	3.5
Max x Dia. Depth	3	4-5	3	4-5	3	4*	6*	4*	4*
Tool Group	A	A	B	B	E	F	F	G	G
Page No.	10	14	12	15	21	22	23	32	34
Style No.	114 / 114A	118A	113	116	155	153	154	110	115

* Greater hole depth may be achieved dependent upon material being cut and actual flute length. (See individual pages).



COOLANT FED PRODUCTS



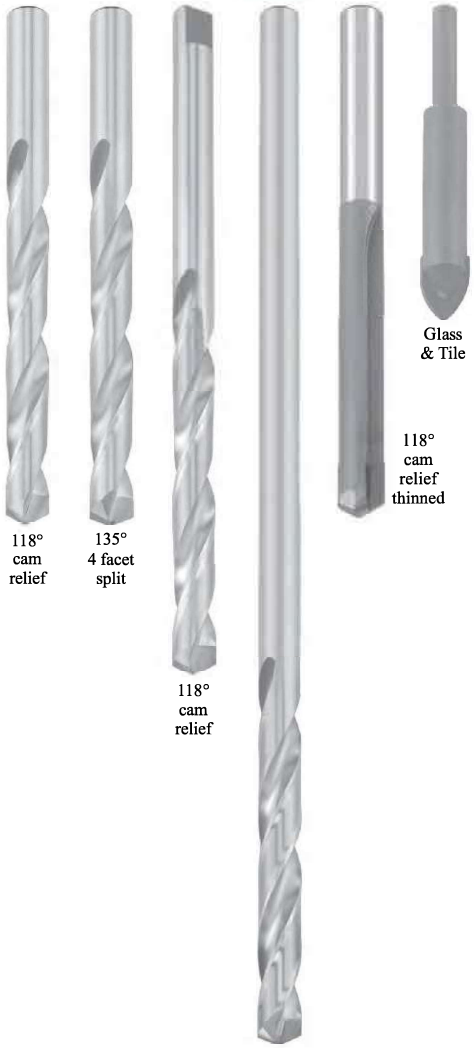
	High Performance Kooltwist®				Koolcarb®		High Performance Kooltwist®		Heavy Duty Kooltwist®		Koolcarb®			
Style No.	294	294A	293	293A	292	174	175	296	297	295	290	176	171	170	172
Page No.	62		64		66	67	68	70	73	76	78	79	81	83	85
Tool Group	M		M		M	N	N	P	P	Q	Q	R	R	R	R
Inch Dia. Max.	0.7500″		0.5938″		0.75″	0.75″	0.25″	1.125″	1.125″	1.125″	0.75″	1″	1″	1″	1″
Inch Stocked Dia. Min.	0.125″		0.125″		0.6094″	0.125″	0.125″	0.246″	0.25″	0.25″	0.25″	0.1875″	0.1875″	0.1875″	0.25″
Metric Dia. Max.	19.279		15.0		19.0	6.0	6.0	26.0	26.0	26.0	—	—	25.0	25.0	—
Metric Stocked Dia. Min.	3.2		3.2		15.5	3.5	3.5	6.5	6.5	6.5	—	—	5.0	5.0	—
Max x Dia. Depth	4		6		6	10.5*	17.5*	4*	4*	4*	7-12	5.5-8	5.5-8	7-15	12-28

Solid Carbide | **Carbide Tipped**

NON-COOLANT FED PRODUCTS

Carbide Tipped						
Standard Helix				Heavy Duty	Special Purpose	
0.6875″ 0.098″	0.6875″ 0.116″	1″ 0.125″	0.5″ 0.116″	1″ 0.1719″	0.625″ 0.125″	**Dia. Max.** } **Inch** **Dia. Min.** } **Stocked**
13.0 3.0	— —	19.0 5.0	— —	14.0 5.0	— —	**Dia. Max.** } **Metric** **Dia. Min.** } **Stocked**
4*	4*	4*	4*	3*	—	**Max x Dia. Depth**
G	**G**	**G**	**G**	**J**	—	**Tool Group**
36	40	42	46	48	50	**Page No.**
120	**125**	**130**	**129**	**150**	**162**	**Style No.**

* Greater hole depth may be achieved dependent upon material being cut and actual flute length. (See individual pages).



118° cam relief

135° 4 facet split

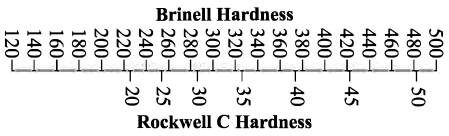
118° cam relief

135° split (NASP3)

118° cam relief thinned

Glass & Tile

Tool Group / Material Selection Guide



DURAPOINT®

Tool Group

Material Group No.	Material / Workpiece (See Page 102 for Detailed Information)	Chip Class	SOLID CARBIDE NON-COOLANT FED: High Penetration Spiral Flute TiN TiAlN — A	SOLID CARBIDE NON-COOLANT FED: High Penetration Spiral Flute TiCN — B	SOLID CARBIDE NON-COOLANT FED: Str. Flute Heavy Duty — E	SOLID CARBIDE NON-COOLANT FED: Bore Drill Straight Flute — F	CARBIDE TIP NON-COOLANT FED: Standard Helix — G	CARBIDE TIP NON-COOLANT FED: Str. Flute Heavy Duty — J
1	**Aluminum Alloys [< 5% Si]** 2011 6061 2014 7075 2024		(12) 250-450	○	○	○	○	○
2	**Aluminum [> 5% Si]** AZ61A 356 319 380 355 390		(12) 350-600	○	○	(6-7) 200-400	(6-7) 150-350	○
3	**Copper - Zinc (Brass)** 268-Yellow 464-Naval 380-Free Cut 836-Red		(9) 200-400	○	(4-5) 150-300	(4-5) 150-300	(5-6) 150-300	(4-5) 150-300
4	**Copper Alloys (Bronze)** 510-Phos. Bronze 614-Alum. Bronze 905-Tin Bronze		(9) 200-400	○	(4-5) 150-250	(4-5) 150-300	(5-6) 150-300	(4-5) 150-200
5	**Cast (Grey) Iron** G3000 G4500 G4000 G5500		(9-10) 150-350	○	○	(5-6) 200-350	(5-7) 150-225	○
6	**Ductile (Nodular) Iron Powder Metal** D4018 80-55-06 60-40-18 100-70-03 65-45-12		(9) 150-300	(9) 150-300	○	(3-5) 150-250	(4-6) 125-275	○
7	**Carbon Steels [≤.35C]** 1018 5120 4118 1035 5134 4130 1117 8620 516-70 1215 9310 4620		(8) 150-250	(10-11) 200-350	○	○	○	○
8	**Medium Carbon Steels [>.35 to .50C]** P20 1541 1045 4140 1050 4150 1141 4340 1144 6150		(6-8) 150-250	(6-8) 130-220	○	○	○	○
9	**High Carbon and Tool Steels [>.50C]** A-2 M-2 D-2 O-1 H-13 S-7		(5-7) 80-140	(5-7) 65-120	(1-2) 60-125	○	○	(1-2) 60-125
10	**Hardened Steels (48 to 65Rc)**		(1-2) 40-80	○	(1) 25-60	○	○	(1) 25-60
11	**Free Machining Stainless Steel** 303 440F		(5-6) 100-200	○	(2-3) 80-180	○	(3-4) 80-160	○
12	**Stainless Steel** 15-5PH 410 17-4PH 440		(5-6) 90-150	(5-6) 90-150	(2-3) 60-140	○	○	○
13	**High Nickel Stainless Steel** Nitronic 50 316 304 321 13-8		(5-6) 30-70	(5-6) 30-70	○	○	○	○
14	**Titanium** 6AL4V Commercially Pure = Type B Tool		(5-6) 60-120	(5-7) 55-110	(2-3) 50-100	○	(2-3) 40-80	○
15	**Moderate Temperature Alloys** Inconel 718		(2-3) 50-100		(1-2) 50-100	○	○	○
16	**High Temperature Alloys** Rene Hastelloy L605		(2-3) 25-80	○	(1-2) 25-80	○	○	(1-2) 25-80
17	**Hard Plastics, Resin Fiberglass, Graphite and Carbon**		○	○	○	○	(3-5) 100-200	○

(Feed Curve) Notes

SFM - Surface Feet per Minute

Most Appropriate | Occasionally Appropriate | ○ Do Not Use

(877) 497-8665 | gwstoolgroup.com | sales@gwstoolgroup.com

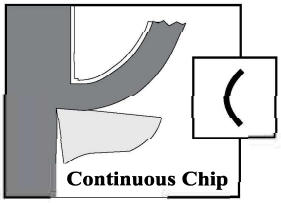
Tool Group / Material Selection Guide

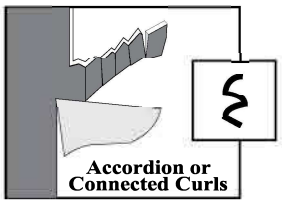
KOOLTWIST,® KOOLCARB®

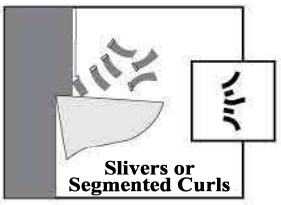
Tool Group

Material Group No.	Chip Class	SOLID CARBIDE COOLANT FED: High Penetration Spiral Flute TiN TiAlN — M	SOLID CARBIDE COOLANT FED: Straight Flute — N	CARBIDE TIP COOLANT FED: High Performance Spiral Flute TiN — P	CARBIDE TIP COOLANT FED: Spiral Flute Heavy Duty — Q	CARBIDE TIP COOLANT FED: Straight Flute — R
1	(	(11-12) 500-650	(6) 200-400	(8-9) a 250-425	(6-7) a 200-400	(6-7) 200-400
2	≈	(11-12) 500-650	(6-7) 350-550	(8-9) 300-500	(6-7) 200-400	(6-7) 300-500
3	≈	(9-11) 400-550	(4-5) 225-300	(5-7) 250-450	(5-7) 225-425	(4-5) 200-400
4	S	(9-11) 500-650	(4-5) 175-250	(5-7) 200-400	(5-7) 200-300	(4-5) 200-300
5	≈	(9-10) 300-400	(4-6) 200-300	(6-8) 225-325	(6-8) 200-260	(5-7) 225-300
6	≈	(9) 275-350	(4-6) 150-250	(6-7) a 225-275	(6-7) a 200-260	(4-6) 190-250
7	(	(8-10) 290-390	○	(5-7) a 180-250	○	○
8	S	(6-8) 150-250	(2-3) 110-150	(4-6) 150-200	(3-4) 100-150	(2-3) 100-150
9	≈	(5-7) 120-225	(2-3) 80-135	(4-6) 135-185	(1-2) 70-100	(2-3) 100-150
10	≈	(1-2) 50-100	○	(1-2) b 45-90	(1-2) b 60-90	○
11	≈	(4-6) 130-200	(2-3) 120-180	(2-3) 120-170	(2-3) 100-160	(2-3) 70-125
12	(S	(4-6) 100-150	(1-2) 80-120	(2-3) a 80-120	(2-3) a 60-100	○
13	(	(4-6) 90-150	○	(1-2) a 40-60	○	○
14	S	(4-6) 90-150	(1-2) 60-100	(2-3) 50-110	(2-3) 50-100	(1-2) 60-120
15	S	(2-3) 70-130	○	(2) 60-90	(2) 60-90	○
16	S	(2-3) 40-80	○	(1-2) 40-80	(1-2) b 40-80	○
17	≈	○	(4-5) 150-225	○	○	(4-5) 125-200

Most Appropriate | Occasionally Appropriate | ○ Do Not Use







SFM = Surface Feet per Minute

$$RPM = \frac{SFM \times 3.82}{\text{Tool Ø Decimal (Inch)}}$$

IPR = FM* x Tool Ø

Use 4 place inch decimal diameter

IPM = Inch per Minute Penetration

IPM = RPM x IPR

(Feed Curve)	FM*
(1)	0.004
(2)	0.006
(3)	0.008
(4)	0.010
(5)	0.012
(6)	0.014
(7)	0.016
(8)	0.018
(9)	0.020
(10)	0.024
(11)	0.028
(12)	0.035
(13)	0.045

*FM is the proportionate Feed Multiplier

ie.: $\frac{.0040 \text{ IPR}}{.3346\text{" Ø}} = \frac{.012 \text{ IPR}}{1.000\text{" Ø}} = \frac{.012 \text{ FM*}}{1.000\text{" Ø}}$

Notes

a. 1 to 2 x Ø deep holes only.
b. Use more aggressive points.

(Feed Curve) Notes | SFM - Surface Feet per Minute

Penetration Rate

	Penetration Rate, Inch per Minute (IPM**)												
Feed Curve	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10↓**	**11**	**12**	**13**
Feed Multiplier	**0.004**	**0.006**	**0.008**	**0.010**	**0.012**	**0.014**	**0.016**	**0.018**	**0.020**	**0.024**	**0.028**	**0.035**	**0.045**
Surface Feet per Minute (SFM)													
20	.31	.46	.61	.76	.92	1.07	1.22	1.38	1.53	1.83	2.14	2.67	3.44
40	.61	.92	1.22	1.53	1.83	2.14	2.44	2.75	3.06	3.67	4.28	5.35	6.88
60	.92	1.38	1.83	2.29	2.75	3.21	3.67	4.13	4.58	5.50	6.42	8.02	10.31
80	1.22	1.83	2.44	3.06	3.67	4.28	4.89	5.50	6.11	7.33	8.56	10.70	13.75
100	1.53	2.29	3.06	3.82	4.58	5.35	6.11	6.88	7.64	9.17	10.70	13.37	17.19
125	1.91	2.87	3.82	4.78	5.73	6.69	7.64	8.60	9.55	11.46	13.37	16.71	21.49
150	2.29	3.44	4.58	5.73	6.88	8.02	9.17	10.31	11.46	13.75	16.04	20.06	25.79
175	2.67	4.01	5.35	6.69	8.02	9.36	10.70	12.03	13.37	16.04	18.72	23.40	30.08
200	3.06	4.58	6.11	7.64	9.17	10.70	12.22	13.75	15.28	18.34	21.39	26.74	34.38
225	3.44	5.16	6.88	8.60	10.31	12.03	13.75	15.47	17.19	20.63	24.07	30.08	38.68
250	3.82	5.73	7.64	9.55	11.46	13.37	15.28	17.19	19.10	22.92	26.74	33.43	42.98
275 →	4.20	6.30	8.40	10.51	12.61	14.71	16.81	18.91	21.01	25.21	29.41	36.77	47.27
300	4.58	6.88	9.17	11.46	13.75	16.04	18.34	20.63	22.92	27.50	32.09	40.11	51.57
350	5.35	8.02	10.70	13.37	16.04	18.72	21.39	24.07	26.74	32.09	37.44	46.80	60.17
400	6.11	9.17	12.22	15.28	18.34	21.39	24.45	27.50	30.56	36.67	42.78	53.48	68.76
450	6.88	10.31	13.75	17.19	20.63	24.07	27.50	30.94	34.38	41.26	48.13	60.17	77.36
500	7.64	11.46	15.28	19.10	22.92	26.74	30.56	34.38	38.20	45.84	53.48	66.85	85.95
550	8.40	12.61	16.81	21.01	25.21	29.41	33.62	37.82	42.02	50.42	58.83	73.54	94.55
600	9.17	13.75	18.34	22.92	27.50	32.09	36.67	41.26	45.84	55.01	64.18	80.22	103.14

* (Surface Feet per Minute) SFM x .3048 = Surface Meters per Minute

DRILL SELECTOR & APPLICATION GUIDE

1. Identify material group number based on the material being cut (Pg. 4 or 102-103).
2. Select a Tool Group letter from the non-coolant or coolant fed categories in the Tool Group/Material Selection Guide from (Pg. 4-5).
3. Choose drill style using Pictorial Index (Pg. 2-3) based on your specific diameter requirement and depth/diameter ratio of the hole.
4. Obtain coolant pressure and volume requirements from charts (Pg. 98-99).
5. Note the recommended SFM and Feed Curve for the identified tool group (Pg. 4-5). Calculate the penetration rate (IPM) from the chart located on top of Pg. 6. For specific RPM and IPR calculations see Pg. 5.
   - Start at the middle of SFM range shown for average material hardness. Lower speed for harder materials, dry cutting or limited coolant pressure/volume applications.
   - Use higher feed curve for softer continuously chipping material. Use lower feed curve where limited coolant pressure is available. Add feed withdrawals (pecks) as needed to lubricate cutting edges and clear chips on deeper holes.

     Example: To drill a .3346" hole in 1018 mild steel using a tool in group B, the suggested speed is 200-350 SFM and a Feed Curve of 10. Start at 275 SFM and see chart above to arrive at the inch/minute penetration rate of 25.21 IPM.
   - TiAlN coated tools can typically run 20% higher SFM then TiN coated tools with the same feed curve. Styles 114, 118A, 292, 293 & 294 are stocked with TiAlN coating at no extra charge. To order TiAlN coating add the letter A after the EDP number.
6. Determine if the drill can be self-started, soft-feed started or if a starting hole/guide bushing is necessary. See guide on Pg. 7.

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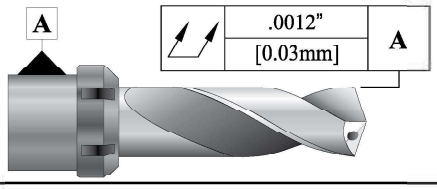
Starting Procedures for Drilling

Tool Material	Self Start Entry Feed Rate: Up to 100%	Self Start Entry Feed Rate: Reduce 30 to 50%
Carbide	5.5 x Ø	8.5 x Ø
Carbide Tip	4 x Ø	6 x Ø
HSS, Cobalt	4 x Ø	6 x Ø
	Drill Depth	

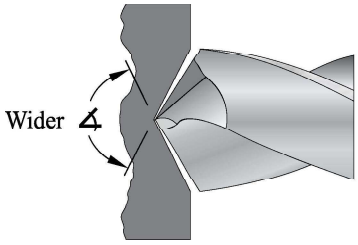
To properly self start a drill use the following:

- Shortened projection
- Rigid part fixturing
- Enter machined surface

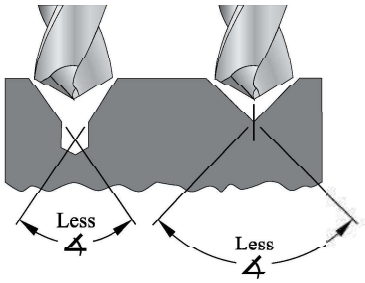


For greater drill depths or better positioning use other starting methods shown.

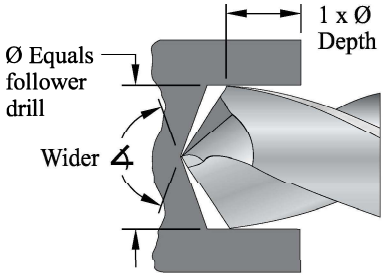
Spot for carbide



Spot for H.S.S.

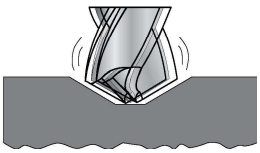


Starting hole for carbide**



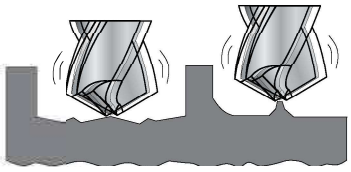
Tool Groups	Spot/Starting Hole Versus Follower Drill: Wider +5° to +10°	Same	Less
HPS Carbide (A, B, M)	●	●	◒
Carbide Standard	●	◒	○ *
Carbide Tipped	●	◒	○ *
HSS, Cobalt	◒	◒	●
	● Most Appropriate	◒ Occasionally Appropriate	● Don't Use

* If you can not drill first and chamfer the hole afterwards, reducing RPM (up to 60%) and Feed/Rev. (up to 40%) while machining out the difference in point angles may help protect the carbide drill.



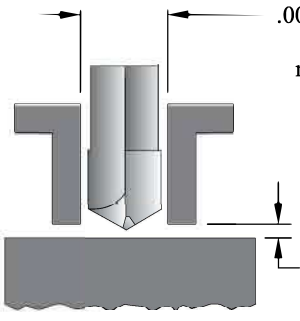
Avoid using a spot drill with a chisel flat. Use styles 114, 113 and 115 for spotting.

** Accurate position & size control to within .002" (0.05 mm) oversized on the start hole can yield hole accuracy comparable to most bushing starts. DO NOT rotate long tools i.e. #172 & #175 outside starting hole at high RPM or whip-out will occur. Ease the long tool into the starting hole at 200 RPM and .025" (.635 mm) / Rev.

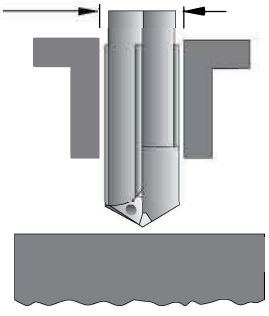


Avoid convex spots from indexable drills or non-center cut tools.

Bushing against



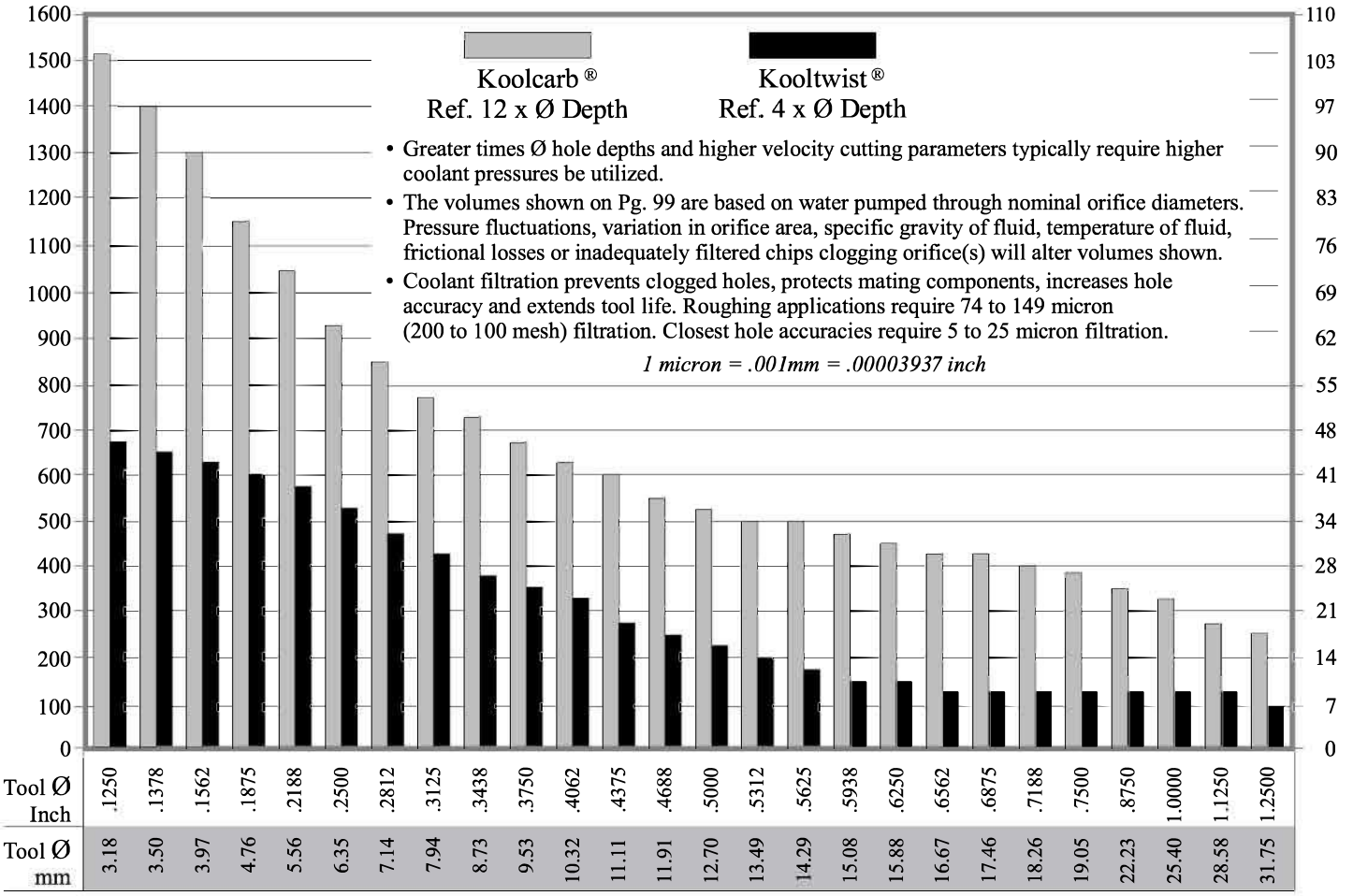
Bushing away



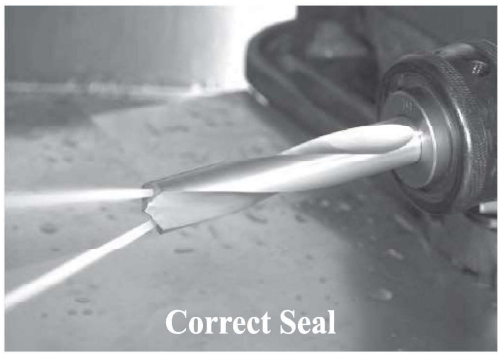
CJT Tool Group Letter(s)	Bushing: Against	Bushing: Away	
A, B, E, M, P, T	◒	●	● Most Appropriate
D, G, J, Q, R	●	◒	◒ Occasionally Appropriate
F, N	●	●	● Don't Use

Special double margin drills can be made to optimize performance in bushing starts and angular entry/exit applications.

Correct coolant pressure helps insure sufficient lubrication and cooling at the cutting zone.



Lack of proper holder seal decreases coolant velocity and chip evacuation.



Use of a sealed collet or other coolant sealing system is necessary for optimal tool performance and chip evacuation.

1 US Gallon = 3.785 Liters = 8.337 lbs. Water
2.2046 lbs. = 1 Kg.
1 Bar = 14.504 PSI
1 Kg/cm² = 14.223 PSI
PSI = lbs/in²

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Coolant Flow Capacities for Drills

Drill Style	Cutting Diameter Range (inches)	Oil Hole Flow Capacities in GPM at listed pressures 50 psi - 1500 psi											
		50 psi	100 psi	200 psi	300 psi	400 psi	500 psi	600 psi	700 psi	800 psi	1000 psi	1200 psi	1500 psi
174 175	.125 - .158	0.19	0.27	0.38	0.47	0.54	0.61	0.67	0.72	0.77	0.86	0.94	1.05
	.172 - .219	0.30	0.43	0.61	0.75	0.86	0.96	1.06	1.14	1.22	1.36	1.49	1.67
	.234 - .250	0.61	0.86	1.22	1.49	1.72	1.92	2.10	2.27	2.43	2.72	2.98	3.33
292 293 294	.156 - .177	0.19	0.27	0.38	0.47	0.54	0.61	0.67	0.72	0.77	0.86	0.94	1.05
	.188 - .221	0.27	0.38	0.54	0.66	0.76	0.85	0.94	1.01	1.08	1.21	1.32	1.48
	.234 - .339	0.53	0.76	1.07	1.31	1.51	1.69	1.85	2.00	2.14	2.39	2.62	2.93
	.344 - .472	0.98	1.39	1.96	2.40	2.78	3.10	3.40	3.67	3.93	4.39	4.81	5.37
	.484 - .689	1.56	2.21	3.13	3.83	4.42	4.94	5.42	5.85	6.25	6.99	7.66	8.56
	.703 - .350	2.00	2.84	4.01	4.91	5.67	6.34	6.94	7.50	8.02	8.97	9.82	10.98
170 171 172 176 290 295 296 297	.188 - .201	0.25	0.36	0.51	0.62	0.72	0.80	0.88	0.95	1.01	1.13	1.24	1.39
	.213 - .219	0.33	0.47	0.66	0.81	0.94	1.05	1.15	1.24	1.33	1.49	1.63	1.82
	.234 - .261	0.44	0.63	0.89	1.09	1.25	1.40	1.54	1.66	1.77	1.98	2.17	2.43
	.266 - .281	0.58	0.82	1.17	1.43	1.65	1.84	2.02	2.18	2.33	2.61	2.85	3.19
	.295 - .316	0.71	1.01	1.43	1.75	2.02	2.26	2.47	2.67	2.85	3.19	3.49	3.91
	.328 - .344	0.80	1.13	1.60	1.95	2.26	2.52	2.76	2.98	3.19	3.57	3.91	4.37
	.354 - .375	0.92	1.30	1.84	2.25	2.60	2.90	3.18	3.43	3.67	4.11	4.50	5.03
	.386 - .406	1.18	1.67	2.37	2.90	3.35	3.74	4.10	4.43	4.74	5.29	5.80	6.48
	.413 - .438	1.33	1.88	2.66	3.26	3.76	4.20	4.61	4.97	5.32	5.95	6.51	7.28
	.453 - .472	1.48	2.10	2.97	3.63	4.20	4.69	5.14	5.55	5.93	6.63	7.27	8.13
	.484 - .500	1.63	2.31	3.26	4.00	4.62	5.16	5.65	6.11	6.53	7.30	8.00	8.94
	.519 - .532	1.93	2.73	3.86	4.72	5.45	6.10	6.68	7.22	7.71	8.62	9.45	10.56
	.547 - .563	2.04	2.89	4.09	5.00	5.78	6.46	7.08	7.64	8.17	9.14	10.01	11.19
170 171 172 176	.571 - .594	2.20	3.11	4.40	5.39	6.22	6.95	7.62	8.23	8.80	9.83	10.77	12.04
	.610 - .625	2.36	3.33	4.72	5.78	6.67	7.46	8.17	8.82	9.43	10.54	11.55	12.91
	.630 - .656	2.52	3.56	5.04	6.17	7.13	7.97	8.73	9.43	10.08	11.27	12.34	13.80
						At listed pressures 50 psi - 700 psi							
		50 psi	100 psi	200 psi	250 psi	300 psi	350 psi	400 psi	450 psi	500 psi	550 psi	600 psi	700 psi
	.669 - .689	2.85	4.03	5.69	6.36	6.97	7.53	8.05	8.54	9.00	9.44	9.86	10.65
	.703 - .750	3.21	4.54	6.42	7.18	7.87	8.50	9.08	9.63	10.15	10.65	11.12	12.01
	.767 - .813	3.49	4.93	6.98	7.80	8.54	9.23	9.87	10.46	11.03	11.57	12.08	13.05
	.827 - .875	3.94	5.57	7.88	8.81	9.65	10.42	11.14	11.82	12.46	13.07	13.65	14.74
	.886 - .938	4.30	6.08	8.60	9.61	10.53	11.37	12.16	12.89	13.59	14.26	14.89	16.08
	.945 - 1.000	4.80	6.78	9.59	10.73	11.75	12.69	13.57	14.39	15.17	15.91	16.62	17.95
	1.125	5.41	7.65	10.82	12.10	13.26	14.32	15.31	16.24	17.12	17.95	18.75	20.25
	1.25	6.00	8.49	12.00	13.42	14.70	15.88	16.97	18.00	18.97	19.90	20.79	22.45
290 295 296 297	.571 - .688	2.10	2.98	4.21	4.71	5.15	5.57	5.95	6.31	6.65	6.98	7.29	7.87
	.703 - .781	2.48	3.51	4.97	5.56	6.09	6.57	7.03	7.45	7.86	8.24	8.61	9.30
	.797 - .844	3.13	4.42	6.25	6.99	7.66	8.27	8.84	9.38	9.89	10.37	10.83	11.70
	.859 - .938	3.85	5.44	7.70	8.61	9.43	10.18	10.89	11.55	12.17	12.77	13.33	14.40
	.953 - 1.000	4.15	5.87	8.30	9.28	10.16	10.98	11.74	12.45	13.12	13.76	14.37	15.52
	1.125	4.45	6.29	8.89	9.94	10.89	11.76	12.58	13.34	14.06	14.75	15.40	16.64