CJT KOOLCARB, INC.

Since 1969

Solid Carbide & Carbide Tipped

DRILLS / REAMERS / END MILLS

& Coolant Fed Cutting Tools

Durapoint® Koolcarb® Kooltwist® Koolream® Kooldex®

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Carol Stream, IL 60188 USA

www.cjtkoolcarb.com

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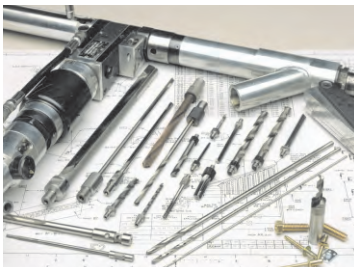
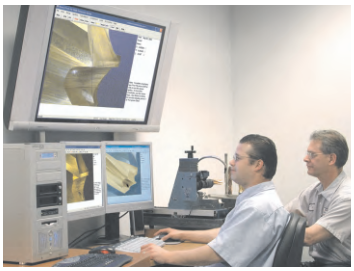
CJT KOOLCARB, INC.

- CJT Koolcarb, Inc. provides over 3000 sizes of coolant/non-coolant fed solid carbide/ carbide tipped drills, reamers and end mills available as standards with TiN, TiCN and TiAlN coatings.
- Over 40,000 performance guaranteed solid carbide and carbide tipped drills, reamers and end mills in stock.
- CJT specializes in application specific tool designs tailored to meet your special tool requirements.
- In factory re-sharp and re-coat services.





Since 1969

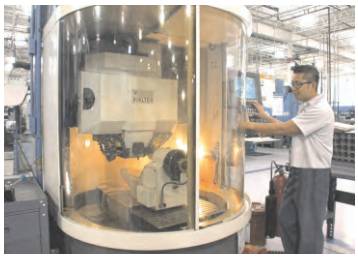
Quality and innovation in cutting tools delivered on time is our trademark.

Charles J. Trost
(CJT) Founder
1924-1992

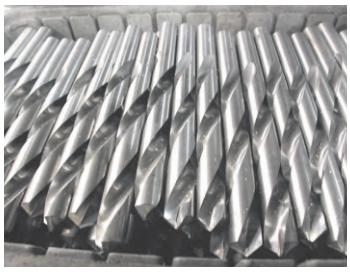
Quality Statement

The management of CJT Koolcarb, Inc. firmly believes that providing quality products and services is the surest path toward continued growth and profitability. In having trained, qualified and motivated employees, we can ensure that our customer's needs and expectations will be met or exceeded.







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*Stocked standard available in TiN or TiAlN coatings.

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Standard Product Index

	Solid Carbide												Carbide Tipped	
	High Performance				High Helix 3 flute	Standard Helix			Heavy Duty		Bore Drill/ Burnisher		Standard Helix	
Inch Dia. Max.	0.75″	0.75″	0.75″	0.75″	0.5″	0.500″	0.5″	0.2188″	0.5″	0.5″	0.6875″	0.6875″	1.25″	1.25″
Inch Stocked Dia. Min.	0.098″	0.125″	0.125″	0.125″	0.0980″	0.125″	0.040″	0.0469″	0.0469″	0.0625″	0.0938″	0.0938″	0.125″	0.125″
Metric Dia. Max.	19.0	19.0	19.0	19.0	12.5	11.0	12.5	—	—	—	16.0	16.0	14.0	14.0
Metric Stocked Dia. Min.	2.5	3.5	3.2	3.5	2.5	2.5	1.5	—	—	—	2.5	2.5	3.5	3.5
Max x Dia. Depth	3	4-5	3	4-5	4*	1.5-3.5	4*	—	3	2	4*	6*	4*	4*
Tool Group	A	A	B	B	C	D	D	D	E	E	F	F	G	G
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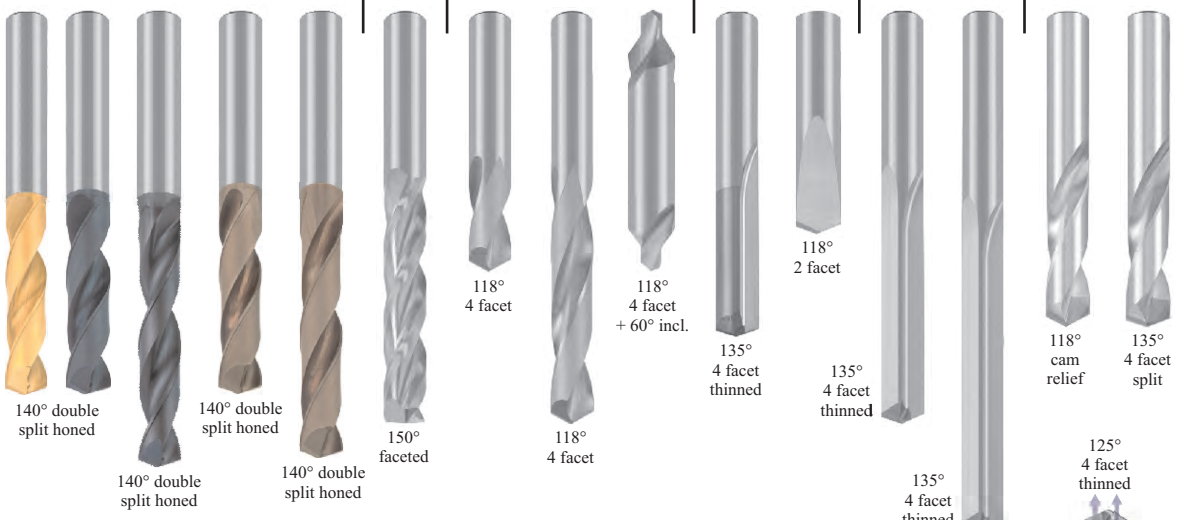
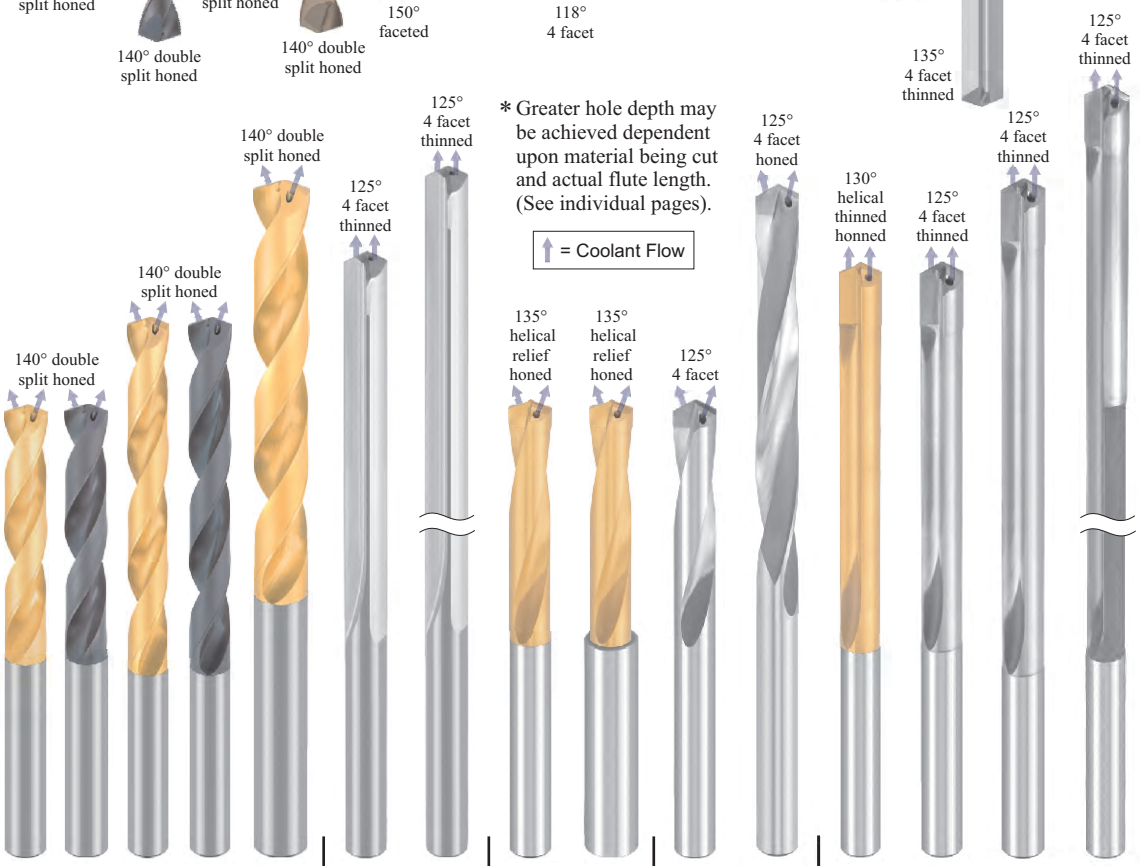


NON-COOLANT FED PRODUCTS



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

= Coolant Flow

COOLANT FED PRODUCTS

	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

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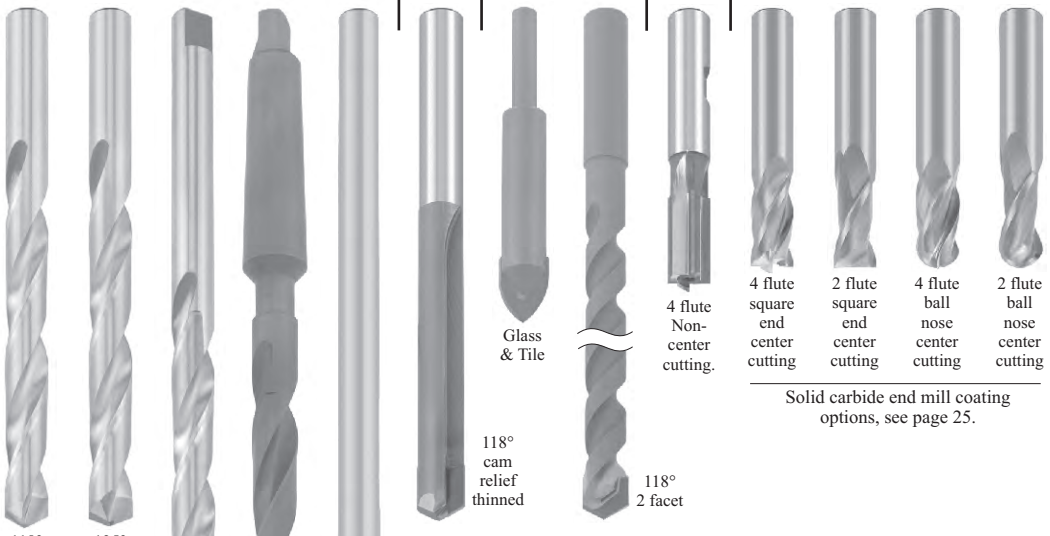
Standard Product Index

Carbide Tipped

Standard Helix

0.6875″ 0.098″	0.6875″ 0.116″	1″ 0.125″	1.250″ 0.500″	0.5″ 0.116″	1″ 0.1719″	0.625″ 0.125″	1.375″ 0.5″	1.25″ 0.25″	1″ 0.125″	1″ 0.125″	1″ 0.125″	1″ 0.125″	Dia. Max. / Dia. Min. } Inch Stocked
13.0 3.0	— —	19.0 5.0	— —	— —	14.0 5.0	— —	— —	— —	25.0 3.0	— —	— —	— —	Dia. Max. / Dia. Min. } Metric Stocked
4*	4*	4*	4*	4*	3*	—	—	—	—	—	—	—	Max x Dia. Depth
G	G	G	G	G	J	—	—	—	—	—	—	—	Tool Group
36	40	42	44	46	48	50	51	59	26	27	28	29	Page No.
120	**125**	**130**	**140**	**129**	**150**	**162**	**163**	**320**	**304**	**302**	**314**	**312**	**Style No.**



Solid carbide end mill coating options, see page 25.

All reamers have 90° included chamfer point.

P/M Cobalt 140° double split

Indexable 160° Included "W" form

= Coolant Flow

Special Tool Configurations, see page 30.

Aerospace Extension and Threaded Shank Tools, see page 45.

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

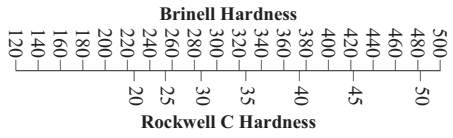
260	560	Style No.	452	452A	453	453A	450	470	480	490	Style No.
86	87	Page No.	92	93	94	95	54	56	57	58	Page No.
T	—	Tool Group	—	—	—	—	—	—	—	—	Tool Group
0.625″ 0.25″	2″ 0.625″	Dia. Max. / Dia. Min. } Inch Stocked	1.125″ 0.2344″	1.125″ 0.2344″	0.75″ 0.25″	0.75″ 0.25″	1.5″ 0.1855″	0.75″ 0.25″	0.75″ 0.25″	1.375″ 0.375″	Dia. Max. / Dia. Min. } Inch Stocked
— —	— —	Dia. Max. / Dia. Min. } Metric Stocked	— —	— —	— —	— —	9.5 4.75	— —	— —	— —	Dia. Max. / Dia. Min. } Metric Stocked
5*	2.5-3	Max x Dia. Depth	—	—	—	—	—	—	—	—	Max x Dia. Depth

P/M Cobalt Kooltwist | **Indexable**

Koolream® — **Carbide Tipped**

Reamers — **Carbide Tipped**

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						CARBIDE TIP NON-COOLANT FED	
			High Penetration Spiral Flute TiN TiAlN **A**	High Penetration Spiral Flute TiCN **B**	Standard Helix **D**	3 Flute High Helix **C**	Str. Flute Heavy Duty **E**	Bore Drill Straight Flute **F**	Standard Helix **G**	Str. Flute Heavy Duty **J**
1	**Aluminum Alloys [< 5% Si]** 2011 6061 2014 7075 2024	(	(12) 250-450	○	(6-7) a 150-350	(8-9) 200-400	○	○	○	○
2	**Aluminum [> 5% Si]** AZ61A 356 319 380 355 390	≈	(12) 350-600	○	(6-7) 200-400	(8-9) 300-500	○	(6-7) 200-400	(6-7) 150-350	○
3	**Copper - Zinc (Brass)** 268-Yellow 464-Naval 380-Free Cut 836-Red	≈	(9) 200-400	○	(5-6) a 150-300	(7-8) 175-350	(4-5) 150-300	(4-5) 150-300	(5-6) 150-300	(4-5) 150-300
4	**Copper Alloys (Bronze)** 510-Phos. Bronze 614-Alum. Bronze 905-Tin Bronze	S	(9) 200-400	○	(5-6) 150-250	(6-7) 200-300	(4-5) 150-250	(4-5) 150-300	(5-6) 150-300	(4-5) 150-200
5	**Cast (Grey) Iron** G3000 G4500 G4000 G5500	≈	(9-10) 150-350	○	(5-7) 150-300	(6-8) 175-325	○	(5-6) 200-350	(5-7) 150-225	○
6	**Ductile (Nodular) Iron Powder Metal** D4018 80-55-06 60-40-18 100-70-03 65-45-12	≈	(9) 150-300	(9) 150-300	(4-6) 150-250	(6-8) 150-250	○	(3-5) 150-250	(4-6) 125-275	○
7	**Carbon Steels [≤.35C]** 1018 5120 4118 1035 5134 4130 1117 8620 516-70 1215 9310 4620	(	(8) 150-250	(10-11) 200-350	○	○	○	○	○	○
8	**Medium Carbon Steels [>.35 to .50C]** P20 1541 1045 4140 1050 4150 1141 4340 1144 6150	S	(6-8) 150-250	(6-8) 130-220	○	○	○	○	○	○
9	**High Carbon and Tool Steels [>.50C]** A-2 M-2 D-2 O-1 H-13 S-7	≈	(5-7) 80-140	(5-7) 65-120	○	○	(1-2) 60-125	○	○	(1-2) 60-125
10	**Hardened Steels (48 to 65Rc)**	≈	(1-2) 40-80	○	○	○	(1) 25-60	○	○	(1) 25-60
11	**Free Machining Stainless Steel** 303 440F	≈	(5-6) 100-200	○	(3-5) 80-180	(4-6) 80-180	(2-3) 80-180	○	(3-4) 80-160	○
12	**Stainless Steel** 15-5PH 410 17-4PH 440	(S	(5-6) 90-150	(5-6) 90-150	(3-5) 60-140	(4-6) 60-140	(2-3) 60-140	○	○	○
13	**High Nickel Stainless Steel** Nitronic 50 316 304 321 13-8	(	(5-6) 30-70	(5-6) 30-70	○	○	○	○	○	○
14	**Titanium** 6AL4V Commercially Pure = Type B Tool	S	(5-6) 60-120	(5-7) 55-110	(3-5) 50-90	(3-5) 50-90	(2-3) 50-100	○	(2-3) 40-80	○
15	**Moderate Temperature Alloys** Inconel 718	S	(2-3) 50-100		○	○	(1-2) 50-100	○	○	○
16	**High Temperature Alloys** Rene Hastelloy L605	S	(2-3) 25-80	○	○	○	(1-2) 25-80	○	○	(1-2) 25-80
17	**Hard Plastics, Resin Fiberglass, Graphite and Carbon**	≈	○	○	(3-5) 100-200	(4-6) 125-225	○	○	(3-5) 100-200	○

(Feed Curve) Notes

SFM - Surface Feet per Minute

Most Appropriate | Occasionally Appropriate | ○ Do Not Use

Phone: 630-690-5933 800-323-2299 Fax: 630-690-6355

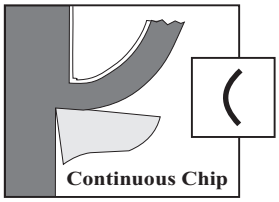
Tool Group / Material Selection Guide

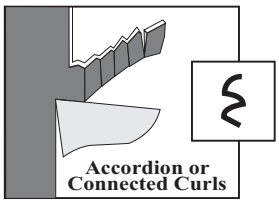
KOOLTWIST,® KOOLCARB®

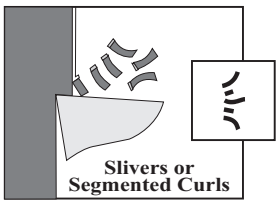
Tool Group

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	OTHER COOLANT FED: PM Cobalt TiAlN — T
1	Continuous Chip	(11-12) 500-650	(6) 200-400	(8-9) a 250-425	(6-7) a 200-400	(6-7) 200-400	○
2	Continuous Chip	(11-12) 500-650	(6-7) 350-550	(8-9) 300-500	(6-7) 200-400	(6-7) 300-500	○
3	Continuous Chip	(9-11) 400-550	(4-5) 225-300	(5-7) 250-450	(5-7) 225-425	(4-5) 200-400	○
4	Accordion or Connected Curls	(9-11) 500-650	(4-5) 175-250	(5-7) 200-400	(5-7) 200-300	(4-5) 200-300	○
5	Continuous Chip	(9-10) 300-400	(4-6) 200-300	(6-8) 225-325	(6-8) 200-260	(5-7) 225-300	(7-9) 75-110
6	Continuous Chip	(9) 275-350	(4-6) 150-250	(6-7) a 225-275	(6-7) a 200-260	(4-6) 190-250	(7-9) 60-100
7	Continuous Chip	(8-10) 290-390	○	(5-7) a 180-250	○	○	(7-9) 100-130
8	Accordion or Connected Curls	(6-8) 150-250	(2-3) 110-150	(4-6) 150-200	(3-4) 100-150	(2-3) 100-150	(6-8) 60-100
9	Continuous Chip	(5-7) 120-225	(2-3) 80-135	(4-6) 135-185	(1-2) 70-100	(2-3) 100-150	(5-7) 50-90
10	Continuous Chip	(1-2) 50-100	○	(1-2) b 45-90	(1-2) b 60-90	○	○
11	Continuous Chip	(4-6) 130-200	(2-3) 120-180	(2-3) 120-170	(2-3) 100-160	(2-3) 70-125	(4-5) 60-90
12	Accordion or Connected Curls	(4-6) 100-150	(1-2) 80-120	(2-3) a 80-120	(2-3) a 60-100	○	(4-5) 50-85
13	Continuous Chip	(4-6) 90-150	○	(1-2) a 40-60	○	○	○
14	Accordion or Connected Curls	(4-6) 90-150	(1-2) 60-100	(2-3) 50-110	(2-3) 50-100	(1-2) 60-120	○
15	Accordion or Connected Curls	(2-3) 70-130	○	(2) 60-90	(2) 60-90	○	(2-3) 30-75
16	Accordion or Connected Curls	(2-3) 40-80	○	(1-2) 40-80	(1-2) b 40-80	○	(2) 25-60
17	Slivers or Segmented Curls	○	(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**)

Surface Feet per Minute (SFM)	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
	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.

REAMER SELECTOR & APPLICATION GUIDE

1. Identify material group number based on the material being cut (Pg. 4 or 102-103).
2. Choose reamer style using pictorial index (Pg. 2-3) based on your specific diameter requirement.
3. Determine recommended reaming stock removal (Pg. 107) & coolant pressure required per chart (Pg. 98).
4. Obtain recommended SFM and IPR total (see Pg. 52 for non-coolant fed or Pg. 90 for coolant fed).

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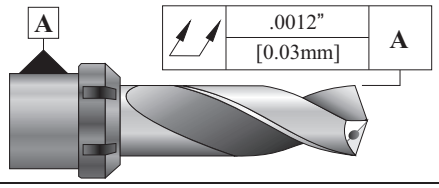
Starting Procedures for Drilling

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	

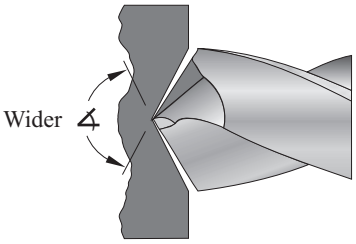
To properly self start a drill use the following:

- Shortened projection
- Rigid part fixturing
- Enter machined surface

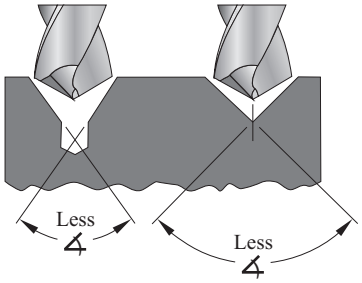


For greater drill depths or better positioning use other starting methods shown.

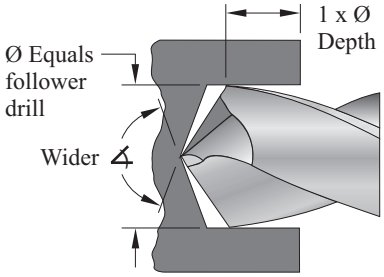
Spot for carbide



Spot for H.S.S.

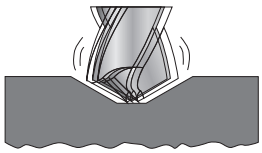


Starting hole for carbide**



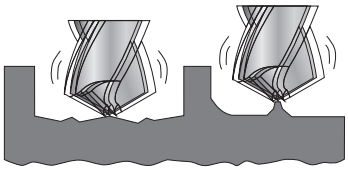
Tool Groups	Spot/Starting Hole Versus Follower Drill: Wider +5° to +10°	Same	Less
HPS Carbide (A, B, M)	●	●	◒
Carbide Standard	●	◒	○*
Carbide Tipped	●	◒	○*
HSS, Cobalt	◒	◒	●
	● Most Appropriate	◒ Occasionally Appropriate	○ Don't Use

* 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.



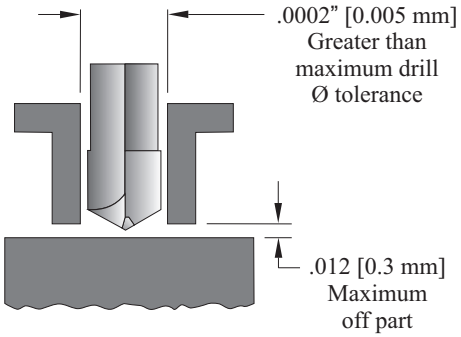
Avoid using a spot drill with a chisel flat. Use CJT Styles 114, 113 and 115 for spotting.

** 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.

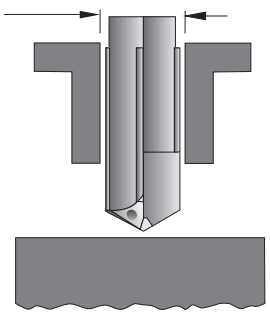


Avoid convex spots from indexable drills or non-center cut tools.

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 by CJT to optimize performance in bushing starts and angular entry/exit applications. Please consult CJT.

Durapoint® Solid Carbide Case Histories

CASE HISTORY for Style #114

Customer manufactures scientific instrumentation

Material: 316 Stainless Steel
Machine type: Horizontal CNC
Lubrication type: Soluble oil
Tool diameter: .1540″
Hole depth: .400″ deep (2.6 x Ø)
SFM: 117 (2900 RPM)
IPM: 5.8 (.002 IPR)
Tool life per regrind: 640″ (1600 holes)
Hole tolerance: .0015″ true position

Prior process: High speed steel drill was drilling .010″ over size.

Results: Customer was impressed with the performance of CJT's solid carbide, high performance style 114 Durapoint to eliminate center drilling and improve tool life over five times that of high speed steel.

CASE HISTORY for Style #114

Customer manufactures glass molds

Material: Phosphorous Bronze
Machine type: Vertical CNC
Lubrication type: Flood, water soluble
Tool diameter: .2656″
Hole depth: .75″ deep
SFM: 200 (2876 RPM)
IPM: 15 (.0052 IPR)
Tool life per regrind: 1080″ (1440 holes)

Prior process: High speed steel drill was drilling .010″ over size.

Results: CJT's solid carbide, high performance style 113 Durapoint reduced the drilling cycle time by 10 min. per part or 225%

CASE HISTORY for Style #113

Customer manufactures gears

Material: 8620 steel
Tool diameter: .4134″
Hole depth: .875″
SFM: 260 (2403 RPM)
IPM: 16.8 (.007 IPR)
Tool life per regrind: 3000
Hole tolerance: .4135″/.4110″

Prior process: High speed steel running 5.1 IPM

Results: CJT's solid carbide, high performance style 113 Durapoint drilled 3000 holes within the diameter tolerance and eliminated the need for a secondary reaming operation. Reduced drilling time by 68%.

CASE HISTORY for Style #113

Material: A36
Machine type: VMC
Lubrication type: Water Soluble
Tool diameter: .6299″
Hole depth: 1.25″ thru
SFM: 340 (2062 RPM)
IPM: 29 (.014 IPR)
Tool life per regrind: 2975 holes, 3718″

Prior process: High speed steel drill needed 7.5 hrs per part

Results: With CJT's solid carbide, high performance style 113 Durapoint, customer was able to reduce cycle time to 1hour and 58 min.

CASE HISTORY for Style #154

Customer manufactures engine manifolds

Material: 319 Aluminum, 6% Silicon
Machine type: Transfer line with guide bushings
Lubrication type: Flood synthetic
Tool diameter: .5512″ (14mm)
Hole depth: .44″ (8 x Ø)
SFM: 478 (3313 RPM)
IPM: 14.9 (.0045 IPR)
Tool life per regrind: 10,000
Hole tolerance: .002″

Prior process: Cobalt step drill and ream process

Results: Customer received 10 times the tool life between drill sharpening and eliminated the reaming pass by holding 100 RMS finish.

CASE HISTORY for Style #154

Customer manufactures transmissions

Material: 390 Aluminum, 18% Silicon
Machine type: Dial machine with bushings
Lubrication type: Flood semi-synthtic
Tool diameter: .3965″ (10.07mm)
Hole depth: 1.5″ cored hole (4 x Ø)
SFM: 175 (1686 RPM)
IPM: 11.4 (00675 IPR)
Tool life per regrind: 13,000
Hole tolerance: .002″ true position held in one pass drilling

Prior process: Solid Carbide double margin parabolic drill

Results: Customer eliminated over 5% part scrap and used the extra transfer station for a de-burring station to avoid an off-line manual operation.

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Solid Carbide Non-Coolant Fed Drills

HIGH PERFORMANCE


Style 114

High performance, stub length. For high carbon, high alloy and stainless steels, titanium, high temperature alloys, aluminum, bronze, cast and ductile iron. Available in TiN and TiAlN coating. **Page. 10**


Style 113

High performance, stub length. For low to medium carbon steels under 30 Rc/286 Hb and softer stainless steels. TiCN coated. **Page. 12**


Style 118A

High performance, jobber length. For high carbon, high alloy and stainless steels, titanium, high temperature alloys, aluminum, bronze, cast and ductile iron. TiAlN coated **Page. 14**


Style 116

High performance, jobber length. For low to medium carbon steels under 30 Rc/286 Hb, and softer stainless steels. TiCN coated. **Page. 15**

GENERAL PURPOSE


Style 121

High helix, jobber length. For maximum wear resistance and increased penetration rates in short chipping materials. Ideal for gray iron, cast aluminum, brass and bronze. **Page. 16**


Style 111

General purpose flute, stub length. Self-centering four facet point provides efficient drilling of cast iron, cast aluminum, bronze, hard plastics and other non-ferrous materials. **Page. 17**


Style 124

General purpose flute, jobber length. Self-centering four facet point provides efficient drilling of cast iron, cast aluminum, bronze and hard plastics. **Page. 18**


Style 144

Drill/Countersink, double ended construction offers extreme rigidity.

Page. 20

STRAIGHT FLUTE, HEAVY DUTY


Style 151

Spade style die drill. Straight flute, right hand cut, heavy duty web reduces breakage drilling shallow holes in hardened steels. **Page. 20**


Style 155

Die drill, heavy duty. Straight flute, right hand cut, heavy web construction. Ideal for high accuracy hole drilling in hard metal parts over 40 Rc and abrasive materials. **Page. 21**

STRAIGHT FLUTE, BORE DRILLS


Style 153

Bore drill/Burnisher, short length. Double margin, flat clearance construction. For cast iron, cast aluminum, cored holes and angular exits. **Page. 22**


Style 154

Bore drill/Burnisher, long length. Double margin, flat clearance construction. For cast iron, cast aluminum, cored holes and angular exits. **Page. 23**

Style 114 (TiN) / 114A (TiAlN)

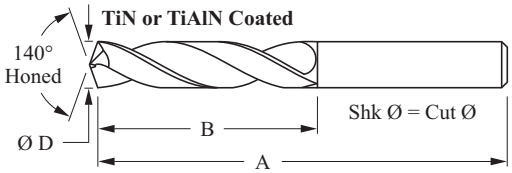
Available in TiN or TiAlN coating

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

- Stub length and 140° double split point eliminates spot drilling and reaming in most instances.
- Heavy web, high helix flute clears chips effectively allowing up to five times greater penetration rate vs. standard high speed steel.
- Right hand spiral, right hand cut.
- See style 113 for steel cutting carbide grade.
- Coating adds lubricity, enhances wear resistance and prevents edge build-up. **TiAlN** coating is recommended for short chipping, abrasive and high temperature materials. **TiN** coating is recommended for long chipping, low-carbon, ductile and gummy 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 ≅ 3 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



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
11400980	*40*	2.489	.0980	1-15/16	49.	9/16	14.
11400984		2.5	.0984				
11400995	*39*	2.527	.0995				
11401015	*38*	2.578	.1015				
11401040	*37*	2.642	.1040	2	51.	5/8	16.
11401065	*36*	2.705	.1065				
11401094	7/64	2.779	.1094				
11401100	*35*	2.794	.1100				
11401110	*34*	2.819	.1110				
11401130	*33*	2.87	.1130				
11401160	*32*	2.946	.1160	2-1/16	52.	11/16	17.
11401181		3.	.1181				
11401200	*31*	3.048	.1200				
11401250	1/8	3.175	.1250				
11401260		3.2	.1260				
11401285	*30*	3.264	.1285				
11401299		3.3	.1299				
11401339		3.4	.1339				
11401360	*29*	3.454	.1360				
11401378		3.5	.1378	2-5/32	55.	25/32	20.
11401405	*28*	3.569	.1405				
11401406	9/64	3.571	.1406				
11401417		3.6	.1417				
11401440	*27*	3.658	.1440				
11401470	*26*	3.734	.1470				
11401495	*25*	3.797	.1495				
11401520	*24*	3.861	.1520				
11401540	*23*	3.912	.1540	2-7/32	56.	27/32	21.
11401562	5/32	3.967	.1562				
11401570	*22*	3.988	.1570				
11401575		4.	.1575				
11401590	*21*	4.039	.1590				
11401610	*20*	4.089	.1610				
11401614		4.1	.1614				
11401624		4.125	.1624				
11401654		4.2	.1654				

Shk Ø = Cut Ø

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
11401660	*19*	4.216	.1660	2-7/32	56.	27/32	21.
11401673		4.25	.1673	2-9/32	58.	29/32	23.
11401695	*18*	4.305	.1695				
11401719	11/64	4.366	.1719				
11401730	*17*	4.394	.1730				
11401770	*16*	4.496	.1770				
11401772		4.5	.1772				
11401800	*15*	4.572	.1800				
11401820	*14*	4.623	.1820	2-3/8	60.	1	25.
11401850	*13*	4.7	.1850				
11401875	3/16	4.763	.1875				
11401890	*12*	4.801	.1890				
11401910	*11*	4.851	.1910				
11401929		4.9	.1929				
11401935	*10*	4.915	.1935				
11401960	*9*	4.978	.1960				
11401969		5.	.1969	2-7/16	62.	1-1/16	27.
11401990	*8*	5.055	.1990				
11402010	*7*	5.105	.2010				
11402031	13/64	5.159	.2031				
11402040	*6*	5.182	.2040				
11402055	*5*	5.22	.2055				
11402090	*4*	5.309	.2090	2-1/2	64.	1-1/8	29.
11402130	*3*	5.41	.2130				
11402165		5.5	.2165				
11402188	7/32	5.558	.2188				
11402205		5.6	.2205				
11402210	*2*	5.613	.2210				
11402280	*1*	5.791	.2280				
11402340	*A*	5.944	.2340	2-17/32	64.	1-5/32	29.
11402344	15/64	5.954	.2344				
11402362		6.	.2362				
11402380	*B*	6.045	.2380				
11402402		6.1	.2402				
11402420	*C*	6.147	.2420				

Shk Ø = Cut Ø

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Style 114(TiN)/ 114A(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
11402460	*D*	6.248	.2460	2-19/32	66.	1-7/32	31.
11402480		6.3	.2480				
11402500	1/4	6.35	.2500				
11402520		6.4	.2520				
11402559		6.5	.2559				
11402570	*F*	6.528	.2570				
11402598		6.6	.2598	2-5/8	67.	1-1/4	32.
11402610	*G*	6.629	.2610				
11402630		6.68	.2630				
11402656	17/64	6.746	.2656				
11402660	*H*	6.756	.2660				
11402697		6.85	.2697				
11402720	*I*	6.909	.2720				
11402756		7.	.2756				
11402770	*J*	7.036	.2770	2-11/16	68.	1-5/16	33.
11402795		7.1	.2795				
11402810	*K*	7.137	.2810				
11402812	9/32	7.142	.2812				
11402835		7.2	.2835				
11402900	*L*	7.366	.2900				
11402950	*M*	7.493	.2950	2-3/4	70.	1-3/8	35.
11402953		7.5	.2953				
11402969	19/64	7.541	.2969				
11402992		7.6	.2992				
11403020	*N*	7.671	.3020				
11403071		7.8	.3071	2-13/16	71.	1-7/16	37.
11403125	5/16	7.938	.3125				
11403150		8.	.3150				
11403160	*O*	8.026	.3160				
11403189		8.1	.3189				
11403230	*P*	8.204	.3230				
11403281	21/64	8.334	.3281	2-7/8	73.	1-1/2	38.
11403320	*Q*	8.433	.3320				
11403346		8.5	.3346				
11403370		8.56	.3370	2-15/16	75.	1-9/16	40.
11403390	*R*	8.611	.3390				
11403438	11/32	8.733	.3438				
11403480	*S*	8.839	.3480				
11403543		9.	.3543	3	76.	1-5/8	41.
11403580	*T*	9.093	.3580				
11403594	23/64	9.129	.3594				
11403680	*U*	9.347	.3680				
11403740		9.5	.3740	3-1/4	83.	1-3/4	44.
11403750	3/8	9.525	.3750				
11403770	*V*	9.576	.3770				
11403819		9.7	.3819	3-5/16	84.	1-13/16	46.
11403860	*W*	9.804	.3860				
11403906	25/64	9.921	.3906				
11403937		10.	.3937				
11403970	*X*	10.084	.3970	3-3/8	86.	1-7/8	48.
11404040	*Y*	10.262	.4040				
11404062	13/32	10.317	.4062				
11404094		10.4	.4094				
11404130	*Z*	10.49	.4130				
11404134		10.5	.4134				
11404173		10.6	.4173				

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
11404219	27/64	10.716	.4219	3-7/16	87.	1-15/16	49.
11404252		10.8	.4252				
11404311		10.95	.4311				
11404331		11.	.4331				
11404375	7/16	11.113	.4375	3-1/2	89.	2	51.
11404488		11.4	.4488				
11404528		11.5	.4528				
11404531	29/64	11.509	.4531				
11404567		11.6	.4567				
11404688	15/32	11.908	.4688	3-15/16	100.	2-3/16	56.
11404724		12.	.4724				
11404764		12.1	.4764				
11404844	31/64	12.304	.4844				
11404862		12.35	.4862				
11404882		12.4	.4882				
11404921		12.5	.4921				
11404961		12.6	.4961	4-7/16	113.	2-3/8	60.
11405000	1/2	12.7	.5000				
11405039		12.8	.5039				
11405079	21/64	12.9	.5079				
11405118		13.	.5118				
11405156	33/64	13.096	.5156				
11405312	17/32	13.492	.5312				
11405315		13.5	.5315				
11405354		13.6	.5354	4-1/2	114.	2-1/2	64.
11405433		13.8	.5433				
11405469	35/64	13.891	.5469				
11405512		14.	.5512				
11405551		14.1	.5551				
11405571		14.15	.5571				
11405625	9/16	14.288	.5625				
11405709		14.5	.5709	4-5/8	117.	2-5/8	67.
11405748		14.6	.5748				
11405781	37/64	14.684	.5781				
11405906		15.	.5906				
11405938	19/32	15.083	.5938				
11406094	39/64	15.479	.6094	4-3/4	121.	2-3/4	70.
11406102		15.5	.6102				
11406250	5/8	15.875	.6250				
11406299		16.	.6299				
11406406	41/64	16.271	.6406	5	127.	3	76.
11406496		16.5	.6496				
11406562	21/32	16.667	.6562				
11406594		16.75	.6594				
11406693		17.	.6693				
11406719	43/64	17.066	.6719				
11406875	11/16	17.463	.6875				
11406890		17.5	.6890	5-1/4	133.	3-1/4	83.
11406929		17.6	.6929				
11407031	45/64	17.859	.7031				
11407087		18.	.7087				
11407188	23/32	18.258	.7188				
11407283		18.5	.7283				
11407344	47/64	18.654	.7344				
11407480		19.	.7480	5-1/2	140.	3-1/2	89.
11407500	3/4	19.05	.7500				

Shk Ø = Cut Ø

Style 113

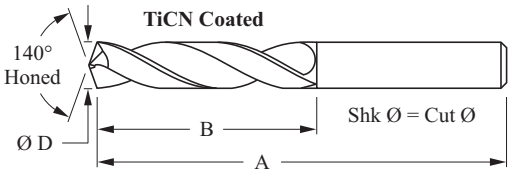
TiCN coating

Steel cutting carbide grade provides maximum tool life when cutting low to medium carbon steels under 30 Rc/286 Hb, softer stainless steels.

- Stub length and 140º double split point eliminate spot drilling and reaming in most instances.
- Heavy web and unique flute shape break chips at high feed rates in gummy and stringy materials.
- Right hand spiral, right hand cut.
- TiCN coating adds lubricity, heat resistance and prevents edge build-up.
- See style 114 for non-ferrous materials, hardened steels and stainless.
- Allow 1.5 x Ø of flute for chip exit up to 7/16″ (11.1mm) and 1 x Ø over 7/16″.

Depth ≅ 3 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



EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"	
	Inch/ *Wire*	mm	Inch	Inch	mm	Inch	mm
11301250	1/8	3.175	.1250	2-1/16	52.	11/16	17.
11301260		3.2	.1260				
11301285	*30*	3.264	.1285				
11301339		3.4	.1339				
11301360	*29*	3.454	.1360				
11301378		3.5	.1378	2-5/32	55.	25/32	20.
11301405	*28*	3.569	.1405				
11301406	9/64	3.571	.1406				
11301440	*27*	3.658	.1440				
11301470	*26*	3.734	.1470				
11301495	*25*	3.797	.1495				
11301520	*24*	3.861	.1520				
11301540	*23*	3.912	.1540	2-7/32	56.	27/32	21.
11301562	5/32	3.967	.1562				
11301570	*22*	3.988	.1570				
11301575		4.	.1575				
11301590	*21*	4.039	.1590				
11301610	*20*	4.089	.1610				
11301624		4.125	.1624				
11301660	*19*	4.216	.1660				
11301673		4.25	.1673	2-9/32	58.	29/32	23.
11301695	*18*	4.305	.1695				
11301719	11/64	4.366	.1719				
11301730	*17*	4.394	.1730				
11301770	*16*	4.496	.1770				
11301772		4.5	.1772				
11301800	*15*	4.572	.1800				
11301820	*14*	4.623	.1820	2-3/8	60.	1	25.
11301850	*13*	4.7	.1850				
11301875	3/16	4.763	.1875				
11301890	*12*	4.801	.1890				
11301910	*11*	4.851	.1910				

EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"	
	Inch/ *Wire*	mm	Inch	Inch	mm	Inch	mm
11301935	*10*	4.915	.1935	2-3/8	60.	1	25.
11301960	*9*	4.978	.1960				
11301969		5.	.1969	2-7/16	62.	1-1/16	27.
11301990	*8*	5.055	.1990				
11302010	*7*	5.105	.2010				
11302031	13/64	5.159	.2031				
11302040	*6*	5.182	.2040				
11302055	*5*	5.220	.2055				
11302090	*4*	5.309	.2090	2-1/2	64.	1-1/8	29.
11302130	*3*	5.41	.2130				
11302165		5.5	.2165				
11302188	7/32	5.558	.2188				
11302205		5.6	.2205				
11302210	*2*	5.613	.2210				
11302280	*1*	5.791	.2280				
11302340	*A*	5.944	.2340	2-17/32	64.	1-5/32	29.
11302344	15/64	5.954	.2344				
11302362		6.	.2362				
11302380	*B*	6.045	.2380				
11302402		6.1	.2402				
11302420	*C*	6.147	.2420				
11302460	*D*	6.248	.2460	2-19/32	66.	1-7/32	31.
11302500	1/4	6.35	.2500				
11302559		6.5	.2559				
11302570	*F*	6.528	.2570				
11302610	*G*	6.629	.2610	2-5/8	67.	1-1/4	32.
11302630		6.68	.2630				
11302656	17/64	6.746	.2656				
11302660	*H*	6.756	.2660				
11302697		6.85	.2697				
11302720	*I*	6.909	.2720				
11302756		7.	.2756				

Shk Ø = Cut Ø

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Style 113 TiCN coating

EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"	
	Inch/ *Wire*	mm	Inch	Inch	mm	Inch	mm
11302770	*J*	7.036	.2770	2-11/16	68.	1-5/16	33.
11302795		7.1	.2795				
11302810	*K*	7.137	.2810				
11302812	9/32	7.142	.2812				
11302900	*L*	7.366	.2900				
11302950	*M*	7.493	.2950	2-3/4	70.	1-3/8	35.
11302953		7.5	.2953				
11302969	19/64	7.541	.2969				
11303020	*N*	7.671	.3020				
11303071		7.8	.3071	2-13/16	71.	1-7/16	37.
11303125	5/16	7.938	.3125				
11303150		8.	.3150				
11303160	*O*	8.026	.3160				
11303189		8.1	.3189				
11303230	*P*	8.204	.3230				
11303281	21/64	8.334	.3281	2-7/8	73.	1-1/2	38.
11303320	*Q*	8.433	.3320				
11303346		8.5	.3346				
11303370		8.56	.3370	2-15/16	75.	1-9/16	40.
11303390	*R*	8.611	.3390				
11303438	11/32	8.733	.3438				
11303480	*S*	8.839	.3480				
11303543		9.	.3543	3	76.	1-5/8	41.
11303580	*T*	9.093	.3580				
11303594	23/64	9.129	.3594				
11303680	*U*	9.347	.3680				
11303740		9.5	.3740	3-1/4	83.	1-3/4	44.
11303750	3/8	9.525	.3750				
11303770	*V*	9.576	.3770				
11303819		9.7	.3819	3-5/16	84.	1-13/16	46.
11303860	*W*	9.804	.3860				
11303906	25/64	9.921	.3906				
11303937		10.	.3937				
11303970	*X*	10.084	.3970	3-3/8	86.	1-7/8	48.
11304040	*Y*	10.262	.4040				
11304062	13/32	10.317	.4062				
11304094		10.4	.4094				
11304130	*Z*	10.49	.4130				
11304134		10.5	.4134				
11304173		10.6	.4173				
11304219	27/64	10.716	.4219	3-7/16	87.	1-15/16	49.
11304252		10.8	.4252				
11304311		10.95	.4311				
11304331		11.	.4331				
11304375	7/16	11.113	.4375	3-1/2	89.	2	51.
11304488		11.4	.4488				
11304528		11.5	.4528				
11304531	29/64	11.509	.4531				
11304567		11.6	.4567				
11304688	15/32	11.908	.4688	3-15/16	100.	2-3/16	56.
11304724		12.	.4724				
11304764		12.1	.4764				
11304844	31/64	13.304	.4844				
11304862		12.35	.4862				

Shk Ø = Cut Ø

EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"	
	Inch/ *Wire*	mm	Inch	Inch	mm	Inch	mm
11304882		12.4	.4882	3-15/16	100.	2-3/16	56.
11304921		12.5	.4921				
11304961		12.6	.4961	4-7/16	113.	2-3/8	60.
11305000	1/2	12.7	.5000				
11305079		12.9	.5079				
11305118		13.	.5118				
11305156	33/64	13.096	.5156				
11305312	17/32	13.492	.5312				
11305315		13.5	.5315				
11305354		13.6	.5354	4-1/2	114.	2-1/2	64.
11305433		13.8	.5433				
11305469	35/64	13.891	.5469				
11305512		14.	.5512				
11305551		14.1	.5551				
11305571		14.15	.5571				
11305625	9/16	14.288	.5625				
11305709		14.5	.5709	4-5/8	117.	2-5/8	67.
11305748		14.6	.5748				
11305781	37/64	14.684	.5781				
11305906		15.	.5906				
11305938	19/32	15.083	.5938				
11306094	39/64	15.479	.6094	4-3/4	121.	2-3/4	70.
11306102		15.5	.6102				
11306250	5/8	15.875	.6250				
11306299		16.	.6299				
11306331		16.08	.6331	5	127.	3	76.
11306406	41/64	16.271	.6406				
11306496		16.5	.6496				
11306562	21/32	16.667	.6562				
11306594		16.75	.6594				
11306693		17	.6693				
11306719	43/64	17.066	.6719				
11306875	11/16	17.463	.6875				
11306890		17.5	.6890	5-1/4	133.	3-1/4	83.
11306929		17.6	.6929				
11307031	45/64	17.859	.7031				
11307087		18.	.7087				
11307188	23/32	18.258	.7188				
11307283		18.5	.7283				
11307344	47/64	18.654	.7344				
11307480		19.	.7480	5-1/2	140.	3-1/2	89.
11307500	3/4	19.05	.7500				
11307579		19.25	.7579				

Shk Ø = Cut Ø

Style 118A

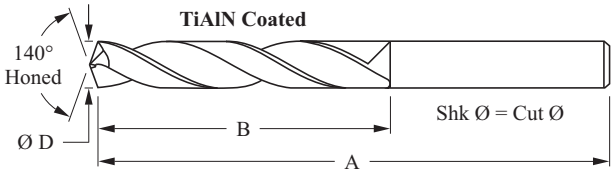
TiAlN coating

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

- Jobber length and 140° double split point eliminate spot drilling and reaming in most instances.
- Heavy web, high helix flute clears chips effectively allowing up to five times greater penetration rate vs. standard high speed steel.
- Right hand spiral, right hand cut.
- See style 116 for steel cutting carbide grade.
- TiAlN coating adds lubricity, enhances wear resistance, prevents edge build-up, and 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 ≅ 4.5 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



EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"	
	Inch/ *Wire*	mm	Inch	Inch	mm	Inch	mm
11801250A	1/8	3.175	.1250	2-1/4	57.	7/8	22.
11801378A		3.5	.1378	2-11/32	60.	31/32	25.
11801406A	9/64	3.572	.1406	2-3/8		1	
11801562A	5/32	3.967	.1562	2-15/32	63.	1-1/8	29.
11801575A		4.	.1575				
11801719A	11/64	4.366	.1719	2-5/8	67.	1-1/4	32.
11801772A		4.5	.1772				
11801875A	3/16	4.763	.1875	2-11/16	68.	1-5/16	33.
11801969A		5.	.1969	2-3/4	70.	1-3/8	35.
11802010A	*7*	5.105	.2010	2-13/16	71.	1-7/16	37.
11802031A	13/64	5.159	.2031				
11802165A		5.5	.2165	2-15/16	75.	1-17/32	39.
11802188A	7/32	5.558	.2188				
11802344A	15/64	5.954	.2344	3	76.	1-5/8	41.
11802362A		6.	.2362				
11802460A	*D*	6.248	.2460	3-3/16	81.	1-5/8	41.
11802500A	1/4	6.35	.2500				
11802559A		6.5	.2559				
11802570A	*F*	6.528	.2570				
11802656A	17/64	6.746	.2656	3-1/4	83.	1-23/32	44.
11802720A	*I*	6.909	.2720				
11802756A		7.	.2756				
11802812A	9/32	7.142	.2812	3-7/16	87.	1-25/32	45.
11802953A		7.5	.2953				
11802969A	19/64	7.541	.2969	3-9/16	90.	1-31/32	48.
11803125A	5/16	7.938	.3125				
11803150A		8.	.3150				
11803230A	*P*	8.204	.3230	3-25/32	96.	2-3/32	53.
11803281A	21/64	8.334	.3281				
11803320A	*Q*	8.433	.3320				
11803346A		8.5	.3346	3-7/8	98.	2-13/16	56.
11803438A	11/32	8.733	.3438				
11803480A	*S*	8.839	.3480				
11803543A		9.	.3543				
11803594A	23/64	9.129	.3594	4-1/32	102.	2-9/32	58.
11803680A	*U*	9.347	.3680				
11803740A		9.5	.3740				
11803750A	3/8	9.525	.3750				
11803860A	*W*	9.804	.3860	4-1/8	105.	2-3/8	60.
11803906A	25/64	9.921	.3906				

EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"	
	Inch/ *Wire*	mm	Inch	Inch	mm	Inch	mm
11803937A		10.	.3937	4-1/8	105.	2-3/8	60.
11804062A	13/32	10.317	.4062	4-1/8	105.	2-19/32	66.
11804134A		10.5	.4134				
11804219A	27/64	10.716	.4219	4-1/2	114.	2-11/16	68.
11804331A		11.	.4331				
11804375A	7/16	11.113	.4375	4-21/32	118.	2-13/16	71.
11804528A		11.5	.4528				
11804531A	29/64	11.509	.4531				
11804688A	15/32	11.908	.4688	4-25/32	121.	2-7/8	73.
11804724A		12.	.4724				
11804844A	31/64	12.304	.4844	5-5/16	135.	3	76.
11804921A		12.5	.4921	5-13/32	137.	3-3/32	79.
11805000A	1/2	12.7	.5000				
11805118A		13.	.5118				
11805156A	33/64	13.096	.5156	5-11/16	144.	3-5/16	84.
11805312A	17/32	13.492	.5312				
11805315A		13.5	.5315				
11805469A	35/64	13.891	.5469	5-15/16	151.	3-13/32	87.
11805512A		14.	.5512				
11805625A	9/16	14.288	.5625	5-15/16	151.	3-1/2	89.
11805709A		14.5	.5709				
11805781A	37/64	14.684	.5781	6-3/16	157.	3-11/16	94.
11805906A		15.	.5906				
11805938A	19/32	15.083	.5938				
11806094A	39/64	15.479	.6094				
11806102A		15.5	.6102				
11806250A	5/8	15.875	.6250	6-5/16	160.	3-25/32	96.
11806299A		16.	.6299				
11806496A		16.5	.6496	6-19/32	167.	4-1/8	103.
11806562A	21/32	16.667	.6562				
11806693A		17.	.6693				
11806719A	43/64	17.066	.6719				
11806875A	11/16	17.463	.6875				
11806890A		17.5	.6890				
11807031A	45/64	17.859	.7031				
11807087A		18.	.7087				
11807283A		18.5	.7283	7-1/16	179.	4-1/2	114.
11807344A	47/64	18.654	.7344				
11807480A		19.	.7480				
11807500A	3/4	19.05	.7500				

Shk Ø = Cut Ø

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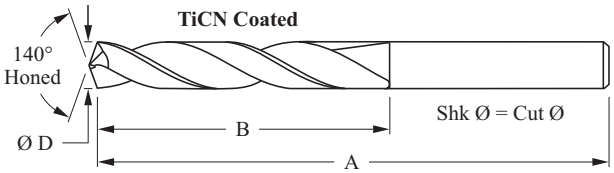
Steel cutting carbide grade provides maximum tool life when cutting low to medium carbon steels under 30 Rc/286 Hb, softer stainless steels.

Style 116

TiCN coating

- Solid carbide, heavy web and 140° double split point allow self-starting without spot drilling in many extended reach situations.
- Heavy web and unique flute shape break chips at high feed rates in gummy and stringy materials.
- Right hand spiral, right hand cut.
- See style 118A for non-ferrous materials, hardened steels and stainless.
- TiCN coating adds lubricity, heat resistance and prevents edge build-up.
- Allow 1.5 x Ø of flute for chip exit up to 7/16″ (11.1mm) and 1 x Ø over 7/16″.



Depth ≅ 4.5 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

EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"	
	Inch/ *Wire*	mm	Inch	Inch	mm	Inch	mm
11601250	1/8	3.175	.1250	2-1/4	57.	7/8	22.
11601378		3.5	.1378	2-11/32	60.	31/32	25.
11601406	9/64	3.572	.1406	2-3/8		1	
11601562	5/32	3.967	.1562	2-15/32	63.	1-1/8	29.
11601575		4.	.1575				
11601719	11/64	4.366	.1719	2-5/8	67.	1-1/4	32.
11601772		4.5	.1772				
11601875	3/16	4.763	.1875	2-11/16	68.	1-5/16	33.
11601969		5.	.1969	2-3/4	70.	1-3/8	35.
11602010	*7*	5.105	.2010	2-13/16	71.	1-7/16	37.
11602031	13/64	5.159	.2031				
11602165		5.5	.2165	2-15/16	75.	1-17/32	39.
11602188	7/32	5.558	.2188				
11602344	15/64	5.954	.2344	3	76.	1-5/8	41.
11602362		6.	.2362				
11602460	*D*	6.248	.2460	3-3/16	81.	1-5/8	41.
11602500	1/4	6.35	.2500				
11602559		6.5	.2559				
11602570	*F*	6.528	.2570				
11602656	17/64	6.746	.2656	3-1/4	83.	1-23/32	44.
11602720	*I*	6.909	.2720				
11602756		7.	.2756				
11602812	9/32	7.142	.2812	3-7/16	87.	1-25/32	45.
11602953		7.5	.2953				
11602969	19/64	7.541	.2969	3-9/16	90.	1-31/32	48.
11603125	5/16	7.938	.3125				
11603150		8.	.3150				
11603230	*P*	8.204	.3230	3-25/32	96.	2-3/32	53.
11603281	21/64	8.334	.3281				
11603320	*Q*	8.433	.3320				
11603346		8.5	.3346	3-7/8	98.	2-13/16	56.
11603438	11/32	8.733	.3438				
11603480	*S*	8.839	.3480				
11603543		9.	.3543				
11603594	23/64	9.129	.3594	4-1/32	102.	2-9/32	58.
11603680	*U*	9.347	.3680				
11603740		9.5	.3740				
11603750	3/8	9.525	.3750				

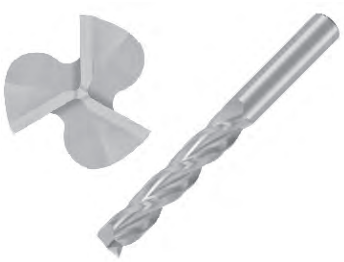
Shk Ø = Cut Ø

EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"	
	Inch/ *Wire*	mm	Inch	Inch	mm	Inch	mm
11603860	*W*	9.804	.3860	4-1/8	105.	2-3/8	60.
11603906	25/64	9.921	.3906				
11603937		10.	.3937				
11604062	13/32	10.317	.4062			2-19/32	66.
11604134		10.5	.4134				
11604219	27/64	10.716	.4219	4-1/2	114.	2-11/16	68.
11604331		11.	.4331				
11604375	7/16	11.113	.4375	4-21/32	118.	2-13/16	71.
11604528		11.5	.4528				
11604531	29/64	11.509	.4531				
11604688	15/32	11.908	.4688	4-25/32	121.	2-7/8	73.
11604724		12.	.4724				
11604844	31/64	12.304	.4844	5-5/16	135.	3	76.
11605000	1/2	12.7	.5000	5-13/32	137.	3-3/32	79.
11605118		13.	.5118				
11605156	33/64	13.096	.5156	5-11/16	144.	3-5/16	84.
11605312	17/32	13.492	.5312				
11605315		13.5	.5315				
11605469	35/64	13.891	.5469	5-15/16	151.	3-13/32	87.
11605512		14.	.5512				
11605625	9/16	14.288	.5625			3-1/2	89.
11605709		14.5	.5709				
11605906		15.	.5906	6-3/16	157.	3-11/16	94.
11605938	19/32	15.083	.5938				
11606102		15.5	.6102				
11606250	5/8	15.875	.6250	6-5/16	160.	3-25/32	96.
11606299		16.	.6299				
11606496		16.5	.6496	6-19/32	167.	4-1/8	103.
11606562	21/32	16.667	.6562				
11606693		17.	.6693				
11606875	11/16	17.463	.6875				
11606890		17.5	.6890				
11607031	45/64	17.859	.7031				
11607087		18.	.7087				
11607283		18.5	.7283	7-1/16	179.	4-1/2	114.
11607344	47/64	18.654	.7344				
11607480		19.	.7480				
11607500	3/4	19.05	.7500				

Shk Ø = Cut Ø

Style 121

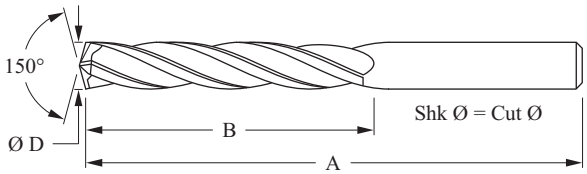
High abrasion resistant carbide provides maximum wear resistance and increased penetration rates in short chipping materials. Ideal for gray iron, brass, bronze.



- 3-flute, high helix construction offers exceptional straightness, diameter tolerances, core drilling capability and can eliminate reaming operations.
- Jobber length and 150° self centering web thinned point can eliminate spot drilling in most applications.
- Excellent hole positioning and size control make this an excellent starting drill.
- Right hand spiral, right hand cut.
- 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 -.0005	+0.000 -0.013	+.0000 -.0020	+0.000 -0.051



EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"	
	Inch	mm	Inch	Inch	mm	Inch	mm
12100938	3/32	2.383	.0938	2	51.	1	25.
12100984		2.5	.0984				
12101094	7/64	2.778	.1094	2-1/4	57.	1-1/4	32.
12101250	1/8	3.175	.1250				
12101378		3.5	.1378	2-1/2	64.	1-3/8	35.
12101406	9/64	3.571	.1406				
12101562	5/32	3.967	.1562				
12101575		4.	.1575				
12101719	11/64	4.366	.1719	2-3/4	70.	1-5/8	41.
12101772		4.5	.1772				
12101875	3/16	4.763	.1875				
12101969		5.	.1969	3	76.	1-3/4	44.
12102031	13/64	5.159	.2031				
12102165		5.5	.2165				
12102188	7/32	5.558	.2188				
12102344	15/64	5.954	.2344	3-1/4	83.	2	51.
12102362		6.	.2362				
12102500	1/4	6.35	.2500				
12102559		6.5	.2559				
12102656	17/64	6.746	.2656	3-1/2	89.	2-1/8	54.
12102756		7.	.2756				
12102812	9/32	7.142	.2812				
12102953		7.5	.2953	3-3/4	95.	2-3/8	60.
12102969	19/64	7.541	.2969				
12103125	5/16	7.938	.3125				
12103150		8.	.3150				
12103281	21/64	8.334	.3281	4	102.	2-1/2	64.
12103346		8.5	.3346				
12103438	11/32	8.733	.3438				
12103543		9.	.3543				
12103594	23/64	9.129	.3594	4-1/4	108.	2-3/4	70.
12103740		9.5	.3740				
12103750	3/8	9.525	.3750				

Shk Ø = Cut Ø

EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"	
	Inch	mm	Inch	Inch	mm	Inch	mm
12103906	25/64	9.921	.3906	4-1/2	114.	2-7/8	73.
12103937		10.	.3937				
12104062	13/32	10.317	.4062				
12104134		10.5	.4134				
12104219	27/64	10.716	.4219				
12104331		11.	.4331				
12104375	7/16	11.113	.4375				
12104528		11.5	.4528				
12104531	29/64	11.509	.4531	4-3/4	121.	3	76.
12104688	15/32	11.908	.4688				
12104724		12.	.4724				
12104844	31/64	13.304	.4844				
12104921		12.5	.4921				
12105000	1/2	12.7	.5000				

Shk Ø = Cut Ø

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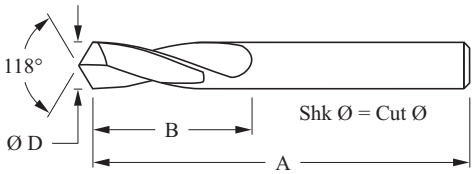
Style 111

Standard helix and self-centering four facet point provides efficient drilling of cast iron, aluminum casting, bronze, hard plastics and other non-ferrous materials.

- Submicron carbide grade offers additional toughness.
- Short tool length increases accuracy and drill life.
- Right hand spiral, right hand cut.
- Allow 1.5 to 2 x Ø of flute for chip exit.



Depth ≅ 1 x Ø

Diameter Tolerances				
Nominal Size	Cutting Ø		Shank Ø	
	Inch	mm	Inch	mm
All	+.0000 -.0005	+0.000 -0.013	+.0000 -.0020	+0.000 -0.025

EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"	
	Inch	mm	Inch	Inch	mm	Inch	mm
11100984		2.5	.0984	1-3/4	44.	5/8	16.
11101181		3.	.1181				
11101250	1/8	3.175	.1250	2	51.	5/8	16.
11101378		3.5	.1378				
11101406	9/64	3.571	.1406				
11101562	5/32	3.967	.1562				
11101575		4.	.1575				
11101654		4.2	.1654				
11101719	11/64	4.366	.1719				
11101772		4.5	.1772	2-1/2	64.	3/4	19.
11101875	3/16	4.763	.1875				
11101969		5.	.1969				
11102031	13/64	5.159	.2031				
11102087		5.3	.2087				
11102165		5.5	.2165				
11102188	7/32	5.558	.2188				
11102244		5.7	.2244				
11102344	15/64	5.954	.2344				
11102362		6.	.2362	2-1/2	64.	1	25.
11102500	1/4	6.35	.2500				
11102559		6.5	.2559				
11102656	17/64	6.746	.2656				
11102756		7.	.2756				
11102812	9/32	7.142	.2812				
11102953		7.5	.2953				
11102969	19/64	7.541	.2969				
11103125	5/16	7.938	.3125	2-3/4	70.	1-1/4	32.
11103150		8.	.3150				
11103281	21/64	8.334	.3281				

Shk Ø = Cut Ø

EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"	
	Inch	mm	Inch	Inch	mm	Inch	mm
11103346		8.5	.3346				
11103438	11/32	8.733	.3438				
11103543		9.	.3543				
11103594	23/64	9.129	.3594				
11103740		9.5	.3740				
11103750	3/8	9.525	.3750				
11103906	25/64	9.921	.3906				
11103937		10.	.3937	3	76.	1-1/4	32.
11104062	13/32	10.317	.4062				
11104219	27/64	10.716	.4219				
11104331		11.	.4331				
11104375	7/16	11.113	.4375				
11104531	29/64	11.509	.4531				
11104688	15/32	11.908	.4688				
11104844	31/64	12.304	.4844				
11105000	1/2	12.7	.5000				

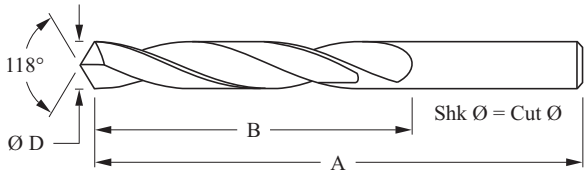
Shk Ø = Cut Ø

Style 124

Standard helix and self-centering four facet point provides efficient drilling of cast iron, cast aluminum, bronze, hard plastics and other abrasive and easily machined materials.

- Submicron carbide grade offers additional toughness.
- Special parabolic flute and high helix constructions, threaded shank adapters and aerospace split points available upon request.
- Right hand spiral, right hand cut.
- Allow 1.5 to 2 x Ø of flute for chip exit.

Diameter Tolerances				
Nominal Size	Cutting Ø		Shank Ø	
	Inch	mm	Inch	mm
All	+.0000 -.0005	+0.000 -0.013	+.0000 -.0020	+0.000 -0.051



EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"	
	Inch/ *Wire*	mm	Inch	Inch	mm	Inch	mm
12400400	*60*	1.016	.0400	1-1/2	38.	3/4	19.
12400410	*59*	1.041	.0410				
12400420	*58*	1.067	.0420				
12400430	*57*	1.092	.0430				
12400465	*56*	1.181	.0465				
12400469	3/64	1.191	.0469				
12400520	*55*	1.321	.0520				
12400550	*54*	1.397	.0550				
12400591		1.5	.0591				
12400595	*53*	1.511	.0595				
12400625	1/16	1.588	.0625				
12400635	*52*	1.613	.0635				
12400670	*51*	1.702	.0670				
12400700	*50*	1.778	.0700	1-3/4	44.	7/8	22.
12400730	*49*	1.854	.0730				
12400760	*48*	1.93	.0760				
12400781	5/64	1.984	.0781				
12400785	*47*	1.994	.0785				
12400787		2.	.0787				
12400810	*46*	2.057	.0810				
12400820	*45*	2.083	.0820				
12400827		2.1	.0827	2	51.	1	25.
12400860	*44*	2.184	.0860				
12400890	*43*	2.261	.0890				
12400925		2.35	.0925				
12400935	*42*	2.375	.0935				
12400938	3/32	2.383	.0938				
12400960	*41*	2.438	.0960				
12400980	*40*	2.489	.0980				
12400984		2.5	.0984				

Shk Ø = Cut Ø

EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"	
	Inch/ *Wire*	mm	Inch	Inch	mm	Inch	mm
12400995	*39*	2.527	.0995	2-1/4	57.	1-1/4	32.
12401015	*38*	2.578	.1015				
12401040	*37*	2.642	.1040				
12401065	*36*	2.705	.1065				
12401094	7/64	2.779	.1094				
12401100	*35*	2.794	.1100				
12401110	*34*	2.819	.1110				
12401130	*33*	2.87	.1130				
12401142		2.9	.1142				
12401160	*32*	2.946	.1160				
12401181		3.	.1181				
12401200	*31*	3.048	.1200				
12401250	1/8	3.175	.1250				
12401285	*30*	3.264	.1285				
12401360	*29*	3.454	.1360	2-1/2	64.	1-3/8	35.
12401378		3.5	.1378				
12401405	*28*	3.569	.1405				
12401406	9/64	3.571	.1406				
12401440	*27*	3.658	.1440				
12401470	*26*	3.734	.1470				
12401495	*25*	3.797	.1495				
12401520	*24*	3.861	.1520				
12401540	*23*	3.912	.1540				
12401562	5/32	3.967	.1562				
12401570	*22*	3.988	.1570				
12401575		4.	.1575				
12401590	*21*	4.039	.1590				
12401610	*20*	4.089	.1610				

Shk Ø = Cut Ø

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Style 124

EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"	
	Inch/ *Wire*	mm	Inch	Inch	mm	Inch	mm
12401800	*15*	4.572	.1800				
12401820	*14*	4.623	.1820				
12401850	*13*	4.7	.1850				
12401875	3/16	4.763	.1875	2-3/4	70.	1-5/8	41.
12401890	*12*	4.801	.1890				
12401910	*11*	4.851	.1910				
12401935	*10*	4.915	.1935				
12401960	*9*	4.978	.1960				
12401969		5.	.1969				
12401990	*8*	5.055	.1990				
12402010	*7*	5.105	.2010				
12402031	13/64	5.159	.2031				
12402040	*6*	5.182	.2040				
12402055	*5*	5.22	.2055	3	76.	1-3/4	44.
12402090	*4*	5.309	.2090				
12402130	*3*	5.41	.2130				
12402165		5.5	.2165				
12402188	7/32	5.558	.2188				
12402210	*2*	5.613	.2210				
12402280	*1*	5.791	.2280				
12402340	*A*	5.944	.2340				
12402344	15/64	5.954	.2344				
12402362		6.	.2362				
12402380	*B*	6.045	.2380				
12402420	*C*	6.147	.2420	3-1/4	83.	2	51.
12402460	*D*	6.248	.2460				
12402500	1/4	6.35	.2500				
12402559		6.5	.2559				
12402570	*F*	6.528	.2570				
12402610	*G*	6.629	.2610				
12402656	17/64	6.746	.2656				
12402660	*H*	6.756	.2660				
12402720	*I*	6.909	.2720				
12402756		7.	.2756	3-1/2	89.	2-1/8	54.
12402770	*J*	7.036	.2770				
12402810	*K*	7.137	.2810				
12402812	9/32	7.142	.2812				
12402900	*L*	7.366	.2900				
12402950	*M*	7.493	.2950				
12402953		7.5	.2953				
12402969	19/64	7.541	.2969				
12403020	*N*	7.671	.3020	3-3/4	95.	2-3/8	60.
12403125	5/16	7.938	.3125				
12403150		8.	.3150				
12403160	*O*	8.026	.3160				
12403230	*P*	8.204	.3230				

Shk Ø = Cut Ø

EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"	
	Inch/ *Wire*	mm	Inch	Inch	mm	Inch	mm
12403281	21/64	8.334	.3281				
12403320	*Q*	8.433	.3320				
12403346		8.5	.3346				
12403390	*R*	8.611	.3390	4	102.	2-1/2	64.
12403438	11/32	8.733	.3438				
12403480	*S*	8.839	.3480				
12403543		9.	.3543				
12403580	*T*	9.093	.3580				
12403594	23/64	9.129	.3594				
12403680	*U*	9.347	.3680	4-1/4	108.	2-3/4	70.
12403740		9.5	.3740				
12403750	3/8	9.525	.3750				
12403770	*V*	9.576	.3770				
12403860	*W*	9.804	.3860				
12403906	25/64	9.921	.3906				
12403937		10.	.3937				
12403970	*X*	10.084	.3970				
12404040	*Y*	10.262	.4040				
12404062	13/32	10.317	.4062	4-1/2	114.	2-7/8	73.
12404130	*Z*	10.49	.4130				
12404134		10.5	.4134				
12404219	27/64	10.716	.4219				
12404331		11	.4331				
12404375	7/16	11.113	.4375				
12404528		11.5	.4528				
12404531	29/64	11.509	.4531				
12404688	15/32	11.908	.4688				
12404724		12.	.4724	4-3/4	121.	3	76.
12404844	31/64	12.304	.4844				
12404921		12.5	.4921				
12405000	1/2	12.7	.5000				

Shk Ø = Cut Ø

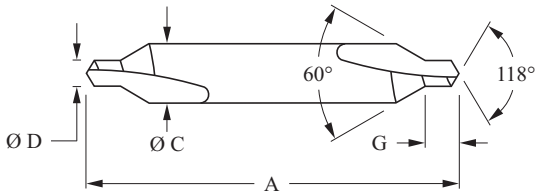
Solid Carbide, Double End Drill/Countersink

Style 144

Submicron solid carbide construction offers extreme rigidity.

- 118° four facet point.
- Right hand spiral, right hand cut.

Diameter Tolerances				
Nominal Size	Body Ø		Drill Ø	
	Inch	mm	Inch	mm
All	+.0000 -.0010	+0.000 -0.025	+.0030 -.0000	+0.076 -0.000



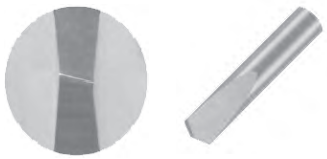
EDP #	Size Designation	Body Diameter "C"			Overall Length "A"		Drill Diameter "D"			Drill Length "G"	
	Inch	Inch	Decimal	mm	Inch	mm	Inch	Decimal	mm	Inch	mm
14400469	1	1/8	.1250	3.175	1-1/4	32.	3/64	.0469	1.191	3/64	1.2
14400781	2	3/16	.1875	4.763	1-7/8	48.	5/64	.0781	1.984	5/64	2.0
14401094	3	1/4	.2500	6.35	2	51.	7/64	.1094	2.779	7/64	2.8
14401250	4	5/16	.3125	7.938	2-1/8	54.	1/8	.1250	3.175	1/8	3.2
14401875	5	7/16	.4375	11.113	2-3/4	70.	3/16	.1875	4.763	3/16	4.8
14402188	6	1/2	.5000	12.7	3	76.	7/32	.2188	5.558	7/32	5.6

Solid Carbide, Spade Style, Die Drill

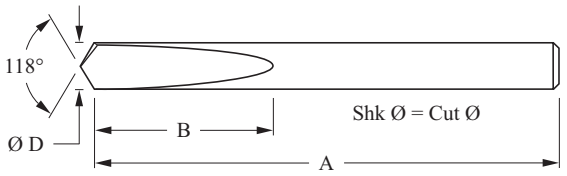
Style 151

Straight flute, right hand cut, heavy duty web reduces breakage drilling shallow holes in hardened steels.

- Solid carbide, 118° point.
- Also see drill Styles 150 &155.
- Not recommended for more than 2 x Ø deep.



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



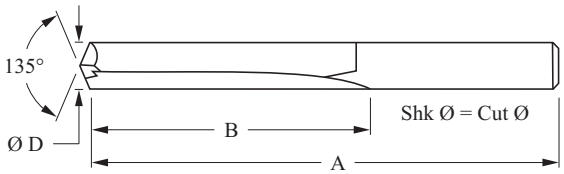
EDP #	Cutting Ø "D"		Decimal Equiv.	Overall Length "A"		Flute Length "B"	
	Inch	mm	Inch	Inch	mm	Inch	mm
15100625	1/16	1.588	.0625	1-1/2	38.	3/8	10.
15100781	5/64	1.984	.0781				
15100938	3/32	2.383	.0938	1-1/2	38.	7/16	11.
15101250	1/8	3.175	.1250			1/2	13.
15101562	5/32	3.967	.1562			9/16	14.
15101875	3/16	4.763	.1875	2	51.	11/16	17.
15102188	7/32	5.558	.2188				
15102500	1/4	6.35	.2500				
15102812	9/32	7.142	.2812	2	51.	7/8	22.
15103125	5/16	7.938	.3125	2-1/2	64.	7/8	22.
15103438	11/32	8.733	.3438			15/16	24.
15103750	3/8	9.525	.3750	2-1/2	64.	1-1/8	29.
15104062	13/32	10.317	.4062				
15104375	7/16	11.113	.4375	2-1/2	64.	1-3/16	30.
15104688	15/32	11.908	.4688				
15105000	1/2	12.7	.5000			1-5/16	33.

Phone: 630-690-5933 800-323-2299 Fax: 630-690-6355

Style 155

Straight flute, right hand cut, heavy web construction is ideal for high accuracy hole drilling in hard metal parts over 40 Rc/371 Hb and abrasive materials.

- 135° modified four facet notched thinned point.
- Submicron carbide grade.
- Produces reamer like hole finish, accurate hole size and can be used for coring out pre-existing holes.
- Clear chips frequently and leave 2 x Ø for chip exit.
- Also see die drill Styles 150 & 151.



Depth ≅ 3 x Ø

Diameter Tolerances				
Nominal Size	Cutting Ø		Shank Ø	
	Inch	mm	Inch	mm
All	+.0000 -.0005	+.0000 -.0254	+.0000 -.0020	+.0000 -.0508

EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"	
	Inch	mm	Inch	Inch	mm	Inch	mm
15500469	3/64	1.191	.0469	1-1/2	38.	1/2	13.
15500625	1/16	1.588	.0625	1-1/2	38.	5/8	16.
15500781	5/64	1.984	.0781	1-11/16	43.	11/16	17.
15500938	3/32	2.383	.0938	1-3/4	44.	3/4	19.
15501094	7/64	2.779	.1094	1-13/16	46.	13/16	21.
15501250	1/8	3.175	.1250	1-7/8	48.	7/8	22.
15501406	9/64	3.571	.1406	1-15/16	49.	15/16	24.
15501562	5/32	3.967	.1562	2-1/16	52.	1	25.
15501719	11/64	4.366	.1719	2-1/8	54.	1-1/16	27.
15501875	3/16	4.763	.1875	2-3/16	56.	1-1/8	29.
15502031	13/64	5.159	.2031	2-1/4	57.	1-3/16	30.
15502188	7/32	5.558	.2188	2-3/8	60.	1-1/4	32.
15502344	15/64	5.954	.2344	2-7/16	62.	1-5/16	33.
15502500	1/4	6.35	.2500	2-1/2	64.	1-3/8	35.
15502656	17/64	6.746	.2656	2-5/8	67.	1-7/16	37.

Shk Ø = Cut Ø

EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"	
	Inch	mm	Inch	Inch	mm	Inch	mm
15502812	9/32	7.142	.2812	2-11/16	68.	1-1/2	38.
15502969	19/64	7.541	.2969	2-3/4	70.	1-9/16	40.
15503125	5/16	7.938	.3125	2-13/16	71.	1-5/8	41.
15503281	21/64	8.334	.3281	2-15/16	75.	1-11/16	43.
15503438	11/32	8.733	.3438	3	76.	1-11/16	43.
15503594	23/64	9.129	.3594	3-1/16	78.	1-3/4	44.
15503750	3/8	9.525	.3750	3-1/8	79.	1-13/16	46.
15503906	25/64	9.921	.3906	3-1/4	83.	1-7/8	48.
15504062	13/32	10.317	.4062	3-5/16	84.	1-15/16	49.
15504219	27/64	10.716	.4219	3-3/8	86.	2	51.
15504375	7/16	11.113	.4375	3-7/16	87.	2-1/16	52.
15504688	15/32	11.908	.4688	3-5/8	92.	2-1/8	54.
15505000	1/2	12.7	.5000	3-3/4	95.	2-1/4	57.

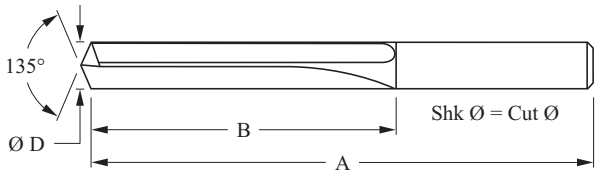
Shk Ø = Cut Ø

Style 153

Double margin, flat clearance construction produces reamer like finishes and resists walking when cutting aluminum castings, cast iron, cored holes and angular exits.

- Effective chip control up to 3.5 x Ø deep with flood coolant.
- High abrasion resistance carbide.
- Excellent tool life and easy to regrind four facet point.
- Straight flute, right hand cut.
- Step drill and coolant feeding designs available upon request.
- Allow 2.5 x Ø of flute for chip exit up to 1/4″ (6.35mm), 2 x Ø up to 7/16″ (11.1mm) and 1.5 x Ø over 7/16″.

Diameter Tolerances				
Nominal Size	Cutting Ø		Shank Ø	
	Inch	mm	Inch	mm
All	+.0000 -.0005	+0.000 -0.013	+.0000 -.0020	+0.000 -0.025



EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"	
	Inch	mm	Inch	Inch	mm	Inch	mm
15300938	3/32	2.383	.0938	2	51.	1	25.
15300984		2.5	.0984				
15301094	7/64	2.779	.1094	2-1/4	57.	1-1/4	32.
15301181		3.	.1181				
15301250	1/8	3.175	.1250				
15301378		3.5	.1378	2-1/2	64.	1-3/8	35.
15301406	9/64	3.571	.1406				
15301562	5/32	3.967	.1562				
15301575		4.	.1575				
15301719	11/64	4.366	.1719	2-3/4	70.	1-5/8	41.
15301772		4.5	.1772				
15301875	3/16	4.763	.1875				
15301969		5.	.1969	3	76.	1-3/4	44.
15302031	13/64	5.159	.2031				
15302165		5.5	.2165				
15302188	7/32	5.558	.2188				
15302344	15/64	5.954	.2344	3-1/4	83.	2	51.
15302362		6.	.2362				
15302500	1/4	6.35	.2500				
15302559		6.5	.2559				
15302656	17/64	6.746	.2656	3-1/2	89.	2-1/8	54.
15302756		7.	.2756				
15302812	9/32	7.142	.2812				
15302953		7.5	.2953	3-3/4	95.	2-3/8	60.
15302969	19/64	7.541	.2969				
15303125	5/16	7.938	.3125				
15303150		8.	.3150				
15303281	21/64	8.334	.3281	4	102.	2-1/2	64.
15303346		8.5	.3346				
15303438	11/32	8.733	.3438				
15303543		9.	.3543				
15303594	23/64	9.129	.3594	4-1/4	108.	2-3/4	70.

EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"	
	Inch	mm	Inch	Inch	mm	Inch	mm
15303740		9.5	.3740	4-1/4	108.	2-3/4	70.
15303750	3/8	9.525	.3750				
15303906	25/64	9.921	.3906	4-1/2	114.	2-7/8	73.
15303937		10.	.3937				
15304062	13/32	10.317	.4062				
15304134		10.5	.4134				
15304219	27/64	10.716	.4219				
15304331		11.	.4331				
15304375	7/16	11.113	.4375				
15304528		11.5	.4528				
15304531	29/64	11.509	.4531	4-3/4	121.	3	76.
15304688	15/32	11.908	.4688				
15304724		12.	.4724				
15304844	31/64	12.304	.4844				
15304921		12.5	.4921				
15305000	1/2	12.7	.5000				
15305118		13.	.5118	5	127.	3-1/4	83.
15305156	33/64	13.096	.5156				
15305312	17/32	13.492	.5312				
15305315		13.5	.5315				
15305469	35/64	13.891	.5469				
15305512		14.	.5512				
15305625	9/16	14.288	.5625				
15305709		14.5	.5709	5-1/4	133.	3-1/2	89.
15305781	37/64	14.684	.5781				
15305906		15.	.5906				
15305938	19/32	15.083	.5938				
15306094	39/64	15.479	.6094				
15306102		15.5	.6102				
15306250	5/8	15.875	.6250				
15306299		16	.6299				
15306875	11/16	17.463	.6875	5-1/2	140.	3-5/8	92.

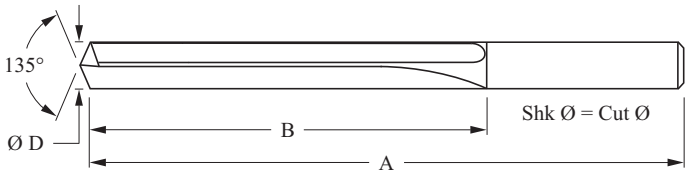
Shk Ø = Cut Ø

Phone: 630-690-5933 800-323-2299 Fax: 630-690-6355

Style 154

Double margin, flat clearance construction produces reamer like finishes and resists walking when cutting aluminum castings, cast iron, cored holes and angular exits.

- Effective chip control up to 3.5 x Ø deep with flood coolant.
- High abrasion resistance carbide.
- Straight flute, right hand cut.
- Excellent tool life and easy to regrind four facet point.
- Step drill and coolant feeding designs available upon request.
- Allow 2.5 x Ø of flute for chip exit up to 1/4″ (6.35mm), 2 x Ø up to 7/16″ (11.1mm) and 1.5 x Ø over 7/16″.



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

EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"	
	Inch	mm	Inch	Inch	mm	Inch	mm
15400938	3/32	2.383	.0938	2-15/16	75.	31/32	25.
15400984		2.5	.0984	3-9/32	83.	1-9/32	33.
15401094	7/64	2.779	.1094				
15401181		3.	.1181				
15401250	1/8	3.175	.1250				
15401378		3.5	.1378	3-1/2	89.	1-9/16	40.
15401406	9/64	3.571	.1406				
15401562	5/32	3.967	.1562				
15401575		4.	.1575	3-29/32	99.	1-7/8	48.
15401719	11/64	4.366	.1719				
15401772		4.5	.1772				
15401875	3/16	4.763	.1875				
15401969		5.	.1969	3-29/32	99.	2-1/16	52.
15402031	13/64	5.159	.2031				
15402165		5.5	.2165				
15402188	7/32	5.558	.2188				
15402344	15/64	5.954	.2344	5	127.	2-5/16	59.
15402362		6.	.2362				
15402500	1/4	6.35	.2500				
15402559		6.5	.2559	5	127.	2-9/16	65.
15402656	17/64	6.746	.2656				
15402756		7.	.2756				
15402812	9/32	7.142	.2812				
15402953		7.5	.2953	5	127.	2-13/16	71.
15402969	19/64	7.541	.2969				
15403125	5/16	7.938	.3125				
15403150		8.	.3150	5-1/2	140.	3	76.
15403281	21/64	8.334	.3281				
15403346		8.5	.3346				
15403438	11/32	8.733	.3438				
15403543		9.	.3543	5-1/2	140.	3-3/16	81.
15403594	23/64	9.129	.3594				

EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"	
	Inch	mm	Inch	Inch	mm	Inch	mm
15403740		9.5	.3740	5-1/2	140.	3-7/16	87.
15403750	3/8	9.525	.3750				
15403906	25/64	9.921	.3906				
15403937		10.	.3937				
15404062	13/32	10.317	.4062				
15404134		10.5	.4134	5-7/8	149.	3-11/16	94.
15404219	27/64	10.716	.4219				
15404331		11.	.4331				
15404375	7/16	11.113	.4375				
15404528		11.5	.4528	5-7/8	149.	3-29/32	99.
15404531	29/64	11.509	.4531				
15404688	15/32	11.908	.4688				
15404724		12.	.4724	6-5/16	160.	4-1/8	105.
15404844	31/64	12.304	.4844				
15404921		12.5	.4921				
15405000	1/2	12.7	.5000				
15405118		13.	.5118	6-5/8	168.	4-7/16	113.
15405156	33/64	13.096	.5156				
15405312	17/32	13.492	.5312				
15405315		13.5	.5315				
15405469	35/64	13.891	.5469				
15405512		14.	.5512				
15405625	9/16	14.288	.5625				
15405709		14.5	.5709	6-11/16	170.	4-7/8	124.
15405781	37/64	14.684	.5781				
15405906		15.	.5906				
15405938	19/32	15.083	.5938				
15406094	39/64	15.479	.6094				
15406102		15.5	.6102				
15406250	5/8	15.875	.6250				
15406299		16.	.6299				
15406875	11/16	17.463	.6875				

Shk Ø = Cut Ø

End Mill Guidelines

Select the shortest possible length of cut and largest end mill permissible for the application. This will allow greater rigidity, increased feed rates and improved tool life. Deflection and chip load will be less with a larger diameter end mill. The feed per tooth (FPT) value is a critical factor in choosing the proper end mill because this will determine the amount of material removed per tooth, workpiece finish and tool life.

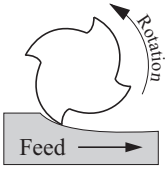
2-Flute end mills are excellent multi-purpose tools providing high feed rates with maximum chip volume and used for plunge milling, peripheral milling, roughing of slots and where dimensional accuracy and part finish is not critical. Use a two flute for milling softer materials at higher speeds & feeds when more chip space is needed or machine horsepower is not adequate.

4-Flute end mills are commonly used for finishing and dimensional accuracy. The added rigidity of a four flute makes it much stronger than a two flute allowing for greater metal removal rates, minimum deflection and improved workpiece finishes. Select a four flute for milling tougher materials at reduced speeds and feeds. Deep plunge cutting is not recommended.

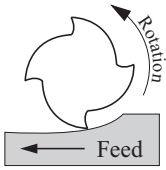
Speed/Feed

The proper selection of speed & feed are the two most important factors to be considered for the efficient and economical use of any style cutting tool. Approximate ranges of speeds & feeds can be found on page 25, and should be considered only a starting point as variations will be needed to achieve optimum results. Exact speed & feed will depend on machine condition, work holding fixture, type of tool material, material machinability, tool coatings, available coolant, etc. Solid carbide end mills should be run at greater speeds than high speed steel end mills so it is extremely important to maintain rigid set-ups and well maintained machinery.

Speeds should be increased when milling softer materials, lighter cuts or finishing. Decreased speeds should be used for a heavy or slotting cut and hard/tough materials. Reduce SFM as material hardness increases. Workpiece finish may improve with lighter cuts at higher speeds however a thick chip is desirable as a fine feed may cause rapid wear to the cutting edge. When milling hardened steels up to 60 Rc a tan colored chip indicates proper operating parameters. If chips are blue or dark blue the speeds are too high. White chips or no color change indicates the speeds are too low. Coolant is highly recommended when milling steel and high temperature alloys to improve performance and help prevent recutting of chips that may damage the tool cutting edge. The condition of the end mill should be monitored for the first sign of any dulling and be replaced or re-ground before permanent workpiece or tool damage occurs.



Climb Milling means the cutter revolves in the same direction as the table feed producing the thickest part of the chip first. Generally climb milling will improve surface finish and tool life.



Conventional Milling means the cutter revolves in the opposite direction of the table feed. The width of the chip starts at zero and increases to maximum at the end of the cut. Under some conditions this may lead to accelerated tool wear.

End Milling - Metal removal by feeding the workpiece into a revolving cutter.
Peripheral Milling - The machining of an edge surface of a part.
Plunge Cut - Direct plunging into the face of a part or feeding in an axial direction.

Tool Coatings

AlTiN (Aluminum Titanium Nitride) is a coating recommended for cutting all steels, cast iron, stainless steel, forming, die casting, hardened steel work-pieces, nickel based high temperature alloys and titanium alloys. AlTiN coating has excellent oxidation resistance in higher temperature conditions allowing dry or semi-dry machining with higher speed and feed rates.

TiCN (Titanium Carbonitride) is a high performance coating for improving wear resistence to abrasive or difficult to machine materials such as low carbon steel, cast iron and aluminum. TiCN coating is excellent for milling, forming and mechanically stressed cutting where high speed & feed rates are required and when low to moderate temperatures are generated at the cutting edge.

TiN (Titanium Nitride) is a general all purpose coating with excellent wear resistance, corrosion resistance and heat transmission with a wide variety of materials including stainless, hardened steels and iron based materials. Increase speed & feed and tool life by three to eight times depending on the application, coolant, etc.

Phone: 630-690-5933 800-323-2299 Fax: 630-690-6355

Solid Carbide Standard Length End Mills

SQUARE END


Style 304

Square end, four flute, center cutting, 30° right hand spiral, right hand cut. Also available with AlTiN or TiCN coating.

Page. 26


Style 302

Square end, two flute, center cutting, 30° right hand spiral, right hand cut. Also available with AlTiN or TiCN coating.

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BALL NOSE


Style 314

Ball nose, four flute, center cutting, 30° right hand spiral, right hand cut. Also available with AlTiN or TiCN coating.

Page. 28


Style 312

Ball nose, two flute, center cutting, 30° right hand spiral, right hand cut. Also available with AlTiN or TiCN coating.

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End Mill Speed and Feed Recommendations

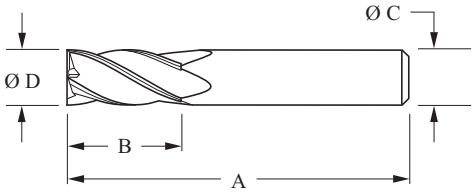
MATERIAL	SPEED (SFM)	FEED PER TOOTH (FPT)				
		1/8″	1/4″	1/2″	3/4″	1″
Aluminum /Aluminum Alloys	1000-2000	.001	.002	.004	.006	.008
Magnesium	1000-min	.001	.002	.004	.006	.008
Brass	300-450	.001	.002	.003	.004	.005
Bronze	250-350	.001	.002	.003	.004	.005
Copper / Copper Alloys	500-1,100	.001	.002	.003	.005	.007
FRP Thermoset	200-600	.001	.002	.003	.004	.005
Thermoplastics	800-1600	.001	.003	.006	.010	.015
Graphite	200-400	.001	.005	.010	.015	.020
Cast Iron - (ductile)	250-500	.0005	.0015	.002	.004	.006
(grey)	350-500	.0005	.002	.004	.006	.008
(malleable)	250-500	.0005	.002	.004	.006	.008
Nickel Alloys	150-250	.0005	.001	.002	.003	.004
Steel - (low carbon)	350-500	.0005	.001	.002	.004	.006
(medium carbon)	200-400	.0005	.001	.002	.004	.006
Steel Alloys - (39-45 Rc)	200-250	.0003	.0005	.001	.002	.003
(46-51 Rc)	80-150	.0002	.0005	.001	.002	.003
(52-86 Rc)	35-100	.0002	.0005	.001	.002	.003
Stainless Steel - (free machining)	250-350	.0005	.001	.002	.004	.006
(work hardening)	200-350	.0005	.005	.001	.003	.005
Titanium - (soft)	150-300	.0005	.001	.002	.004	.006
(hard)	50-150	.0005	.0005	.001	.002	.004

Note: The suggested speed and feed rates should be considered only a starting point to be adjusted in order to achieve optimum results.

Style 304 (Uncoated) / 304A (AlTiN) / 304C (TiCN)

- Standard length, 30° right hand spiral, right hand cut.
- For general purpose milling in a wide range of materials.
- Submicron carbide grade for increased wear resistance and toughness.
- Superior performance and tool life over H.S.S.

Diameter Tolerances						
Nominal Size			Cutting Ø		Shank Ø	
			Inch	mm	Inch	mm
Through		.2500″	+.000 -.002	+0.000 -0.051	+.000 -.0005	+0.000 -0.013
		6.35mm				
.2501″	To	1.0000″	+.000 -.003	+0.000 -0.076		
6.352mm		25.4mm				



EDP # For coating add the letter (A or C) after the EDP number.	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Length of Cut "B"		Shank Diameter "C"	
	Inch	mm	Inch	Inch	mm	Inch	mm	Inch	mm
30401250	1/8	3.175	.1250	1-1/2	38.	1/2	13.	1/8	3.175
30401562	5/32	3.967	.1562	2	51.	9/16	14.	3/16	4.763
30401875	3/16	4.763	.1875			5/8	16.		
30402188	7/32	5.558	.2188	2-1/2	64.			1/4	6.35
30402500	1/4	6.35	.2500			3/4	19.		
30402812	9/32	7.142	.2812					5/16	7.938
30403125	5/16	7.938	.3125	2-1/2	64.	13/16	21.		
30403438	11/32	8.733	.3438			7/8	22.	3/8	9.525
30403750	3/8	9.525	.3750			1	25.		
30404062	13/32	10.317	.4062	2-3/4	70.	1	25.	7/16	11.113
30404375	7/16	11.113	.4375						
30404688	15/32	11.908	.4688	3	76.	1	25.	1/2	12.7
30405000	1/2	12.7	.5000						
30405625	9/16	14.288	.5625	3-1/2	89.	1-1/4	32.	9/16	14.288
30406250	5/8	15.875	.6250					5/8	15.875
30407500	3/4	19.05	.7500	4	102.	1-1/2	38.	3/4	19.05
30408750	7/8	22.225	.8750					7/8	22.225
30410000	1	25.4	1.0000					1	25.4

Metric Sizes

EDP # For coating add the letter (A or C) after the EDP number.	Cutting Ø "D"	Dec. Equiv.	Overall Length "A"		Length of Cut "B"		Shank Diameter "C"
	mm	Inch	mm	Inch	mm	Inch	mm
30401181	3.	.1181	38.	1-1/2	12.	15/32	3.
30401575	4.	.1575	51.	2	14.	35/64	4.
30401969	5.	.1969			16.	5/8	5.
30402362	6.	.2362	64.	2-1/2	19.	3/4	6.
30402756	7.	.2756					8.
30403150	8.	.3150	64.	2-1/2	22.	55/64	8.
30403543	9.	.3543					10.
30403937	10.	.3937			25.	63/64	10.
30404724	12.	.4724	76.	3			12.
30405512	14.	.5512	89.	3-1/2	32.	1-17/64	14.
30406299	16.	.6299					16.
30407087	18.	.7087	102.	4	38.	1-1/2	18.
30407874	20.	.7874					20.
30408661	22.	.8661					22.
30409843	25.	.9843					25.

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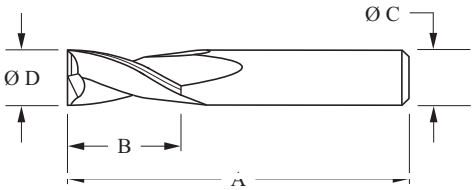
302C (TiCN) / 302A (AlTiN) / (Uncoated) Style 302

- Standard length, 30° right hand spiral, right hand cut.
- Two flute construction for maximum chip evacuation.
- Submicron carbide grade for increased wear resistance and toughness.
- Superior performance and tool life over H.S.S.



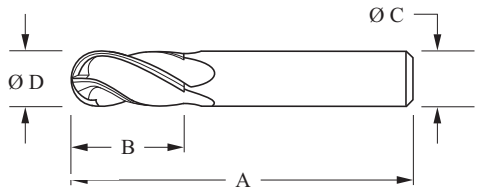
Diameter Tolerances						
Nominal Size			Cutting Ø		Shank Ø	
			Inch	mm	Inch	mm
Through		.2500″	+.000	+0.000	+.000	+0.000
		6.35mm	-.002	-0.051	-.0005	-0.013
.2501″	To	1.0000″	+.000	+0.000		
6.352mm		25.4mm	-.003	-0.076		

EDP # For coating add the letter (A or C) after the EDP number.	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Length of Cut "B"		Shank Diameter "C"	
	Inch	mm	Inch	Inch	mm	Inch	mm	Inch	mm
30201250	1/8	3.175	.1250	1-1/2	38.	1/2	13.	1/8	3.175
30201562	5/32	3.967	.1562	2	51.	9/16	14.	3/16	4.763
30201875	3/16	4.763	.1875			5/8	16.		
30202188	7/32	5.558	.2188	2-1/2	64.			1/4	6.35
30202500	1/4	6.35	.2500			3/4	19.		
30202812	9/32	7.142	.2812					5/16	7.938
30203125	5/16	7.938	.3125	2-1/2	64.	13/16	21.		
30203438	11/32	8.733	.3438			7/8	22.	3/8	9.525
30203750	3/8	9.525	.3750			1	25.		
30204062	13/32	10.317	.4062	2-3/4	70.	1	25.	7/16	11.113
30204375	7/16	11.113	.4375						
30204688	15/32	11.908	.4688	3	76.	1	25.	1/2	12.7
30205000	1/2	12.7	.5000						
30205625	9/16	14.288	.5625	3-1/2	89.	1-1/4	32.	9/16	14.288
30206250	5/8	15.875	.6250					5/8	15.875
30207500	3/4	19.05	.7500	4	102.	1-1/2	38.	3/4	19.05
30208750	7/8	22.225	.8750					7/8	22.225
30210000	1	25.4	1.0000					1	25.4

Style 314(Uncoated) / 314A(AlTiN) / 314C(TiCN)

- Standard length, 30° right hand spiral, right hand cut.
- Full radius ball for contour milling.
- Submicron carbide grade for increased wear resistance and toughness.
- Superior performance and tool life over H.S.S.

Diameter Tolerances					
Nominal Size		Cutting Ø		Shank Ø	
		Inch	mm	Inch	mm
Through	.2500″	+.000	+0.000	+.000	+0.000
	6.35mm	-.002	-0.051	-.0005	-0.013
.2501″	1.0000″	+.000	+0.000		
6.352mm To	25.4mm	-.003	-0.076		



EDP # For coating add the letter (A or C) after the EDP number.	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Length of Cut "B"		Shank Diameter "C"	
	Inch	mm	Inch	Inch	mm	Inch	mm	Inch	mm
31401250	1/8	3.175	.1250	1-1/2	38.	1/2	13.	1/8	3.175
31401562	5/32	3.967	.1562	2	51.	9/16	14.	3/16	4.763
31401875	3/16	4.763	.1875			5/8	16.		
31402188	7/32	5.558	.2188	2-1/2	64.			1/4	6.35
31402500	1/4	6.35	.2500			3/4	19.		
31402812	9/32	7.142	.2812					5/16	7.938
31403125	5/16	7.938	.3125	2-1/2	64.	13/16	21.		
31403438	11/32	8.733	.3438			7/8	22.	3/8	9.525
31403750	3/8	9.525	.3750			1	25.		
31404062	13/32	10.317	.4062	2-3/4	70.	1	25.	7/16	11.113
31404375	7/16	11.113	.4375						
31404688	15/32	11.908	.4688	3	76.	1	25.	1/2	12.7
31405000	1/2	12.7	.5000						
31405625	9/16	14.288	.5625	3-1/2	89.	1-1/4	32.	9/16	14.288
31406250	5/8	15.875	.6250					5/8	15.875
31407500	3/4	19.05	.7500	4	102.	1-1/2	38.	3/4	19.05
31408750	7/8	22.225	.8750					7/8	22.225
31410000	1	25.4	1.0000					1	25.4

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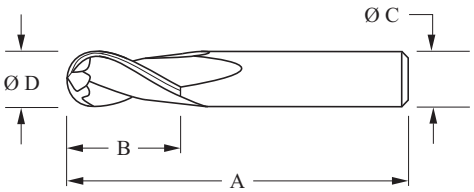
312C (TiCN) / 312A (AlTiN) / (Uncoated) Style 312

- Standard length, 30° right hand spiral, right hand cut.
- Two flute construction for maximum chip evacuation.
- Submicron carbide grade for increased wear resistance and toughness.
- Superior performance and tool life over H.S.S.



Diameter Tolerances						
Nominal Size			Cutting Ø		Shank Ø	
			Inch	mm	Inch	mm
Through		.2500″ / 6.35mm	+.000 -.002	+0.000 -0.051	+.000 -.0005	+0.000 -0.013
.2501″ / 6.352mm	To	1.0000″ / 25.4mm	+.000 -.003	+0.000 -0.076		

EDP # For coating add the letter (A or C) after the EDP number.	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Length of Cut "B"		Shank Diameter "C"	
	Inch	mm	Inch	Inch	mm	Inch	mm	Inch	mm
31201250	1/8	3.175	.1250	1-1/2	38.	1/2	13.	1/8	3.175
31201562	5/32	3.967	.1562	2	51.	9/16	14.	3/16	4.763
31201875	3/16	4.763	.1875			5/8	16.		
31202188	7/32	5.558	.2188	2-1/2	64.			1/4	6.35
31202500	1/4	6.35	.2500			3/4	19.		
31202812	9/32	7.142	.2812					5/16	7.938
31203125	5/16	7.938	.3125	2-1/2	64.	13/16	21.		
31203438	11/32	8.733	.3438			7/8	22.	3/8	9.525
31203750	3/8	9.525	.3750			1	25.		
31204062	13/32	10.317	.4062	2-3/4	70.	1	25.	7/16	11.113
31204375	7/16	11.113	.4375						
31204688	15/32	11.908	.4688	3	76.	1	25.	1/2	12.7
31205000	1/2	12.7	.5000						
31205625	9/16	14.288	.5625	3-1/2	89.	1-1/4	32.	9/16	14.288
31206250	5/8	15.875	.6250					5/8	15.875
31207500	3/4	19.05	.7500	4	102.	1-1/2	38.	3/4	19.05
31208750	7/8	22.225	.8750					7/8	22.225
31210000	1	25.4	1.0000					1	25.4

Special Tool Configurations

Special Overall and/or Flute Lengths
While we recommend using a standard overall and flute length whenever possible, there are situations where the use of special overall and/or flute lengths are warranted. If you have any questions on the relative merits of using special lengths, CJT's application specialists will be glad to be of assistance.

Special Point Geometries
With many applications, special point geometries can increase tool life and/or performance. Any type of point that can be put on a high speed drill can be put on a solid carbide drill and most on a carbide tipped drill with some exceptions.

Some of the special point geometries we offer:

- **Ball nose and radial lip point grinds**
- **Double angle points**
- **Flat points (180 degrees)**
- **Split points**
- **"K" notch points**
- **Zero and negative rake cutting edges**
- **Polyrake point**
- **Spur and Brad points**

Double Margin Drills
Both solid carbide and carbide tipped drills can be made with "double margin" construction for applications requiring added stability and straightness while drilling.

Multiple Diameter Step Tools
Drills, reamers and end mills can all be produced as step tools. Solid carbide and carbide tipped construction is available in non-coolant fed and with internal coolant holes.

Special Coatings
TiAlCN and Wc/C are two examples of the special coatings available. Our application specialist will help you determine which coating is appropriate for your application.

Ask our Application Specialist
The above are some examples of special purpose drill configurations we make. For more information on what we can produce or what we would recommend in special situations please contact CJT's application specialists.

Aerospace Specials
Refer to page 45 for more information.

Phone: 630-690-5933 800-323-2299 Fax: 630-690-6355

Carbide Tip Non-Coolant Fed Drills

GENERAL PURPOSE & AEROSPACE


Style 110 General purpose, screw machine length. For cast aluminum, bronze, cast and ductile irons, fiberglass, hard plastics and other abrasive materials. **Page. 32**


Style 115 General purpose, 135° split point, screw machine length. For cast aluminum, bronze, cast and ductile irons, titaniums, fiberglass, hard plastics and non-ferrous metals **Page. 34**


Style 120 General purpose, jobber length. For cast aluminum, bronze, cast and ductile irons, fiberglass, hard plastics, other non-ferrous materials. Not recommended for soft steels. **Page. 36**


Style 125 General purpose, 135° split point, jobber length. For cast aluminum, bronze, cast and ductile irons, titaniums, fiberglass, hard plastics and non-ferrous metals. **Page. 40**


Style 130 General purpose, taper length, tanged. For cast aluminum, bronze, cast and ductile irons, fiberglass, hard plastics and non-ferrous materials. **Page. 42**


Style 140 General purpose, Morse taper shank. For cast aluminum, bronze, cast and ductile irons, fiberglass, hard plastics and non-ferrous materials. **Page. 44**


Style 129 Aerospace, 135° NAS907 (P3) split point, aircraft (12") extension length. For cast aluminum, bronze, cast and ductile irons, titaniums, graphite, fiberglass, hard plastics and non-ferrous metals. **Page. 46**

HEAVY DUTY


Style 150 Hard steel, die drill. Extra thick carbide tip, high temperature braze. For hardened and case hardened steels. **Page. 48**

SPECIAL PURPOSE


Style 162 Precision glass and tile drill. Carbide tip offers excellent abrasion resistance when drilling glass, tile, mirrors and ceramics. **Page. 50**

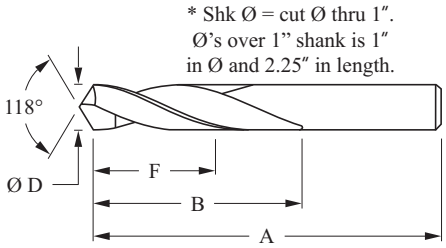

Style 163 Bowling Ball drill, Silver & Deming style. Brazed carbide tip on high helix masonry flute is ideal for the economic drilling of carbon, hard plastics, concrete, plaster, wall board, stone, brick and asphalt. **Page. 51**

Style 110

Premium carbide grade provides excellent wear resistance when cutting cast aluminum, bronze, cast and ductile irons, fiberglass, hard plastics and other abrasive materials. Not recommended for soft steels.

- Right hand spiral, right hand cut, heavy duty high speed steel body.
- 2 to 2.5 times faster speed of standard high speed steel yields faster holes with better hole finish.
- 118° cam relieved point, strong edge, free cutting.
- Allow 2.5 x Ø of flute for chip exit up to 1/4″ (6.35mm), 2 x Ø up to 7/16″ (11.1mm) and 1.5 x Ø over 7/16″.

Diameter Tolerances					
Nominal Size		Cutting Ø		Shank Ø	
		Inch	mm	Inch	mm
Through	.2500″	+.0000	+0.000	+.0000	+0.000
	6.35mm	-.0010	-0.025	-.0030	-0.076
.2501″	.5000″	+.0000	+0.000	+.0000	+0.000
6.36mm To	12.7mm	-.0010	-0.025	-.0045	-0.114
.5001″	And Up	+.0000	+0.000	+.0000	+0.000
12.7mm		-.0010	-0.025	-.0030	-0.076



EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Usable Flute at Full Regrind "F"		Grind Down Range	
	Inch/ *Wire*	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm
11001250	1/8	3.175	.1250	1-7/8	48.	7/8	22.	.52	13.	.0981 - .1290	2.492 - 3.277
11001378		3.5	.1378	2-1/16	52.	1	25.	.61	15.	.1291 - .1590	3.279 - 4.039
11001406	9/64	3.572	.1406								
11001562	5/32	3.967	.1562								
11001575		4.	.1575								
11001719	11/64	4.366	.1719	2-3/16	56.	1-1/8	29.	.70	18.	.1591 - .1910	4.041 - 4.851
11001772		4.5	.1772								
11001875	3/16	4.763	.1875								
11001969		5.	.1969	2-3/8	60.	1-1/4	32.	.72	18.	.1911 - .2210	4.854 - 5.613
11002010	*7*	5.105	.2010								
11002031	13/64	5.159	.2031								
11002130	*3*	5.41	.2130								
11002165		5.5	.2165								
11002188	7/32	5.558	.2188								
11002280	1	5.791	.2280	2-1/2	64.	1-3/8	35.	.83	21.	.2211 - .2530	5.616 - 6.426
11002344	15/64	5.954	.2344								
11002362		6.	.2362								
11002460	*D*	6.248	.2460								
11002500	1/4	6.35	.2500								
11002559		6.5	.2559	2-11/16	68.	1-1/2	38.	.88	22.	.2531 - .2840	6.429 - 7.214
11002570	*F*	6.528	.2570								
11002610	*G*	6.629	.2610								
11002656	17/64	6.746	.2656								
11002660	*H*	6.756	.2660								
11002720	*I*	6.909	.2720								
11002756		7.	.2756								
11002812	9/32	7.142	.2812								
11002953		7.5	.2953	2-13/16	71.	1-5/8	41.	1.0	25.	.2841 - .3160	7.216 - 8.026
11002969	19/64	7.541	.2969								
11003125	5/16	7.938	.3125								
11003150		8.	.3150								
11003160	*O*	8.026	.3160								

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Style 110

EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Usable Flute at Full Regrind "F"		Grind Down Range	
	Inch/ *Wire*	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm
11003281	21/64	8.334	.3281	3	76.	1-11/16	43.	1.0	25.	.3161 - .3470	8.029 - 8.814
11003320	*Q*	8.433	.3320								
11003346		8.5	.3346								
11003390	*R*	8.611	.3390								
11003438	11/32	8.733	.3438								
11003543		9.	.3543	3-1/8	79.	1-13/16	46.	1.0	27.	.3471 - .3780	8.816 - 9.601
11003594	23/64	9.129	.3594								
11003680	*U*	9.347	.3680								
11003740		9.5	.3740								
11003750	3/8	9.525	.3750								
11003860	*W*	9.804	.3860	3-5/16	84.	1-15/16	49.	1.1	28.	.3781 - .4100	9.604 - 10.414
11003906	25/64	9.921	.3906								
11003937		10.	.3937								
11003970	*X*	10.084	.3970								
11004062	13/32	10.317	.4062								
11004134		10.5	.4134	3-7/16	87.	2-1/16	52.	1.2	30.	.4101 - .4410	10.417 - 11.201
11004219	27/64	10.716	.4219								
11004331		11.	.4331								
11004375	7/16	11.113	.4375								
11004528		11.5	.4528	3-5/8	92.	2-1/8	54.	1.2	30.	.4411 - .4730	11.204 - 12.014
11004531	29/64	11.509	.4531								
11004688	15/32	11.908	.4688								
11004724		12.	.4724								
11004844	31/64	12.304	.4844	3 3/4	95.	2-1/4	57.	1.3	33.	.4731 - .5040	12.017 - 12.802
11004921		12.5	.4921								
11005000	1/2	12.7	.5000								
11005118		13.	.5118	3-7/8	98.	2-3/8	60.	1.4	36.	.5041 - .5340	12.804 - 13.564
11005312	17/32	13.492	.5312								
11005315		13.5	.5315								
11005512		14.	.5512	4	102.	2-1/2	64.	1.5	39.	.5341 - .5650	13.566 - 14.351
11005625	9/16	14.288	.5625								
11005938	19/32	15.083	.5938	4-1/8	105.	2-5/8	67.	1.6	41.	.5651 - .5960	14.354 - 15.138
11006250	5/8	15.875	.6250	4-1/4	108.	2-3/4	70.	1.7	44.	.5961 - .6280	15.141 - 15.951
11006562	21/32	16.667	.6562	4-1/2	114.	2-7/8	73.	1.8	46.	.6281 - .6590	15.954 - 16.739
11006875	11/16	17.463	.6875	4-5/8	117.					.6591 - .6900	16.741 - 17.526
11007188	23/32	18.258	.7188	4-3/4	121.	3	76.	1.9	48.	.6901 - .7210	17.529 - 18.313
11007500	3/4	19.05	.7500	5	127.	3-1/8	79.	2	51.	.7211 - .7530	18.316 - 19.126
11007812	25/32	19.842	.7812	5-1/8	130.	3-1/4	83.			.7531 - .7840	19.129 - 19.914
11008125	13/16	20.638	.8125	5-1/4	133.	3-3/8	86.	2.2	55.	.7841 - .8150	19.916 - 20.701
11008438	27/32	21.433	.8438	5-3/8	137.	3-1/2	89.	2.3	58.	.8151 - .8460	20.704 - 21.488
11008750	7/8	22.225	.8750	5-1/2	140.					.8461 - .8780	21.491 - 22.301
11009062	29/32	23.017	.9062	5-5/8	143.	3-5/8	92.	2.4	61.	.8781 - .9090	22.304 - 23.089
11009375	15/16	23.813	.9375	5-3/4	146.	3-3/4	95.	2.5	63.	.9091 - .9400	23.091 - 23.876
11009688	31/32	24.608	.9688	5-7/8	149.	3-7/8	98.	2.6	66.	.9401 - .9710	23.879 - 24.663
11010000	1*	25.4	1.0000	6	152.	4	102.	2.7	68.	.9711 - 1.0030	24.666 - 25.476
11010625	1-1/16*	26.988	1.0625	6-1/4	159.			2.6	66.	1.0310 - 1.0650	26.187 - 27.051
11011250	1-1/8*	28.575	1.1250	6-3/8	162.					1.0930 - 1.1280	27.762 - 28.651
11011875	1-3/16*	30.163	1.1875	6-5/8	168.	4-1/4	108.	2.7	69.	1.1560 - 1.1900	29.362 - 30.266
11012500	1-1/4*	31.75	1.2500	6-3/4	171.	4-3/8	111.	2.9	73.	1.2180 - 1.2530	30.937 - 31.826

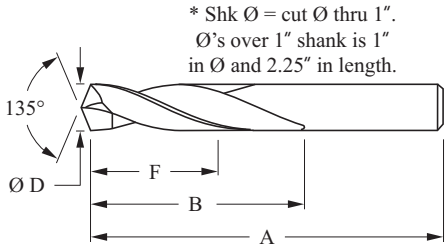
* Shk Ø = cut Ø thru 1″.
Ø's over 1″ shank is 1″
in Ø and 2.25″ in length

Style 115

Premium carbide grade provides excellent wear resistance when cutting cast aluminum, bronze, cast and ductile irons, titaniums, fiberglass, hard plastics and non-ferrous metals. Not recommended for soft steels.

- 135° four facet split point improves true position and is an excellent starting drill for longer coolant fed drills.
- 2 to 2.5 times faster speed than standard high speed steel with better hole finish.
- Right hand spiral, right hand cut, heavy duty high speed steel body.
- Allow 2.5 x Ø of flute for chip exit up to 1/4″ (6.35mm), 2 x Ø up to 7/16″ (11.1mm) and 1.5 x Ø over 7/16″.

Diameter Tolerances					
Nominal Size		Cutting Ø		Shank Ø	
		Inch	mm	Inch	mm
Through	.2500″	+.0000	+0.000	+.0000	+0.000
	6.35mm	-.0010	-0.025	-.0030	-0.076
.2501″	.5000″	+.0000	+0.000	+.0000	+0.000
6.36mm To	12.7mm	-.0010	-0.025	-.0045	-0.114
.5001″	And Up	+.0000	+0.000	+.0000	+0.000
12.7mm		-.0010	-0.025	-.0030	-0.076



EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Usable Flute at Full Regrind "F"		Grind Down Range	
	Inch/ *Wire*	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm
11501250	1/8	3.175	.1250	1-7/8	48.	7/8	22.	.52	13.	.0981 - .1290	2.492 - 3.277
11501378		3.5	.1378	2-1/16	52.	1	25.	.61	15.	.1291 - .1590	3.279 - 4.039
11501406	9/64	3.571	.1406								
11501562	5/32	3.967	.1562								
11501575		4.	.1575								
11501719	11/64	4.366	.1719	2-3/16	56.	1-1/8	29.	.70	18.	.1591 - .1910	4.041 - 4.851
11501772		4.5	.1772								
11501875	3/16	4.763	.1875								
11501969		5.	.1969	2-3/8	60.	1-1/4	32.	.72	18.	.1911 - .2210	4.854 - 5.613
11502010	*7*	5.105	.2010								
11502031	13/64	5.159	.2031								
11502130	3	5.41	.2130								
11502165		5.5	.2165								
11502188	7/32	5.558	.2188								
11502344	15/64	5.954	.2344	2-1/2	64.	1-3/8	35.	.83	21.	.2211 - .2530	5.616 - 6.426
11502362		6.	.2362								
11502460	*D*	6.248	.2460								
11502500	1/4	6.35	.2500								
11502559		6.5	.2559	2-11/16	68.	1-1/2	38.	.88	22.	.2531 - .2840	6.429 - 7.214
11502570	*F*	6.528	.2570								
11502610	*G*	6.629	.2610								
11502656	17/64	6.746	.2656								
11502720	*I*	6.909	.2720								
11502756		7.	.2756								
11502812	9/32	7.142	.2812								
11502953		7.5	.2953	2-13/16	71.	1-5/8	41.	1.0	25.	.2841 - .3160	7.216 - 8.026
11502969	19/64	7.541	.2969								
11503125	5/16	7.938	.3125								
11503150		8.	.3150								
11503160	*O*	8.026	.3160								
11503281	21/64	8.334	.3281	3	76.	1-11/16	43.	1.0	25.	.3161 - .3470	8.029 - 8.814
11503320	*Q*	8.433	.3320								

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Style 115

EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Usable Flute at Full Regrind "F"		Grind Down Range	
	Inch/ *Wire*	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm
11503346		8.5	.3346	3	76.	1-11/16	43.	1.0	25.	.3161 - .3470	8.029 - 8.814
11503390	*R*	8.611	.3390								
11503438	11/32	8.733	.3438								
11503543		9.	.3543	3-1/8	79.	1-13/16	46.	1.0	27.	.3471 - .3780	8.816 - 9.601
11503594	23/64	9.129	.3594								
11503680	*U*	9.347	.3680								
11503740		9.5	.3740								
11503750	3/8	9.525	.3750								
11503860	*W*	9.804	.3860	3-5/16	84.	1-15/16	49.	1.1	28.	.3781 - .4100	9.604 - 10.414
11503906	25/64	9.921	.3906								
11503937		10.	.3937								
11504062	13/32	10.317	.4062								
11504134		10.5	.4134	3-7/16	87.	2-1/16	52.	1.2	30.	.4101 - .4410	10.417 - 11.201
11504219	27/64	10.716	.4219								
11504331		11.	.4331								
11504375	7/16	11.113	.4375								
11504528		11.5	.4528	3-5/8	92.	2-1/8	54.	1.2	30.	.4411 - .4730	11.204 - 12.014
11504531	29/64	11.509	.4531								
11504688	15/32	11.908	.4688								
11504724		12.	.4724								
11504844	31/64	12.303	.4844	3-3/4	95.	2-1/4	57.	1.3	33.	.4731 - .5040	12.017 - 12.802
11504921		12.5	.4921								
11505000	1/2	12.7	.5000								
11505118		13.	.5118	3-7/8	98.	2-3/8	60.	1.4	36.	.5041 - .5340	12.804 - 13.564
11505312	17/32	13.492	.5312								
11505315		13.5	.5315								
11505512		14.	.5512	4	102.	2-1/2	64.	1.5	38.	.5341 - .5650	13.566 - 14.351
11505625	9/16	14.288	.5625								
11505938	19/32	15.083	.5938	4-1/8	105.	2-5/8	67.	1.6	41.	.5651 - .5960	14.354 - 15.138
11506250	5/8	15.875	.6250	4-1/4	108.	2-3/4	70.	1.7	43.	.5961 - .6280	15.141 - 15.951
11506562	21/32	16.667	.6562	4-1/2	114.	2-7/8	73.	1.8	46.	.6281 - .6590	15.954 - 16.739
11506875	11/16	17.463	.6875	4-5/8	117.					.6591 - .6900	16.741 - 17.526
11507188	23/32	18.256	.7188	4-3/4	121.	3	76.	1.9	48.	.6901 - .7210	17.529 - 18.313
11507500	3/4	19.05	.7500	5	127.	3-1/8	79.	2.0	51.	.7211 - .7530	18.316 - 19.126
11507812	25/32	19.842	.7812	5-1/8	130.	3-1/4	83.			.7531 - 7840	19.129 - 19.914
11508125	13/16	20.638	.8125	5-1/4	133.	3-3/8	86.	2.2	56.	.7841 - .8150	19.916 - 20.702
11508438	27/32	21.433	.8438	5-3/8	137.	3-1/2	89.	2.3	58.	.8151 - .8460	20.704 - 21.488
11508750	7/8	22.225	.8750	5-1/2	140.					.8461 - .8780	21.491 - 22.301
11509062	29/32	23.017	.9062	5-5/8	143.	3-5/8	92.	2.4	61.	.8781 - .9090	22.304 - 23.089
11509375	15/16	23.813	.9375	5-3/4	146.	3-3/4	95.	2.5	64.	.9091 - .9400	23.091 - 23.876
11509688	31/32	24.608	.9688	5-7/8	149.	3-7/8	98.	2.6	66.	.9401 - .9710	23.879 - 24.663
11510000	1*	25.4	1.0000	6	152.	4	102.	2.7	69.	.9711 - 1.0030	24.666 - 25.476
11510625	1-1/16*	26.988	1.0625	6-1/4	159.			2.6	66.	1.0310 - 1.0650	26.187 - 27.051
11511250	1-1/8*	28.575	1.1250	6-3/8	162.					1.0930 - 1.1280	27.762 - 28.651
11511875	1-3/16*	30.163	1.1875	6-5/8	168.	4-1/4	108.	2.7	69.	1.1560 - 1.1900	29.362 - 30.226
11512500	1-1/4*	31.75	1.2500	6-3/4	171.	4-3/8	111.	2.9	74.	1.2180 - 1.2530	30.937 - 31.826

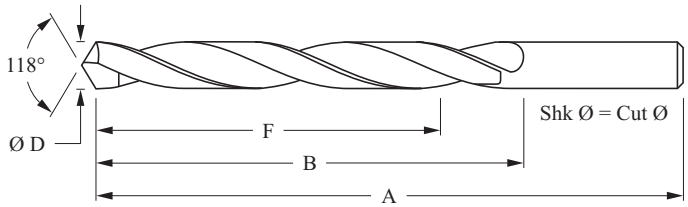
* Shk Ø = cut Ø thru 1″.
Ø's over 1″, shank is 1″
in Ø and 2.25″ in length

Style 120

Premium carbide grade provides excellent wear resistance when cutting cast aluminum, bronze, cast and ductile irons, fiberglass, hard plastics, other non-ferrous materials. Not recommended for soft steels.

- Right hand spiral, right hand cut, heavy duty high speed steel body.
- 2 to 2.5 times faster speed of standard high speed steel yields faster holes with better hole finish.
- 118° cam relieved point, strong edge, free cutting.
- Tang (automotive) drive available with quick delivery.
- For intermediate decimal sizes see grind down range column.
- Allow 2.5 x Ø of flute for chip exit up to 1/4″ (6.35mm), 2 x Ø up to 7/16″ (11.1mm) and 5 x Ø over 7/16″.

Diameter Tolerances					
Nominal Size		Cutting Ø		Shank Ø	
		Inch	mm	Inch	mm
Through	.2500″	+.0000	+0.000	+.0000	+0.000
	6.35mm	-.0007	-0.018	-.0030	-0.076
.2501″	.5000″	+.0000	+0.000	+.0000	+0.000
6.36mm To	12.7mm	-.0010	-0.025	-.0045	-0.114
.5001″	And Up	+.0000	+0.000	+.0000	+0.000
12.7mm		-.0010	-0.025	-.0030	-0.076



EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Usable Flute at Full Regrind "F"		Grind Down Range	
	Inch/ *Wire*	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm
12000980	*40*	2.489	.0980	2-3/4	70.	1-5/8	41.	1.3	32.	.0980 - .1290	2.489 - 3.277
12000995	*39*	2.527	.0995								
12001015	*38*	2.578	.1015								
12001040	*37*	2.642	.1040								
12001065	*36*	2.705	.1065								
12001094	7/64	2.778	.1094								
12001100	*35*	2.794	.1100								
12001110	*34*	2.819	.1110								
12001130	*33*	2.87	.1130								
12001160	*32*	2.946	.1160								
12001181		3.	.1181								
12001200	*31*	3.048	.1200								
12001220		3.1	.1220								
12001250	1/8	3.175	.1250								
12001260		3.2	.1260								
12001285	*30*	3.264	.1285								
12001299		3.3	.1299	3-1/8	79.	2	51.	1.6	41.	.1291 - .1590	3.279 - 4.039
12001339		3.4	.1339								
12001360	*29*	3.454	.1360								
12001378		3.5	.1378								
12001405	*28*	3.569	.1405								
12001406	9/64	3.571	.1406								
12001417		3.6	.1417								
12001440	*27*	3.658	.1440								
12001457		3.7	.1457								
12001470	*26*	3.734	.1470								
12001495	*25*	3.797	.1495								
12001496		3.8	.1496								
12001520	*24*	3.861	.1520								
12001535		3.9	.1535								
12001540	*23*	3.912	.1540								
12001562	5/32	3.967	.1562								
12001570	*22*	3.988	.1570								
12001575		4.	.1575								
12001590	*21*	4.039	.1590								

Shk Ø = Cut Ø

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Style 120

EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Usable Flute at Full Regrind "F"		Grind Down Range	
	Inch/ *Wire*	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm
12001610	*20*	4.089	.1610								
12001614		4.1	.1614								
12001654		4.2	.1654								
12001660	*19*	4.216	.1660								
12001693		4.3	.1693								
12001695	*18*	4.305	.1695								
12001719	11/64	4.366	.1719								
12001730	*17*	4.394	.1730								
12001732		4.4	.1732	3-1/2	89.	2-5/16	59.	1.9	48.	.1591 - .1910	4.041 - 4.851
12001770	*16*	4.496	.1770								
12001772		4.5	.1772								
12001800	*15*	4.572	.1800								
12001811		4.6	.1811								
12001820	*14*	4.623	.1820								
12001850	*13*	4.7	.1850								
12001875	3/16	4.763	.1875								
12001890	*12*	4.801	.1890								
12001910	*11*	4.851	.1910								
12001929		4.9	.1929								
12001935	*10*	4.915	.1935								
12001960	*9*	4.978	.1960								
12001969		5.	.1969								
12001990	*8*	5.055	.1990								
12002008		5.1	.2008								
12002010	*7*	5.105	.2010								
12002031	13/64	5.159	.2031								
12002040	*6*	5.182	.2040								
12002047		5.2	.2047	3-3/4	95.	2-1/2	64.	2	50.	.1911 - .2210	4.854 - 5.613
12002055	*5*	5.22	.2055								
12002087		5.3	.2087								
12002090	*4*	5.309	.2090								
12002126		5.4	.2126								
12002130	*3*	5.41	.2130								
12002165		5.5	.2165								
12002188	7/32	5.558	.2188								
12002205		5.6	.2205								
12002210	*2*	5.613	.2210								
12002244		5.7	.2244								
12002280	*1*	5.791	.2280								
12002283		5.8	.2283								
12002323		5.9	.2323								
12002340	*A*	5.944	.2340								
12002344	15/64	5.954	.2344								
12002362		6.	.2362								
12002380	*B*	6.045	.2380	4	102.	2-3/4	70.	2.2	56.	.2211 - .2530	5.616 - 6.426
12002402		6.1	.2402								
12002420	*C*	6.147	.2420								
12002441		6.2	.2441								
12002460	*D*	6.248	.2460								
12002480		6.3	.2480								
12002500	1/4	6.35	.2500								
12002520		6.4	.2520								
12002559		6.5	.2559								
12002570	*F*	6.528	.2570	4-1/4	108.	2-15/16	75.	2.3	59.	.2531 - .2840	6.429 - 7.214
12002598		6.6	.2598								
12002610	*G*	6.629	.2610								

Shk Ø = Cut Ø

Style 120

EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Usable Flute at Full Regrind "F"		Grind Down Range	
	Inch/ *Wire*	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm
12002638		6.7	.2638								
12002656	17/64	6.746	.2656								
12002660	*H*	6.756	.2660								
12002677		6.8	.2677								
12002717		6.9	.2717								
12002720	*I*	6.909	.2720	4-1/4	108.	2-15/16	75.	2.3	59.	.2531 - .2840	6.429 - 7.214
12002756		7.	.2756								
12002770	*J*	7.036	.2770								
12002795		7.1	.2795								
12002810	*K*	7.137	.2810								
12002812	9/32	7.142	.2812								
12002835		7.2	.2835								
12002874		7.3	.2874								
12002900	*L*	7.366	.2900								
12002913		7.4	.2913								
12002950	*M*	7.493	.2950								
12002953		7.5	.2953								
12002969	19/64	7.541	.2969								
12002992		7.6	.2992								
12003020	*N*	7.671	.3020	4-1/2	114.	3-3/16	81.	2.6	65.	.2841 - .3160	7.216 - 8.026
12003031		7.7	.3031								
12003071		7.8	.3071								
12003110		7.9	.3110								
12003125	5/16	7.938	.3125								
12003150		8.	.3150								
12003160	*O*	8.026	.3160								
12003189		8.1	.3189								
12003228		8.2	.3228								
12003230	*P*	8.204	.3230								
12003268		8.3	.3268								
12003281	21/64	8.334	.3281								
12003307		8.4	.3307								
12003320	*Q*	8.433	.3320	4-3/4	121.	3-7/16	87.	2.7	69.	.3161 - .3470	8.029 - 8.814
12003346		8.5	.3346								
12003386		8.6	.3386								
12003390	*R*	8.611	.3390								
12003425		8.7	.3425								
12003438	11/32	8.733	.3438								
12003465		8.8	.3465								
12003480	*S*	8.839	.3480								
12003504		8.9	.3504								
12003543		9.	.3543								
12003580	*T*	9.093	.3580								
12003583		9.1	.3583								
12003594	23/64	9.129	.3594								
12003622		9.2	.3622	5	127.	3-5/8	92.	2.9	73.	.3471 - .3780	8.816 - 9.601
12003661		9.3	.3661								
12003680	*U*	9.347	.3680								
12003701		9.4	.3701								
12003740		9.5	.3740								
12003750	3/8	9.525	.3750								
12003770	*V*	9.576	.3770								
12003780		9.6	.3780								
12003819		9.7	.3819	5-1/4	133.	3-7/8	98.	3.1	78.	.3781 - .4100	9.604 - 10.414
12003858		9.8	.3858								

Shk Ø = Cut Ø

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Style 120

EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Usable Flute at Full Regrind "F"		Grind Down Range	
	Inch/ *Wire*	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm
12003860	*W*	9.804	.3860	5-1/4	133.	3-7/8	98.	3.1	78.	.3781 - .4100	9.604 - 10.414
12003898		9.9	.3898								
12003906	25/64	9.921	.3906								
12003937		10.	.3937								
12003970	*X*	10.084	.3970								
12003976		10.1	.3976								
12004016		10.2	.4016								
12004040	*Y*	10.262	.4040								
12004055		10.3	.4055								
12004062	13/32	10.317	.4062								
12004094		10.4	.4094								
12004130	*Z*	10.49	.4130	5-1/2	140.	4-1/16	103.	3.2	81.	.4101 - .4410	10.417 - 11.201
12004134		10.5	.4134								
12004173		10.6	.4173								
12004213		10.7	.4213								
12004219	27/64	10.716	.4219								
12004252		10.8	.4252								
12004291		10.9	.4291								
12004331		11.	.4331								
12004370		11.1	.4370								
12004375	7/16	11.113	.4375								
12004409		11.2	.4409								
12004449		11.3	.4449	5-3/4	146.	4-5/16	110.	3.4	86.	.4411 - .4730	11.204 - 12.014
12004488		11.4	.4488								
12004528		11.5	.4528								
12004531	29/64	11.509	.4531								
12004567		11.6	.4567								
12004606		11.7	.4606								
12004646		11.8	.4646								
12004685		11.9	.4685								
12004688	15/32	11.908	.4688								
12004724		12.	.4724								
12004764		12.1	.4764	6	152.	4-1/2	114.	3.5	90.	.4731 - .5040	12.017 - 12.802
12004803		12.2	.4803								
12004843		12.3	.4843								
12004844	31/64	12.304	.4844								
12004882		12.4	.4882								
12004921		12.5	.4921								
12004961		12.6	.4961								
12005000	1/2	12.7	.5000								
12005039		12.8	.5039								
12005079		12.9	.5079	6-5/8	168.	4-13/16	122.	3.9	98.	.5041 - .5340	12.804 - 13.564
12005118		13.	.5118								
12005156	33/64	13.096	.5156								
12005312	17/32	13.492	.5312								
12005469	35/64	13.891	.5469							.5341 - .5650	13.566 - 14.351
12005625	9/16	14.288	.5625								
12005781	37/64	14.684	.5781	6-5/8	168.	5-3/16	132.	3.8	97.	.5781 only	14.684
12005938	19/32	15.083	.5938	7-1/8	181.	5-3/16	132.	4.2	107.	.5651 - .5960	14.354 - 15.138
12006094	39/64	15.479	.6094							.5961 - .6280	15.141 - 15.951
12006250	5/8	15.875	.6250								
12006406	41/64	16.271	.6406					4.1	104.	.6281 - .6590	15.954 - 16.739
12006562	21/32	16.667	.6562								
12006719	43/64	17.066	.6719	7-5/8	194.	5-5/8	143.	4.5	114.	.6591 - .6900	16.741 - 17.526
12006875	11/16	17.463	.6875								

Shk Ø = Cut Ø

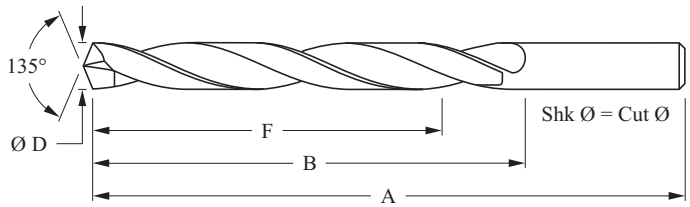
Style 125

Premium carbide grade provides excellent wear resistance when cutting cast aluminum, bronze, cast and ductile irons, titaniums, fiberglass, hard plastics and non-ferrous metals. Not recommended for soft steels.

- 135° four facet split point improves true position on CNC applications.
- 2 to 2.5 times faster speed than standard high speed steel with better hole finish.
- Tang (automotive) drive available with quick delivery.
- Right hand spiral, right hand cut, heavy duty high speed steel bodies.
- Allow 2.5 x Ø of flute for chip exit up to 1/4″ (6.35mm), 2 x Ø up to 7/16″ (11.1mm) and 1.5 x Ø over 7/16″.

Diameter Tolerances

Nominal Size			Cutting Ø		Shank Ø	
			Inch	mm	Inch	mm
Through		.2500″	+.0000	+0.000	+.0000	+0.000
		6.35mm	-.0007	-0.018	-.0030	-0.076
.2501″	To	.5000″	+.0000	+0.000	+.0000	+0.000
6.36mm		12.7mm	-.0010	-0.025	-.0045	-0.114
.5001″		And Up	+.0000	+0.000	+.0000	+0.000
12.7mm			-.0010	-0.025	-.0030	-0.076



EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Usable Flute at Full Regrind "F"		Grind Down Range	
	Inch/ *Wire*	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm
12501160	*32*	2.946	.1160	2-3/4	70.	1-5/8	41.	1.3	33.	.0980 - .1290	2.489 - 3.277
12501200	*31*	3.048	.1200								
12501250	1/8	3.175	.1250								
12501285	*30*	3.264	.1285								
12501360	*29*	3.454	.1360	3-1/8	79.	2	51.	1.6	41.	.1291 - .1590	3.279 - 4.039
12501405	*28*	3.569	.1405								
12501406	9/64	3.571	.1406								
12501440	*27*	3.658	.1440								
12501470	*26*	3.734	.1470								
12501495	*25*	3.797	.1495								
12501520	*24*	3.861	.1520								
12501540	*23*	3.912	.1540								
12501562	5/32	3.967	.1562								
12501570	*22*	3.988	.1570								
12501590	*21*	4.039	.1590								
12501610	*20*	4.089	.1610	3-1/2	89.	2-5/16	59.	1.9	48.	.1591 - .1910	4.041 - 4.851
12501660	*19*	4.216	.1660								
12501695	*18*	4.305	.1695								
12501719	11/64	4.366	.1719								
12501730	*17*	4.394	.1730								
12501770	*16*	4.496	.1770								
12501800	*15*	4.572	.1800								
12501820	*14*	4.623	.1820								
12501850	*13*	4.7	.1850								
12501875	3/16	4.763	.1875								
12501890	*12*	4.801	.1890								
12501910	*11*	4.851	.1910								
12501935	*10*	4.915	.1935	3-3/4	95.	2-1/2	64.	2	51.	.1911 - .2210	4.854 - 5.613
12501960	*9*	4.978	.1960								
12501990	*8*	5.055	.1990								
12502010	*7*	5.105	.2010								
12502031	13/64	5.159	.2031								
12502040	*6*	5.182	.2040								
12502055	*5*	5.22	.2055								
12502090	*4*	5.309	.2090								
12502130	*3*	5.41	.2130								

Shk Ø = Cut Ø

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Style 125

EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Usable Flute at Full Regrind "F"		Grind Down Range	
	Inch/ *Wire*	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm
12502188	7/32	5.558	.2188	3-3/4	95.	2-1/2	64.	2	51.	.1911 - .2210	4.854 - 5.613
12502210	*2*	5.613	.2210								
12502280	*I*	5.791	.2280	4	102.	2-3/4	70.	2.2	56.	.2211 - .2530	5.616 - 6.426
12502340	*A*	5.944	.2340								
12502344	15/64	5.954	.2344								
12502380	*B*	6.045	.2380								
12502420	*C*	6.147	.2420								
12502460	*D*	6.248	.2460								
12502500	1/4	6.35	.2500								
12502570	*F*	6.528	.2570	4-1/4	108.	2-15/16	75.	2.3	59.	.2531 - .2840	6.429 - 7.214
12502610	*G*	6.629	.2610								
12502656	17/64	6.746	.2656								
12502660	*H*	6.756	.2660								
12502720	*I*	6.909	.2720								
12502770	*J*	7.036	.2770								
12502810	*K*	7.137	.2810								
12502812	9/32	7.142	.2812								
12502900	*L*	7.366	.2900	4-1/2	114.	3-3/16	81.	2.6	66.	.2841 - .3160	7.216 - 8.026
12502950	*M*	7.493	.2950								
12502969	19/64	7.541	.2969								
12503020	*N*	7.671	.3020								
12503125	5/16	7.938	.3125								
12503160	*O*	8.026	.3160								
12503230	*P*	8.204	.3230	4-3/4	121.	3-7/16	87.	2.7	69.	.3161 - .3470	8.029 - 8.814
12503281	21/64	8.334	.3281								
12503320	*Q*	8.433	.3320								
12503390	*R*	8.611	.3390								
12503438	11/32	8.733	.3438								
12503480	*S*	8.839	.3480	5	127.	3-5/8	92.	2.9	74.	.3471 - .3780	8.816 - 9.601
12503580	*T*	9.093	.3580								
12503594	23/64	9.129	.3594								
12503680	*U*	9.347	.3680								
12503750	3/8	9.525	.3750								
12503770	*V*	9.576	.3770								
12503860	*W*	9.804	.3860	5-1/4	133.	3-7/8	98.	3.1	78.	.3781 - .4100	9.604 - 10.414
12503906	25/64	9.921	.3906								
12503970	*X*	10.084	.3970								
12504040	*Y*	10.262	.4040								
12504062	13/32	10.317	.4062								
12504130	*Z*	10.49	.4130	5-1/2	140.	4-1/16	103.	3.2	81.	.4101 - .4410	10.417 - 11.201
12504219	27/64	10.716	.4219								
12504375	7/16	11.113	.4375								
12504531	29/64	11.509	.4531	5-3/4	146.	4-5/16	110.	3.4	86.	.4411 - .4730	11.204 - 12.014
12504688	15/32	11.908	.4688								
12504844	31/64	12.304	.4844	6	152.	4-1/2	114.	3.5	89.	.4731 - .5040	12.017 - 12.802
12505000	1/2	12.7	.5000								
12505156	33/64	13.096	.5156	6-5/8	168.	4-13/16	122.	3.9	99.	.5041 - .5340	12.804 - 13.564
12505312	17/32	13.492	.5312								
12505469	35/64	13.891	.5469	6-5/8	168.	4-13/16	122.	3.9	99.	.5341 - .5650	13.566-14.351
12505625	9/16	14.288	.5625								
12505781	37/64	14.684	.5781	6-5/8	168.	5-3/16	132.	3.8	97.	.5781 only	14.684
12505938	19/32	15.083	.5938	7-1/8	181.	5-3/16	132.	4.2	107.	.5651 - .5960	14.354 - 15.138
12506094	39/64	15.479	.6094							.5961 - .6280	15.141 - 15.951
12506250	5/8	15.875	.6250								
12506406	41/64	16.271	.6406	7-1/8	181.	5-3/16	132.	4.1	104.	.6281 - .6590	15.954 - 16.739
12506562	21/32	16.667	.6562								
12506719	43/64	17.066	.6719	7-5/8	194.	5-5/8	143.	4.5	114.	.6591 - .6900	16.741 - 17.526
12506875	11/16	17.463	.6875								

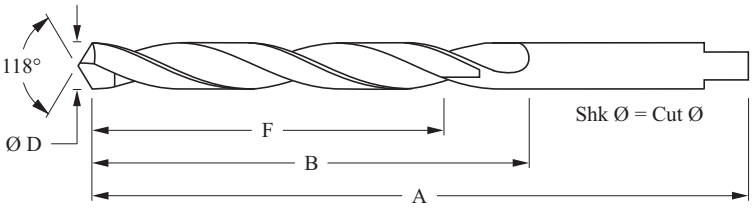
Shk Ø = Cut Ø

Style 130

Premium carbide grade provides excellent wear resistance when cutting cast aluminum, bronze, cast and ductile irons, fiberglass, hard plastics and non-ferrous materials.

- 118° cam relieved point, strong edge, free cutting.
- Right hand spiral, right hand cut, heavy duty high speed steel body.
- 2 to 2.5 times faster speed of standard high speed steel yields faster holes with better hole finish.
- Tanged shank provides positive drive.
- Allow 2.5 x Ø of flute for chip exit up to 1/4″ (6.35mm), 2 x Ø up to 7/16″ (11.1mm) and 1.5 x Ø over 7/16″.

Diameter Tolerances					
Nominal Size		Cutting Ø		Shank Ø	
		Inch	mm	Inch	mm
Through	.2500″	+.0000	+0.000	+.0000	+0.000
	6.35mm	-.0007	-0.018	-.0030	-0.076
.2501″	.5000″	+.0000	+0.000	+.0000	+0.000
6.36mm To	12.7mm	-.0010	-0.025	-.0045	-0.114
.5001″	And Up	+.0000	+0.000	+.0000	+0.000
12.7mm		-.0010	-0.025	-.0030	-0.076



EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Usable Flute at Full Regrind "F"		Grind Down Range	
	Inch	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm
13001250	1/8	3.175	.1250	5-1/8	130.	2-3/4	70.	2.4	61.	.0981 - .1290	2.492 - 3.277
13001406	9/64	3.571	.1406	5-3/8	137.	3	76.	2.6	66.	.1291 - .1590	3.279 - 4.039
13001562	5/32	3.967	.1562								
13001719	11/64	4.366	.1719	5-3/4	146.	3-3/8	86.	2.9	75.	.1591 - .1910	4.041 - 4.851
13001875	3/16	4.763	.1875								
13001969		5.	.1969	6	152.	3-5/8	92.	3.1	79.	.1911 - .2210	4.854 - 5.613
13002031	13/64	5.159	.2031								
13002165		5.5	.2165								
13002188	7/32	5.558	.2188								
13002344	15/64	5.954	.2344	6-1/8	156.	3-3/4	95.	3.2	81.	.2211 - .2530	5.616 - 6.426
13002362		6.	.2362								
13002500	1/4	6.35	.2500								
13002559		6.5	.2559	6-1/4	159.	3-7/8	98.	3.3	83.	.2531 - .2840	6.429 - 7.214
13002656	17/64	6.746	.2656								
13002756		7.	.2756								
13002812	9/32	7.142	.2812								
13002953		7.5	.2953	6-3/8	162.	4	102.	3.4	86.	.2841 - .3160	7.216 - 8.026
13002969	19/64	7.541	.2969								
13003125	5/16	7.938	.3125								
13003150		8.	.3150								
13003281	21/64	8.344	.3281	6-1/2	165.	4-1/8	105.	3.4	86.	.3161 - .3470	8.029 - 8.814
13003346		8.5	.3346								
13003438	11/32	8.733	.3438								
13003543		9.	.3543	6-3/4	171.	4-1/4	108.	3.5	88.	.3471 - .3780	8.816 - 9.601
13003594	23/64	9.129	.3594								
13003740		9.5	.3740								
13003750	3/8	9.525	.3750								
13003906	25/64	9.921	.3906	7	178.	4-3/8	111.	3.6	90.	.3781 - .4100	9.604 - 10.414
13003937		10.	.3937								
13004062	13/32	10.317	.4062								

Shk Ø = Cut Ø

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Style 130

EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Usable Flute at Full Regrind "F"		Grind Down Range	
	Inch	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm
13004134		10.5	.4134	7-1/4	184.	4-5/8	117.	3.8	96.	.4101 - .4410	10.417 - 11.201
13004219	27/64	10.716	.4219								
13004331		11.	.4331								
13004375	7/16	11.113	.4375								
13004528		11.5	.4528	7-1/2	191.	4-3/4	121.	3.8	96.	.4411 - .4730	11.204 - 12.014
13004531	29/64	11.509	.4531								
13004688	15/32	11.908	.4688								
13004724		12.	.4724								
13004844	31/64	12.304	.4844	7-3/4	197.	4-3/4	121.	3.8	96.	.4731 - .5040	12.017 - 12.802
13004921		12.5	.4921								
13005000	1/2	12.7	.5000								
13005118		13.	.5118	8	203.	4-3/4	121.	3.8	96.	.5041 - .5340	12.804 - 13.564
13005156	33/64	13.096	.5156								
13005312	17/32	13.492	.5312								
13005315		13.5	.5315								
13005469	35/64	13.891	.5469	8-1/4	210.	4-7/8	124.	3.9	99.	.5341 - .5650	13.566 - 14.351
13005512		14.	.5512								
13005625	9/16	14.288	.5625								
13005709		14.5	.5709	8-3/4	222.	4-7/8	124.	3.9	99.	.5651 - .5960	14.354 - 15.138
13005781	37/64	14.684	.5781								
13005906		15.	.5906								
13005938	19/32	15.083	.5938								
13006094	39/64	15.479	.6094	8-3/4	222.	4-7/8	124.	3.9	99.	.5961 - .6280	15.141 - 15.951
13006102		15.5	.6102								
13006250	5/8	15.875	.6250								
13006299		16.	.6299	9	229.	5-1/8	130.	4	103.	.6281 - .6590	15.954 - 16.739
13006406	41/64	16.271	.6406								
13006496		16.5	.6496								
13006562	21/32	16.667	.6562								
13006693		17.	.6693	9-1/4	235.	5-3/8	137.	4.3	108.	.6591 - .6900	16.741 - 17.526
13006719	43/64	17.066	.6719								
13006875	11/16	17.463	.6875								
13006890		17.5	.6890								
13007031	45/64	17.859	.7031	9-1/2	241.	5-5/8	143.	4.5	115.	.6901 - .7210	17.529 - 18.313
13007087		18.	.7087								
13007188	23/32	18.258	.7188								
13007283		18.5	.7283	9-3/4	248.	5-7/8	149.	4.7	120.	.7211 - .7530	18.316 - 19.126
13007344	47/64	18.654	.7344								
13007480		19.	.7480								
13007500	3/4	19.05	.7500								
13008125	13/16	20.638	.8125	10	254.	6-1/8	156.	4.9	125.	.7841 - .8150	19.916 - 20.701
13008750	7/8	22.225	.8750							.8461 - .8780	21.491 - 22.301
13009375	15/16	23.813	.9375	10-3/4	273.	6-1/8	156.	4.9	124.	.9091 - .9400	23.091 - 23.876
13010000	1	25.4	1.0000	11	279.	6-3/8	162.	5	128.	.9711 - 1.0030	24.666 - 25.476

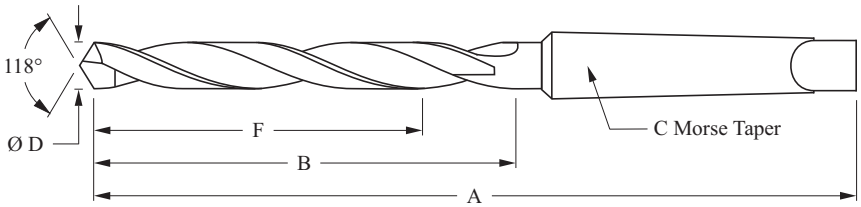
Shk Ø = Cut Ø

Style 140

Premium carbide grade provides excellent wear resistance when cutting cast aluminum, bronze, cast and ductile irons, fiberglass, hard plastics and non-ferrous materials.

- 118° cam relieved point, strong edge, free cutting.
- 2 to 2.5 times faster speed of standard high speed steel yields faster holes with better hole finish.
- Right hand spiral, right hand cut, high speed steel body, general purpose construction. (General purpose construction is not suitable for severe drilling applications. Heavy duty construction is priced on application.)
- Extra high temperature braze.
- Taper shank with positive drive.
- Allow 1.5 x Ø of flute for chip exit.

Diameter Tolerances			
Nominal Size		Cutting Ø	
		Inches	mm
Only	.5000″	+.0000 -.0010	+.0000 -.0254
	12.7mm		
Over	.5000″	+.0000 -.0015	+.0000 -.0381
	12.7mm		



EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Shk "C"	Usable Flute at Full Regrind "F"		Grind Down Range	
	Inch	mm	Inch	Inch	mm	Inch	mm	MT	Inch	mm	Inch	mm
14005000	1/2	12.7	.5000	8-1/4	210.	4-3/8	111.	2	3.4	86.	.4689 - .5000	11.91 - 12.7
14005312	17/32	13.492	.5312	8-1/2	216.	4-5/8	117.		3.7	93.	.5001 - .5312	12.703 - 13.492
14005625	9/16	14.288	.5625	8-3/4	222.	4-7/8	124.		3.9	99.	.5313 - .5625	13.495 - 14.288
14005938	19/32	15.083	.5938								.5626 - .5938	14.29 - 15.083
14006250	5/8	15.875	.6250							98.	.5939 - .6250	15.085 - 15.875
14006562	21/32	16.667	.6562	9	229.	5-1/8	130.	2	4	103.	.6251 - .6562	15.878 - 16.667
14006875	11/16	17.463	.6875	9-1/4	235.	5-3/8	137.		4.3	108.	.6563 - .6875	16.67 - 17.463
14007188	23/32	18.258	.7188	9-1/2	241.	5-5/8	143.		4.5	115.	.6876 - .7188	17.465 - 18.258
14007500	3/4	19.05	.7500	9-3/4	248.	5-7/8	149.		4.7	120.	.7189 - .7500	18.26 - 19.05
14007812	25/32	19.842	.7812	9-7/8	251.	6	152.		4.8	122.	.7501 - .7812	19.053 - 19.842
14008125	13/16	20.638	.8125	10-3/4	273.	6-1/8	156.	3	4.9	125.	.7813 - .8125	19.845 - 20.638
14008438	27/32	21.432	.8438								.8126 - .8438	20.640 - 21.431
14008750	7/8	22.225	.8750							124.	.8439 - .8750	21.435 - 22.225
14009062	29/32	23.017	.9062								.8751 - .9062	22.228 - 23.017
14009375	15/16	23.812	.9375								.9063 - .9375	23.020 - 23.813
14009688	31/32	24.608	.9688	11	279.	6-3/8	162.	3	5.1	129.	.9376 - .9688	23.815 - 24.608
14010000	1	25.4	1.0000						5	128.	.9689 - 1.0000	24.610 - 25.4
14010625	1-1/16	26.988	1.0625	11-1/4	286.	6-5/8	168.	3	5.2	132.	1.0001 - 1.0625	25.403 - 26.988
14011250	1-1/8	28.575	1.1250	12-3/4	324.	7-1/8	181.	4	5.7	144.	1.0930 - 1.1250	27.762 - 28.575
14011875	1-3/16	30.163	1.1875	13	330.	7-3/8	187.		5.9	149.	1.1560 - 1.1900	29.362 - 30.266
14012500	1-1/4	31.75	1.2500	13-1/2	343.	7-7/8	200.		6.4	162.	1.2180 - 1.2500	30.937 - 31.75

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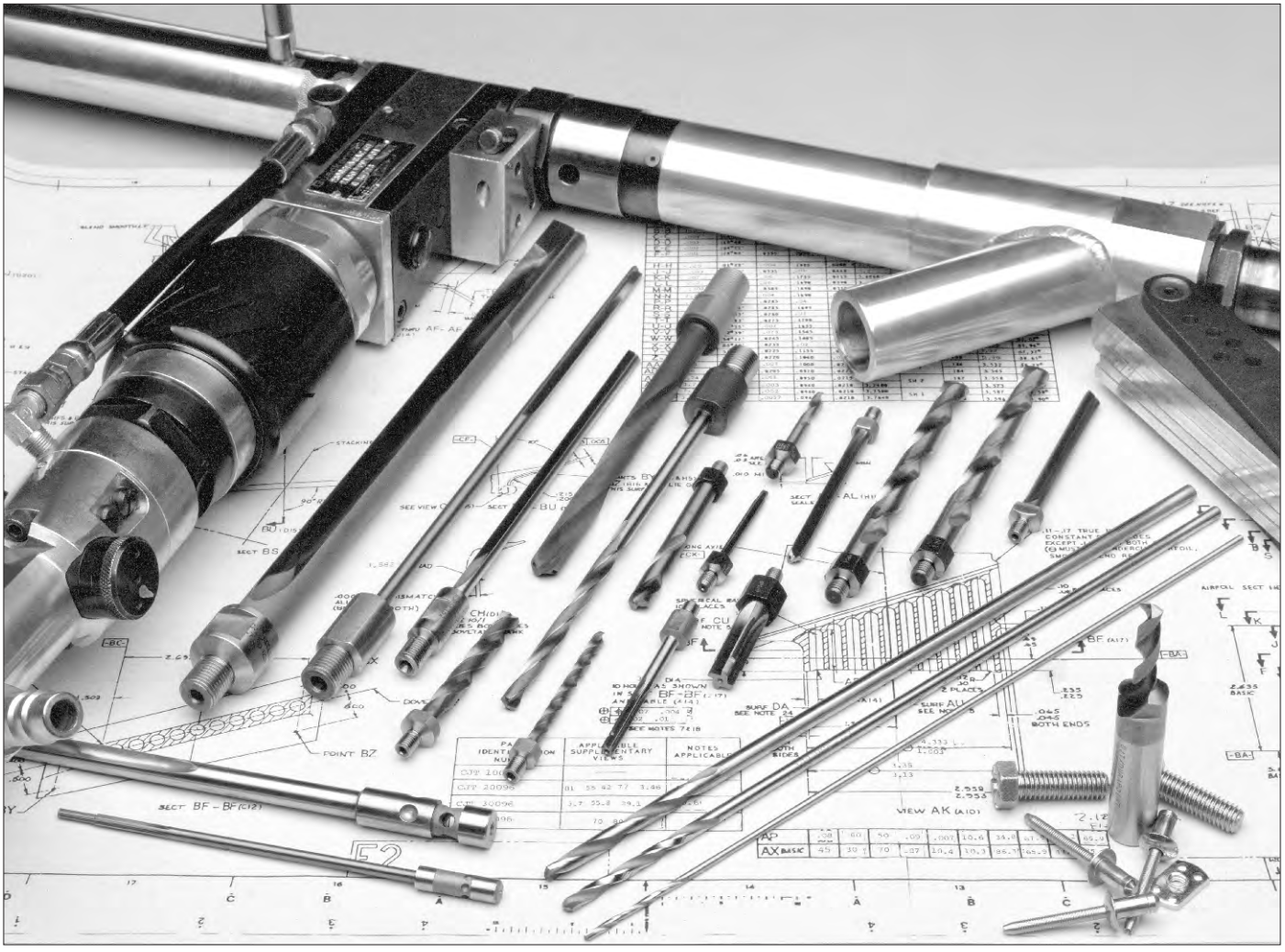
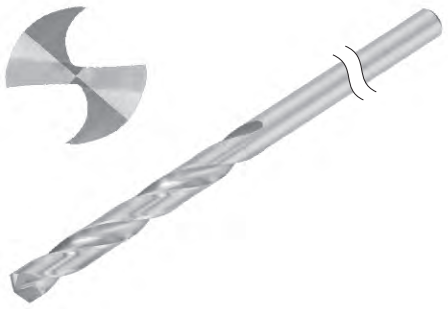
A large assortment of solid carbide and carbide tipped drills, reamers and coolant fed tooling can be adapted with threaded, extended and other specialized shanks for aerospace applications.



Style 129

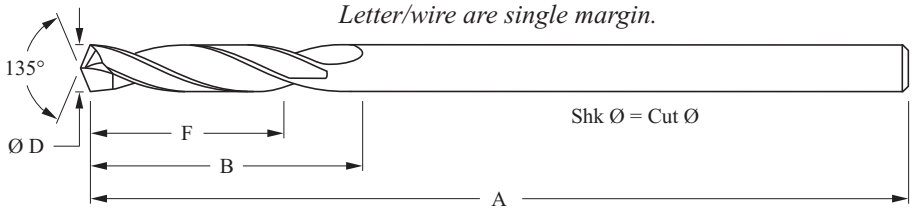
Premium carbide grade provides excellent wear resistance when cutting cast aluminum, bronze, cast and ductile irons, titaniums, graphite, fiberglass, hard plastics and non-ferrous metals. Not recommended for soft steels.



- Aircraft extension drills are used principally for the drilling of holes in inaccessible places which cannot be reached with regular length drills.
- 135° split point per NAS-907-P3 improves accuracy and decreases power consumption.
- 2 to 2.5 times faster speed than standard high speed steel with better hole finish.
- 6″ overall length, threaded shank adapters and eight facet point available upon request.
- Right hand spiral, right hand cut, heavy duty high speed steel bodies.
- Allow 2.5 x Ø up to 1/4″ (6.35mm), 2 x Ø up to 7/16″) 11.1mm) and over 7/16″ allow 1.5 x Ø of flute for chip exit.

Diameter Tolerances					
Nominal Size		Cutting Ø		Shank Ø	
		Inch	mm	Inch	mm
Through	.2500″	+.0000	+0.000	+.0000	+0.000
	6.35mm	-.0007	-0.018	-.0030	-0.076
.2501″	.5000″	+.0000	+0.000	+.0000	+0.000
6.36mm To	12.7mm	-.0010	-0.025	-.0045	-0.114
.5001″	And Up	+.0000	+0.000	+.0000	+0.000
12.7mm		-.0010	-0.025	-.0030	-0.076

Note: *Fractional sizes are double margin. Letter/wire are single margin.*



EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Usable Flute at Full Regrind "F"		Grind Down Range	
	Inch/ *Wire*	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm
12901160	*32*	2.946	.1160	12	305.	1-5/8	41.	1.3	33.	.0980 - .1290	2.489 - 3.277
12901200	*31*	3.048	.1200								
12901250	1/8	3.175	.1250								
12901285	*30*	3.264	.1285								
12901360	*29*	3.454	.1360	12	305.	2	51.	1.6	41.	.1291 - .1590	3.279 - 4.039
12901405	*28*	3.569	.1405								
12901406	9/64	3.571	.1406								
12901440	*27*	3.658	.1440								
12901470	*26*	3.734	.1470								
12901495	*25*	3.797	.1495								
12901520	*24*	3.861	.1520								
12901540	*23*	3.912	.1540								
12901562	5/32	3.967	.1562								
12901570	*22*	3.988	.1570								
12901590	*21*	4.039	.1590								
12901610	*20*	4.089	.1610	12	305.	2-5/16	59.	1.9	48.	.1591 - .1910	4.041 - 4.851
12901660	*19*	4.216	.1660								
12901695	*18*	4.305	.1695								
12901719	11/64	4.366	.1719								
12901730	*17*	4.394	.1730								
12901770	*16*	4.496	.1770								
12901800	*15*	4.572	.1800								
12901820	*14*	4.623	.1820								
12901850	*13*	4.7	.1850								
12901875	3/16	4.763	.1875								
12901890	*12*	4.801	.1890								
12901910	*11*	4.851	.1910								

Shk Ø = Cut Ø

Phone: 630-690-5933 800-323-2299 Fax: 630-690-6355

Style 129

EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Usable Flute at Full Regrind "F"		Grind Down Range	
	Inch/ *Wire*	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm
12901935	*10*	4.915	.1935	12	305.	2-1/2	64.	2	51.	.1911 - .2210	4.854 - 5.613
12901960	*9*	4.978	.1960								
12901990	*8*	5.055	.1990								
12902010	*7*	5.105	.2010								
12902031	13/64	5.159	.2031								
12902040	*6*	5.182	.2040								
12902055	*5*	5.22	.2055								
12902090	*4*	5.309	.2090								
12902130	*3*	5.41	.2130								
12902188	7/32	5.558	.2188								
12902210	*2*	5.613	.2210								
12902280	*1*	5.791	.2280	12	305.	2-3/4	70.	2.2	56.	.2211 - .2530	5.616 - 6.426
12902340	*A*	5.944	.2340								
12902344	15/64	5.954	.2344								
12902380	*B*	6.045	.2380								
12902420	*C*	6.147	.2420								
12902460	*D*	6.248	.2460								
12902500	1/4	6.35	.2500								
12902570	*F*	6.528	.2570	12	305.	2-15/16	75.	2.3	58.	.2531 - .2840	6.429 - 7.214
12902610	*G*	6.629	.2610								
12902656	17/64	6.746	.2656								
12902660	*H*	6.756	.2660								
12902720	*I*	6.909	.2720								
12902770	*J*	7.036	.2770								
12902810	*K*	7.137	.2810								
12902812	9/32	7.142	.2812								
12902900	*L*	7.366	.2900	12	305.	3-3/16	81.	2.6	66.	.2841 - .3160	7.216 - 8.026
12902950	*M*	7.493	.2950								
12902969	19/64	7.541	.2969								
12903020	*N*	7.671	.3020								
12903125	5/16	7.938	.3125								
12903160	*O*	8.026	.3160								
12903230	*P*	8.204	.3230	12	305.	3-7/16	87.	2.7	69.	.3161 - .3470	8.029 - 8.814
12903281	21/64	8.344	.3281								
12903320	*Q*	8.433	.3320								
12903390	*R*	8.611	.3390								
12903438	11/32	8.733	.3438								
12903480	*S*	8.839	.3480	12	305.	3-5/8	92.	2.9	74.	.3471 - .3780	8.816 - 9.601
12903580	*T*	9.093	.3580								
12903594	23/64	9.129	.3594								
12903680	*U*	9.347	.3680								
12903750	3/8	9.525	.3750								
12903770	*V*	9.576	.3770								
12903860	*W*	9.804	.3860	12	305.	3-7/8	98.	3.1	79.	.3781 - .4100	9.604 - 10.414
12903906	25/64	9.921	.3906								
12903970	*X*	10.084	.3970								
12904040	*Y*	10.262	.4040								
12904062	13/32	10.317	.4062								
12904130	*Z*	10.49	.4130	12	305.	4-1/16	103.	3.2	81.	.4101 - .4410	10.417 - 11.201
12904219	27/64	10.716	.4219								
12904375	7/16	11.113	.4375								
12904531	29/64	11.509	.4531	12	305.	4-5/16	110.	3.4	86.	.4411 - .4730	11.204 - 12.014
12904688	15/32	11.908	.4688								
12904844	31/64	12.304	.4844	12	305.	4-1/2	114.	3.5	89.	.4731 - .5040	12.017 - 12.802
12905000	1/2	12.7	.5000								

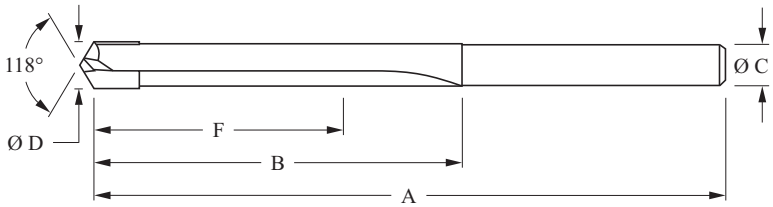
Shk Ø = Cut Ø

Style 150

Extra thick carbide tip, high temperature braze and heavy land construction withstand the heavy feed pressure necessary to penetrate hardened and case hardened steels over 45 Rc/421 Hb.

- 118° cam relieved notched thinned point decreases the thrust needed to penetrate hard materials.
- Straight flute, right hand cut, heavy duty high speed steel body.
- 20° negative rake and MN notch available for severe application drilling. Priced on request.
- Produces reamer like hole finish, accurate hole size and can be used for coring out pre-existing holes.
- Also see solid carbide die drill Styles 151 & 155.
- Allow 1.5-2 x Ø of flute for chip exit.

Diameter Tolerances					
Nominal Size		Cutting Ø		Shank Ø	
		Inch	mm	Inch	mm
Up to	.2500″	+.0000	+0.000	+.0000	+0.000
	6.35mm	-.0010	-0.025	-.0015	-0.038
Over	.2500″	+.0000	+0.000	+.0000	+0.000
	6.35mm	-.0015	-0.038	-.0015	-0.038



EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Usable Flute at full Regrind "F"		Shank Ø "C"		Grind Down Range		Ineffective Flute Length	
	Inch	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
15001719	11/64	4.366	.1719	3-1/2	89.	1-1/2	38.	.92	23.	5/32		.1701 - .1920	4.321 - 4.877	.34	9.
15001875	3/16	4.763	.1875							11/64					
15001969		5.	.1969	3-3/4	95.	1-3/4	44.	1.1	28.		4.5	.1921 - .2230	4.879 - 5.664	.41	10.
15002031	13/64	5.159	.2031							3/16					
15002165		5.5	.2165								5				
15002188	7/32	5.558	.2188							13/64					
15002344	15/64	5.954	.2344	4	102.	2	51.	1.3	34.	7/32		.2231 - .2550	5.667 - 6.477	.40	10.
15002362		6.	.2362								5.5				
15002500	1/4	6.35	.2500							15/64					
15002559		6.5	.2559	4-1/4	108.	2-1/4	57.	1.5	38.		6	.2551 - .2860	6.48 - 7.264	.49	13.
15002656	17/64	6.746	.2656							1/4					
15002756		7.	.2756								6.5				
15002812	9/32	7.142	.2812							17/64					
15002953		7.5	.2953	4-1/2	114.	2-1/2	64.	1.7	44.		7	.2861 - .3170	7.267 - 8.052	.46	12.
15002969	19/64	7.541	.2969							9/32					
15003125	5/16	7.938	.3125							19/64					
15003150		8.	.3150								7.5				
15003281	21/64	8.344	.3281	4-3/4	121.	2-3/4	70.	2	50.	5/16		.3171 - .3480	8.054 - 8.839	.47	12.
15003346		8.5	.3346								8				
15003438	11/32	8.733	.3438							21/64					
15003543		9.	.3543	5	127.	3	76.	2.2	56.		8.5	.3481 - .3800	8.842 - 9.652	.48	12.
15003594	23/64	9.129	.3594							11/32					
15003740		9.5	.3740								9				
15003750	3/8	9.525	.3750							23/64					

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Style 150

EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Usable Flute at full Regrind "F"		Shank Ø "C"		Grind Down Range		Ineffective Flute Length	
	Inch	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
15003906	25/64	9.921	.3906	5-1/4	133.	3	76.	2.1	53.	3/8		.3801-.4110	9.655-10.439	.57	14.
15003937		10.	.3937								9.5				
15004062	13/32	10.317	.4062							25/64					
15004134		10.5	.4134	5-1/2	140.	3	76.	2.1	53.		10	.4111-.4420	10.442-11.227	.65	17.
15004219	27/64	10.716	.4219							13/32					
15004331		11.	.4331								10.5				
15004375	7/16	11.113	.4375							27/64					
15004528		11.5	.4528	5-3/4	146.	3-1/4	83.	2.2	56.		11	.4421-.4730	11.229-12.014	.62	16.
15004531	29/64	11.509	.4531							7/16					
15004688	15/32	11.908	.4688							29/64					
15004724		12.	.4724								11.5				
15004844	31/64	12.304	.4844	6	152.	3-1/2	89.	2.4	61.	15/32		.4731-.5050	12.017-12.827	.68	17.
15004921		12.5	.4921								11.5				
15005000	1/2	12.7	.5000								11.908				
15005118		13.	.5118	6	152.	3-1/2	89.	2.4	61.		12.5	.5051-.5360	12.83-13.614	.70	18.
15005312	17/32	13.492	.5312							1/2					
15005315		13.5	.5315								12.5				
15005512		14.	.5512	6	152.	3-1/2	89.	2.4	61.		13	.5361-.5670	13.617-14.402	.63	16.
15005625	9/16	14.288	.5625							17/32					
15005938	19/32	15.083	.5938	7	178.	4	102.	2.9	74.	9/16		.5671-.5990	14.404-15.215	.65	16.
15006250	5/8	15.875	.6250					2.8	72.	19/32		.5991-.6300	15.217-16.002	.58	15.
15006562	21/32	16.667	.6562	7-1/2	191.	4-1/2	114.	3.3	84.	5/8		.6301-.6610	16.005-16.789	.65	17.
15006875	11/16	17.463	.6875					3.2	82.	21/32		.6611-.6930	16.792-17.602	.71	18.
15007188	23/32	18.258	.7188	8	203.	4-3/4	121.	3.5	88.	11/16		.6931-.7240	17.605-18.39	.61	16.
15007500	3/4	19.05	.7500					3.4	87.	23/32		.7241-.7560	18.392-19.202	.68	17.
15008125	13/16	20.638	.8125					3.3	84.	25/32		.7561-.8190	19.205-20.803	.69	18.
15008750	7/8	22.225	.8750	8	203.	4-3/4	121.	3.2	82.	27/32		.8191-.8820	20.805-22.403	.76	19.
15009375	15/16	23.813	.9375							29/32		.8821-.9450	22.405-24.003	.80	20.
15010000	1	25.4	1.000					3.1	80.	31/32		.9451-1.0070	24.006-25.578	.90	23.

Using the Die Drill as a Reamer or Core Drill

Many customers are using the die drill configuration as a very effective reamer or core drill for producing close diameter smooth holes.

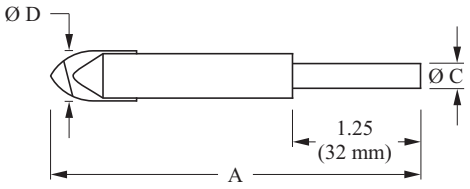
Many years ago we discovered the sizing characteristics of the straight fluted die drill. However because the straight flute cannot “lift chips” out of the hole to the depth that can be drilled from solid it is limited to several diameters at most in vertical applications. That’s why we developed the Koolcarb coolant feeding style drills. But in reaming or core drilling the die drill can be used to many more diameters deep than when drilling from solid.

Style 162

Carbide tip offers excellent abrasion resistance when drilling glass, tile, mirrors and ceramics.

- Precision ground spear point allows these fragile materials to be drilled with reduced cutting pressure to avoid cracking the material.
- 30 SFM using steady hand feed is recommended. Apply coolant generously or drill part submerged in a bath of lubricant.
- Right hand cut, high temperature braze.

Diameter Tolerances		
Nominal Size	Cutting Ø	
	Inch	mm
All	+.0060 -.0020	+0.152 -0.051



EDP #	Cutting Ø "D"		Decimal Equiv.		Overall Length "A"		Shank Ø "C"	
	Inch	mm	Inch	mm	Inch	mm	Inch	mm
16201250	1/8	3.175	.1250	3.175	2-1/2	64.	7/64	2.778
16201875	3/16	4.763	.1875	4.763			5/32	3.967
16202500	1/4	6.35	.2500	6.35			13/64	5.159
16203125	5/16	7.938	.3125	7.938	3	76.	1/4	6.35
16203750	3/8	9.525	.3750	9.525	3-1/2	89.	1/4	6.35
16204375	7/16	11.113	.4375	11.113				
16205000	1/2	12.7	.5000	12.7	3-5/8	92.	1/4	6.35
16205625	9/16	14.288	.5625	14.288	4	102.	3/8	9.525
16206250	5/8	15.875	.6250	15.875				

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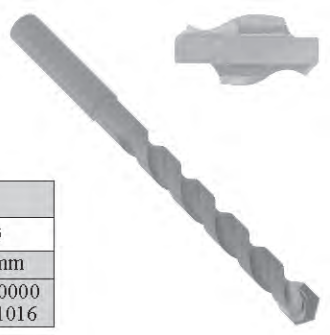
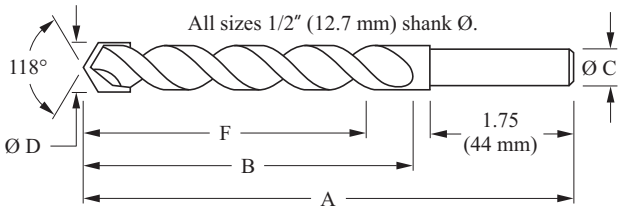
Carbide Tip, Bowling Ball Drill, (Silver & Deming Style)

Brazed carbide tip on high helix masonry flute is ideal for the economic drilling of carbon, hard plastics, concrete, plaster, wall board, stone, brick and asphalt.

Style 163

- Not recommended where precise hole sizing or close concentricity is required.
- Right hand spiral, right hand cut.





Diameter Tolerances				
Nominal Size	Cutting Ø		Shank Ø	
	Inch	mm	Inch	mm
All	+.0000 -.0015	+0.000 -.0381	+.0000 -.0040	+.0000 -.1016

EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Usable Flute at full Regrind "F"		Shank Ø "C"	
	Inch	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm
16305000	1/2	12.7	.5000	6-1/4	159.	4-1/4	108.	3.8	95.	1/2	12.7
16305312	17/32	13.492	.5312								
16305469	35/64	13.891	.5469					3.7	95.	1/2	12.7
16305625	9/16	14.288	.5625								
16305781	37/64	14.684	.5781								
16305938	19/32	15.083	.5938								
16306094	39/64	15.479	.6094	6-1/4	159.	4-1/4	108.	3.7	93.	1/2	12.7
16306250	5/8	15.875	.6250								
16306406	41/64	16.271	.6406								
16306562	21/32	16.667	.6562								
16306719	43/64	17.066	.6719								
16306875	11/16	17.463	.6875								
16307031	45/64	17.859	.7031								
16307188	23/32	18.258	.7188								
16307344	47/64	18.654	.7344								
16307500	3/4	19.05	.7500								
16307656	49/64	19.446	.7656								
16307812	25/32	19.842	.7812								
16307969	51/64	20.241	.7969	6-1/4	159.	4-1/4	108.	3.6	91.	1/2	12.7
16308125	13/16	20.638	.8125								
16308281	53/64	21.034	.8281								
16308438	27/32	21.433	.8438								
16308594	55/64	21.829	.8594								
16308750	7/8	22.225	.8750								
16308906	57/64	22.621	.8906								
16309062	29/32	23.017	.9062								
16309219	59/64	23.416	.9219								
16309375	15/16	23.813	.9375								
16309531	61/64	24.209	.9531								
16309688	31/32	24.606	.9688								
16309844	63/64	25.003	.9844								
16310000	1	25.4	1.0000								
16310156	1-1/64	25.796	1.0156	6-1/4	159.	4-1/4	108.	3.5	90.	1/2	12.7
16310312	1-1/32	26.192	1.0312								
16310469	1-3/64	26.591	1.0469								
16310625	1-1/16	26.988	1.0625								
16310781	1-5/64	27.384	1.0781								
16310938	1-3/32	27.783	1.0938								
16311094	1-7/64	28.179	1.1094								
16311250	1-1/8	28.575	1.1250								
16312500	1-1/4	31.75	1.2500	6-1/4	159.	4-1/4	108.	3.5	89.	1/2	12.7
16313750	1-3/8	34.925	1.3750								
16315000	1-1/2	38.1	1.5000								

Chucking Reamers

Reamers made to a tolerance other than standard (+.0003″ - .0000″) within the decimal range shown in decimal size range column may be priced using standard list price of closer fractional size plus the add on per piece as shown in the price list.
Semi-standards or decimal sizes within decimal size range shown are understood to have the exact same specifications (overall, flute length, shank configuration, number of flutes, etc.) as the closest fractional size within this range.

Important Factors in Reaming Operations

Proper Speed

Excessive speed will cause chatter and poor finish.

Proper Feed

Insufficient feed will cause glazing and excessive wear. Excessive feed will reduce accuracy and the quality of the finish.

Stock Removal

Insufficient stock removal will result in burnishing and will cause premature wear.

Proper Set Up

Reamers should have a minimum overhang and be run through a bushing whenever possible with a heavy flow of lubricant.

Reamer Feed Rates in Inch Per Revolution

Type	Material Group #	Speed SFM		Tool Diameter		
		Low	High	Ø 0.125 to 0.472	Ø 0.4721 to 0.878	Ø 0.879 to1.503
A1 < 5% Si	1	150	270	0.0030 to 0.0070	0.0050 to 0.0110	0.0070 to 0.0150
A1 > 5% Si	2					
Brass	3	125	200			
Bronze	4	100	160			
Cast Iron	5	80	160	0.0027 to 0.0063	0.0045 to 0.0100	0.0063 to 0.0137
Ductile Iron	6	55	110			
Steel < 35%C	7		90			
Steel > 35%C	8			0.0023 to 0.0057	0.0045 to 0.0090	0.0057 to 0.0123
Tool Steel	9	30	50			
Hard Steel	10	15	30	0.0017 to 0.0043	0.0050 to 0.0070	0.0043 to 0.0097
Stainless Steel - Free Machining	11	35	70	0.0023 to 0.0057	0.0040 to 0.0090	0.0057 to 0.0123
Stainless Steel	12	30	55			
Titanium	13	20	45	0.0027 to 0.0063	0.0045 to 0.0100	0.0063 to 0.0137
Soft High Temp. Alloy	14		35	0.0023 to 0.0057	0.0040 to 0.0090	0.0057 to 0.0123
Hard High Temp. Alloy	15	10	30	0.0020 to 0.0050	0.0035 to 0.0080	0.0050 to 0.0110
Plastics	16	35	70	0.0030 to 0.0070	0.0050 to 0.0110	0.0070 to 0.0150

For recommended stock removal and troubleshooting guide please see page 107.

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Carbide Tip Non-Coolant Fed Reamers / End Mills

REAMERS


Style 450

General purpose, straight flute, RHC. For reaming aluminum, cast iron, steels, plastics, and other abrasive materials.

Page. 54


Style 470

Right hand spiral, RHC. For better chip evacuation when used on ductile materials or blind holes.

Page. 56


Style 480

Straight flute, full flute carbide, RHC. Provides precision hole tolerances in aluminum, cast iron, steel, plastics and other abrasive materials

Page. 57


Style 490

Straight flute, expansion style, RHC, straight shank. Expansion adjustment screw is used to compensate for wear by allowing the reamer to be re-ground to original size.

Page. 58

END MILLS


Style 320

Four flute, straight flute. For milling cast, ductile and malleable iron as well as non-ferrous materials.

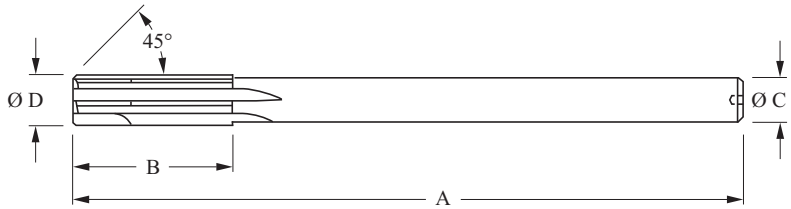
Page. 59

Style 450

General purpose reaming of aluminum, cast iron, steels, plastics, and other abrasive materials.

- Polished flutes for smooth chip flow.
- Carbide tipped, high speed steel bodies.
- Straight flute, right hand cut.
- Precision ground cutting edges.
- Use decimal size range column to determine the overall length, flute length and shank dimensions for modified and grind down reamers.

Diameter Tolerances				
Class of Tolerance	Cutting Ø		Shank Ø	
	Inch	mm	Inch	mm
Standard	+.0003 -.0000	+0.008 -0.000	+.0000 -.0010	+0.000 -0.025
Oversize/ Undersize *	+.0002 -.0000	+0.005 -0.000	+.0000 -.0010	+0.000 -0.025
Dowel Pin Size **	+.0000 -.0002	+0.000 -0.005	+.0000 -.0010	+0.000 -0.025



EDP #	Cutting Diameter "D"		Dec. Equiv.	Diam. Tol.	Overall Length "A"		Flute Length "B"		Shank Diameter "C"		Decimal Size Range		Ref. Tip Length	No of Flts.
	Inch	mm	Inch	Class	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	
45001855		4.712	.1855	* *										
45001865		4.737	.1865	*										
45001870		4.75	.1870	* *	4-1/2	114.	1-1/8	29.	11/64	4.366	.1770 - .1900	4.496 - 4.826		
45001875	3/16	4.763	.1875										.50	4
45001885		4.788	.1885	*										
45002031	13/64	5.159	.2031		5	127.	1-1/4	32.	3/16	4.763	.1901 - .2060	4.829 - 5.232		
45002188	7/32	5.558	.2188						13/64	5.159	.2061 - .2210	5.235 - 5.613		
45002344	15/64	5.954	.2344						7/32	5.558	.2211 - .2380	5.616 - 6.045		
45002480		6.299	.2480	* *										
45002490		6.325	.2490	*										
25002495		6.337	.2495	* *	6	152.	1-1/2	38.	15/64	5.954	.2381 - .2530	6.048 - 6.426		
45002500	1/4	6.35	.2500										.50	4
45002510		6.375	.2510	*										
45002656	17/64	6.746	.2656		6	152.	1-1/2	38.	15/64	5.954	.2531 - .2840	6.429 - 7.214		
45002812	9/32	7.142	.2812											
45002969	19/64	7.541	.2969											
45003105		7.887	.3105	* *										
45003115		7.912	.3115	*										
45003120		7.925	.3120	* *	6	152.	1-1/2	38.	9/32	7.142	.2841 - .3150	7.216 - 8.001		
45003125	5/16	7.938	.3125										.50	4
45003135		7.963	.3135	*										
45003281	21/64	8.334	.3281		6	152.	1-1/2	38.	9/32	7.142	.3151 - .3470	8.004 - 8.814		
45003438	11/32	8.733	.3438											
45003594	23/64	9.129	.3594											
45003730		9.474	.3730	* *										
45003740		9.5	.3740	*	7	178.	1-3/4	44.	5/16	7.938	.3471 - .3780	8.816 - 9.601	.50	4
45003745		9.512	.3745	* *										
45003750	3/8	9.525	.3750											
45003760		9.55	.3760	*										

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Style 450

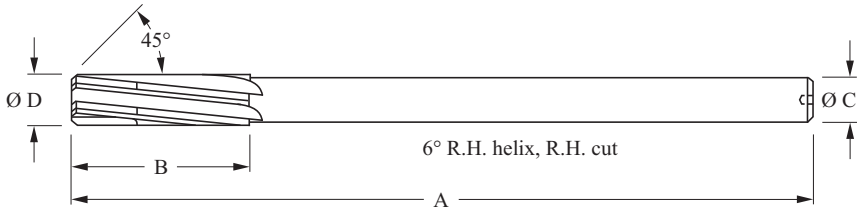
EDP #	Cutting Diameter "D"		Dec. Equiv.	Diam. Tol.	Overall Length "A"		Flute Length "B"		Shank Diameter "C"		Decimal Size Range		Ref. Tip Length	No of Flts.
	Inch	mm	Inch	Class	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	
45003906	25/64	9.921	.3906		7	178.	1-3/4	44.	5/16	7.938	.3781 - .4090	9.604 - 10.389		
45004062	13/32	10.317	.4062											
45004219	27/64	10.716	.4219		7	178.	1-3/4	44.	3/8	9.525	.4091 - .4410	10.391 - 11.201	.63	4
45004355		11.062	.4355	* *										
45004365		11.087	.4365	*										
45004370		11.1	.4370	* *										
45004375	7/16	11.113	.4375											
45004385		11.138	.4385	*										
45004531	29/64	11.509	.4531		7	178.	1-3/4	44.	3/8	9.525	.4411 - .4720	11.204 - 11.989		
45004688	15/32	11.908	.4688											
45004844	31/64	12.304	.4844		8	203.	2	51.	7/16	11.113	.4721 - .5030	11.991 - 12.776	.63	6
45004980		12.649	.4980	* *										
45004990		12.675	.4990	*										
45004995		12.687	.4995	* *										
45005000	1/2	12.7	.5000											
45005010		12.725	.5010	*										
45005156	33/64	13.096	.5156		8	203.	2	51.	7/16	11.113	.5031 - .5340	12.779 - 13.564		
45005312	17/32	13.492	.5312											
45005625	9/16	14.288	.5625								.5341 - .5660	13.566 - 14.376		
45005938	19/32	15.083	.5938								.5661 - .5970	14.379 - 15.164		
45006250	5/8	15.875	.6250		9	229.	2-1/4	57.	9/16	14.288	.5971 - .6280	15.166 - 15.951		
45006562	21/32	16.667	.6562								.6281 - .6590	15.954 - 16.739		
45006875	11/16	17.463	.6875								.6591 - .6910	16.741 - 17.551		
45007500	3/4	19.05	.7500		9-1/2	241.	2-1/2	64.	5/8	15.875	.7221 - .7530	18.341 - 19.126	.75	6
45008125	13/16	20.638	.8125								.7841 - .8160	19.916 - 20.726		
45008750	7/8	22.225	.8750		10	254.	2-5/8	67.	3/4	19.05	.8471 - .8780	21.516 - 22.301		
45009375	15/16	23.813	.9375								.9091 - .9410	23.091 - 23.901	.75	8
45010000	1	25.4	1.0000		10-1/2	267.	2-3/4	70.	7/8	22.225	.9721 - 1.0030	24.691 - 25.476		
45010625	1-1/16	26.988	1.0625								1.0031 - 1.0660	25.479 - 27.076		
45011250	1-1/8	28.575	1.1250		11	279.	2-7/8	73.	7/8	22.225	1.0661 - 1.1280	27.079 - 28.651		
45011875	1-3/16	30.163	1.1875						1	25.4	1.1281 - 1.1905	28.654 - 30.239		
45012500	1-1/4	31.75	1.2500		11-1/2	292.	3	76.	1	25.4	1.1906 - 1.2530	30.241 - 31.826		
45013750	1-3/8	34.925	1.3750		12	305.	3-1/4	83.	1	25.4	1.3156 - 1.3780	33.416 - 35.001		
45015000	1-1/2	38.1	1.5000		12-1/2	318.	3-1/2	89.	1-1/4	31.75	1.4406 - 1.5030	36.591 - 38.176		

Style 470

Right hand spiral, right hand cut construction has better chip evacuation when used on ductile materials or blind holes.

- Polished flutes for smooth chip flow.
- Carbide tipped, high speed steel bodies.
- Precision ground cutting edges.
- Use decimal size range column to determine the overall length, flute length and shank dimensions for modified and grind down reamers.

Diameter Tolerances				
Nominal Size	Cutting Ø		Shank Ø	
	Inch	mm	Inch	mm
All	+.0003 -.0000	+0.008 -0.000	+.0000 -.0010	+0.000 -0.025



EDP #	Cutting Diameter "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Shank Diameter "C"		Decimal Size Range		Ref. Tip Length	No. of Flts.
	Inch	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	
47002500	1/4	6.35	.2500	6	152.	1-1/2	38.	15/64	5.954	.2381-.2530	6.048-6.426	.50	4
47002812	9/32	7.142	.2812							.2531-.2840	6.429-7.214		
47003125	5/16	7.938	.3125					9/32	7.142	.2841-.3150	7.216-8.001		
47003438	11/32	8.733	.3438							.3151-.3470	8.004-8.814		
47003750	3/8	9.525	.3750	7	178.	1-3/4	44.	5/16	7.938	.3471-.3780	8.816-9.601		
47004062	13/32	10.317	.4062							.3781-.4090	9.604-10.389	.63	4
47004375	7/16	11.113	.4375					3/8	9.525	.4091-.4410	10.391-11.201		
47004688	15/32	11.908	.4688							.4411-.4720	11.204-11.989		
47005000	1/2	12.7	.5000	8	203.	2	51.	7/16	11.113	.4721-.5030	11.991-12.776		6
47005625	9/16	14.288	.5625							.5341-.5660	13.566-14.376		
47006250	5/8	15.875	.6250	9	229.	2-1/4	57.	9/16	14.288	.5971-.6280	15.166-15.951		
47006875	11/16	17.463	.6875							.6591-.6910	16.741-17.551		
47007500	3/4	19.05	.7500	9-1/2	241.	2-1/2	64.	5/8	15.875	.7221-.7530	18.341-19.126	.75	

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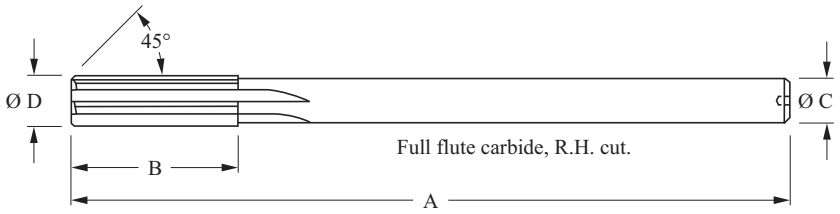
Carbide Tip, Full Flute Carbide, RHC Chucking Reamer

Full flute carbide provides precision hole tolerances on high production runs in aluminum, cast iron, steel, plastics and other abrasive materials.

Style 480

- Polished flutes for smooth chip flow.
- Carbide tipped, high speed steel bodies.
- Straight flute, right hand cut.
- Precision ground cutting edges.
- Use decimal size range column to determine the overall length, flute length and shank dimensions for modified and grind down reamers only.



Diameter Tolerances				
Nominal Size	Cutting Ø		Shank Ø	
	Inch	mm	Inch	mm
All	+.0003 -.0000	+0.008 -0.000	+.0000 -.0010	+0.000 -0.025

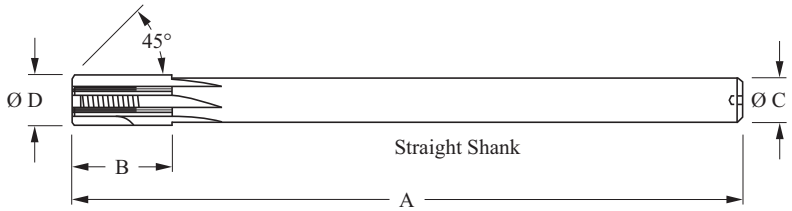
EDP #	Cutting Diameter "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Shank Diameter "C"		Decimal Size Range		No. of Flts.
	Inch	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm	
48002500	1/4	6.35	.2500	6	152.	1-1/2	38.	15/64	5.954	.2381 - .2530	6.048 - 6.426	4
48002812	9/32	7.142	.2812							.2531 - .2840	6.429 - 7.214	
48003125	5/16	7.938	.3125					9/32	7.142	.2841 - .3150	7.216 - 8.001	
48003438	11/32	8.733	.3438							.3151 - .3470	8.004 - 8.814	
48003750	3/8	9.525	.3750	7	178.	1-3/4	44.	5/16	7.938	.3471 - .3780	8.816 - 9.601	
48004062	13/32	10.317	.4062							.3781 - .4090	9.604 - 10.389	
48004375	7/16	11.113	.4375					3/8	9.525	.4091 - .4410	10.391 - 11.201	
48004688	15/32	11.908	.4688							.4411 - .4720	11.204 - 11.989	
48005000	1/2	12.7	.5000	8	203.	2	51.	7/16	11.113	.4721 - .5030	11.991 - 12.776	6
48005625	9/16	14.288	.5625							.5341 - .5660	13.566 - 14.376	
48006250	5/8	15.875	.6250	9	229.	2	51.	9/16	14.288	.5971 - .6280	15.166 - 15.951	
48006875	11/16	17.463	.6875							.6591 - .6910	16.741 - 17.551	
48007500	3/4	19.05	.7500	9-1/2	241.			5/8	15.875	.7221 - .7530	18.341 - 19.126	

Style 490

An expansion adjustment screw is used to compensate for wear by allowing the reamer to be reground to its original size.

- Polished flutes for smooth chip flow.
- Carbide tipped, high speed steel bodies.
- Straight flute, right hand cut.
- Precision ground cutting edges.
- This is not an adjustable reamer for producing holes of different sizes.
- These reamers have less rigidity than conventional solid types and must be used accordingly. Excessive amounts of stock removal will result in poorly finished holes.

Diameter Tolerances				
Nominal Size	Cutting Ø		Shank Ø	
	Inch	mm	Inch	mm
All	+.0003 -.0000	+0.008 -0.000	+.0000 -.0010	+0.000 -0.025



EDP #	Cutting Diameter "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Shank Diameter "C"		Ref. Tip Lng.	No. of Flts.
	Inch	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	
49003750	3/8	9.525	.3750	7	178.	1	25.	5/16	7.938	.50	4
49004375	7/16	11.113	.4375					3/8	9.525	.63	
49005000	1/2	12.7	.5000	8	203.	1	25.	7/16	11.113		6
49005625	9/16	14.288	.5625			1-1/8	29.				
49006250	5/8	15.875	.6250	9	229.	1-1/4	32.	9/16	14.288		
49006875	11/16	17.463	.6875								
49007500	3/4	19.05	.7500	9-1/2	241.	1-3/8	35.	5/8	15.875	.75	6
49008125	13/16	20.638	.8125								
49008750	7/8	22.225	.8750	10	254.	1-1/2	38.	3/4	19.05		8
49009375	15/16	23.813	.9375								
49010000	1	25.4	1.0000	10-1/2	267.	1-5/8	41.	7/8	22.225		
49011250	1-1/8	28.575	1.1250	11	279.	1-3/4	44.				
49012500	1-1/4	31.75	1.2500	11-1/2	292.	1-7/8	48.	1	25.4		
49013750	1-3/8	34.925	1.3750	12	305.	2	51.				

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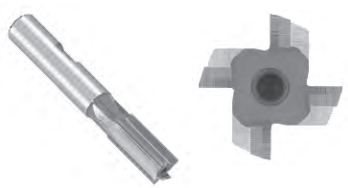
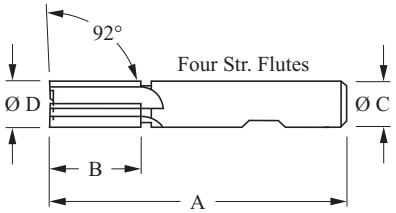
Carbide Tip, 4 Flute, Straight Flute End Mill

Carbide tipped, submicron grade for milling cast, ductile and malleable iron as well as non-ferrous materials.

Style 320



- Four straight flutes, right hand cut, non-center cutting.
- Machine horsepower must be adequate for this high capacity end mill.
- Sharp edge for smoother finish.
- Weldon shank is standard.



Diameter Tolerances				
Nominal Size	Cutting Ø		Shank Ø	
	Inch	mm	Inch	mm
All	+.0050 -.0000	+0.127 -0.000	+.0001 -.0006	+0.003 -0.015

EDP #	Cutting Diameter "D"		Dec. Equiv.	Overall Length "A"		Length of Carbide "B"		Shank Diameter "C"	
	Inch	mm	Inch	Inch	mm	Inch	mm	Inch	mm
32002500	1/4	6.35	.2500	2-1/2	64.	1/2	13.	3/8	9.525
32003125	5/16	7.938	.3125			5/8	16.		
32003750	3/8	9.525	.3750						
32004375	7/16	11.113	.4375	2-11/16	68.	1	25.		
32005000	1/2	12.7	.5000	3-1/4	83.			1/2	12.7
32005625	9/16	14.288	.5625	3-3/8	86.	1	25.		
32006250	5/8	15.875	.6250						
32007500	3/4	19.05	.7500	3-5/8	92.	1	25.	5/8	15.875
32008750	7/8	22.225	.8750	4	102.	1-1/4	32.		
32010000	1	25.4	1.0000					7/8	22.225
32011250	1-1/8	28.575	1.1250	4-1/4	108.	1-1/4	32.	1	25.4
32012500	1-1/4	31.75	1.2500						

CASE HISTORY for Style #293

Material: 17-4 PH
Machine type: VMC
Lubrication type: 50 PSI, synthetic
Tool diameter: .1875″
Hole depth: 1.125″ blind
SFM: 146
IPM: 9
Tool life per regrind: 1012″

Prior process: Solid carbide coolant fed, 146 SFM, 9.0 IPM, tool life 675″.
Results: Increased tool life by 50%

CASE HISTORY for Style #293

Material: 1045 steel cold draw, 180 Bhn Max.
Machine type: Lathe with precision alignment chuck
Lubrication type: 100 PSI, soluble oil thru
Tool diameter: .3438″
Hole depth: 2.1″
Spot: 120° x .100 Ø
SFM: 400
IPM: 33
New tool life: 700 holes (1.470″)
Note: Reground without recoat run 265 SFM x 17.6 IPM and are pulled at 350 holes life.

Prior process: High speed steel, TiN coated at 75 SFM x 5 IPM.

Results: CJT drill produced the holes over 600% faster than high speed steel drill.

CASE HISTORY for Style #293

Material: Nodular iron
Machine type: Vertical CNC mill
Lubrication type: 500 PSI synthetic
Tool diameter: .5938″
Hole depth: 3.1″
SFM: 275
IPM: 27.3
Tool life per regrind: 12,000 holes

Prior process: Solid carbide parabolic flute drill running at 225 SFM x 8.6 IPM.
Results: Customer eliminated spot drilling and was able to drill at over three times the penetration rate.

CASE HISTORY for Style #293

Material: 8620 steel
Machine type: Lathe
Lubrication type: 70 PSI soluble
Tool diameter: .1969″ (5.0 mm)
Hole depth: 1.06″
Spot: 90°
SFM: 216
IPM: 18 IPM with 2 pecks
Tool life per regrind: 1200 holes

Prior process: High speed steel parabolic flute

Results: Competitors drill lasted only 50 holes and took 2.5 times longer to drill a hole than CJT's style 293 drill

CASE HISTORY for Style #294

Material: Inconel 718, 35 Rc
Machine type: Vertical CNC
Lubrication type: 100 PSI soluble oil
Tool diameter: .2362″ (16 mm)
Hole depth: .93″ thru
Spot: 150°
SFM: 75
IPM: 2
Tool life per regrind: 55 holes

Prior process: Solid carbide 135° point twist non-coolant fed with peck drilling at 50 SFM x 1 IPM. Standard solid carbide lasts 9 holes.
Results: Customer received 600% increase in tool life between drill sharpening and eliminated the reaming pass by holding 100 RMS finish.

CASE HISTORY for Style #294

Material: G3500 cast iron
Machine type: Horizontal machining center
Lubrication type: 210 PSI semi-synthtic 7%
Tool diameter: .3346″
Hole depth: .79 to 1.18 thru and blind
SFM: 420
IPM: 64.0
Tool life per regrind: 3350 holes

Prior process: Solid carbide coolant fed drill running 42.0 IPM

Results: Increased penetration rate over 50%.

Phone: 630-690-5933 800-323-2299 Fax: 630-690-6355

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.

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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.

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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

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Style 175

Straight flute, extra length. For high carbon and tool steels, titanium, cast aluminum, bronze, cast iron, plastics and other abrasive materials

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Style 294(TiN) / 294A(TiAlN)

Available in TiN or TiAlN coating

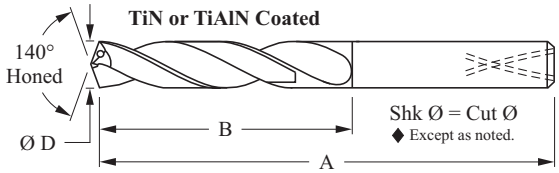
Submicron carbide grade provides maximum wear resistance when cutting steels, stainless steels, titanium, high temperature alloys, aluminum, bronze, cast and ductile iron.

- 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

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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

Style 293(TiN) / 293A(TiAlN)

Available in TiN or TiAlN coating

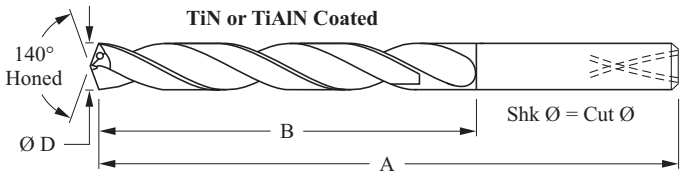
Submicron carbide grade provides maximum wear resistance when cutting steels, stainless steels, titanium, high temperature alloys, aluminum, bronze, cast and ductile iron.

- Coolant feeding S.C. Kooltwist® high performance drills yield higher penetration compared to non-coolant fed high performance drills when drilling deep holes.
- 140° double split point provides excellent chip flow over the entire cutting edge.
- High helix, right hand cut.
- Tool life is increased and peck drilling can be eliminated when used with high pressure coolant.
- Larger sizes available see Style 292.
- 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 ≅ 6 x Ø

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

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
29301250	1/8	3.175	.1250	3-11/32	85.	1-1/8	29.
29301260		3.2	.1260				
29301285	30	3.264	.1285				
29301299		3.3	.1299	3-5/8	92.	1-13/32	36.
29301339		3.4	.1339				
29301360	29	3.454	.1360				
29301378		3.5	.1378				
29301405	28	3.569	.1405				
29301406	9/64	3.572	.1406				
29301417		3.6	.1417				
29301440	*27*	3.658	.1440				
29301470	*26*	3.734	.1470				
29301495	*25*	3.797	.1495				
29301520	*24*	3.861	.1520				
29301540	*23*	3.912	.1540				
29301562	5/32	3.967	.1562				
29301570	*22*	3.988	.1570	3-5/8	92.	1-13/32	36.
29301575		4.	.1575				
29301590	*21*	4.039	.1590				
29301610	*20*	4.089	.1610				
29301614		4.1	.1614				
29301624		4.125	.1624				
29301654		4.2	.1654				
29301660	*19*	4.216	.1660				
29301673		4.25	.1673				
29301695	*18*	4.305	.1695				
29301719	11/64	4.366	.1719				
29301730	*17*	4.394	.1730				
29301770	*16*	4.496	.1770	3-25/32	96.	1-9/16	40.
29301772		4.5	.1772				
29301800	*15*	4.572	.1800				
29301820	*14*	4.623	.1820				

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
29301850	*13*	4.7	.1850	3-25/32	96.	1-9/16	40.
29301875	3/16	4.763	.1875				
29301890	*12*	4.8	.1890				
29301910	*11*	4.851	.1910				
29301929		4.9	.1929	3-15/16	100.	1-23/32	44.
29301935	*10*	4.915	.1935				
29301960	*9*	4.978	.1960				
29301969		5.	.1969				
29301990	*8*	5.055	.1990				
29302010	*7*	5.105	.2010				
29302031	13/64	5.159	.2031				
29302040	*6*	5.182	.2040				
29302055	*5*	5.22	.2055				
29302090	*4*	5.309	.2090				
29302130	*3*	5.41	.2130	4-1/8	105.	1-29/32	48.
29302165		5.5	.2165				
29302188	7/32	5.558	.2188				
29302205		5.6	.2205				
29302210	*2*	5.613	.2210				
29302280	*1*	5.791	.2280	4-5/16	110.	2-1/8	54.
29302340	*A*	5.944	.2340				
29302344	15/64	5.954	.2344				
29302362		6.	.2362				
29302380	*B*	6.045	.2380				
29302402		6.1	.2402				
29302420	*C*	6.147	.2420				
29302460	*D*	6.248	.2460				
29302480		6.3	.2480				
29302500	1/4	6.35	.2500				
29302520		6.4	.2520				
29302559		6.5	.2559				

Shk Ø = Cut Ø

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Style 293(TiN) / 293A(TiAlN)

Available in TiN or TiAlN coating

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
29302570	*F*	6.528	.2570	4-1/2	114.	2-1/4	57.
29302598		6.6	.2598				
29302610	*G*	6.629	.2610				
29302630		6.68	.2630				
29302656	17/64	6.746	.2656				
29302660	*H*	6.756	.2660				
29302697		6.85	.2697				
29302720	*I*	6.909	.2720				
29302756		7.	.2756				
29302770	*J*	7.036	.2770				
29302795		7.1	.2795				
29302810	*K*	7.137	.2810				
29302812	9/32	7.142	.2812				
29302835		7.2	.2835				
29302900	*L*	7.366	.2900	4-3/4	121.	2-17/32	64.
29302950	*M*	7.493	.2950				
29302953		7.5	.2953				
29302969	19/64	7.541	.2969				
29302992		7.6	.2992				
29303020	*N*	7.671	.3020				
29303071		7.8	.3071				
29303125	5/16	7.938	.3125				
29303150		8.	.3150				
29303160	*O*	8.026	.3160				
29303189		8.1	.3189				
29303230	*P*	8.204	.3230	5	127.	2-27/32	72.
29303281	21/64	8.334	.3281				
29303320	*Q*	8.433	.3320				
29303346		8.5	.3346				
29303370		8.56	.3370				
29303390	*R*	8.611	.3390				
29303438	11/32	8.733	.3438				
29303480	*S*	8.839	.3480	5-3/8	136.	3-5/32	80.
29303543		9.	.3543				
29303580	*T*	9.093	.3580				
29303594	23/64	9.129	.3594				
29303680	*U*	9.347	.3680				
29303740		9.5	.3740				
29303750	3/8	9.525	.3750				
29303770	*V*	9.576	.3770				
29303819		9.7	.3819	5-7/8	149.	3-5/16	84.
29303860	*W*	9.804	.3860				
29303906	25/64	9.921	.3906				
29303937		10.	.3937				
29303970	*X*	10.084	.3970				
29304040	*Y*	10.262	.4040				
29304062	13/32	10.317	.4062				
29304094		10.4	.4094				
29304130	*Z*	10.49	.4130				
29304134		10.5	.4134				
29304173		10.6	.4173				

Shk Ø = Cut Ø

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
29304219	27/64	10.716	.4219	6-7/32	158.	3-5/8	92.
29304252		10.8	.4252				
29304311		10.95	.4311				
29304331		11.	.4331				
29304375	7/16	11.113	.4375				
29304488		11.4	.4488				
29304528		11.5	.4528				
29304531	29/64	11.509	.4531	6-7/32	158.	3-25/32	96.
29304567		11.6	.4567				
29304688	15/32	11.908	.4688				
29304724		12.	.4724				
29304764		12.1	.4764				
29304844	31/64	12.304	.4844	6-9/32	160.	4-3/32	104.
29304882		12.4	.4882				
29304921		12.5	.4921				
29304961		12.6	.4961				
29305000	1/2	12.7	.5000				
29305079		12.9	.5079	6-9/32	160.	4-7/32	107.
29305118		13.	.5118				
29305156	33/64	13.096	.5156				
29305312	17/32	13.492	.5312				
29305315		13.5	.5315				
29305354		13.6	.5354				
29305433		13.8	.5433				
29305469	35/64	13.891	.5469				
29305512		14.	.5512				
29305625	9/16	14.288	.5625				
29305709		14.5	.5709				
29305748		14.6	.5748				
29305781	37/64	14.684	.5781				
29305906		15.	.5906				
29305938	19/32	15.083	.5938				

Shk Ø = Cut Ø

Larger sizes available see Style 292.

Style 292(TiN) / 292A(TiAlN)

Available in TiN or TiAlN coating

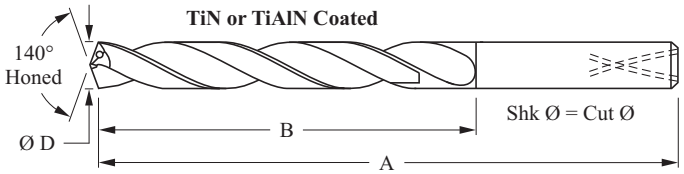
Submicron carbide grade provides maximum wear resistance when cutting steels, stainless steels, titanium, high temperature alloys, aluminum, bronze, cast and ductile iron.

- Coolant feeding S.C. Kooltwist® high performance drills yield higher penetration compared to non-coolant fed high performance drills when drilling deep holes.
- 140° double split point provides excellent chip flow over the entire cutting edge.
- High helix, right hand cut.
- Tool life is increased and peck drilling can be eliminated when used with high pressure coolant.
- Smaller sizes in jobber length available see Style 293.
- 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 x Ø of flute for chip exit.

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.

Depth ≅ 6 x Ø

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



EDP # For TiAlN coating add the letter (A) after EDP #	Cutting Diameter "D"		Decimal Equiv.	Overall Length "A"		Flute Length "B"	
	Inch	(mm)	Inch	Inch	(mm)	Inch	(mm)
29206094	39/64	15.479	.6094	7-15/16	202.	4-29/32	125.
29206102		15.5	.6102				
29206250	5/8	15.875	.6250				
29206299		16.	.6299	8-3/16	208.	5-5/32	131.
29206406	41/64	16.271	.6406				
29206496		16.5	.6496				
29206562	21/32	16.667	.6562				
29206693		17.	.6693	8-13/32	214.	5-3/8	137.
29206719	43/64	17.066	.6719				
29206875	11/16	17.463	.6875				
29206890		17.5	.6890				
29207031	45/64	17.859	.7031	8-13/32	214.	5-5/16	135.
29207087		18.	.7087				
29207188	23/32	18.258	.7188				
29207283		18.5	.7283	8-13/32	214.	5-5/16	135.
29207344	47/64	18.654	.7344				
29207480		19.	.7480				
29207500	3/4	19.05	.7500				

Shk Ø = Cut Ø

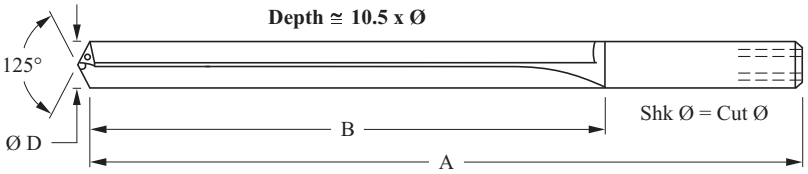
Phone: 630-690-5933 800-323-2299 Fax: 630-690-6355

Style 174

Submicron carbide grade provides maximum wear resistance when cutting tool steels, titanium, cast aluminum, bronze, cast iron, plastics, and other abrasive materials.

- Coolant feeding S.C. Koolcarb® double margin drills provide excellent hole straightness and smoother finish.
- 125° four facet web thinned point starts best into a larger point angle.
- Carbide body increases penetration rate over gundrills for use on machining centers.
- Smaller diameters available to .1181" (3.0 mm), larger diameters and step constructions available up to .9483" (25.0 mm).
- Straight flute, right hand cut.
- Allow 2.5 x Ø up to 1/4" (6.35mm), 2 x Ø up to 7/16" (11.1mm) and over 7/16" allow 1.5 x Ø of flute for chip exit.

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.



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

EDP #	Cutting Diameter "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"	
	Inch	mm	Inch	Inch	mm	Inch	mm
17401250	1/8	3.175	.1250	4-1/4	108.	1-13/16	46.
17401378		3.5	.1378	4-7/16	113.	2	51.
17401406	9/64	3.571	.1406				
17401562	5/32	3.967	.1562	4-21/32	118.	2-7/32	56.
17401575		4.	.1575				
17401719	11/64	4.366	.1719	4-7/8	124.	2-7/16	62.
17401772		4.5	.1772	5	127.	2-5/8	67.
17401875	3/16	4.763	.1875				
17401969		5.	.1969	5-1/4	133.	2-13/16	71.
17402031	13/64	5.159	.2031				
17402165		5.5	.2165	5-7/16	138.	3	76.
17402188	7/32	5.558	.2188				
17402344	16/64	5.954	.2344	5-3/4	146.	3-9/32	83.
17402362		6.	.2362				
17402500	1/4	6.35	.2500	5-7/8	149.	3-7/16	87.
17402656	17/64	6.746	.2656	6	152.	3-9/16	90.
17402812	9/32	7.142	.2812				
17402969	19/64	7.541	.2969	6-1/8	156.	3-11/16	94.
17403125	5/16	7.938	.3125				
17403281	21/64	8.334	.3281	6-1/4	159.	3-13/16	97.
17403438	11/32	8.733	.3438				

Shk Ø = Cut Ø

EDP #	Cutting Diameter "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"	
	Inch	mm	Inch	Inch	mm	Inch	mm
17403594	23/64	9.129	.3594	6-3/8	162.	3-15/16	100.
17403750	3/8	9.525	.3750				
17403906	25/64	9.921	.3906	6-1/2	165.	4-1/16	103.
17404062	13/32	10.317	.4062				
17404219	27/64	10.716	.4219	6-5/8	168.	4-3/16	106.
17404375	7/16	11.113	.4375				
17404531	29/64	11.509	.4531	6-3/4	171.	4-5/16	110.
17404688	15/32	11.908	.4688				
17404844	31/64	12.304	.4844	7	178.	4-9/16	116.
17405000	1/2	12.7	.5000				
17405156	33/64	13.096	.5156	7-1/8	181.	4-11/16	119.
17405312	17/32	13.492	.5312				
17405625	9/16	14.288	.5625	7-1/4	184.	4-13/16	122.
17405938	19/32	15.083	.5938				
17406250	5/8	15.875	.6250	7-3/8	187.	4-15/16	125.
17406562	21/32	16.667	.6562	7-1/2	191.	5-1/16	129.
17406875	11/16	17.463	.6875	7-5/8	194.	5-3/16	132.
17407188	23/32	18.258	.7188	7-3/4	197.	5-5/16	135.
17407500	3/4	19.05	.7500	7-7/8	200.	5-7/16	138.

Shk Ø = Cut Ø

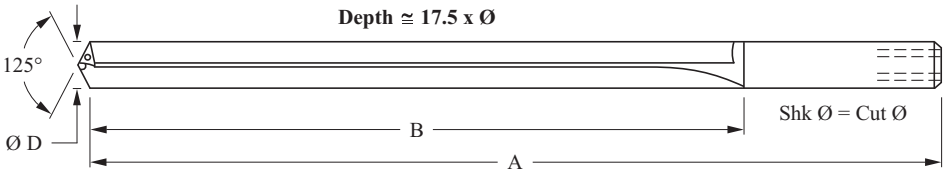
Style 175

Submicron carbide grade provides maximum wear resistance when cutting tool steels, titanium, cast aluminum, bronze, cast iron, plastics, and other abrasive materials.

- Coolant feeding S.C. Koolcarb® double margin drills provide excellent hole straightness and smoother finish.
- 125° four facet web thinned point starts best into a larger point angle.
- Carbide body increases penetration rate over gundrills for use on machining centers.
- Smaller diameters available to .1181″ (3.0 mm), larger diameters and step constructions available up to .9483″ (25.0 mm)
- Straight flute, right hand cut.
- 2.5 x Ø up to 1/4″ (6.35mm), 2 x Ø up to 7/16″ (11.1mm) and over 7/16″ allow 1.5 x Ø of flute for chip exit.

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.

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



EDP #	Cutting Diameter "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"	
	Inch	mm	Inch	Inch	mm	Inch	mm
17501250	1/8	3.175	.1250	5-1/4	133.	2-7/8	73.
17501378		3.5	.1378	5-9/16	141.	3-1/8	79.
17501406	9/64	3.571	.1406				
17501562	5/32	3.967	.1562	5-29/32	150.	3-15/32	88.
17501575		4.	.1575				
17501719	11/64	4.366	.1719	6-7/32	158.	3-3/4	95.
17501772		4.5	.1772	6-9/16	167.	4-1/8	105.
17501875	3/16	4.763	.1875				
17501969		5.	.1969	6-7/8	175.	4-7/16	113.
17502031	13/64	5.159	.2031				
17502165		5.5	.2165	7-7/32	183.	4-3/4	121.
17502188	7/32	5.558	.2188				
17502344	15/64	5.954	.2344	7-1/2	191.	5	127.
17502362		6.	.2362				
17502500	1/4	6.35	.2500	7-7/8	200.	5-7/16	138.

Shk Ø = Cut Ø

Phone: 630-690-5933 800-323-2299 Fax: 630-690-6355

Carbide Tip Coolant Fed Drills

KOOLTWIST® HIGH PERFORMANCE


Style 296

High performance, helical point, stub length. For alloy steels, tool steels, free machining stainless steels, aluminum casting, bronze, cast iron and some nickel base high temperature alloys.TiN coated **Page. 70**


Style 297

High performance, helical point, stub length, common shank. For alloy steels, tool steels, free machining stainless steels, aluminum casting, bronze, cast iron and some nickel base high temperature alloys.
TiN coated **Page. 73**

KOOLTWIST® HEAVY DUTY


Style 295

Four facet point, stub length, heavy duty. For titanium, aluminum, casting, bronze, cast iron and powdered metal. **Page. 76**


Style 290

Four facet point, long series, heavy duty. Cuts best in cast irons, powdered metals, brass, bronze, free machining stainless steels, titaniums and some high temperature alloys. **Page. 78**

KOOLCARB®


Style 176

Helical point, jobber length. For medium carbon and tool steels, cast iron and some nickel based materials. TiN coated. **Page. 79**


Style 171

Four facet point, jobber length. For tool steels, cast and ductile irons, bronze, cast aluminum and other abrasive materials. **Page. 81**


Style 170

Four facet point, intermediate length. For tool steels, cast and ductile irons, cast aluminum and other abrasive materials. **Page. 83**


Style 172

Four facet point, extra length. For tool steels, cast and ductile irons, cast aluminum and other abrasive materials. **Page. 85**

KOOLTWIST® PM COBALT


Style 260A

High helix, PM cobalt, intermediate length. For Ductile iron, steel, stainless steel, and high temperature alloys and other difficult to machine materials.
TiAlN coated. **Page. 86**

KOOLDEX® INDEXABLE INSERT DRILL AND INSERTS


Style 560

Indexable insert, coolant fed, stub length. Unique right hand spiral flute design gets the chips out of the hole and away from the cutting edges. **Page. 87**

Style 296

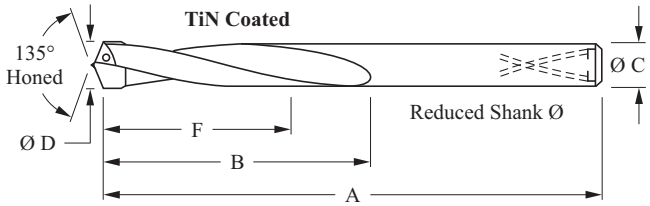
TiN coating

Submicron carbide tipped coolant fed construction provides maximum wear resistance when cutting alloy steels, tool steels, free machining stainless steels, aluminum casting, bronze, cast iron and some nickel base high temperature alloys.

- Stub length and self centering 135° helical point eliminate the need for spot drilling.
- Body diameter reduced to eliminate galling.
- TiN coating adds lubricity and prevents edge build-up.
- Heavy web, slow spiral for maximum feed rates and chip flow.
- Request intermediate sizes from grind down range.
- Right hand spiral, right hand cut.
- Reduced shank diameter. See below.
- Same style drill available with common size shanks, see Style 297.

Depth ≅ 4 x Ø

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



EDP #	Cutting Diameter "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Shank Diameter "C"		Usable Flute at full Regrind "F"		Grind Down Range		Min. Body Dia.	Ineffective Flute Length	
	Inch/ *Wire*	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	Inch	mm
29602460	*D*	6.248	.2460	3-15/16	100.	1-17/32	39.	15/64		1	25.	.2420 - .2610	6.147 - 6.629	.234	.32	8.
29602500	1/4	6.35	.2500					15/64								
29602559		6.5	.2559						6.							
29602570	*F*	6.528	.2570					1/4								
29602610	*G*	6.629	.2610					1/4								
29602656	17/64	6.746	.2656	4	102.	1-19/32	40.	1/4		1.1	29.	.2700 - .2953	6.858 - 7.501	.258	.34	9.
29602720	*I*	6.909	.2720					17/64								
29602756		7.	.2756						6.5							
29602812	9/32	7.142	.2812					17/64								
29602953		7.5	.2953						7.							
29602969	19/64	7.541	.2969	4-5/32	106.	1-3/4	44.	9/32		1.3	32.	.2960 - .3230	7.518 - 8.204	.287	.37	9.
29603125	5/16	7.938	.3125					19/64								
29603150		8.	.3150						7.5							
29603160	*O*	8.026	.3160					19/64								
29603281	21/64	8.334	.3281	4-11/32	110.	1-15/16	49.	5/16		1.4	35.	.3280 - .3550	8.331 - 9.017	.317	.41	10.
29603320	*Q*	8.433	.3320					5/16								
29603346		8.5	.3346						8.							
29603390	*R*	8.611	.3390					21/64								
29603438	11/32	8.733	.3438					21/64								
29603543		9.	.3543						8.5							
29603594	23/64	9.129	.3594	4-17/32	115.	2-1/8	54.	11/32		1.5	38.	.3551 - .3850	9.020 - 9.779	.345	.44	11.
29603680	*U*	9.347	.3680					23/64								
29603740		9.5	.3740						9.							
29603750	3/8	9.525	.3750					23/64								
29603860	*W*	9.804	.3860	4-11/16	119.	2-9/32	58.	3/8		1.6	41.	.3851 - .4170	9.782 - 10.592	.376	.47	12.
29603906	25/64	9.921	.3906													
29603937		10.	.3937						9.5							
29604062	13/32	10.317	.4062					25/64								
29604134		10.5	.4134						10.							

Reduced Shank Ø

Phone: 630-690-5933 800-323-2299 Fax: 630-690-6355

Style 296 TiN coating

EDP #	Cutting Diameter "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Shank Diameter "C"		Usable Flute at full Regrind "F"		Grind Down Range		Min. Body Dia.	Ineffective Flute Length	
	Inch/ *Wire*	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	Inch	mm
29604219	27/64	10.716	.4219	4-29/32	125.	2-1/2	64.	13/32		1.8	44.	.4171 - .4430	10.594 - 11.252	.398	.50	13.
29604331		11.	.4331						10.5							
29604375	7/16	11.113	.4375					27/64								
29604528		11.5	.4528	5-1/16	129.	2-21/32	67.		11.	1.9	48.	.4431 - .4740	11.255 - 12.040	.422	.53	13.
29604531	29/64	11.509	.4531					7/16								
29604688	15/32	11.908	.4688					29/64								
29604724		12.	.4724						11.5							
29604844	31/64	12.304	.4844	5-7/32	133.	2-13/16	71.	15/32		2	51.	.4741 - .5060	12.042 - 12.852	.454	.56	14.
29604921		12.5	.4921						12.							
29605000	1/2	12.7	.5000					31/64								
29605118		13.	.5118	5-13/32	137.	3	76.		12.5	2.1	54.	.5061 - .5360	12.855 - 13.614	.486	.58	15.
29605156	33/64	13.096	.5156					1/2								
29605312	17/32	13.492	.5312					33/64								
29605315		13.5	.5315						13.							
29605469	35/64	13.891	.5469	5-17/32	140.	3-1/8	79.	17/32		2.3	57.	.5361 - .5680	13.617 - 14.427	.516	.59	15.
29605512		14.	.5512						13.5							
29605625	9/16	14.288	.5625					35/64								
29605709		14.5	.5709	5-11/16	144.	3-9/32	83.		14.	2.4	60.	.5681 - .5990	14.43 - 15.215	.548	.62	16.
29605781	37/64	14.684	.5781					9/16								
29605906		15.	.5906						14.5							
29605938	19/32	15.083	.5938					37/64								
29606094	39/64	15.479	.6094	5-27/32	148.	3-7/16	87.	19/32		2.5	64.	.5991 - .6310	15.217 - 16.027	.579	.66	17.
29606102		15.5	.6102						15.							
29606250	5/8	15.875	.6250					39/64								
29606299		16.	.6299						15.5							
29606406	41/64	16.271	.6406	6-1/16	154.	3-21/32	93.	5/8		2.6	67.	.6311 - .6710	16.03 - 17.043	.611	.67	17.
29606496		16.5	.6496						16.							
29606562	21/32	16.667	.6562					41/64								
29606693		17.	.6693						16.5							
29606719	43/64	17.066	.6719	6-7/32	158.	3-13/16	97.	21/32		2.8	70.	.6711 - .6930	17.046 - 17.602	.651	.69	17.
29606875	11/16	17.463	.6875					43/64								
29606890		17.5	.6890						17.							
29607031	45/64	18.859	.7031	6-11/32	161.	3-15/16	100.	11/16		2.9	73.	.6931 - .7300	17.605 - 18.542	.673	.70	18.
29607087		18.	.7087						17.5							
29607188	23/32	18.258	.7188					45/64								
29607283		18.5	.7283						18.							
29607344	47/64	18.654	.7344	6-17/32	166.	4-1/8	105.	23/32		3	76.	.7301 - .7560	18.545 - 19.202	.710	.72	18.
29607480		19.	.7480						18.5							
29607500	3/4	19.05	.7500					47/64								
29607656	49/64	19.446	.7656	6-25/32	172.	4-9/32	109.	3/4		3.1	79.	.7561 - .7890	19.205 - 20.041	.736	.75	19.
29607677		19.5	.7677						19.							
29607812	25/32	19.842	.7812					49/64								
29607874		20.	.7874						19.5							
29607969	51/64	20.241	.7969	6-15/16	176.	4-7/16	113.	25/32		3.3	83.	.7891 - .8180	20.043 - 20.777	.769	.78	20.
29608071		20.5	.8071						20.							
29608125	13/16	20.638	.8125					51/64								

Reduced Shank Ø

Style 296 TiN coating

EDP #	Cutting Diameter "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Shank Diameter "C"		Usable Flute at full Regrind "F"		Grind Down Range		Min. Body Dia.	Ineffective Flute Length	
	Inch/ *Wire*	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	Inch	mm
29608268		21.	.8268	7-3/32	180.	4-19/32	117.		20.5	3.4	86.	.8181 - .8590	20.78 - 21.819	.798	.84	21.
29608281	53/64	21.034	.8281					13/16								
29608438	27/32	21.433	.8438					53/64								
29608465		21.5	.8465						21.							
29608594	55/64	21.829	.8594	7-3/16	183.	4-11/16	119.	27/32		3.5	89.	.8591 - .8810	21.821 - 22.377	.839	.89	23.
29608661		22.	.8661						21.5							
29608750	7/8	22.225	.8750					55/64								
29608858		22.5	.8858	7-3/8	187.	4-7/8	124.		22.	3.6	92.	.8811 - .9190	22.38 - 23.343	.861	.87	22.
29608906	57/64	22.621	.8906					7/8								
29609055		23.	.9055						22.5							
29609062	29/32	23.017	.9062					57/64								
29609219	59/64	23.416	.9219	7-17/32	191.	5-1/32	128.	29/32		3.8	95.	.9191 - .9420	23.343 - 23.927	.899	.84	21.
29609252		23.5	.9252						23.							
29609375	15/16	23.813	.9375					59/64								
29609449		24.	.9449	7-11/16	195.	5-3/16	132.		23.5	3.9	98.	.9421 - .9830	23.929 - 24.968	.922	.88	22.
29609531	61/64	24.209	.9531					15/16								
29609646		24.5	.9646						24.							
29609688	31/32	24.608	.9688					61/64								
29609843		25.	.9843	7-13/16	198.	5-5/16	135.		24.5	4	102.	.9831 - 1.0060	24.971 - 25.552	.963	.91	23.
29609844	63/64	25.004	.9844					31/32								
29610000	1	25.4	1.0000					63/64								
29610236		26.	1.0236	8-3/16	208.	5-11/16	144.		25.0	4.3	108.	1.0061 - 1.1320	25.555 - 28.753	.963	.89	22.
29610312	1-3/32	26.192	1.0312					1						.986		
29610625	1-1/16	26.988	1.0625					1								
29610938	1-3/32	27.783	1.0938					1								
29611250	1-1/8	28.575	1.1250					1								

Reduced Shank Ø

Phone: 630-690-5933 800-323-2299 Fax: 630-690-6355

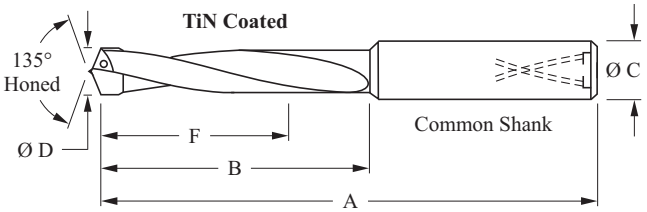
Carbide Tip, Kooltwist,® Common Shank, Stub Length Drill

Submicron carbide tipped coolant fed construction provides maximum wear resistance when cutting alloy steels, tools steels, free machining stainless steels, aluminum casting, bronze, cast iron and some nickel base high temperature alloys.

Style 297

TiN coating

- Stub length and self centering 135° helical point eliminate the need for spot drilling.
- Body diameter reduced to eliminate galling.
- TiN coating adds lubricity and prevents edge build-up.
- Heavy web slow spiral for maximum feed rates and chip flow.
- Right hand spiral, right hand cut.
- Request intermediate sizes from grind down range.
- Same style drill available with reduced size shanks, see Style 296.



Depth ≅ 4 x Ø

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

EDP #	Cutting Diameter "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Shank Diameter "C"		Usable Flute at full Regrind "F"		Grind Down Range		Ineffective Flute Length	
	Inch	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
29702500	1/4	6.35	.2500	3-15/16	100.	1-17/32	39.	5/8		1	25.	.2420 - .2610	6.147 - 6.629	.32	8.
29702559		6.5	.2559						16.						
29702656	17/64	6.746	.2656	4	102.	1-19/32	40.	5/8		1.1	29.	.2700 - .2953	6.858 - 7.501	.34	9.
29702756		7.	.2756						16.						
29702812	9/32	7.142	.2812					5/8							
29702953		7.5	.2953						16.						
29702969	19/64	7.541	.2969	4-5/32	106.	1-3/4	44.	5/8		1.3	32.	.2960 - .3230	7.518 - 8.204	.37	9.
29703125	5/16	7.938	.3125					5/8							
29703150		8.	.3150						16.						
29703281	21/64	8.334	.3281	4-11/32	110.	1-15/16	49.	5/8		1.4	35.	.3280 - .3550	8.331 - 9.017	.41	10.
29703346		8.5	.3346						16.						
29703438	11/32	8.733	.3438					5/8							
29703543		9.	.3543						16.						
29703594	23/64	9.129	.3594	4-17/32	115.	2-1/8	54.	5/8		1.5	38.	.3551 - .3850	9.02 - 9.779	.44	11.
29703740		9.5	.3740						16.						
29703750	3/8	9.525	.3750					5/8							
29703906	25/64	9.921	.3906	4-11/16	119.	2-9/32	58.	5/8		1.6	41.	.3851 - .4170	9.782 - 10.592	.47	12.
29703937		10.	.3937						16.						
29704062	13/32	10.317	.4062					5/8							
29704134		10.5	.4134						16.						
29704219	27/64	10.716	.4219	4-29/32	125.	2-1/2	64.	5/8		1.8	44.	.4171 - .4430	10.594 - 11.252	.50	13.
29704331		11.	.4331						16.						
29704375	7/16	11.113	.4375					5/8							
29704528		11.5	.4528	5-1/16	129.	2-21/32	67.		16.	1.9	48.	.4431 - .4740	11.255 - 12.04	.53	13.
29704531	29/64	11.509	.4531					5/8							
29704688	15/32	11.908	.4688					5/8							
29704724		12.	.4724						16.						
29704844	31/64	12.304	.4844	5-7/32	133.	2-13/16	71.	5/8		2	51.	.4741 - .5062	12.042 - 12.852	.56	14.
29704921		12.5	.4921						16.						
29705000	1/2	12.7	.5000					5/8							

Common Shank Ø

Style 297 TiN coating

EDP #	Cutting Diameter "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Shank Diameter "C"		Usable Flute at full Regrind "F"		Grind Down Range		Ineffective Flute Length	
	Inch	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
29705118		13.	.5118	5-13/32	137.	3	76.		16.	2.1	54.	.5061 - .5360	12.855 - 13.614	.58	15.
29705156	33/64	13.096	.5156					5/8							
29705312	17/32	13.492	.5312					5/8							
29705315		13.5	.5315						16.						
29705469	35/64	13.891	.5469	5-17/32	140.	3-1/8	79.	5/8		2.3	57.	.5361 - .5680	13.617 - 14.427	.59	15.
29705512		14.	.5512						16.						
29705625	9/16	14.288	.5625					5/8							
29705709		14.5	.5709	5-11/16	144.	3-9/32	83.		20.	2.4	60.	.5681 - .5990	14.43 - 15.215	.62	16.
29705781	37/64	14.684	.5781					3/4							
29705906		15.	.5906						20.						
29705938	19/32	15.083	.5938					3/4							
29706094	39/64	15.479	.6094	5-27/32	148.	3-7/16	87.	3/4		2.5	64.	.5991 - .6310	15.217 - 16.027	.66	17.
29706102		15.5	.6102						20.						
29706250	5/8	15.875	.6250					3/4							
29706299		16.	.6299						20.						
29706406	41/64	16.271	.6406	6-1/6	154.	3-21/32	93.	3/4		2.6	67.	.6311 - .6710	16.03 - 17.043	.67	17.
29706496		16.5	.6496						20.						
29706562	21/32	16.667	.6562					3/4							
29706693		17.	.6693						20.						
29706719	43/64	17.066	.6719	6-7/32	158.	3-13/16	97.	3/4		2.8	70.	.6711 - .6930	17.046 - 17.602	.69	17.
29706875	11/16	17.463	.6875					3/4							
29706890		17.5	.6890						20.						
29707031	45/64	17.859	.7031	6-11/32	161.	3-15/16	100.	3/4		2.9	73.	.6931 - .7300	17.605 - 18.542	.70	18.
29707087		18.	.7087						20.						
29707188	23/32	18.258	.7188					3/4							
29707283		18.5	.7283						20.						
29707344	47/64	18.654	.7344	6-17/32	166.	4-1/8	105.	1		3	76.	.7301 - .7560	18.545 - 19.202	.72	18.
29707480		19.	.7480						25.						
29707500	3/4	19.05	.7500					1							
29707590		19.279	.7590	6-25/32	172.	4-9/32	109.		25.	3.1	79.	.7561 - .7890	19.205 - 20.041	.75	19.
29707656	49/64	19.446	.7656					1							
29707677		19.5	.7677						25.						
29707812	25/32	19.842	.7812					1							
29707874		20.	.7874						25.						
29707969	51/64	20.241	.7969	6-15/16	176.	4-7/16	113.	1		3.3	83.	.7891 - .8180	20.043 - 20.777	.78	20.
29708071		20.5	.8071						25.						
29708125	13/16	20.638	.8125					1							
29708268		21.	.8268	7-3/32	180.	4-19/32	117.		25.	3.4	86.	.8181 - .8590	20.78 - 21.819	.84	21.
29708281	53/64	21.034	.8281					1							
29708438	27/32	21.433	.8438					1							
29708465		21.5	.8465						25.						
29708594	55/64	21.829	.8594	7-3/16	183.	4-11/16	119.	1		3.5	89.	.8591 - .8810	21.821 - 22.377	.89	23.
29708661		22.	.8661						25.						
29708750	7/8	22.225	.8750					1							

Common Shank Ø

Phone: 630-690-5933 800-323-2299 Fax: 630-690-6355

Style 297 TiN coating

EDP #	Cutting Diameter "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Shank Diameter "C"		Usable Flute at full Regrind "F"		Grind Down Range		Ineffective Flute Length	
	Inch	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
29708858		22.5	.8858						25.						
29708906	57/64	22.621	.8906	7-3/8	187.	4-7/8	124.	1		3.6	92.	.8811 - .9190	22.38 - 23.343	.87	22.
29709055		23.	.9055						25.						
29709062	29/32	23.017	.9062					1							
29709219	59/64	23.416	.9219					1							
29709252		23.5	.9252	7-17/32	191.	5-1/32	128.		25.	3.8	95.	.9191 - .9420	23.345 - 23.927	.84	21.
29709375	15/16	23.813	.9375					1							
29709449		24.	.9449						25.						
29709531	61/64	24.209	.9531	7-11/16	195.	5-3/16	132.	1		3.9	98.	.9421 - .9830	23.929 - 24.968	.88	22.
29709646		24.5	.9646						25.						
29709688	31/32	24.608	.9688					1							
29709843		25.	.9843						25.						
29709844	63/64	25.004	.9844	7-13/16	198.	5-5/16	135.	1		4	102.	.9831 - 1.0060	24.971 - 25.552	.91	23.
29710000	1	25.4	1.0000					1							
29710110	1.011	25.679	1.0110					1							
29710236		26.	1.0236						25.						
29710312	1-1/32	26.192	1.0312	8-3/16	208.	5-11/16	144.	1		4.3	108.	1.0061 - 1.1320	25.555 - 28.753	.89	22.
29710625	1-1/16	26.988	1.0625					1							
29710938	1-3/32	27.783	1.0938					1							
29711250	1-1/8	28.575	1.1250					1							

Common Shank Ø

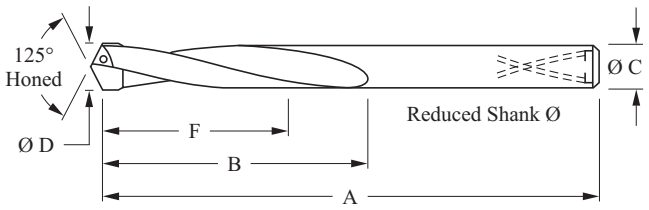
Style 295

Submicron carbide tipped coolant fed construction provides maximum wear resistance when cutting titanium, aluminum casting, bronze, cast iron and powdered metal.

Depth ≅ 4 x Ø

- Stub length and 125º four facet point typically eliminate the need for spot drilling. Four facet point is easily re-sharpened on standard equipment.
- Body diameter reduced to eliminate galling.
- Right hand spiral, right hand cut.
- Heavy web, slow spiral for maximum rigidity.
- Reduced shank diameter, see below.
- Request intermediate sizes from grind down range.

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



EDP #	Cutting Diameter "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Shank Diameter "C"		Usable Flute at Full Regrind "F"		Grind Down Range		Min. Body Dia.	Ineffective Flute Length	
	Inch	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	Inch	mm
29502500	1/4	6.35	.2500	3-15/16	100.	1-17/32	39.	15/64		1	25.	.2420 - .2610	6.147 - 6.629	.234	.32	8.
29502559		6.5	.2559						6.							
29502656	17/64	6.746	.2656	4	102.	1-19/32	40.	1/4		1.1	29.	.2700 - .2953	6.858 - 7.501	.258	.34	9.
29502756		7.	.2756						6.5							
29502812	9/32	7.142	.2812					17/64								
29502953		7.5	.2953						7.							
29502969	19/64	7.541	.2969	4-5/32	106.	1-3/4	44.	9/32		1.3	32.	.2960 - .3230	7.518 - 8.204	.287	.37	9.
29503125	5/16	7.938	.3125					19/64								
29503150		8.	.3150						7.5							
29503281	21/64	8.334	.3281	4-11/32	110.	1-15/16	49.	5/16		1.4	35.	.3280 - .3550	8.311 - 9.017	.317	.41	10.
29503346		8.5	.3346						8.							
29503438	11/32	8.733	.3438					21/64								
29503543		9.	.3543						8.5							
29503594	23/64	9.129	.3594	4-17/32	115.	2-1/8	54.	11/32		1.5	38.	.3551 - .3850	9.020 - 9.779	.345	.44	11.
29503740		9.5	.3740						9.							
29503750	3/8	9.525	.3750					23/64								
29503906	25/64	9.921	.3906	4-11/16	119.	2-9/32	58.	3/8		1.6	41.	.3851 - .4170	9.782 - 10.592	.376	.47	12.
29503937		10.	.3937						9.5							
29504062	13/32	10.317	.4062					25/64								
29504134		10.5	.4134						10.							
29504219	27/64	10.716	.4219	4-29/32	125.	2-1/2	64.	13/32		1.8	44.	.4171 - .4430	10.594 - 11.252	.398	.50	13.
29504331		11.	.4331						10.5							
29504375	7/16	11.113	.4375					27/64								
29504528		11.5	.4528	5-1/16	129.	2-21/32	67.		11.	1.9	48.	.4431 - .4740	11.255 - 12.040	.422	.53	13.
29504531	29/64	11.509	.4531					7/16								
29504688	15/32	11.908	.4688					29/64								
29504724		12.	.4724						11.5							
29504844	31/64	12.304	.4844	5-7/32	133.	2-13/16	71.	15/32		2	51.	.4741 - .5060	12.042 - 12.852	.454	.56	14.
29504921		12.5	.4921						12.							
29505000	1/2	12.7	.5000					31/64								
29505118		13.	.5118	5-13/32	137.	3	76.		12.5	2.1	54.	.5061 - .5360	12.855 - 13.614	.486	.58	15.
29505156	33/64	13.096	.5156					1/2								
29505312	17/32	13.492	.5312					33/64								
29505315		13.5	.5315						13.							
29505469	35/64	13.891	.5469	5-17/32	140.	3-1/8	79.	17/32		2.3	57.	.5361 - .5680	13.617 - 14.472	.516	.59	15.
29505512		14.	.5512						13.5							
29505625	9/16	14.288	.5625					35/64								

Reduced Shank Ø

Phone: 630-690-5933 800-323-2299 Fax: 630-690-6355

Style 295

EDP #	Cutting Diameter "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Shank Diameter "C"		Usable Flute at Full Regrind "F"		Grind Down Range		Min. Body Dia.	Ineffective Flute Length	
	Inch	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	Inch	mm
29505709		14.5	.5709						14.							
29505781	37/64	14.684	.5781	5-11/16	144.	3-9/32	83.	9/16		2.4	60.	.5681 - .5990	14.430 - 15.215	.548	.63	16.
29505906		15.	.5906						14.5							
29505938	19/32	15.083	.5938					37/64								
29506094	39/64	15.479	.6094					19/32								
29506102		15.5	.6102	5-27/32	148.	3-7/16	87.		15.	2.5	64.	.5991 - .6310	15.217 - 16.027	.579	.66	17.
29506250	5/8	15.875	.6250					39/64								
29506299		16.	.6299						15.5							
29506406	41/64	16.271	.6406					5/8								
29506496		16.5	.6496	6-1/16	154.	3-21/32	93.		16.	2.6	67.	.6311 - .6710	16.03 - 17.043	.611	.68	17.
29506562	21/32	16.667	.6562					41/64								
29506693		17.	.6693						16.5							
29506719	43/64	17.066	.6719					21/32								
29506875	11/16	17.463	.6875	6-7/32	158.	3-13/16	97.	43/64		2.8	70.	.6711 - .6930	17.046 - 17.602	.651	.69	17.
29506890		17.5	.6890						17.							
29507031	45/64	17.859	.7031					11/16								
29507087		18.	.7087	6-11/32	161.	3-15/16	100.		17.5	2.9	73.	.6931 - .7300	17.605 - 18.542	.673	.71	18.
29507188	23/32	18.258	.7188					45/64								
29507283		18.5	.7283						18.							
29507344	47/64	18.654	.7344					23/32								
29507480		19.	.7480	6-17/32	166.	4-1/8	105.		18.5	3	76.	.7301 - .7560	18.545 - 19.202	.710	.75	18.
29507500	3/4	19.05	.7500					47/64								
29507656	49/64	19.466	.7656					3/4								
29507677		19.5	.7677	6-25/32	172.	4-9/32	109.		19.	3.1	79.	.7561 - .7890	19.205 - 20.041	.736	.78	19.
29507812	25/32	19.842	.7812					49/64								
29507874		20.	.7874						19.5							
29507969	51/64	20.241	.7969					25/32								
29508071		20.5	.8071	6-15/16	176.	4-7/16	113.		20.	3.3	83.	.7891 - .8180	20.043 - 20.777	.769	.81	20.
29508125	13/16	20.638	.8125					51/64								
29508268		21.	.8268						20.5							
29508281	53/64	21.034	.8281	7-3/32	180.	4-19/32	117.	13/16		3.4	86.	.8181 - .8590	20.78 - 21.819	.798	.84	21.
29508438	27/32	21.433	.8438					53/64								
29508465		21.5	.8465						21.							
29508594	55/64	21.829	.8594					27/32								
29508661		22.	.8661	7-3/16	183.	4-11/16	119.		21.5	3.5	89.	.8591 - .8810	21.821 - 22.377	.839	.87	23.
29508750	7/8	22.225	.8750					55/64								
29508858		22.5	.8858						22.							
29508906	57/64	22.621	.8906	7-3/8	187.	4-7/8	124.	7/8		3.6	92.	.8811 - .9190	22.38 - 23.343	.861	.87	22.
29509055		23.	.9055						22.5							
29509062	29/32	23.017	.9062					57/64								
29509219	59/64	23.416	.9219					29/32								
29509252		23.5	.9252	7-17/32	191.	5-1/32	128.		23.	3.8	95.	.9191 - .9420	23.345 - 23.927	.899	.89	21.
29509375	15/16	23.813	.9375					59/64								
29509449		24.	.9449						23.5							
29509531	61/64	24.209	.9531	7-11/16	195.	5-3/16	132.	15/16		3.9	98.	.9421 - .9830	23.929 - 24.968	.922	.92	22.
29509646		24.5	.9646						24.							
29509688	31/32	25.608	.9688					61/64								
29509843		25.	.9843						24.5							
29509844	63/64	25.004	.9844	7-13/16	198.	5-5/16	135.	31/32		4	102.	.9831 - 1.0060	24.971 - 25.552	.963	.95	23.
29510000	1	25.4	1.0000					63/64								
29510236		26.	1.0236						25.					.963	.94	22.
29510312	1-1/32	26.192	1.0312					1								
29510625	1-1/16	26.988	1.0625	8-3/16	208.	5-11/16	144.	1		4.3	108.	1.0061 - 1.1320	25.555 - 28.753	.986	.94	22.
29510938	1-3/32	27.783	1.0938					1								
29511250	1-1/8	28.575	1.1250					1								

Reduced Shank Ø

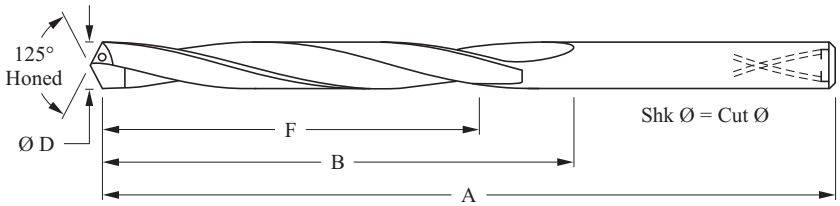
Style 290

Submicron carbide tipped coolant fed oil hole construction cuts best in cast irons, powdered metals, brass, bronze, free machining stainless steels, titaniums and some high temperature alloys.

- Heavy web slow spiral for maximum rigidity.
- Right hand spiral, right hand cut.
- Self centering 125° four facet point is easily re-sharpened on standard point grinding equipment.

Depth ≅ 7 to 12 x Ø

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



EDP #	Cutting Diameter "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Usable Flute at full Regrind "F"		Grind Down Range		Ineffective Flute Length	
	Inch	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
29002500	1/4	6.35	.2500	6-1/8	156.	3-3/4	95.	3.1	79.	.2420 - .2520	6.147 - 6.401	.48	12.
29002812	9/32	7.142	.2812	6-1/4	159.	3-7/8	98.	3.2	81.	.2680 - .2840	6.807 - 7.214	.49	
29003125	5/16	7.938	.3125	6-3/8	162.	4	102.	3.3	83.	.2960 - .3150	7.518 - 8.001	.54	14.
29003438	11/32	8.731	.3438	6-1/2	165.	4-1/8	105.	3.4	86.	.3290 - .3460	8.357 - 8.788	.56	
29003750	3/8	9.525	.3750	6-3/4	171.	4-1/4	108.	3.5	88.	.3570 - .3770	9.068 - 9.576	.60	15.
29004062	13/32	10.317	.4062	7	178.	4-3/8	111.	3.6	90.	.3900 - .4080	9.906 - 10.363	.58	
29004375	7/16	11.113	.4375	7-1/4	184.	4-5/8	117.	3.8	96.	.4130 - .4390	10.49 - 11.151	.64	16.
29004688	15/32	11.906	.4688	7-1/2	191.	4-7/8	124.	4.0	102.	.4391 - .4710	11.153 - 11.963	.61	
29005000	1/2	12.7	.5000	7-3/4	197.	5	127.	4.1	104.	.4711 - .5020	11.966 - 12.751	.65	17.
29005312	17/32	13.492	.5312	8	203.	5-1/4	133.	4.3	109.	.5021 - .5330	12.753 - 13.538	.67	
29005625	9/16	14.288	.5625	8-1/4	210.	5-3/8	137.	4.4	112.	.5331 - .5640	13.541 - 14.326	.71	
29005938	19/32	15.083	.5938	8-1/2	216.	5-5/8	143.	4.6	116.	.5641 - .5940	14.328 - 15.088	.81	20.
29006250	5/8	15.875	.6250	8-3/4	222.	5-3/4	146.	4.7	118.	.5941 - .6260	15.09 - 15.9	.76	19.
29006562	21/32	16.667	.6562	9	229.	5-7/8	149.	4.8	121.	.6261 - .6570	15.903 - 16.688	.78	20.
29006875	11/16	17.463	.6875	9-1/4	235.	6	152.	4.8	123.	.6571 - .6900	16.69 - 17.526	.84	21.
29007188	23/32	18.258	.7188	9-1/2	241.	6-3/16	157.	5.0	126.	.6901 - .7210	17.529 - 18.313	.92	23.
29007500	3/4	19.05	.7500	9-3/4	248.	6-3/8	162.	5.1	131.	.7211 - .7520	18.316 - 19.101		

Shk Ø = Cut Ø

Phone: 630-690-5933 800-323-2299 Fax: 630-690-6355

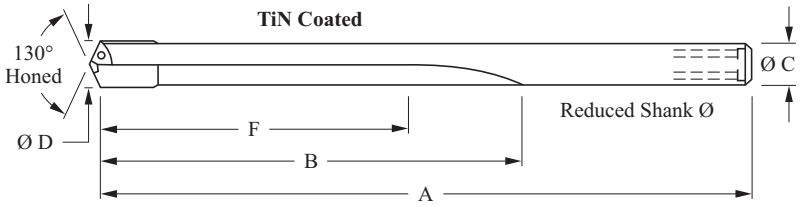
Carbide Tip, Koolcarb® Helical Point Drill

Helical point increases tool life in medium carbon and tool steels, cast iron and some nickel based materials.

Style 176

TiN coating

- Coolant feeding carbide tip Koolcarb® construction creates straighter holes and smoother finish.
- TiN coating adds lubricity and prevents edge build-up.
- Not intended for interrupted cuts.
- High speed "milled" body runs 2 to 4 times gundrill feeds on conventional equipment.
- Longer carbide yields increased regrinds and improved drill support.
- Straight flute, right hand cut.
- Specials available to 1.375″ (35.925 mm) Ø. Request smaller sizes from grind down range.



Depth ≅ 5.5 to 8 x Ø

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

EDP #	Cutting Diameter "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Usable Flute at full Regrind "F"		Shank Diam "C"		Grind Down Range		Min. Body Dia.	Ineffect. Flute Length	
	Inch	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	Inch	mm
17601875	3/16	4.763	.1875	4	102.	2	51.	1.3	33.	3/16	4.763	.1820 - .2100	4.623- 5.334	.174	.41	10.
17602010	7	5.105	.2010													
17602130	3	5.41	.2130	4-1/4	108.	2-1/4	57.	1.5	38.	13/64	5.159	2101 - .2290	5.336- 5.816	.196	.46	12.
17602188	7/32	5.558	.2188							7/32	5.558					
17602500	1/4	6.35	.2500	4-29/32	125.	2-1/2	64.	1.7	43.	15/64	5.954	.2291 - .2610	5.819- 6.629	.221	.48	12.
17602812	9/32	7.142	.2812	5-5/32	131.	2-3/4	70.	1.9	47.	17/64	6.746	.2611 - .2880	6.632- 7.315	.250	.51	13.
17603125	5/16	7.938	.3125	5-19/32	142.	3-3/16	81.	2.3	58.	19/64	7.541	.2881 - .3200	7.318- 8.128	.278	.53	13.
17603438	11/32	8.733	.3438	5-27/32	148.	3-7/16	87.	2.5	64.	21/64	8.334	.3201 - .3510	8.130- 8.915	.310	.55	14.
17603750	3/8	9.525	.3750	6-1/32	153.	3-5/8	92.	2.7	69.	23/64	9.129	.3540 - .3820	8.992 - 9.703	.345	.56	14.
17604062	13/32	10.317	.4062	6-9/32	160.	3-7/8	98.	2.9	73.	25/64	9.921	.3850 - .4130	9.779 - 10.490	.376	.61	15.
17604375	7/16	11.113	.4375	6-15/32	164.	4-1/16	103.	3	76.	27/64	10.716	.4131 - .4460	10.493 - 11.328	.398	.61	16.
17604688	15/32	11.908	.4688	6-23/32	171.	4-5/16	110.	3.2	81.	29/64	11.509	.4461 - .4740	11.331 - 12.040	.422	.63	16.
17605000	1/2	12.7	.5000	6-29/32	175.	4-1/2	114.	3.3	84.	31/64	12.304	.4741 - .5050	12.042 - 12.827	.454	.65	17.
17605312	17/32	13.492	.5312	7-7/32	183.	4-13/16	122.	3.6	91.	33/64	13.096	.5051 - .5350	12.830 - 13.589	.486	.69	18.
17605625	9/16	14.288	.5625					3.5	90.	35/64	13.891	.5351 - .5650	13.592 - 14.351	.515	.68	17.
17605938	19/32	15.083	.5938	7-19/32	193.	5-3/16	132.	3.9	99.	37/64	14.684	.5651 - .5990	14.354 - 15.215	.546	.68	17.

Reduced Shank Ø

Style 176 TiN coating

EDP #	Cutting Diameter "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Usable Flute at full Regrind "F"		Shank Diam "C"		Grind Down Range		Min. Body Dia.	Ineffect. Flute Length	
	Inch	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	Inch	mm
17606250	5/8	15.875	.6250	7-19/32	193.	5-3/16	132.	3.9	99.	39/64	15.479	.5991 - .6300	15.217 - 16.002	.578	.72	18.
17606562	21/32	16.667	.6562	7-19/32	193.	5-3/16	132.	3.8	96.	41/64	16.271	.6301 - .6600	16.005 - 16.764	.609	.75	19.
17606875	11/16	17.463	.6875	8-1/32	204.	5-5/8	143.	4.2	106.	43/64	17.066	.6601 - .6940	16.767 - 17.628	.649	.79	20.
17607188	23/32	18.256	.7188	8-1/32	204.	5-5/8	143.	4.2	106.	45/64	17.859	.6941 - .7300	17.630 - 18.542	.671	.81	21.
17607500	3/4	19.05	.7500	8-15/32	215.	6-1/16	154.	4.5	114.	47/64	18.654	.7301 - .7550	18.545 - 19.177	.708	.83	21.
17607812	25/32	19.842	.7812	8-9/16	217.	6-1/16	154.	4.5	114.	49/64	19.446	.7551 - .7890	19.180 - 20.041	.734	.86	22.
17608125	13/16	20.638	.8125	8-9/16	217.	6-1/16	154.	4.4	112.	51/64	20.241	.7891 - .8170	20.043 - 20.752	.765	.85	22.
17608438	27/32	21.433	.8438	9	229.	6-1/2	165.	4.9	124.	53/64	21.034	.8171 - .8590	20.754 - 21.819	.796	.89	23.
17608750	7/8	22.225	.8750	9	229.	6-1/2	165.	4.8	122.	55/64	21.829	.8591 - .8800	21.821 - 22.352	.843	.92	23.
17609062	29/32	23.017	.9062	9-7/16	240.	6-15/16	176.	5.3	133.	57/64	22.621	.8801 - .9190	22.355 - 23.343	.859	.95	24.
17609375	15/16	23.813	.9375	9-7/16	240.	6-15/16	176.	5.2	132.	59/64	23.416	.9191 - .9420	23.345 - 23.927	.905	.98	25.
17609688	31/32	24.608	.9688	9-7/16	240.	6-15/16	176.	5.2	132.	61/64	24.209	.9421 - .9830	23.929 - 24.968	.921	1.02	26.
17610000	1	25.4	1.0000	9-7/8	251.	7-3/8	187.	5.6	142.	63/64	25.004	.9831 - 1.0060	24.971 - 25.552	.964	1.05	27.

Reduced Shank Ø

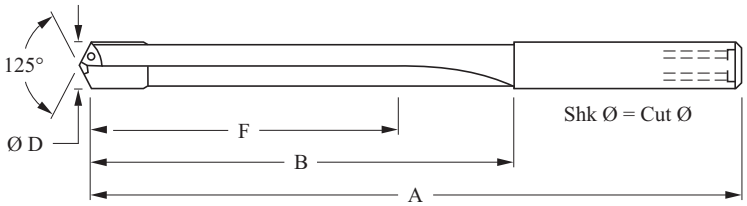
Phone: 630-690-5933 800-323-2299 Fax: 630-690-6355

Carbide Tip, Koolcarb® Jobber Length Drill

Submicron carbide tip yields exceptional tool life in tool steels, cast and ductile irons, bronze, cast aluminum and other abrasive materials.

Style 171

- Coolant feeding carbide tip Koolcarb® construction creates straighter holes and smoother finish.
- 125° four facet web thinned point starts best into a larger point angle. Not intended for interrupted cut drilling.
- High speed "milled" body runs 2 to 4 times gundrill feeds on conventional equipment.
- Longer carbide yields increased regrinds.
- Straight flute, right hand cut.
- Specials available to 1.535″ (39.0 mm) Ø. Request intermediate sizes from grind down range.



Depth ≅ 5.5 to 8 x Ø

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

EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Usable Flute at full Regrind "F"		Grind Down Range		Ineffective Flute Length	
	Inch	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
17101875	3/16	4.763	.1875	4	102.	2	51.	1.3	33.	.1820 - .2100	4.623 - 5.334	.41	10.
17101969		5.	.1969										
17102165		5.5	.2165	4-1/4	108.	2-1/4	57.	1.5	38.	.2101 - .2290	5.336 - 5.816	.46	12.
17102188	7/32	5.558	.2188										
17102344	15/64	5.954	.2344	4-29/32	125.	2-1/2	64.	1.7	44.	.2291 - .2610	5.819 - 6.629	.48	12.
17102362		6.	.2362										
17102500	1/4	6.35	.2500										
17102559		6.5	.2559										
17102656	17/64	6.746	.2656	5-5/32	131.	2-3/4	70.	1.9	47.	.2611 - .2880	6.632 - 7.315	.51	13.
17102756		7.	.2756										
17102812	9/32	7.142	.2812										
17102953		7.5	.2953	5-19/32	142.	3-3/16	81.	2.3	58.	.2881 - .3200	7.318 - 8.128	.53	13.
17102969	19/64	7.541	.2969										
17103125	5/16	7.938	.3125										
17103150		8.	.3150										
17103281	21/64	8.334	.3281	5-27/32	148.	3-7/16	87.	2.5	64.	.3201 - .3510	8.130 - 8.915	.55	14.
17103346		8.5	.3346										
17103438	11/32	8.733	.3438										
17103543		9.	.3543	6-1/32	154.	3-5/8	92.	2.7	69.	.3540 - .3770	8.992 - 9.576	.56	14.
17103594	23/64	9.129	.3594										
17103740		9.5	.3740										
17103750	3/8	9.525	.3750										
17103906	25/64	9.921	.3906	6-9/32	159.	3-7/8	98.	2.9	73.	.3850 - .4080	9.779 - 10.363	.61	15.
17103937		10.	.3937										
17104062	13/32	10.317	.4062										
17104134		10.5	.4134	6-15/32	164.	4-1/16	103.	3	76.	.4100 - .4390	10.414 - 11.151	.61	16.
17104219	27/64	10.716	.4219										
17104331		11.	.4331										
17104375	7/16	11.113	.4375										

Shk Ø = Cut Ø

Style 171

EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Usable Flute at full Regrind "F"		Grind Down Range		Ineffective Flute Length	
	Inch	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
17104528		11.5	.4528	6-23/32	171.	4-5/16	109.	3.2	81.	.4391 - .4710	11.153 - 11.963	.63	16.
17104531	29/64	11.509	.4531										
17104688	15/32	11.908	.4688										
17104724		12.	.4724										
17104844	31/64	12.304	.4844	6-29/32	175.	4-1/2	114.	3.3	84.	.4711 - .5030	11.966 - 12.776	.65	17.
17104921		12.5	.4921										
17105000	1/2	12.7	.5000										
17105118		13.	.5118	7-7/32	183.	4-13/16	122.	3.6	91.	.5031 - .5330	12.779 - 13.538	.69	18.
17105312	17/32	13.492	.5312										
17105315		13.5	.5315										
17105512		14.	.5512	7-7/32	183.	4-13/16	122.	3.5	90.	.5331 - .5650	13.541 - 14.351	.68	17.
17105625	9/16	14.288	.5625										
17105709		14.5	.5709	7-19/32	193.	5-3/16	131.	3.9	99.	.5651 - .5950	14.354 - 15.113	.68	17.
17105906		15.	.5906										
17105938	19/32	15.083	.5938										
17106102		15.5	.6102	7-19/32	193.	5-3/16	131.	3.9	99.	.5951 - .6270	15.116 - 15.926	.72	18.
17106250	5/8	15.875	.6250										
17106299		16.	.6299	7-19/32	193.	5-3/16	131.	3.8	96.	.6271 - .6570	15.928 - 16.688	.75	19.
17106406	41/64	16.271	.6406										
17106496		16.5	.6496										
17106562	21/32	16.667	.6562										
17106693		17.	.6693	8-1/32	204.	5-5/8	143.	4.2	106.	.6571 - .6900	16.69 - 17.526	.79	20.
17106719	43/64	17.066	.6719										
17106875	11/16	17.462	.6875										
17106890		17.5	.6890										
17107031	45/64	17.859	.7031	8-1/32	204.	5-5/8	143.	4.2	106.	.6901 - .7220	17.529 - 18.339	.81	21.
17107087		18.	.7087										
17107188	23/32	18.258	.7188										
17107283		18.5	.7283	8-15/32	215.	6-1/16	154.	4.6	115.	.7221 - .7530	18.341 - 19.126	.83	21.
17107344	47/64	18.654	.7344										
17107480		19.	.7480										
17107500	3/4	19.05	.7500										
17107677		19.5	.7677	8-9/16	217.	6-1/16	154.	4.5	114.	.7531 - .7840	19.129 - 19.914	.86	22.
17107812	25/32	19.842	.7812										
17107874		20.	.7874	8-9/16	217.	6-1/16	154.	4.4	112.	.7841 - .8160	19.916 - 20.726	.85	22.
17108071		20.5	.8071										
17108125	13/16	20.638	.8125										
17108268		21.	.8268	9	229.	6-1/2	165.	4.9	124.	.8161 - .8470	20.729 - 21.514	.89	23.
17108438	27/32	21.433	.8438										
17108465		21.5	.8465										
17108661		22.	.8661	9	229.	6-1/2	165.	4.8	122.	.8471 - .8780	21.516 - 22.3	.92	23.
17108750	7/8	22.225	.8750										
17108858		22.5	.8858	9-7/16	240.	6-15/16	176.	5.3	133.	.8781 - .9090	22.304 - 23.089	.95	24.
17109055		23.	.9055										
17109062	29/32	23.017	.9062										
17109252		23.5	.9252	9-7/16	240.	6-15/16	176.	5.2	132.	.9091 - .9390	23.091 - 23.851	.98	25.
17109375	15/16	23.813	.9375										
17109449		24.	.9449	9-7/16	240.	6-15/16	176.	5.2	132.	.9391 - .9700	23.853 - 24.638	1.02	26.
17109646		24.5	.9646										
17109688	31/32	24.608	.9688										
17109843		25.	.9843	9-7/8	251.	7-3/8	187.	5.6	142.	.9701 - 1.0030	24.641 - 25.476	1.05	27.
17110000	1	25.4	1.0000										

Shk Ø = Cut Ø

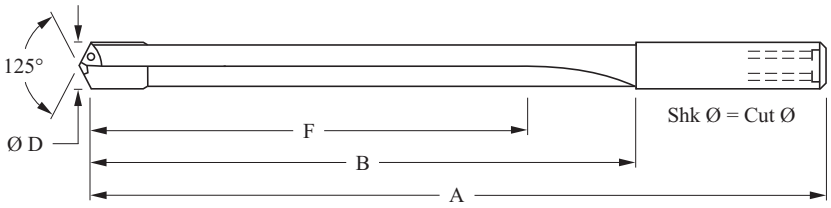
Phone: 630-690-5933 800-323-2299 Fax: 630-690-6355

Carbide Tip, Koolcarb® Intermediate Length Drill

Submicron carbide tip yields exceptional tool life in tool steels, cast and ductile irons, cast aluminum and other abrasive materials.

Style 170

- Coolant feeding carbide tip Koolcarb® construction creates straighter holes and smoother finish.
- 125° four facet web thinned point starts best into a larger point angle. Not intended for interrupted cut drilling.
- High speed "milled" body runs 2 to 4 times gundrill feeds on conventional equipment.
- Longer carbide yields increased regrinds.
- Straight flute, right hand cut.
- Specials available to 1.535″ (39.0 mm) Ø. Request intermediate sizes from grind down range.



Depth ≅ 7 to 15 x Ø

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

EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Usable Flute at full Regrind "F"		Grind Down Range		Ineffective Flute Length	
	Inch	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
17001875	3/16	4.763	.1875	5-3/4	146.	3-3/4	95.	3	77.	.1820 - .2100	4.623 - 5.334	.41	10.
17001969		5.	.1969										
17002165		5.5	.2165	6-1/8	156.	4-1/8	105.	3.4	86.	.2101 - .2290	5.336 - 5.816	.46	12.
17002188	7/32	5.558	.2188										
17002344	15/64	5.954	.2344	6-1/8	156.	4-5/8	117.	3.8	97.	.2291 - .2610	5.819 - 6.629	.48	12.
17002362		6.	.2362										
17002500	1/4	6.35	.2500										
17002559		6.5	.2559										
17002656	17/64	6.746	.2656	6-1/4	159.	4-3/4	121.	3.9	98.	.2611 - .2880	6.632 - 7.315	.51	13.
17002756		7.	.2756										
17002812	9/32	7.142	.2812										
17002953		7.5	.2953	6-3/8	162.	4-7/8	124.	4	101.	.2881 - .3200	7.318 - 8.128	.53	13.
17002969	19/64	7.541	.2969										
17003125	5/16	7.938	.3125										
17003150		8.	.3150										
17003281	21/64	8.334	.3281	6-1/2	165.	5	127.	4.1	104.	.3201 - .3510	8.130 - 8.915	.55	14.
17003346		8.5	.3346										
17003438	11/32	8.733	.3438										
17003543		9.	.3543	6-3/4	171.	5-1/4	133.	4.3	110.	.3540 - .3770	8.992 - 9.576	.56	14.
17003594	23/64	9.129	.3594										
17003740		9.5	.3740										
17003750	3/8	9.525	.3750										
17003906	25/64	9.921	.3906	7	178.	5-1/2	140.	4.5	115.	.3850 - .4080	9.779 - 10.363	.61	15.
17003937		10.	.3937										
17004062	13/32	10.317	.4062										
17004134		10.5	.4134	7-1/4	184.	5-3/4	146.	4.7	119.	.4100 - .4390	10.414 - 11.151	.61	16.
17004219	27/64	10.716	.4219										
17004331		11.	.4331										
17004375	7/16	11.113	.4375										

Shk Ø = Cut Ø

Style 170

EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Usable Flute at full Regrind "F"		Grind Down Range		Ineffective Flute Length	
	Inch	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
17004528		11.5	.4528	7-1/2	191.	5-3/4	146.	4.6	116.	.4391 - .4710	11.153 - 11.963	.63	16.
17004531	29/64	11.509	.4531										
17004688	15/32	11.908	.4688										
17004724		12.	.4724										
17004844	31/64	12.304	.4844	7-3/4	197.	5-3/4	146.	4.6	116.	.4711 - .5030	11.966 - 12.776	.65	17.
17004921		12.5	.4921										
17005000	1/2	12.7	.5000										
17005118		13.	.5118	8	203.	6	152.	4.8	121.	.5031 - .5330	12.779 - 13.538	.69	18.
17005156	33/64	13.096	.5156										
17005312	17/32	13.492	.5312										
17005315		13.5	.5315										
17005512		14.	.5512	8-1/4	210.	6-1/4	159.	5	126.	.5331 - .5650	13.541 - 14.351	.68	17.
17005625	9/16	14.288	.5625										
17005709		14.5	.5709	8-3/4	222.	6-3/4	171.	5.5	139.	.5651 - .5950	14.354 - 15.113	.68	17.
17005906		15.	.5906										
17005938	19/32	15.083	.5938										
17006102		15.5	.6102	8-3/4	222.	6-3/4	171.	5.4	137.	.5951 - .6270	15.116 - 15.926	.72	18.
17006250	5/8	15.875	.6250										
17006299		16.	.6299	9	229.	7	178.	5.6	142.	.6271 - .6570	15.928 - 16.688	.75	19.
17006496		16.5	.6496										
17006562	21/32	16.667	.6562										
17006693		17.	.6693	9-1/4	235.	7-1/4	184.	5.8	147.	.6571 - .6900	16.69 - 17.526	.79	20.
17006875	11/16	17.463	.6875										
17006890		17.5	.6890										
17007087		18.	.7087	9-1/2	241.	7-1/2	191.	6	153.	.6901 - .7220	17.529 - 18.339	.81	21.
17007188	23/32	18.258	.7188										
17007283		18.5	.7283	9-3/4	248.	7-3/4	197.	6.2	158.	.7221 - .7530	18.341 - 19.126	.83	21.
17007480		19.	.7480										
17007500	3/4	19.05	.7500										
17007656	49/64	19.446	.7656	9-7/8	251.	7-7/8	200.	6.3	160.	.7531 - .7840	19.129 - 19.914	.86	22.
17007677		19.5	.7677										
17007812	25/32	19.842	.7812										
17007874		20.	.7874	10	254.	8	203.	6.4	162.	.7841 - .8160	19.916 - 20.726	.85	22.
17008071		20.5	.8071										
17008125	13/16	20.638	.8125										
17008268		21.	.8268	10	254.	8	203.	6.4	162.	.8161 - .8470	20.729 - 21.514	.89	23.
17008438	27/32	21.433	.8438										
17008465		21.5	.8465										
17008661		22.	.8661	10	254.	8	203.	6.3	160.	.8471 - .8780	21.516 - 22.3	.92	23.
17008750	7/8	22.225	.8750										
17008858		22.5	.8858	10	254.	8	203.	6.3	160.	.8781 - .9090	22.304 - 23.089	.95	24.
17009055		23.	.9055										
17009062	29/32	23.017	.9062										
17009252		23.5	.9252	10-3/4	273.	8-3/4	222.	7	179.	.9091 - .9390	23.091 - 23.851	.98	25.
17009375	15/16	23.813	.9375										
17009449		24.	.9449	11	279.	9	229.	7.2	183.	.9391 - .9700	23.853 - 24.638	1.02	26.
17009646		24.5	.9646										
17009688	31/32	24.608	.9688										
17009843		25.	.9843	11	279.	9	229.	7.2	183.	.9701 - 1.0030	24.641 - 25.476	1.05	27.
17010000	1	25.4	1.0000										

Shk Ø = Cut Ø

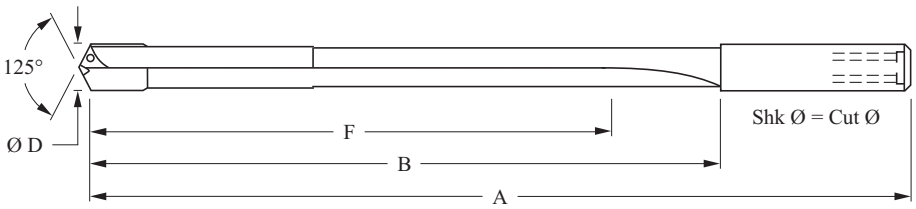
Phone: 630-690-5933 800-323-2299 Fax: 630-690-6355

Carbide Tip Koolcarb® Extra Length Drill

Submicron carbide tip yields exceptional tool life in tool steels, cast and ductile irons, cast aluminum and other abrasive materials.

Style 172

- Pressure coolant Koolcarb® construction creates straighter holes and smoother finish.
- 125° four facet web thinned point starts best into a larger point angle. Not intended for interrupted cut drilling.
- High speed "milled" body runs 2 to 4 times gundrill feeds on conventional equipment.
- Longer carbide yields increased regrinds.
- Straight flute, right hand cut.
- Specials available to 1.535″ (39.0 mm) Ø. Request intermediate sizes from grind down range.



Depth ≅ 12 to 28 x Ø

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

EDP #	Cutting Ø "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Usable Flute at full Regrind "F"		Grind Down Range		Ineffective Flute Length	
	Inch	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
17202500	1/4	6.35	.2500	10	254.	8	203.	7.2	183.	.2400 - .2530	6.096 - 6.426	.48	12.
17202812	9/32	7.142	.2812					7.1	181.	.2656 - .2840	6.746 - 7.214	.51	13.
17203125	5/16	7.938	.3125	10	254.	8	203.	7.1	180.	.2953 - .3160	7.5 - 8.026	.53	13.
17203438	11/32	8.733	.3438							.3281 - .3460	8.334 - 8.788	.55	14.
17203750	3/8	9.525	.3750	11	279.	9	229.	8.1	205.	.3594 - .3770	9.129 - 9.576	.56	14.
17204062	13/32	10.317	.4062					8	204.	.3906 - .4080	9.921 - 10.363	.61	15.
17204375	7/16	11.113	.4375					7.9	202.	.4200 - .4390	10.668 - 11.151	.61	16.
17204688	15/32	11.908	.4688	12	305.	9-3/4	248.	8.6	219.	.4531 - .4710	11.509 - 11.963	.63	16.
17205000	1/2	12.7	.5000						218.	.4800 - .5030	12.192 - 12.776	.65	17.
17205312	17/32	13.492	.5312					8.5	216.	.5118 - .5330	13. - 13.538	.69	18.
17205625	9/16	14.288	.5625	13	330.	10-3/4	273.	9.5	240.	.5430 - .5650	13.564 - 14.351	.68	17.
17206250	5/8	15.875	.6250					9.4	239.	.6070 - .6270	15.418 - 15.926	.72	17.
17207500	3/4	19.05	.7500	14	356.	11-3/4	298.	10.2	260.	.7320 - .7530	18.593 - 19.126	.83	18.
17208750	7/8	22.225	.8750	15	381.	12-3/4	324.	11.1	281.	.8570 - .8780	21.768 - 22.3	.92	19.
17210000	1	25.4	1.0000	16	406.	13-3/4	349.	12	304.	.9820 - 1.0030	24.943 - 25.476	1.05	20.

Shk Ø = Cut Ø

Style 260A

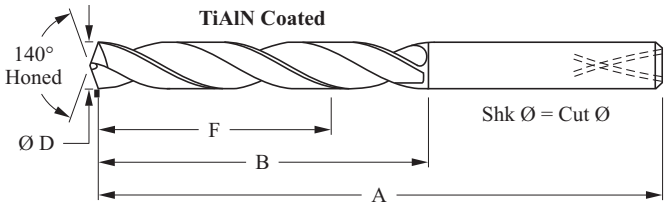
TiAlN coating

Premium cobalt coolant fed construction offers additional wear resistance and edge toughness over carbide tools when cutting forged steel, a wide variety of alloy steels, high temperature alloys and other difficult to machine materials.

- 140° double split point actively cuts along the entire cutting edge.
- TiAlN coating adds lubricity, enhances wear resistance and prevents edge build-up.
- Right hand spiral, right hand cut.
- Heavy web high helix construction clears chips more effectively than conventional flute shapes.

Depth ≅ 5 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



EDP #	Cutting Diameter "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Usable Flute at full Regrind "F"		Ineffective Flute Length	
	Inch	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm
26002500A	1/4	6.35	.2500	4-1/4	108.	1-3/4	44.	1.1	27.	.24	6.
26002656A	17/64	6.746	.2656	4-3/8	111.	1-7/8	48.	1.2	30.		
26002812A	9/32	7.142	.2812	4-1/2	114.	2	51.	1.2	31.	.26	7.
26002969A	19/64	7.541	.2969								
26003125A	5/16	7.938	.3125	4-3/4	121.	2-3/16	56.	1.4	35.	.28	7.
26003281A	21/64	8.334	.3281			2-1/4	57.	1.5	37.	.29	
26003438A	11/32	8.733	.3438	4-7/8	124.	2-3/8	60.	1.5	39.	.30	8.
26003594A	23/64	9.129	.3594	5	127.	2-1/2	64.	1.7	42.	.32	
26003750A	3/8	9.525	.3750	5-1/8	130.	2-5/8	67.	1.8	46.	.33	8.
26003906A	25/64	9.921	.3906	5-3/8	137.	2-3/4	70.	1.9	49.		
26004062A	13/32	10.317	.4062	5-1/2	140.	2-7/8	73.	2	50.	.35	9.
26004219A	27/64	10.716	.4219	5-5/8	143.	3	76.	2.1	53.	.37	9.
26004375A	7/16	11.113	.4375								
26004531A	29/64	11.509	.4531	5-3/4	146.	3-1/8	79.	2.2	55.	.39	10.
26004688A	15/32	11.908	.4688	5-7/8	149.	3-1/4	83.	2.3	57.	.40	
26004844A	31/64	12.304	.4844	6	152.	3-3/8	86.	2.4	60.	.40	10.
26005000A	1/2	12.7	.5000			3-1/2	89.	2.4	62.	.41	11.
26005625A	9/16	14.288	.5625	6-1/4	159.	3-7/8	98.	2.7	70.	.47	12.
26006250A	5/8	15.875	.6250	6-3/4	171.	4-3/8	111.	3.1	79.	.52	13.

Shk Ø = Cut Ø

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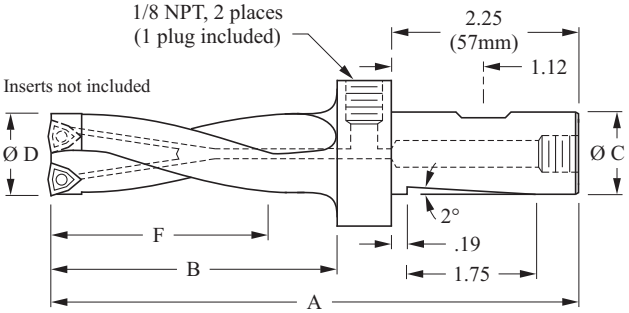
Kooldex® unique right hand spiral flute design gets the chips out of the hole and away from the cutting edges.

Style 560

- Trigon inserts allow smooth entry and excellent centering.
- Coolant feed from the rear of the shank or side entry port for use on lathes where provisions for coolant through on the back of the turret do not exist.
- All drills are provided with a whistle notch and Weldon shank flat for adaptability into a variety of tool holders.
- Precise insert location results in greater stability and tool life.

Depth ≅ 2.5 to 3 x Ø



EDP #	Cutting Diameter "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Shank Diameter "C"		Maximum Depth "F"		Screw EDP #, (2) Incl. With Drill	Insert EDP# Not Incl. With Drill	TORX Drvr. EDP # Incl. w/Drill
	Inch	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm			
56006250	5/8	15.875	.6250	5-3/16	132.	2-5/16	59.	1	25.4	1.7	43.	X560-03	WOMX 030204S,.08R	T6
56006875	11/16	17.462	.6875	5-3/8	137.	2-1/2	64.			1.9	48.			
56007500	3/4	19.05	.7500	5-9/16	141.	2-11/16	68.			2.1	54.			
56008125	13/16	20.638	.8125	5-3/4	146.	2-7/8	73.			2.3	59.			
56008750	7/8	22.225	.8750	5-15/16	151.	3-1/16	78.			2.4	62.			
56009375	15/16	23.813	.9375	6-1/8	156.	3-1/4	83.	1	25.4	2.6	66.	X560-05	WCGX 050304S,.08R	T7
56010000	1	25.4	1.0000	6-5/16	160.	3-7/16	87.			2.8	70.			
56010625	1-1/16	26.988	1.0625	6-1/2	165.	3-5/8	92.	1-1/4	31.75	2.9	75.			
56011250	1-1/8	28.575	1.1250	6-11/16	170.	3-13/16	97.			3.1	79.			
56011875	1-3/16	30.163	1.1875	6-7/8	174.	4	102.	1-1/4	31.75	3.3	83.	X560-06	WCGX 060304S,.08R	T10
56012500	1-1/4	31.75	1.2500	7-1/16	180.	4-3/16	106.			3.5	88.			
56013125	1-5/16	33.338	1.3125	7-1/4	184.	4-3/8	111.			3.6	91.			
56013750	1-3/8	34.925	1.3750	7-7/16	189.	4-9/16	116.			3.8	96.			
56014375	1-7/16	36.513	1.4375	7-5/8	194.	4-3/4	121.			4	100.			
56015000	1-1/2	38.1	1.5000	7-13/16	198.	4-15/16	125.			4.1	104.			
56015625	1-9/16	39.688	1.5625	7-7/8	200.	5	127.	1-1/4	31.75	4.2	106.	X560-06	WCGX 060304S,.08R	T10
56016250	1-5/8	41.275	1.6250											
56016875	1-11/16	42.863	1.6875											
56017500	1-3/4	44.45	1.7500	8-3/8	213.	5-1/2	140.	1-1/2	38.1	4.6	116.	X560-07	WCGX 07T304S,.08R	T10
56018125	1-13/16	46.038	1.8125											
56018750	1-7/8	47.625	1.8750											
56019375	1-15/16	49.213	1.9375											
56020000	2	50.8	2.0000											

For use with Style 560 Indexable Drill

- Typical application is a large radius for the outside insert, small radius for the inside insert.
- Coated inserts can be run in both positions. Uncoated inserts can be run in the center at customers option.

EDP Number	Inscribe Circle	Thickness	Radius	Shape of Insert	Chip Breaker	Coating	Grade
WOMX030204S-C5E	.236	.098	.016	Trigon 80°	Standard	Aluminum Oxide	C5
WOMX030204S-C6E						Aluminum Oxide	C2
WOMX030204S-CK2						Uncoated	C2
WOMX030204S-CP4						Uncoated	C5
WOMX030204S-CT5						TiN Coated	C5
WOMX030208S-C5E	.236	.098	.031	Trigon 80°	Standard	Aluminum Oxide	C5
WOMX030208S-C6E						Aluminum Oxide	C2
WOMX030208S-CK2						Uncoated	C2
WOMX030208S-CP4						Uncoated	C5
WOMX030208S-CT5						TiN Coated	C5
WCGX050304S-C5E	.315	.126	.016	Trigon 80°	Standard	Aluminum Oxide	C5
WCGX050304S-C6E						Aluminum Oxide	C2
WCGX050304S-CK2						Uncoated	C2
WCGX050304S-CP4						Uncoated	C5
WCGX050304S-CT5						TiN Coated	C5
WCGX050308S-C5E	.315	.126	.031	Trigon 80°	Standard	Aluminum Oxide	C5
WCGX050308S-C6E						Aluminum Oxide	C2
WCGX050308S-CK2						Uncoated	C2
WCGX050308S-CP4						Uncoated	C5
WCGX050308S-CT5						TiN Coated	C5
WCGX060304S-C5E	.394	.126	.016	Trigon 80°	Standard	Aluminum Oxide	C5
WCGX060304S-C6E						Aluminum Oxide	C2
WCGX060304S-CK2						Uncoated	C2
WCGX060304S-CP4						Uncoated	C5
WCGX060304S-CT5						TiN Coated	C5
WCGX060308S-C5E	.394	.126	.031	Trigon 80°	Standard	Aluminum Oxide	C5
WCGX060308S-C6E						Aluminum Oxide	C2
WCGX060308S-CK2						Uncoated	C2
WCGX060308S-CP4						Uncoated	C5
WCGX060308S-CT5						TiN Coated	C5
WCGX07T304S-C5E	.472	.156	.016	Trigon 80°	Standard	Aluminum Oxide	C5
WCGX07T304S-C6E						Aluminum Oxide	C2
WCGX07T304S-CK2						Uncoated	C2
WCGX07T304S-CP4						Uncoated	C5
WCGX07T304S-CT5						TiN Coated	C5
WCGX07T308S-C5E	.472	.156	.031	Trigon 80°	Standard	Aluminum Oxide	C5
WCGX07T308S-C6E						Aluminum Oxide	C2
WCGX07T308S-CK2						Uncoated	C2
WCGX07T308S-CP4						Uncoated	C5
WCGX07T308S-CT5						TiN Coated	C5

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Notes (Updates)

Important Factors in Reaming Operations

Proper Speed

Excessive speed will cause chatter and poor finish.

Proper Feed

Insufficient feed will cause glazing and excessive wear. Excessive feed will reduce accuracy and the quality of the finish.

Stock Removal

Insufficient stock removal will result in burnishing and will cause premature wear.

Proper Set Up

Reamers should have a minimum overhang and be run through a bushing whenever possible with a heavy flow of lubricant.

Reamer Feed Rates in Inch Per Revolution

Type	Material Group #	Speed SFM		Tool Diameter		
		Low	High	Ø 0.125 to 0.472	Ø 0.4721 to 0.878	Ø 0.8781 to 1.503
A1 < 5% Si	1	250	500	0.0030 to 0.0070	0.0050 to 0.0110	0.0070 to 0.0150
A1 > 5% Si	2					
Brass	3	250	250			
Bronze	4	150	160			
Cast Iron	5	100	200	0.0027 to 0.0063	0.0045 to 0.0100	0.0063 to 0.0137
Ductile Iron	6	70	120			
Steel < 35% C	7	60	95			
Steel > 35% C	8			0.0023 to 0.0057	0.0045 to 0.0090	0.0057 to 0.0123
Tool Steel	9	35	55			
Hard Steel	10	20	35	0.0017 to 0.0043	0.0050 to 0.0070	0.0043 to 0.0097
Stainless Steel - Free Machining	11	40	75	0.0023 to 0.0057	0.0040 to 0.0090	0.0057 to 0.0123
Stainless Steel	12	35	55			
Titanium	13	25	50	0.0027 to 0.0063	0.0045 to 0.0100	0.0063 to 0.0137
Soft High Temp. Alloy	14		40	0.0023 to 0.0057	0.0040 to 0.0090	0.0057 to 0.0123
Hard High Temp. Alloy	15	15	35	0.0020 to 0.0050	0.0035 to 0.0080	0.0050 to 0.0110
Plastics	16	70	120	0.0030 to 0.0070	0.0050 to 0.0110	0.0070 to 0.0150

For recommended stock removal and troubleshooting guide please see page 107.

Phone: 630-690-5933 800-323-2299 Fax: 630-690-6355

Carbide Tip Coolant Fed Chucking Reamers

KOOLREAM®

	**Style 452**	General purpose, straight flute for blind hole applications. For reaming aluminum, cast iron, steels, plastics and other abrasive materials. **Page. 92**
	**Style 452A**	General purpose, straight flute for thru hole applications. For reaming aluminum, cast iron, steels, plastics and other abrasive materials. **Page. 93**
	**Style 453**	General purpose, right hand spiral for blind hole applications. For reaming aluminum, cast iron, steels, plastics and other abrasive materials. **Page. 94**
	**Style 453A**	General purpose, right hand spiral for thru hole applications. For reaming aluminum, cast iron, steels, plastics and other abrasive materials. **Page. 95**

Style 452 and Style 453 carbide tipped reamers with through the tool coolant capability yield higher tool life, better size control and finer surface finishes than can be achieved with a conventional carbide tipped reamer. Coolant fed through the tool ejects the chips and heat out and away from the piece part decreasing distortion. When ordering, please specify the type of coolant hole configuration desired, “For Blind Hole” reaming or “For Thru Hole″ reaming.

Special threaded shank configurations, oversized flatted shanks or taper shanks are available on request. Standard diameter tolerance is +.0003″ – .0000″, closer tolerances need to be specified at time of quotation.

For Blind Hole Applications

Blind hole coolant feeding reamers carry the coolant down the tool through a centerline coolant port exiting in front and then flushing the chips up the tool’s flutes.

For Thru Hole Applications

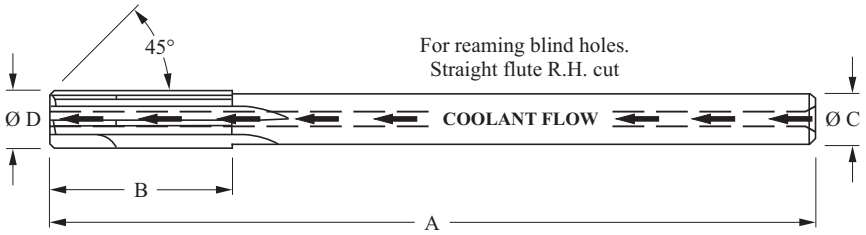
Thru hole coolant feeding reamers have coolant ports exiting out into each of the flutes. The ports are staggered slightly behind the cutting edge and angled forward to flush the chips out of the hole ahead of the reamer.

Style 452

Coolant fed construction increases tool life and improves surface finish when reaming aluminum, cast iron, steels, plastics and other abrasive materials.

- Straight flute, right hand cut.
- Polished flutes for smooth chip flow.
- Precision ground cutting edges.
- Carbide tipped, high speed steel bodies.
- Use decimal size range column to determine the overall length, flute length and shank dimensions for modified and grind down reamers.

Diameter Tolerances				
Nominal Size	Cutting Ø		Shank Ø	
	Inch	mm	Inch	mm
All	+.0003 -.0000	+0.008 -0.000	+.0000 -.0010	+0.000 -0.025



EDP #	Cutting Diameter "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Shank Diameter "C"		Decimal Size Range		Ref. Tip Length	No. of Flts.
Blind Hole	Inch	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	
45202344	15/64	5.954	.2344	6	152.	1-1/2	38.	7/32	5.558	.2211 - .2380	5.616 - 6.045	.50	4
45202500	1/4	6.35	.2500					15/64	5.954	.2381 - .2530	6.048 - 6.426		
45202656	17/64	6.746	.2656							.2531 - .2840	6.429 - 7.214		
45202812	9/32	7.142	.2812										
45202969	19/64	7.541	.2969	6	152.	1-1/2	38.	9/32	7.142	.2841 - .3150	7.216 - 8.001		
45203125	5/16	7.938	.3125										
45203281	21/64	8.334	.3281							.3151 - .3470	8.004 - 8.814		
45203438	11/32	8.733	.3438										
45203594	23/64	9.129	.3594	7	178.	1-3/4	44.	5/16	7.938	.3471 - .3780	8.816 - 9.601		
45203750	3/8	9.525	.3750										
45203906	25/64	9.921	.3906							.3781 - .4090	9.604 - 10.389	.63	
45204062	13/32	10.317	.4062										
45204219	27/64	10.716	.4219	7	178.	1-3/4	44.	3/8	9.525	.4091 - .4410	10.391 - 11.201		
45204375	7/16	11.113	.4375										
45204531	29/64	11.509	.4531							.4411 - .4720	11.204 - 11.989		
45204688	15/32	11.908	.4688										
45204844	31/64	12.304	.4844	8	203.	2	51.	7/16	11.113	.4721 - .5030	11.991 - 12.776	.63	6
45205000	1/2	12.7	.5000										
45205156	33/64	13.096	.5156							.5031 - .5340	12.779 - 13.564		
45205312	17/32	13.492	.5312										
45205625	9/16	14.288	.5625							.5341 - .5660	13.566 - 14.376		
45205938	19/32	15.083	.5938							.5661 - .5970	14.379 - 15.164		
45206250	5/8	15.875	.6250	9	229.	2-1/4	57.	9/16	14.288	.5971 - .6280	15.166 - 15.951		
45206562	21/32	16.667	.6562							.6281 - .6590	15.954 - 16.739		
45206875	11/16	17.463	.6875							.6591 - .6910	16.741 - 17.551		
45207500	3/4	19.05	.7500	9-1/2	241.	2-1/2	64.	5/8	15.875	.7221 - .7530	18.341 - 19.126	.75	6
45208125	13/16	20.638	.8125							.7841 - .8160	19.916 - 20.726		
45208750	7/8	22.225	.8750	10	254.	2-5/8	67.	3/4	19.05	.8471 - .8780	21.516 - 22.301		
45209375	15/16	23.813	.9375							.9091 - .9410	23.091 - 23.901	.75	8
45210000	1	25.4	1.0000	10-1/2	267.	2-3/4	70.	7/8	22.225	.9721 - 1.0030	24.691 - 25.476		
45210625	1-1/16	26.988	1.0625							1.0031 - 1.0660	25.479 - 27.076		
45211250	1-1/8	28.575	1.1250	11	279.	2-7/8	73.			1.0661 - 1.1280	27.079 - 28.651		

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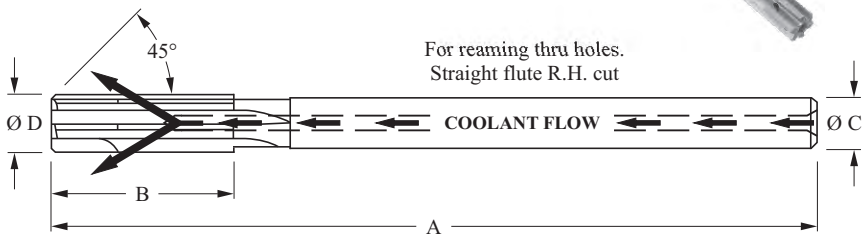
Carbide Tip, "Thru Hole" Koolream® Chucking Reamer

Coolant fed construction increases tool life and improves surface finish when reaming aluminum, cast iron, steels, plastics and other abrasive materials.

Style 452A

- Straight flute, right hand cut.
- Polished flutes for smooth chip flow.
- Precision ground cutting edges.
- Carbide tipped, high speed steel bodies.
- Use decimal size range column to determine the overall length, flute length and shank dimensions for modified and grind down reamers.

Diameter Tolerances				
Nominal Size	Cutting Ø		Shank Ø	
	Inch	mm	Inch	mm
All	+.0003 -.0000	+0.008 -0.000	+.0000 -.0010	+0.000 -0.025



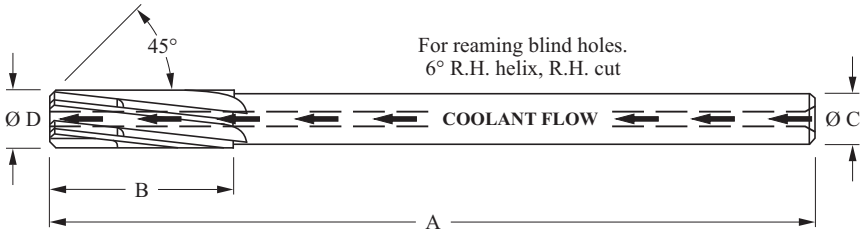
EDP #	Cutting Diameter "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Shank Diameter "C"		Decimal Size Range		Ref. Tip Length	No. of Flts.
Thru Hole	Inch	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	
45202344A	15/64	5.954	.2344	6	152.	1-1/2	38.	7/32	5.558	.2211 - .2380	5.616 - 6.045	.50	4
45202500A	1/4	6.35	.2500					15/64	5.954	.2381 - .2530	6.048 - 6.426		
45202656A	17/64	6.746	.2656							.2531 - .2840	6.429 - 7.214		
45202812A	9/32	7.142	.2812										
45202969A	19/64	7.541	.2969	6	152.	1-1/2	38.	9/32	7.142	.2841 - .3150	7.216 - 8.		
45203125A	5/16	7.938	.3125										
45203281A	21/64	8.334	.3281							.3151 - .3470	8.004 - 8.814		
45203438A	11/32	8.733	.3438										
45203594A	23/64	9.129	.3594	7	178.	1-3/4	44.	5/16	7.938	.3471 - .3780	8.816 - 9.601		
45203750A	3/8	9.525	.3750										
45203906A	25/64	9.921	.3906							.3781 - .4090	9.604 - 10.389	.63	4
45204062A	13/32	10.317	.4062										
45204219A	27/64	10.716	.4219	7	178.	1-3/4	44.	3/8	9.525	.4091 - .4410	10.391 - 11.201		
45204375A	7/16	11.113	.4375										
45204531A	29/64	11.509	.4531							.4411 - .4720	11.204 - 11.989		
45204688A	15/32	11.908	.4688										
45204844A	31/64	12.304	.4844	8	203.	2	51.	7/16	11.113	.4721 - .5030	11.991 - 12.776		
45205000A	1/2	12.7	.5000										
45205156A	33/64	13.096	.5156							.5031 - .5340	12.779 - 13.564		
45205312A	17/32	13.492	.5312										
45205625A	9/16	14.288	.5625							.5341 - .5660	13.566 - 14.376	.63	6
45205938A	19/32	15.083	.5938							.5661 - .5970	14.379 - 15.164		
45206250A	5/8	15.875	.6250	9	229.	2-1/4	57.	9/16	14.288	.5971 - .6280	15.166 - 15.951		
45206562A	21/32	16.667	.6562							.6281 - .6590	15.954 - 16.739		
45206875A	11/16	17.463	.6875							.6591 - .6910	16.741 - 17.551		
45207500A	3/4	19.05	.7500	9-1/2	241.	2-1/2	64.	5/8	15.875	.7221 - .7530	18.316 - 19.126		
45208125A	13/16	20.638	.8125							.7841 - .8160	19.916 - 20.726	.75	6
45208750A	7/8	22.225	.8750	10	254.	2-5/8	67.	3/4	19.05	.8471 - .8780	21.516 - 22.3		
45209375A	15/16	23.813	.9375							.9091 - .9410	23.091 - 23.901		
45210000A	1	25.4	1.0000	10-1/2	267.	2-3/4	70.	7/8	22.225	.9721 - 1.0030	24.691 - 25.476	.75	8
45210625A	1-1/16	26.988	1.0625							1.0031 - 1.0660	25.479 - 27.076		
45211250A	1-1/8	28.575	1.1250	11	279.	2-7/8	73.			1.0661 - 1.1280	27.079 - 28.651		

Style 453

Coolant fed construction increases tool life and improves surface finish when reaming aluminum, cast iron, steels, plastics and other abrasive materials.

- Right hand spiral, right hand cut construction has better chip evacuation when used on ductile materials or blind holes.
- Polished flutes for smooth chip flow.
- Precision ground cutting edges.
- Carbide tipped, high speed steel bodies.
- Use decimal size range column to determine the overall length, flute length and shank dimensions for modified and grind down reamers.

Diameter Tolerances				
Nominal Size	Cutting Ø		Shank Ø	
	Inch	mm	Inch	mm
All	+.0003 -.0000	+0.008 -0.000	+.0000 -.0010	+0.000 -0.025



EDP #	Cutting Diameter "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Shank Diameter "C"		Decimal Size Range		Ref. Tip Length	No. of Flts.
Blind Hole	Inch	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	
45302500	1/4	6.35	.2500	6	152.	1-1/2	38.	15/64	5.954	.2381 - .2530	6.048 - 6.426	.50	4
45302812	9/32	7.142	.2812							.2531 - .2840	6.429 - 7.214		
45303125	5/16	7.938	.3125					9/32	7.142	.2841 - .3150	7.216 - 8.001		
45303438	11/32	8.733	.3438							.3151 - .3470	8.004 - 8.814		
45303750	3/8	9.525	.3750	7	178.	1-3/4	44.	5/16	7.938	.3471 - .3780	8.816 - 9.601		
45304062	13/32	10.317	.4062							.3781 - .4090	9.604 - 10.389	.62	4
45304375	7/16	11.113	.4375					3/8	9.525	.4091 - .4410	10.391 - 11.201		
45304688	15/32	11.908	.4688							.4411 - .4720	11.204 - 11.989		
45305000	1/2	12.7	.5000	8	203.	2	51.	7/16	11.113	.4721 - .5030	11.991 - 12.776		6
45305625	9/16	14.288	.5625							.5341 - .5660	13.566 - 14.376		
45306250	5/8	15.875	.6250	9	229.	2-1/4	57.	9/16	14.288	.5971 - .6280	15.166 - 15.951		
45306875	11/16	17.463	.6875							.6591 - .6910	16.741 - 17.551		
45307500	3/4	19.05	.7500	9-1/2	241.	2-1/2	64.	5/8	15.875	.7221 - .7530	18.341 - 19.126	.75	

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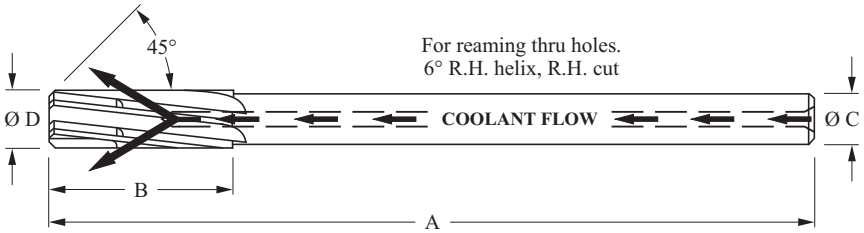
Carbide Tip, "Thru Hole" Koolream® Spiral, Chucking Reamer

Coolant fed construction increases tool life and improves surface finish when reaming aluminum, cast iron, steels, plastics and other abrasive materials.

Style 453A

- Right hand spiral, right hand cut construction improves hole finish in ductile materials.
- Polished flutes for smooth chip flow.
- Precision ground cutting edges.
- Carbide tipped, high speed steel bodies.
- Use decimal size range column to determine the overall length, flute length and shank dimensions for modified and grind down reamers.



Diameter Tolerances				
Nominal Size	Cutting Ø		Shank Ø	
	Inch	mm	Inch	mm
All	+.0003 -.0000	+0.008 -0.000	+.0000 -.0010	+0.000 -0.025

EDP #	Cutting Diameter "D"		Dec. Equiv.	Overall Length "A"		Flute Length "B"		Shank Diameter "C"		Decimal Size Range		Ref. Tip Length	No. of Flts.
Thru Hole	Inch	mm	Inch	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	
45302500A	1/4	6.35	.2500	6	152.	1-1/2	38.	15/64	5.954	.2381 - .2530	6.048 - 6.426	.50	4
45302812A	9/32	7.142	.2812							.2531 - .2840	6.429 - 7.214		
45303125A	5/16	7.938	.3125					9/32	7.142	.2841 - .3150	7.216 - 8.001		
45303438A	11/32	8.733	.3438							.3151 - .3470	8.004 - 8.814		
45303750A	3/8	9.525	.3750	7	178.	1-3/4	44.	5/16	7.938	.3471 - .3780	8.816 - 9.601		
45304062A	13/32	10.317	.4062							.3781 - .4090	9.604 - 10.389	.62	4
45304375A	7/16	11.113	.4375					3/8	9.525	.4091 - .4410	10.391 - 11.201		
45304688A	15/32	11.908	.4688							.4411 - .4720	11.204 - 11.989		
45305000A	1/2	12.7	.5000	8	203.	2	51.	7/16	11.113	.4721 - .5030	11.991 - 12.776		6
45305625A	9/16	14.288	.5625							.5341 - .5660	13.566 - 14.376		
45306250A	5/8	15.875	.6250	9	229.	2-1/4	57.	9/16	14.288	.5971 - .6280	15.166 - 15.951		
45306875A	11/16	17.463	.6875							.6591 - .6910	16.741 - 17.551		
45307500A	3/4	19.05	.7500	9-1/2	241.	2-1/2	64.	5/8	15.875	.7221 - .7530	18.341 - 19.126	.75	

Return your tools to original point specifications.



In order to give our customers the most life and service out of their tools, CJT Koolcarb, in conjunction with our distributors, offers a Re-sharpening/Re-coating service for all drill styles we manufacture. At minimal cost compared to the purchase price of a new drill, re-sharpening can significantly reduce tooling costs over the long term for our customers.

When a CJT drill is returned to us for re-sharpening, it undergoes a professional inspection to determine both the feasibility of re-sharpening success and the minimum amount of material removal required to return the tool to proper working condition. Those tools deemed unacceptable for re-sharpening are returned to the customer at no charge. During the re-sharpening process, the drill point will be returned to "as new" condition using the original pointing specifications. With our "state of the art" equipment and dedicated staff, you can be assured of the utmost care and attention in the handling and processing of your order.

Our knowledgeable staff takes pride in removing as little material as possible during the re-sharpening process that brings a dull, worn tool back to "life." If, during the re-sharpening process we are unable, for any reason, to return the point to original specifications, we will return the drill to the customer at no charge. When a mix of styles and/or coatings is received in a shipment of tools, they are separated into like groups for processing. Since some types of tooling require extra processing time (such as for coating,) CJT Koolcarb will not delay the return of tools until all the tools are ready. Instead, we will ship groups of like tools as they are completed in order to achieve the fastest turn-around time. Those customers that would rather receive all tools in one shipment need only request, "No Partial Shipments," on their P.O. or RFQ.

To start the Re-sharp process, simply do the following:

1. Contact your distributor with your request.
2. Protect your tools individually (in their original CJT container if possible) to prevent shipping damage to the carbide.
3. Enclose your P.O. or RFQ in the package including any additional instructions or requests.
4. Ship the tools per distributors instructions.

Processing Notes:

1. The re-sharpening process removes metal at the point. This, in turn, will decrease the overall and flute length of the tool for every re-sharpening.
2. Chips on or near the point, excessive wear, and/or cracks in the carbide will require greater material removal than normal. You can be assured that we will remove only what is necessary so that the tool will perform as close to "as new" condition as is possible.

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Fluid Pressure Page. 98

Coolant Flow Capacities for Drills Page. 99

Tap Drill Sizes Page. 100-101

Material Group Cross Reference Page. 102-103

Hardness Conversion Page. 104

ISO Conversion Page. 105

Decimal Conversion Page. 106

Reamer Technical Guide Page. 107

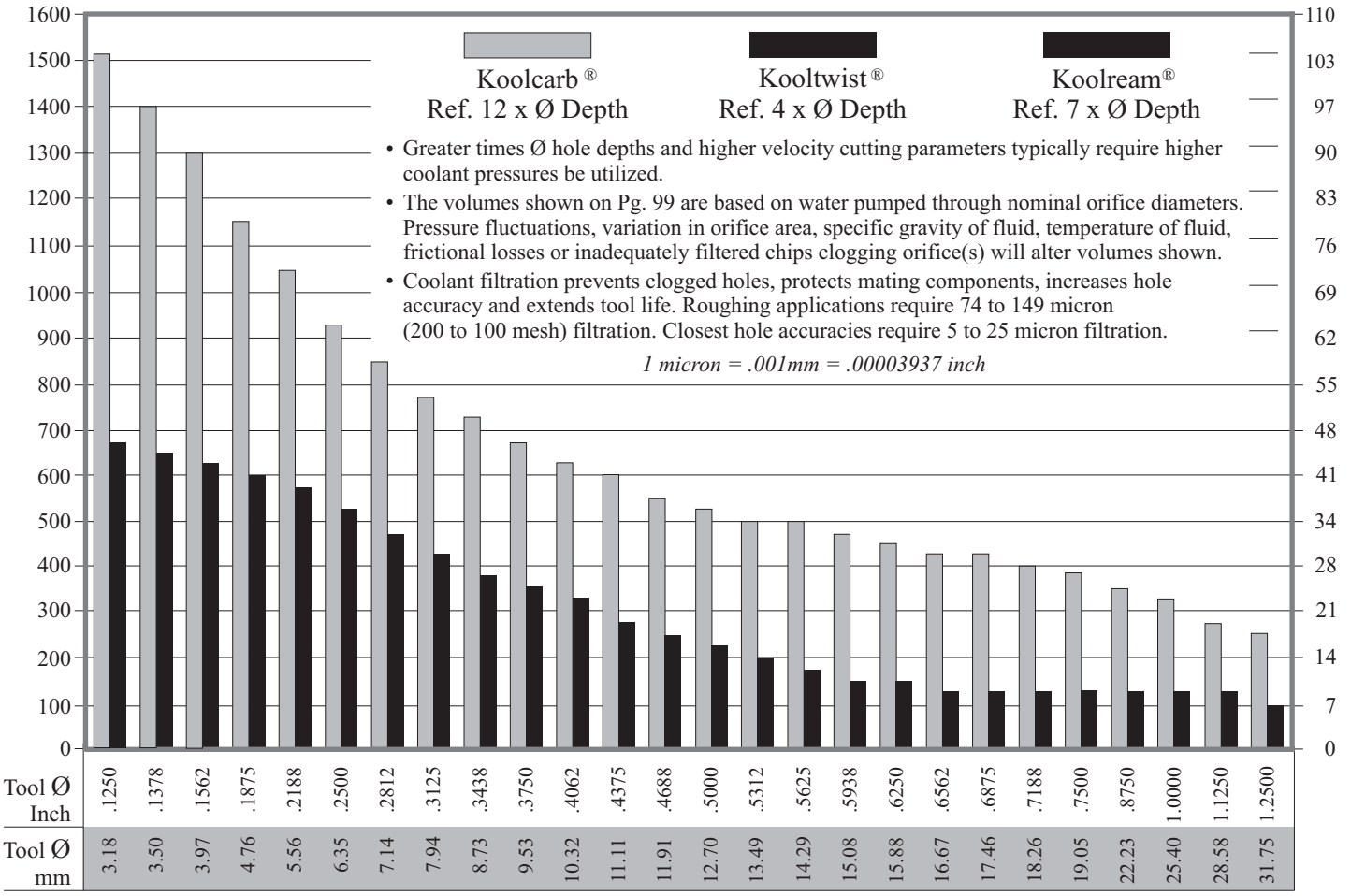
Conversion Tables Page. 108

Application Data Sheet Page. 109

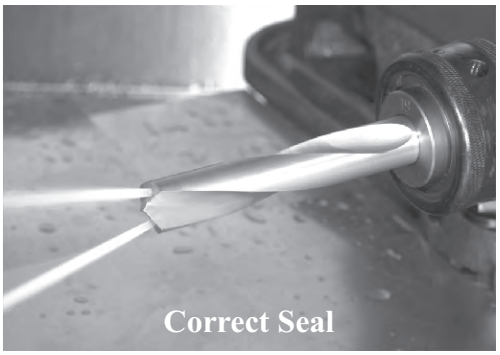
Notes Page. 110

Index Page. 113

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
260	.250 - .266	0.58	0.82	1.17	1.43	1.65	1.84	2.02	2.18	2.33	2.61	2.85	3.19
	.281 - .297	0.74	1.05	1.48	1.81	2.10	2.34	2.57	2.77	2.96	3.31	3.63	4.06
	.313 - .328	0.92	1.30	1.84	2.25	2.60	2.90	3.18	3.43	3.67	4.11	4.50	5.03
	.344 - .375	1.15	1.62	2.30	2.81	3.25	3.63	3.98	4.30	4.60	5.14	5.63	6.29
	.391 - .500	1.48	2.10	2.97	3.63	4.20	4.69	5.14	5.55	5.93	6.63	7.27	8.13
	.563	1.63	2.31	3.26	4.00	4.62	5.16	5.65	6.11	6.53	7.30	8.00	8.94
	.625	2.08	2.94	4.16	5.10	5.89	6.58	7.21	7.79	8.33	9.31	10.20	11.40
170 171 172 176 290 295 296 297	.188 - .201	0.25	0.36	0.51	0.62	0.72	0.80	0.88	0.95	1.01	1.13	1.24	1.39
	.213 - .219	0.33	0.47	0.66	0.81	0.94	1.05	1.15	1.24	1.33	1.49	1.63	1.82
	.234 - .261	0.44	0.63	0.89	1.09	1.25	1.40	1.54	1.66	1.77	1.98	2.17	2.43
	.266 - .281	0.58	0.82	1.17	1.43	1.65	1.84	2.02	2.18	2.33	2.61	2.85	3.19
	.295 - .316	0.71	1.01	1.43	1.75	2.02	2.26	2.47	2.67	2.85	3.19	3.49	3.91
	.328 - .344	0.80	1.13	1.60	1.95	2.26	2.52	2.76	2.98	3.19	3.57	3.91	4.37
	.354 - .375	0.92	1.30	1.84	2.25	2.60	2.90	3.18	3.43	3.67	4.11	4.50	5.03
	.386 - .406	1.18	1.67	2.37	2.90	3.35	3.74	4.10	4.43	4.74	5.29	5.80	6.48
	.413 - .438	1.33	1.88	2.66	3.26	3.76	4.20	4.61	4.97	5.32	5.95	6.51	7.28
	.453 - .472	1.48	2.10	2.97	3.63	4.20	4.69	5.14	5.55	5.93	6.63	7.27	8.13
	.484 - .500	1.63	2.31	3.26	4.00	4.62	5.16	5.65	6.11	6.53	7.30	8.00	8.94
	.519 - .532	1.93	2.73	3.86	4.72	5.45	6.10	6.68	7.22	7.71	8.62	9.45	10.56
	.547 - .563	2.04	2.89	4.09	5.00	5.78	6.46	7.08	7.64	8.17	9.14	10.01	11.19
170 171 172 176	.571 - .594	2.20	3.11	4.40	5.39	6.22	6.95	7.62	8.23	8.80	9.83	10.77	12.04
	.610 - .625	2.36	3.33	4.72	5.78	6.67	7.46	8.17	8.82	9.43	10.54	11.55	12.91
	.630 - .656	2.52	3.56	5.04	6.17	7.13	7.97	8.73	9.43	10.08	11.27	12.34	13.80
		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

Tap Drill Sizes

When you know the hole size and you want to know what % of thread you are producing.
(For roll threads replace .01299 in formula with .0068)

Cut Thread (Inch)

$$\frac{\text{Major Dia. of Tap} - \text{Actual Hole Size}}{.01299} \times (\text{Threads per Inch}) = \%\ \text{of Thread}$$

Cut Thread (Metric)

$$\frac{\text{Major Dia. of Tap (mm)} - \text{Actual Hole Size (mm)}}{.01299 \times \text{Pitch}} = \%\ \text{of Thread}$$

Cut Threads

Inch:

$$\text{Actual Hole Size Needed} = \text{Major Dia. (Basic) of Tap} - \frac{.01299 \times \%\ \text{of Thread}}{(\#\ \text{of Threads per Inch})}$$

Metric:

$$\text{Actual Hole Size Needed mm} = \text{Major Dia. (Basic) of Tap mm} - .01299 \times \%\ \text{of Thread} \times \text{Pitch (mm)}$$

Roll Form Threads

Inch:

$$\text{Actual Hole Size Needed} = \text{Major Dia. (Basic) of Tap} - \frac{.0068 \times \%\ \text{of Thread}}{(\#\ \text{of Threads per Inch})}$$

Metric:

$$\text{Actual Hole Size Needed mm} = \text{Major Dia. (Basic) of Tap mm} - .0068 \times \%\ \text{of Thread} \times \text{Pitch (mm)}$$

Quick reference min/max hole sizes per thread classifications.

TAP SIZE	*" B " Major Dia. Basic All Thread Classes*	*" B " Major Dia. Basic Metric*	Unified 3B ASME B1.1 Cut Tap min / max.	Unified 2B ASME B1.1 Cut Tap min / max	MiL-S-8879 3B A/B/C Cut Tap min / max	Inch Roll Tap min / max	Metric 6H ASME B1.13m Cut Tap min / max	Metric Roll Tap min / max
0 - 80	***.0600***	-	.0465 - .0514	.0465 - .0514	.0479 - .0511	.0546 - .0558	-	-
M 1.6 x 0.35	***.0629***	**1.6 mm**	-	-	-	-	.0480 - .0520	.0561 - .0578
1 - 64	***.0730***	-	.0561 - .0623	.0561 - .0623	.0578 - .0619	.0660 - .0680	-	-
1 - 72	***.0730***	-	.0580 - .0635	.0580 - .0635	.0595 - .0631	.0670 - .0690	-	-
M 2 x 0.4	***.0787***	**2.0 mm**	-	-	-	-	.0616 - .0661	.0709 - .0728
2 - 56	***.0860***	-	.0667 - .0737	.0667 - .0737	.0686 - .0732	.0780 - .0800	-	-
2 - 64	***.0860***	-	.0691 - .0753	.0691 - .0753	.0708 - .0749	.0790 - .0810	-	-
M 2.5 x 0.45	***.0984***	**2.5 mm**	-	-	-	-	.0792 - .0841	.0896 - .0918
3 - 48	***.0990***	-	.0764 - .0845	.0764 - .0845	.0787 - .0841	.0900 - .0920	-	-
3 - 56	***.0990***	-	.0797 - .0865	.0797 - .0855	.0816 - .0862	.0910 - .0930	-	-
4 - 40	***.1120***	-	.0849 - .0939	.0849 - .0939	.0877 - .0942	.1000 - .1030	-	-
4 - 48	***.1120***	-	.0894 - .0968	.0890 - .0968	-	.1030 - .1050	-	-
M 3 x 0.5	***.1181***	**3.0 mm**	-	-	-	-	-	.1087 - .1107
5 - 40	***.1250***	-	.0979 - .1062	.0979 - .1062	.1007 - .1072	.1130 - .1160	-	-
M 3.5 x 0.6	***.1378***	**3.5 mm**	-	-	-	-	.1122 - .1185	.1260 - .1289
6 - 32	***.1380***	-	.1040 - .1140	.1040 - .1140	.1076 - .1157	.1240 - .1260	-	-
6 - 40	***.1380***	-	.1110 - .1186	.1110 - .1190	.1137 - .1202	.1260 - .1280	-	-

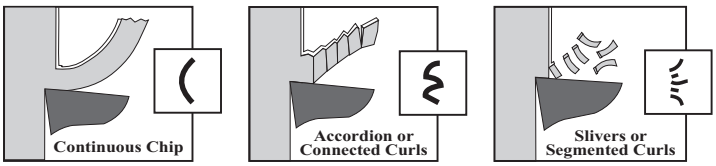
Phone: 630-690-5933 800-323-2299 Fax: 630-690-6355

Tap Drill Sizes

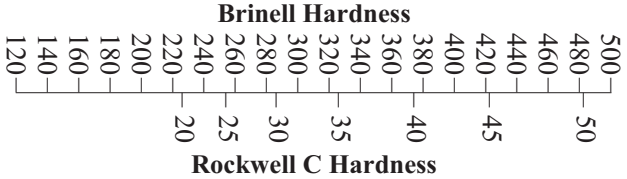
TAP SIZE	" B " Major Dia. Basic All Thread Classes	" B " Major Dia. Basic Metric	Unified 3B ASME B1.1 Cut Tap min / max.	Unified 2B ASME B1.1 Cut Tap min / max	Mi8L-S-8879 3B A/B/C Cut Tap min / max	Inch Roll Tap min / max	Metric 6H ASME B1.13M Cut Tap min / max	Metric Roll Tap min / max
M 4 x 0.7	***.1574***	**4.0 mm**	-	-	-	-	.1276 - .1347	.1437 - .1471
8 - 32	***.1640***	-	.1300 - .1389	.1300 - .1390	.1336 - .1417	.1490 - .1520	-	-
8 - 36	***.1640***	-	.1340 - .1416	.1340 - .1420	.1370 - .1442	.1510 - .1530	-	-
10 - 24	***.1900***	-	.1450 - .1555	.1450 - .1560	.1494 - .1600	.1700 - .1740	-	-
10 - 32	***.1900***	-	.1560 - .1641	.1560 - .1640	.1596 - .1675	.1750 - .1780	-	-
M 5 x 0.8	***.1968***	**5.0 mm**	-	-	-	-	.1627 - .1706	.1811 - .1850
M 6 x 1.0	***.2362***	**6.0 mm**	-	-	-	-	.1935 - .2028	.2165 - .2215
M 6 x 0.75	***.2362***	**6.0 mm**	-	-	-	-	.2042 - .2117	-
1/4 - 20	***.2500***	-	.1960 - .2067	.1960 - .2070	.2013 - .2121	.2250 - .2300	-	-
1/4 - 28	***.2500***	-	.2110 - .2190	.2110 - .2200	.2152 - .2229	.2330 - .2370	-	-
5/16 - 18	***.3125***	-	.2520 - .2630	.2520 - .2650	.2584 - .2690	.2850 - .2910	-	-
5/16 - 24	***.3125***	-	.2670 - .2754	.2670 - .2770	.2719 - .2799	.2920 - .2970	-	-
M 8 x 1.25	***.3149***	**8.0 mm**	-	-	-	-	.2616 - .2721	-
M 8 x 1.0	***.3149***	**8.0 mm**	-	-	-	-	.2723 - .2816	.2927 - .2725
3/8 - 16	***.3750***	-	.3070 - .3182	.3070 - .3210	.3192 - .3251	.3440 - .3500	-	-
3/8 - 24	***.3750***	-	.3300 - .3372	.3300 - .3400	.3344 - .3418	.3550 - .3590	-	-
M 10 x 1.5	***.3937***	**10.0 mm**	-	-	-	-	.3297 - .3415	.3642 - .3716
M 10 x 1.25	***.3937***	**10.0 mm**	-	-	-	-	.3404 - .3508	.3658 - .3712
7/16 - 14	***.4375***	-	.3600 - .3717	.3600 - .3760	.3680 - .3795	.4020 - .4090	-	-
7/16 - 20	***.4375***		.3830 - .3916	.3830 - .3950	.3888 - .3970	.4140 - .4180	-	-
M 12 x 1.75	***.4724***	**12.0 mm**	-	-	-	-	.3978 - .4110	.4380 - .4466
M 12 x 1.25	***.4724***	**12.0 mm**	-	-	-	-	.4192 - .4295	.4445 - .4499
1/2 - 13	***.5000***	-	.4170 - .4284	.4170 - .4340	.4251 - .4368	.4620 - .4700	-	-
1/2 - 20	***.5000***	-	.4460 - .4537	.4460 - .4570	.4513 - .4591	.4750 - .4800	-	-
M 14 x 2.0	***.5511***	**14.0 mm**	-	-	-	-	.4659 - .4807	.5118 - .5217
M 14 x 1.5	***.5511***	**14.0 mm**	-	-	-	-	.4872 - .4990	.5177 - .5239
9/16 - 12	***.5625***	-	.4720 - .4843	.4720 - .4900	.4814 - .4914	.5200 - .5280	-	-
9/16 - 18	***.5625***	-	.5020 - .5106	.5020 - .5150	.5084 - .5156	.5350 - .5400	-	-
5/8 - 11	***.6250***	-	.5270 - .5391	.5270 - .5460	.5365 - .5474	.5790 - .5860	-	-
5/8 - 18	***.6250***	-	.5650 - .5730	.5650 - .5780	.5709 - .5788	.5980 - .6030	-	-
M 16 x 2.0	***.6299***	**16.0 mm**	-	-	-	-	.5446 - .5594	.5906 - .6004
M 16 x 1.5	***.6299***	**16.0 mm**	-	-	-	-	.5659 - .5778	.5964 - .5239
3/4 - 10	***.7500***	-	.6420 - .6545	.6420 - .6630	.6526 - .6646	.7000 - .7090	-	-
3/4 - 16	***.7500***	-	.6820 - .6908	.6820 - .6960	.6892 - .6977	.7200 - .7260	-	-
M 20 x 2.5	***.7874***	**20.0 mm**	-	-	-	-	.6808 - .6985	.7382 - .7505
M 20 x 1.5	***.7874***	**20.0 mm**	-	-	-	-	.7234 - .7352	.7539 - .7601
7/8 - 9	***.8750***	-	.7550 - .7681	.7550 - .7780	.7668 - .7801	.8180 - .8290	-	-
7/8 - 14	***.8750***	-	.7980 - .8068	.7980 - .8140	.8055 - .8152	.8390 - .8450	-	-
M 24 x 3.0	***.9448***	**24.0 mm**	-	-	-	-	.8170 - .8366	.8858 - .9006
M 24 x 2.0	***.9448***	**24.0 mm**	-	-	-	-	.8596 - .8744	-
1" - 8	***1.0000***	-	.8650 - .8797	.8650 - .8900	.8783 - .8933	.9350 - .9480	-	-
1" - 12	***1.0000***	-	.9100 -.9198	.9100 - .9280	.9189 - .9298	.9590 - .9670	-	-

Material Group Cross Reference

	Chip Class	USA	Germany	United Kingdom	France	Japan
Group 1 **Aluminum Alloys up to 5% Silicon**		2011	AlCuBiPb	FC1	A-U5PbBi	A2011
		2014	AlCuSiMn	L102	A-U4SG	A2014
		2024	AlCuSiMg2	L109	A-U4G1	A2024
		6061	AlMgSiCu	L117	A-GSUC	A6061
		7075	AlMgSiCu1.5	2L88	A-Z5GU	A7075
Group 2 **Aluminum Alloys over 5% Silicon and Magnesium**		AZ61A	MgAl6Zn	3373	G-A6Z1	H4202
		319.0				AC2B
		355.0		LM16	A-S4UG	H2117
		356.0	AlSi7Mg	2L99	A-S7G	H5202
		380.0	AlSi8Cu3	LM24	A-S9U3	H5302
		390.0				
Group 3 **Copper - Zinc Alloys (Brass)**		268 (Yellow)	CuZn36	CZ107	UZ33	C2680
		360 (Free Cut)	CuZn36Pb3	CZ124	UZ36Pb3	C3601
		464 (Naval)	CuZn39Sn	CZ112		
		836 (Red)	CuSn5ZnPb		U-E5Pb5Z5	BCIn6
Group 4 **Copper Alloys (Bronze)**		510 (Phosphur)		PB102	UE5P	C5101
		614 (Aluminum)	CuAl8Fe	c		
		905 (Tin)	CuSn10Zn			BC3C
Group 5 **Cast (Grey) Iron**		G3000	GG20	1452 Gr. 220	Ft20D	FC20
		G4000	GG25	1452 Gr. 260	Ft25D	FC25
		G4500	GG30	1452 Gr. 300	Ft30D	FC30
		G5500	GG35	1452 Gr. 350	Ft35D	FC35
Group 6 **Ductile (Nodular) Iron and Powder Metal Alloys**		D4018	GGG 40	420/12	FGS 370-17	FCD 40 FCD
		60-40-18	GGG 40	420/12	FGS 370-17	40
		65-45-12	GGG 50	500/7	FGS 400-12	FCD 50 FCD
		80-55-06	GGG 60	600/3	FGS 600-3	60
		100-70-03	GGG 70	700/2	FGS 700-2	FCD 70
Group 7 **Low Carbon Steels up to . 35% Carbon**		A-36 (Boiler Plate)	13Mn6	150M12	E35-4	S17C
		1018	C16.8	080A17	AF42	S18C
		1035	Ck35	060A35	AF55	S35C
		1117		210A15		SUM31
		1215	9 5Mn 36	240M07	S300	SUM23
		4118	20CrMo5	708H20	18CD4	SCM418H
		4130	30CrMo4	708A30	30CD4	SCM2
		4620		665A19	2ND8	
		5120	76Mn3	080A72	XC75	SCr420H
		5134				
		516-70	C16.8	080A17	AF42	
		8620	21NiCrMoS2	805A20	19NCDB2	SNCM220H
		9310	14NiCrMo134	832H13	16NCD13	



CHIP CLASSIFICATIONS



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Material Group Cross Reference

	Chip Class	USA	Germany	United Kingdom	France	Japan
Group 8 **Medium Carbon Steels** **(.35 - .50% Carbon)**		P20	40CrMnMo7	4659		
		1045	Ck45	080M46	XC45	S45C
		1050	QSt32-2	045AI0	XC12	S50C
		1141		216A42	45MF4	SUM42
		1144	45S20	226M44	45MF6	SUM43
		1541	45SiMn5	150M40	40M6	SMn2
		4140	42CrMo4	708H42	42CD4	SCM4
		4150	50CrMo4		50SCD6	
		4340	40NiCrMo6	2S.119		SNCM8
		6150	50CrV4	735A50	50CV4	SUP10
Group 9 **High Carbon and** **Tool Steels**		A-2	X100CrMoV5 1	BA2	Z100CDV5	SKD12
		D-2	X165CrVMo12 1	BD2	Z160CDV12	SKD11
		H-13	X40CrMoV5 1	BH13	Z40CDV5	SKD61
		M-1	S2-9-1	BM1	Z85DCWV08-04-02-01	
		M-2	S6-5-2Si	BM2	Z85WDCV06-05-04	
		M3-2	S6-5-3		Z120WDCV06-05-04-03	SKH51
		M-7	S2-9-2		Z100DCWV09-04-02-02	SKH58
		M35	X85WMoCo6.5.5		Z90WDCKCV06-05-05-04-02	SKH55
		O-1	100MnCrW4	BO1	90MWCV5	SKS21
		S-7	X79WCo18.5	BT4	Z80WKCV18-05-04	SKH3
		T15	X133WCo12.5	BT15	Z160WKVC12-05-05-04	SKH10
		52100	100CrMn6	970 535A99	A35-552 100C6	
Group 10 **Hardened Steels (48 -65 Rc)**						
Group 11 **Stainless Steel (Free Machining)**		303	X12CrNiS18.8	303S21	Z10CNF18.09	SUS303
		440C	X105CrMo17		Z80CSN20.02	SUS440C
Group 12 **Stainless Steel**		Nitronic 50				
		15-5 PH		15Cr5Ni		
		17-4 PH	X5CrNiCuNb174	17Cr4Ni	Z6CNU17.04	SCS24
		304	X6CrNi189	970 S15	Z5CN18.09	SCS13
		316	X5CrNiMo1812	316S25	Z6CND17.11	SCS14
		321	X8CRNiTi18.10	S-520	Z6CNT18.12	SUSY321
		410	X15Cr13		Z12CN13M	SCS1
		440A	X65CrMo14		Z70CD14	SUS440A
Group 13 **Titanium**						
		6AL4V				
Group 14 **Soft High Temperature Alloys**						
		Inconel718				
Group 15 **Hard High Temperature Alloys**		Rene				
		Hastelloy				
		L605				
		A286	X5NiCrTi26 15	HR650	Z6NCTDV25.15B	SUH660
Group 16 **Hard Plastics, Resin** **Fiberglass, Graphite & Carbon**		PVC				
		SMC				
		Acrylic				

Hardness Conversion

BRINELL	ROCKWELL		
3000 kgm Load Hardness	150 kgm C Scale	100 kgm B Scale	60 kgm A Scale
–	80		92.0
–	79		91.5
–	78		91.0
–	77		90.5
–	76		90.0
–	75		89.5
–	74		89.0
–	73		88.5
–	72		88.0
–	71		87.0
–	70		86.5
–	69		86.0
–	68		85.5
–	67		85.0
–	66		84.5
739	65		84.0
722	64		83.5
706	63		83.0
688	62		82.5
670	61		81.5
654	60		81.0
634	59		80.5
615	58		80.0
595	57		79.5
577	56		79.0
560	55		78.5
543	54		78.0
525	53		78.0
512	52		77.5
496	51		77.0
481	50		76.5
469	49		76.0
455	48		75.5
443	47		75.0
432	46		74.5
421	45		74.0
409	44		73.5
400	43		73.0
390	42		72.5
381	41		72.0
371	40		71.5
362	39		71.0
353	38		70.5
344	37		70.0
336	36	109*	69.5
327	35	109*	69.0
319	34	108*	68.5
311	33	108*	68.0
301	32	107*	67.5
294	31	106*	67.0
286	30	106*	66.5
279	29	105*	65.5
271	28	104*	65.0
264	27	103*	64.5
258	26	103*	64.0
253	25	102*	63.3
247	24	101*	62.8
243	23	100*	62.4

BRINELL	ROCKWELL		
3000 kgm Load Hardness	150 kgm C Scale	100 kgm B Scale	60 kgm A Scale
237	22	100*	62.0
231	21	99*	61.5
226	20	98*	61.0
240	22**	100	61.5
234	21**	99	60.9
228	20**	98	60.2
222	19**	97	59.5
217	18**	96	58.9
210		95	58.0
205		94	57.5
200		93	57.0
195		92	56.5
190		91	56.0
185		90	55.5
180		89	55.0
176		88	54.0
172		87	53.5
169		86	53.0
165		85	52.5
162		84	52.0
159		83	51.0
156		82	50.5
153		81	50.0
150		80	49.5
147		79	49.0
144		78	48.5
141		77	48.0
139		76	47.0
137		75	46.5
135		74	46.0
132		73	45.5
130		72	45.0
127		71	44.5
125		70	44.0
123		69	43.5
121		68	43.0
119		67	42.5
117		66	42.0
116		65	–
114		64	41.5
112		63	41.0
110		62	40.5
108		61	41.0
107		60	39.5
106		59	39.0
104		58	38.5
103		57	38.0
101		56	–
100		55	37.5
–		54	37.0
–		53	36.5
–		52	36.0
–		51	35.5
–		50	35.0
–		53	36.5
–		52	36.0
–		51	35.5
–		50	35.0

* Rockwell "B" values not ordinarily determined on hardened steel & hard alloys.

** Rockwell "C" values not ordinarily determined on soft steel, grey iron & most non-ferrous metals.

Based on Wilson Instruments Chart, 1995

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ISO "h" and "m" Tolerance Metric Conversion Table

Over Inch	Over mm	Up to Inch	Up to mm	In Inch h8	In mm h8	In Inch h7	In mm h7	In Inch h6	In mm h6	In Inch m7	In mm m7
.0394	1.0	.1181	3	-.0006	-.014	-.0004	-.010	-.0002	-.006	+.0006 +.0002	+.016 +.004
.1181	3	.2362	6	-.0007	-.018	-.0005	-.012	-.0003	-.008	+.0008 +.0002	+.021 +.006
.2362	6	.3937	10	-.0009	-.022	-.0006	-.015	-.0004	-.009	+.0008 +.0002	+.021 +.006
.3937	10	.7087	18	-.0011	-.027	-.0007	-.018	-.0004	-.011	+.0010 +.0003	+.025 +.007
.7087	18	1.1811	30	-.0013	-.033	-.0008	-.021	-.0005	-.013	+.0011 +.0003	+.006 +.136
1.1811	30	1.9685	50	-.0015	-.039	-.0010	-.025	-.0006	-.016	+.0013 +.0004	+.034 +.009

Actual evaluation (in inches) of tolerance for practical limits 1 CPK or (+/- 3 Sigma) means 99.72% of total is within this tolerance if the X Bar is totally centered.

Tolerance	Print Tol. CPK 1.00 (+/-3)	75% P.T.* CPK 1.33 (+/-4)	60% P.T.* CPK 1.67 (+/-5)	50% P.T.* CPK 2.00 (+/-6)	42.86% P.T.* CPK 2.33 (+/-7)	
.0200	+/- .0100000	+/- .0075000	+/- .0060000	+/- .0050000	+/- .0042857	
.0150	+/- .0075000	+/-.0056250	+/- .0045000	+/- .0037500	+/- .0032143	
.0100	+/- .0050000	+/- .0037500	+/- .0030000	+/- .0025000	+/- .0021429	
.0050	+/- .0025000	+/- .0018750	+/- .0015000	+/- .0012500	+/- .0010714	
.0045	+/- .0022500	+/- .0016875	+/- .0013500	+/- .0011250	+/- .0009643	0.002
.0040	+/- .0020000	+/- .0015000	+/- .0012000	+/- .0010000	+/- .0008571	TOTAL LIMIT
.0035	+/- .0017500	+/- .0013125	+/-.0010500	+/- .0008750	+/- .0007500	
.0030	+/- .0015000	+/- .0011250	+/- .0009000	+/- .0007500	+/- .0006429	
.0025	+/- .0012500	+/- .0009375	+/- .0007500	+/- .0006250	+/- .0005357	0.001
.0020	+/- .0010000	+/- .0007500	+/- .0006000	+/- .0005000	+/- .0004286	TOTAL LIMIT
.0019	+/- .0009500	+/- .0007125	+/- .0005700	+/- .0004750	+/- .0004071	
.0018	+/- .0009000	+/- .0006750	+/- .0005400	+/- .0004500	+/- .0003857	
.0017	+/- .0008500	+/- .0006375	+/- .0005100	+/- .0004250	+/- .0003643	
.0016	+/- .0008000	+/- .0006000	+/- .0004800	+/- .0004000	+/- .0003429	
.0015	+/- .0007500	+/- .0005625	+/- .0004500	+/- .0003750	+/- .0003214	
.0014	+/- .0007000	+/- .0005250	+/- .0004200	+/- .0003500	+/- .0003000	
.0013	+/- .0006500	+/- .0004875	+/- .0003900	+/- .0003250	+/- .0002786	
.0012	+/- .0006000	+/- .0004500	+/- .0003600	+/- .0003000	+/- .0002571	
.0011	+/- .0005500	+/- .0004125	+/- .0003300	+/- .0002750	+/- .0002357	
.0010	+/- .0005000	+/- .0003750	+/- .0003000	+/- .0002500	+/- .0002143	
.0009	+/- .0004500	+/- .0003375	+/- .0002700	+/- .0002250	+/- .0001929	0.0004
.0008	+/- .0004000	+/- .0003000	+/- .0002400	+/- .0002000	+/- .0001714	TOTAL LIMIT
.0007	+/- .0003500	+/-.0002625	+/- .0002100	+/- .0001750	+/- .0001500	
.0006	+/- .0003000	+/- .0002250	+/- .0001800	+/- .0001500	+/- .0001286	
.0005	+/- .0002500	+/- .0001875	+/- .0001500	+/- .0001250	+/- .0001071	0.0002
.0004	+/- .0002000	+/- .0001500	+/- .0001200	+/- .0001000	+/- .0000857	TOTAL LIMIT
.0003	+/- .0001500	+/- .0001125	+/- .0000900	+/- .0000750	+/- .0000643	
.0002	+/- .0001000	+/- .0000750	+/- .0000600	+/- .0000500	+/- .0000429	
.0001	+/- .0000500	+/- .0000375	+/- .0000300	+/- .0000250	+/- .0000214	

*Any centering error will reduce the stated bands.

Decimal Conversion

Inch Frac.	Inch Dec.	Wire #	mm Equiv.
Micron	0.000039		0.001
	0.000315		0.008
	0.0004		0.010
	0.0039		0.1
	0.0135	80	0.343
	0.0145	79	0.368
1/64	0.0156		0.396
	0.0160	78	0.406
	0.0180	77	0.457
	.0197		0.5
	.0200	76	0.508
	.0210	75	0.533
	.0225	74	0.572
	.0240	73	0.610
	.0250	72	0.635
	.0260	71	0.660
	.0280	70	0.711
	.0292	69	0.742
	.0310	68	0.787
1/32	.0312		0.792
	.0320	67	0.813
	.0330	66	0.838
	.0350	654	0.889
	.0360	64	0.914
	.0370	63	0.940
	.0380	62	0.965
	.0390	61	0.991
	.0394		1.0
	.0400	60	1.016
	.0410	59	1.041
	.0420	58	1.067
	.0430	57	1.092
	.0465	56	1.181
3/64	.0469		1.191
	.0520	55	1.321
	.0550	54	1.397
	.0591		1.5
	.0595	53	1.511
1/16	.0625		1.588
	.0635	52	1.613
	.0670	51	1.702
	.0700	50	1.778
	.0730	49	1.854
	.0760	48	1.93
5/64	.0781		1.984
	.0785	47	1.994
	.0787		2.0
	.0810	46	2.057
	.0820	45	2.083
	.0827		2.1
	.0860	44	2.184
	.0890	43	2.261
	.0925		2.35
	.0935	42	2.375
3/32	.0938		2.383
	.0960	41	2.438
	.0980	40	2.489
	.0984		2.5
	.0995	39	2.527
	.1015	38	2.578
	.1040	37	2.642
	.1065	36	2.705
7/64	.1094		2.779
	.1100	35	2.794
	.1110	34	2.819
	.1130	33	2.87
	.1142		2.9
	.1160	32	2.946
	.1181		3.0
	.1200	31	3.048
	.1220		3.1
1/8	.1250		3.175
	.1260		3.2
	.1285	30	3.264
	.1299		3.3
	.1339		3.4
	.1360	29	3.454
	.1378		3.5
	.1405	28	3.569

Inch Frac.	Inch Dec.	Wire #	mm Equiv.
9/64	.1406		3.571
	.1417		3.6
	.1440	27	3.658
	.1457		3.7
	.1470	26	3.734
	.1495	25	3.797
	.1496		3.8
	.1520	24	3.861
	.1535		3.9
	.1540	23	3.912
5/32	.1562		3.967
	.1570	22	3.988
	.1575		4.0
	.1590	21	4.039
	.1610	20	4.089
	.1614		4.1
	.1624		4.125
	.1654		4.2
	.1660	19	4.216
	.1693		4.3
	.1695	18	4.305
11/64	.1719		4.366
	.1730	17	4.394
	.1732		4.4
	.1770	16	4.496
	.1772		4.5
	.1800	15	4.572
	.1811		4.6
	.1820	14	4.623
	.1850	13	4.7
3/16	.1875		4.763
	.1890	12	4.801
	.1910	11	4.851
	.1929		4.9
	.1935	10	4.915
	.1960	9	4.678
	.1969		5.0
	.1990	8	5.055
	.2008		5.1
	.2010	7	5.105
13/64	.2031		5.159
	.2040	6	5.182
	.2047		5.2
	.2055	5	5.22
	.2067		5.25
	.2087	4	5.3
	.2090		5.309
	.2126	3	5.4
	.2130		5.41
	.2165		5.5
7/32	.2188		5.558
	.2205		5.6
	.2210	2	5.613
	.2244		5.7
	.2280	1	5.791
	.2283		5.8
	.2323		5.9
	.2340	*A*	5.944
15/64	.2344		5.954
	.2362		6.0
	.2380	*B*	6.045
	.2402		6.1
	.2420	*C*	6.147
	.2441		6.2
	.2460	*D*	6.248
	.2480		6.3
1/4	.2500	*E*	6.35
	.2520		6.4
	.2559		6.5
	.2570	*F*	6.528
	.2598		6.6
	.2610	*G*	6.629
	.2630		6.68
	.2638		6.7
17/64	.2656		6.746
	.2660	*H*	6.756
	.2677		6.8
	.2697		6.85
	.2717		6.9

Inch Frac.	Inch Dec.	Wire #	mm Equiv.
	.2720	*I*	6.909
	.2756		7.0
	.2770	*J*	7.036
	.2795		7.1
	.2810	*K*	7.137
9/32	.2812		7.142
	.2835		7.2
	.2874		7.3
	.2900	*L*	7.366
	.2913		7.4
	.2950	*M*	7.493
	.2953		7.5
19/64	.2969		7.541
	.2992		7.6
	.3020	*N*	7.671
	.3031		7.7
	.3071		7.8
	.3110		7.9
5/16	.3125		7.938
	.3150		8.0
	.3160	*O*	8.026
	.3189		8.1
	.3228		8.2
	.3230	*P*	8.204
	.3268		8.3
21/64	.3281		8.334
	.3307		8.4
	.3320	*Q*	8.433
	.3346		8.5
	.3370		8.560
	.3386		8.6
	.3390	*R*	8.611
	.3425		8.7
11/32	.3438		8.733
	.3465		8.8
	.3480	*S*	8.839
	.3504		8.9
	.3543		9.0
	.3580	*T*	9.093
	.3583		9.1
23/64	.3594		9.129
	.3622		9.2
	.3661		9.3
	.3680	*U*	9.347
	.3701		9.4
	.3740		9.5
3/8	.3750		9.525
	.3770	*V*	9.576
	.3780		9.6
	.3819		9.7
	.3858		9.8
	.3860	*W*	9.804
	.3898		9.9
25/64	.3906		9.921
	.3937		10.0
	.3970	*X*	10.084
	.3976		10.1
	.4040	*Y*	10.262
	.4055		10.3
13/32	.4062		10.317
	.4094		10.4
	.4130	*Z*	10.49
	.4134		10.5
	.4173		10.6
	.4213		10.7
27/64	.4219		10.716
	.4252		10.8
	.4291		10.9
	.4311		10.95
	.4331		11.0
	.4370		11.1
7/16	.4375		11.113
	.4409		11.2
	.4449		11.3
	.4488		11.4
	.4528		11.5
29/64	.4531		11.509
	.4567		11.6
	.4606		11.7

Inch Frac.	Inch Dec.	mm Equiv.
29/64	.4646	11.8
	.4685	11.9
15/32	.4688	11.908
	.4724	12.0
	.4764	12.1
	.4803	12.2
31/64	.4844	12.304
	.4882	12.4
	.4921	12.5
	.4961	12.6
1/2	.5000	12.7
	.5039	12.8
	.5079	12.9
	.5118	13.0
33/64	.5156	13.096
17/32	.5312	13.492
	.5315	13.5
35/64	.5469	13.891
	.5512	14.0
	.5571	14.15
9/16	.5625	14.288
	.5709	14.5
37/64	.5781	14.684
	.5906	15.0
19/32	.5938	15.083
39/64	.6094	15.479
	.6102	15.5
5/8	.6250	15.875
	.6299	16.0
41/64	.6406	16.271
	.6496	16.5
21/32	.6562	16.667
	.6594	16.75
	.6693	17.0
43/64	.6719	17.066
11/16	.6875	17.463
	.6890	17.5
45/64	.7031	17.859
	.7087	18.0
23/32	.7188	18.258
	.7283	18.5
47/64	.7344	18.654
	.7480	19.0
3/4	.7500	19.05
49/64	.7656	19.446
	.7677	19.5
25/32	.7812	19.842
	.7874	20.0
51/64	.7969	20.241
	.8071	20.5
13/16	.8125	20.638
	.8268	21.0
53/64	.8281	21.034
27/32	.8438	21.433
	.8465	21.5
55/64	.8594	21.829
	.8661	22.0
7/8	.8750	22.225
	.8858	22.5
57/64	.8906	22.621
	.9055	23.0
29/32	.9062	23.017
59/64	.9219	23.416
	.9252	23.5
15/16	.9375	23.813
	.9449	24.0
61/64	.9531	24.209
	.9646	24.5
31/32	.9688	24.608
	.9843	25.0
63/64	.9844	25.004
1	1.0000	25.4
	1.0039	25.5

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Recommended Reaming Stock (Total)

Type	Material Group #	Tool Diameter							
		0.125	0.25	0.375	0.5	0.625	0.75	0.875	1 to 1.5
A1 < 5% Si	1	0.012		0.015	0.016	0.018	0.020	0.021	0.022
A1 > 5% Si	2			0.013	0.015	0.016	0.018	0.019	0.020
Brass	3								
Bronze	4			0.014		0.017	0.019	0.020	0.021
Cast Iron	5	0.011		0.013	0.014	0.016	0.018	0.019	0.020
Ductile Iron	6						0.017	0.018	0.019
Steel < 35%C	7								
Steel > 35%C	8	0.010		0.012	0.013	0.015			
Tool Steel	9								
Hard Steel	10	0.008		0.010	0.011	0.013	0.014	0.015	0.016
Stainless Steel - Free	11	0.010		0.012	0.013	0.015	0.016	0.017	0.018
Stainless Steel	12								
Titanium	13	0.011		0.013	0.014	0.016	0.017	0.018	0.019
Soft High Temp. Alloy	14	0.010		0.011	0.013	0.014	0.016	0.017	0.018
Hard High Temp. Alloy	15	0.009		0.010	0.012	0.013	0.014	0.015	0.016
Plastics	16	0.012		0.014	0.015	0.017	0.019	0.020	0.021

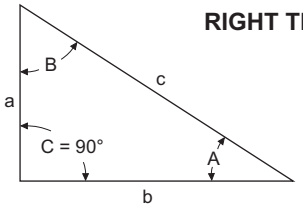
Reamer Trouble Shooting Guide

Cause	Scoring in hole	Bell-mouth hole	Finish poor	High wear	Over-size hole	Under-size hole	Rifle marks or chatter	Cuts hard, jams	Solution
Worn tool margin					X	X			Replace or regrind
Worn cutting edges		X	X						Resharpen reamer
Cutting edges not uniform	X		X				X		Check lip height variation
Built up edge			X		X				Resharpen/coat reamer
Excessive reamer runout		X	X		X				Check assembled runout
Misalignment - spindle to hole		X		X	X	X	X		Correct alignment
Wrong machining data		X	X	X			X	X	Check feeds/speeds
Reamer too small						X			Use a larger reamer
Reamer too big					X				Use a smaller reamer
Excessive stock removal			X	X	X	X			Correct removal amount
Insufficient stock removal			X			X			Increase reaming allowance
Unsuitable coolant	X		X	X	X	X	X	X	Change coolant type & mix
Chips not evacuating			X						Redirect coolant flow
Deflection from angular entry		X		X			X		Counter-sink bore
Deformation of workpiece							X		Correct clamping of workpiece
Poor machinibility		X	X	X	X				Check feeds/speeds/process

For Speed and Feed Recommendations see page 52 for Durapoint® and page 90 for Koolream®

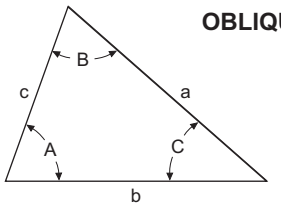
Conversions and Formulas

RIGHT TRIANGLES



Known Sides and Angles	Unknown Sides and Angles			Area
a and b	$c = \sqrt{a^2 + b^2}$	$A = \arctan \frac{a}{b}$	$B = \arctan \frac{b}{a}$	$\frac{a \times b}{2}$
a and c	$b = \sqrt{c^2 - a^2}$	$A = \arcsin \frac{a}{c}$	$B = \arccos \frac{a}{c}$	$\frac{a \times \sqrt{c^2 - a^2}}{2}$
b and c	$a = \sqrt{c^2 - b^2}$	$A = \arccos \frac{b}{c}$	$B = \arcsin \frac{b}{c}$	$\frac{b \times \sqrt{c^2 - b^2}}{2}$
a and ∠A	$b = \frac{a}{\tan A}$	$c = \frac{a}{\sin A}$	B = 90° - A	$\frac{a^2}{2 \times \tan A}$
a and ∠B	b = a x tan B	$c = \frac{a}{\cos B}$	A = 90° - B	$\frac{a^2 \times \tan B}{2}$
b and ∠A	a = b x tan A	$c = \frac{b}{\cos A}$	B = 90° - A	$\frac{b^2 \times \tan A}{2}$
b and ∠B	$a = \frac{b}{\tan B}$	$c = \frac{b}{\sin B}$	A = 90° - B	$\frac{b^2}{2 \times \tan B}$
c and ∠A	a = c x sin A	b = c x cos A	B = 90° - A	$c^2 \times \sin A \times \cos A$
c and ∠B	a = c x cos B	b = c x sin B	A = 90° - B	$c^2 \times \sin B \times \cos B$

OBLIQUE TRIANGLES



Known Sides and Angles	Unknown Sides and Angles			Area
All three sides a, b, c	$A = \arccos \frac{b^2 + c^2 - a^2}{2bc}$	$B = \arcsin \frac{b \times \sin A}{a}$	C = 180° - A - B	$\frac{a \times b \times \sin C}{2}$
Two sides and the angle between them a, b, ∠C	$C = \sqrt{a^2 + b^2 - (2 ab \cos C)}$	$A = \arctan \frac{a \times \sin C}{b - (a \times \cos C)}$	B = 180° - A - C	$\frac{a \times b \times \sin C}{2}$
Two sides and the angle opposite one of the sides a, b, ∠A (∠B less than 90°)	$B = \arcsin \frac{b \times \sin A}{a}$	C = 180° - A - B	$c = \frac{a \times \sin C}{\sin A}$	$\frac{a \times b \times \sin C}{2}$
Two sides and the angle opposite one of the sides a, b, ∠A (∠B greater than 90°)	$B = 180° - \arcsin \frac{b \times \sin A}{a}$	C = 180° - A - B	$c = \frac{a \times \sin C}{\sin A}$	$\frac{a \times b \times \sin C}{2}$
One side and two angles a, ∠A, ∠B	$b = \frac{a \times \sin B}{\sin A}$	C = 180° - A - B	$c = \frac{a \times \sin C}{\sin A}$	$\frac{a \times b \times \sin C}{2}$

AISI / SAE STEEL NUMBER SYSTEM

1018 — Type; Carbon content (Hundredths of a %)

12L14 — L denotes leaded steels; B denotes boron steels

Carbon Steels	10XX 11XX 12XX 15XX	Plain Carbon, Mn 1.00% max Resulfurized Free Maching Resulfurized/Rephosphorized Plain Carbon, Mn 1.00 - 1.65%
Manganese Steels	13XX	Mn 1.75%
Nickel Steels	23XX 25XX	Ni 3.50% Ni 5.00%
Nickel-Chromium Steels	32XX	1.75%, Cr 1.07%
Molybdenum Steels	40XX 44XX	Mo .20 - .25% Mo .40 - .52%
Chromium-Molybdenum Steels	41XX	Cr .50 - 95%, Mo .12 - 30%
Nickel-Chromium-Molybdenum Steels	43XX 47XX	Ni 1.82%, Cr .50 - .80%, Mo .25% Ni 1.05%, Cr .45%, Mo .20 -35%
Nickel-Molybdenum Steels	46XX 48XX	Ni .85 - 1.82%, Mo .20 - 25% Ni 3.50%, Mo .25%
Chromium Steels	50XX 51XX 50XXX 51XXX 52XXX	Cr .27 - 65% Cr .80 - 1.05% Cr .50%, C 1.00% min Cr 1.02%, C 1.00% min Cr 1.45%, C 1.00% min
Chromium-Vanadium Steels	61XX	Cr .60 - 95%, V .10 - 15%
Tungsten-Chromium Steels	72XX	W 1.75%, Cr .75%
Nickel-Chromium-Molybdenum Steels	81XX 86XX	Ni .30%, Cr .40%, Mo .12% Ni .55%, Cr .50%, Mo .20%
Silicon-Manganese Steels	92XX	Si 1.40 - 2.00%, Mn .65 - 85%, Cr 0 - 65%
Nickel-Chromium-Molybdenum Steels	93XX 94XX 97XX	Ni 3.25%, Cr 1.20%, Mo .12% Ni .45%, Cr .40%, Mo .12% Ni 1.00%, Cr .80%, Mo .25%

Brinell Hardness

120 140 160 180 200 220 240 260 280 300 320 340 360 380 400 420 440 460 480 500

20 25 30 35 40 45 50

Rockwell C Hardness

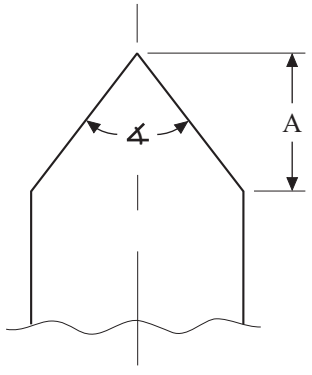
CONVERSION FORMULAS

inch x 25.4 = mm	mm x 0.03937 = inch
foot x 304.8 = mm	meter x 39.37 = inch
mile x 1.609 = Km	Km x 0.6214 = mile

Revolution per Minute	RPM	=	(3.82 x SFM) ÷ D
Surface Feet per Minute	SFM	=	0.262 x D x RPM
Milling Feedrate	IPM	=	FPT x T x RPM
Milling Feed per Tooth	FPT	=	IPM ÷ (T x RPM)
Feed per Revolution	FPR	=	IPM ÷ RPM
Mill Tapping Feedrate	IPM	=	1 ÷ TPI x RPM
Lathe Inches per Minute	IPM	=	IPR x RPM
Lathe Threading Feedrate	IPR	=	1 ÷ TPI
Surface Meters Per Minute	SMPM	=	0.3048 x SFM
Radius of Circle		=	0.159155 x Circum.
Diameter of Circle		=	0.31831 x Circum.
Circumference of Circle		=	3.1416 x D
Area of Circle		=	3.1416 x R^2
Cutting Time in Minutes (Mill)		=	L ÷ IPM
Cutting Time in Seconds (Lathe)		=	Len. of cut x 60 sec. / IPR X RPM

DRILL POINT LENGTHS

Point Angle	A = % of Ø
60°	87%
82°	58%
90°	50%
118°	30%
120°	28.8%
125°	26%
130°	23.3%
135°	20.7%
140°	18.2%
145°	16%
150°	13%



Phone: 630-690-5933 800-323-2299 Fax: 630-690-6355

APPLICATION DATA SHEET

CJT KOOLCARB, INC.
Fax to 630-690-6355 (Please type or print clearly)

Date _____ Attn. _____

COMPANY DATA

Company name _____ Type of company (End User, OEM, Etc.) _____

Contact _____ Position _____ Phone _____ Ext. _____

Mobile phone _____ Fax _____ E-mail _____

Address _____ City _____ State/Province _____

Zip Code _____ Country _____ Comments _____

Additional Contact _____

DISTRIBUTOR INFORMATION

Distributor _____ Contact person _____

Phone _____ Fax _____ E-mail _____

MATERIAL DATA

Material _____ Hardness _____ Part type (con rod, hydraulic manifold, etc.) _____

APPLICATION DATA

Hole diameter _____ Tolerance +/- _____ Depth of cut _____ Finish req. _____

Hole straightness required T.I.R. _____ True tolerance position _____ Blind or thru hole _____

Length of projection required to reach part surface _____ Surface machined or cast _____

Interrupted cut (Yes _____ No _____) Describe interruption _____

MACHINE DATA

Machine _____ Part rotating or stationary _____ Horsepower _____

Number of spindles _____ Maximum RPM _____ Feed per Rev. available _____

Machine vertical or horizontal _____ Type of holder _____

Bushing (Yes _____ No _____) Length of bushing _____ Distance from part _____

Coolant thru spindle (Yes _____ No _____) Coolant inducer available (Yes _____ No _____)

Coolant type _____ Mix _____ Coolant PSI _____ Gallons per min. _____

Comments _____

CURRENT PROCESS

(Drilling, Drilling and Reaming, Chamfering, Etc.)

Is spot drill used (Yes _____ No _____) Drill self starting (Yes _____ No _____) Type of drill _____

Starting drill point angle _____ Other type of starting method used _____

Current tool #1 _____ Current RPM _____ Feed _____ Peck drilling (Yes _____ No _____)

Cycle time _____ Current tool life _____ Qty. of holes per day _____ Week _____ Year _____

Current tool #2 _____ Current RPM _____ Feed _____ Peck drilling (Yes _____ No _____)

Cycle time _____ Current tool life _____ Qty. of holes per day _____ Week _____ Year _____

Current tool #3 _____ Current RPM _____ Feed _____ Peck drilling (Yes _____ No _____)

Cycle time _____ Current tool life _____ Qty. of holes per day _____ Week _____ Year _____

What improvements are desired (cycle time, surface finish, etc.) _____

Comments _____

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*Stocked standard available in TiN or TiAlN coatings.

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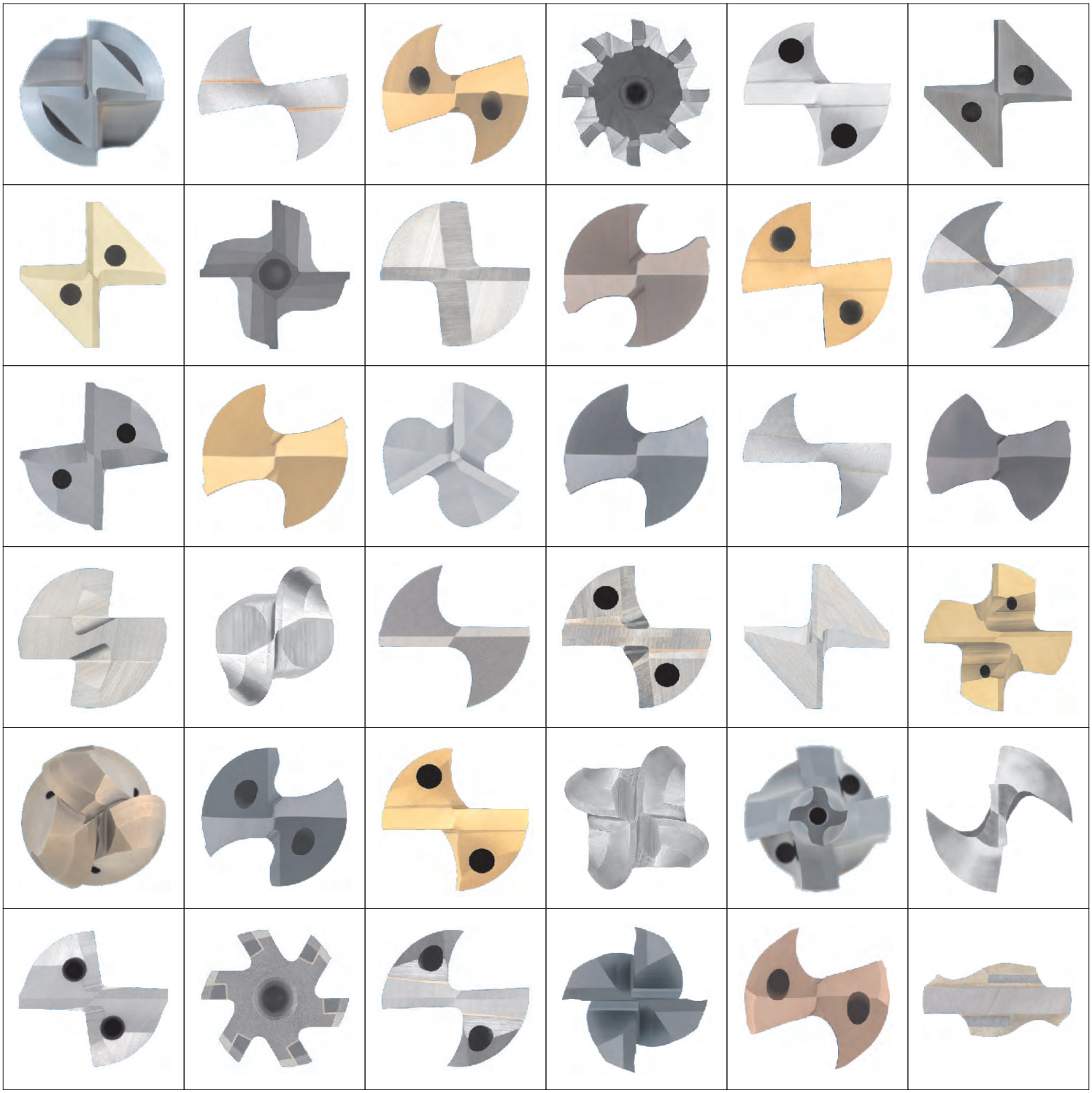

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