



Drills, Reamers, Taps, End Mills



CLEVELAND

**The name you've trusted since 1876
for quality cutting tools.**

Cleveland has been supplying cutting tools for over 130 years. During its long history, Cleveland has earned a reputation for the highest quality tools, superior customer service, and expert technical advice. You can be assured that the Cleveland tradition continues today.

Whether you need one tool or fifty...whether you are drilling, threading, or milling...from high-performance to the best in general-purpose tools...if your need is immediate or you're planning for the future, contact your Cleveland distributor for the solution.



CLEVELAND

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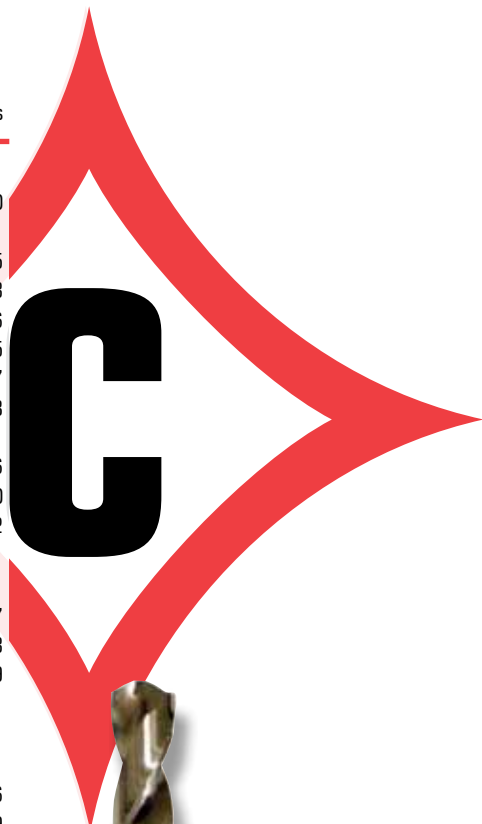
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Drill Diameter Tolerances

Diameter Range (inches)	Plus (+) (inches)	Minus (-) (inches)
through 1/8	.0000	.0005
over 1/8 through 1/4	.0000	.0007
over 1/4 through 1/2	.0000	.0010
over 1/2 through 1	.0000	.0012
over 1 through 2	.0000	.0015
over 2 through 3-1/2	.0000	.0020

Drill Overall Length and Flute Length Tolerances

Diameter Range (inches)	Plus (+) (inches)	Minus (-) (inches)
#80 through 1/8	.1250	.0625
over 1/8 through 1/2	.1250	.1250
over 1/2 through 1	.2500	.1250
over 1 through 2	.2500	.2500
over 2 through 3-1/2	.3750	.3750

Drill Point Angle Tolerances

Diameter Range (inches)	Included Angle (degrees)	Tolerance (degrees)
1/16 through 1/2	118° or 135°	± 5°
over 1/2 through 1-1/2	118°	± 3°
over 1-1/2 through 3-1/2	118°	± 2°

Drill Lip Height Tolerances

Diameter Range (inches)	Total Indicator Variation (inches)
1/16 through 1/8	.0020
over 1/8 through 1/4	.0030
over 1/4 through 1/2	.0040
over 1/2 through 1	.0050
over 1 through 3-1/2	.0060

Determining Feed and Speed**Operating Parameters**

This Cleveland catalog offers starting feed and speed parameters for each style of tool. The recommended operating parameters are found in front of each tool style for high-performance tools and in the beginning of the general application section for those tools. Drill cutting speed tables for individual sizes of drills can be found on pages 114-116.

To determine your own starting speeds and feeds, follow this procedure.

Look up the material to be drilled in the Recommended SFM by material class table on page 2 and determine the geometry class.

Determine the drill style from the Drill Style by Geometry and Length/Construction table on page 3 based on recommended drill type and drill length desired.

Review each drill style to understand the geometry differences. Select the appropriate geometry and check to ensure the desired size is available.

Starting speed and feed recommendations for the drill can be determined from the formulas below.

Recommended operating parameters for high-performance drills are generally 20% faster than for conventional geometries and are shown with the individual drill styles. Feed rates for high performance drills are heavier than for conventional geometries by 50% or more.

Drill Definitions

RPM = revolutions per minute

SFM = surface feet per minute

FR = feed rate in inches per minute

IPR = inches per revolution

Drill Formulae

$RPM = 3.8 \times SFM / \text{drill diameter}$

$SFM = 0.26 \times RPM \times \text{drill diameter}$

$FR = RPM \times IPR$

Drill Feeds

Diameter Range (inches)	Normal Feeds IPR (inches per revolution)	Heavy Feed IPR (inches per revolution)
1/16 through 1/8	.001 - .002	.002 - .004
over 1/8 through 1/4	.002 - .004	.004 - .008
over 1/4 through 1/2	.004 - .008	.008 - .016
over 1/2 through 1	.008 - .016	.016 - .024
over 1	.016 - .024	.024 - .032

Technical Information

Recommended Surface Feet per Minute (SFM) and Coolant by Material Application

Ferrous Materials

Materials	Brinell Hardness	Geometry	SFM	Coolant
Low Carbon Steel	85-125	general-purpose	80-95	Soluble Oil
Medium Carbon Steel	125-175	general-purpose	70-85	Soluble Oil
High Carbon Steel	175-225	heavy-duty	45-65	Soluble Oil
Steels Alloyed	Under 200	general-purpose	60-90	Soluble Oil
	200-300	heavy-duty	40-70	Soluble Oil
	Over 300	cobalt	20-30	Soluble Oil
Steel Drop Forgings Heat Treated	330-370		30-40	Cutting Oil
	370-420		20-30	Cutting Oil
	Over 420		10-20	Cutting Oil
Grey Cast Iron Soft	125	general-purpose	140-150	Dry
Grey Cast Iron Medium	120-200	heavy-duty	50-80	Soluble Oil
Grey Cast Iron Hard	Up to 350	heavy-duty	25-40	Soluble Oil
Titanium Alloys (Ti)-75A	300-440	cobalt	50-60	Cutting Oil
Ti-150A, RS-120	300-440	cobalt	40-50	Cutting Oil
Ti-140A, RC 130B	300-440	cobalt	30-40	Cutting Oil
Ti-6AL -4V	300-440	cobalt	20-30	Cutting Oil
300 Series Stainless	120-200	cobalt	20-40	Cutting Oil
400 Series Stainless	200-300	cobalt	40-70	Cutting Oil
Martensitic 416, 420, F416 Plus K, 400F, 4165SE, 440F	135-185	cobalt	40-50	Cutting Oil
Precipitation Hardening	325-375	cobalt	30	Cutting Oil
Stainless Steel, Cast	400-450	cobalt	20	Cutting Oil
Heat Resisting Steels	175-225	cobalt	10-25	Cutting Oil
Nimonic Alloys	200-300	cobalt	10-20	Cutting Oil
Manganese 12-14% min	125-220	heavy-duty	10-12	Cutting Oil
Spring Steels	402	cobalt	15-30	Soluble Oil
Armor Plate	200-250	cobalt	40	Soluble Oil
	250-300	cobalt	35	Soluble Oil
	300-350	cobalt	30	Cutting Oil

Non-Ferrous Materials

Materials	Brinell Hardness	Geometry	SFM	Coolant
Aluminum Pure	140-350	fast spiral*	130-200	Soluble Oil
Aluminum Alloys	140-330	fast spiral*	150-300	Soluble Oil
Aluminum Leaded	40-100	fast spiral*	200-325	Soluble Oil
Aluminum Silicon Alloy Die Cast	40-100	fast spiral*	25-50	Soluble Oil
Brass	190-210	slow spiral*	200-250	Cutting or Soluble Oil
Bronze	150-200	slow spiral*	200-250	Soluble Oil
Copper - Nickel & Copper Tin Alloy	65-100	general-purpose*	140-200	Cutting or Soluble Oil
Copper - Aluminum Alloys	30-100	general-purpose*	120-200	Cutting or Soluble Oil
Magnesium Alloys - Wrought	50-90	general-purpose*	140-330	Cutting or Soluble Oil
Magnesium Alloys - Cast	50-90	general-purpose*	140-365	Cutting or Soluble Oil
Nickel Alloys - Wrought and Cast	80-170	general-purpose	70	Cutting or Soluble Oil
Nickel Alloys - Monel	115-240	general-purpose	55	Cutting or Soluble Oil
Nickel Alloys - Beryllium Nickel	200-250	general-purpose	12	Cutting or Soluble Oil
Zinc Alloy	112-126	general-purpose	200-250	Soluble Oil

*bright only

Technical Information

Drill Styles by Geometry and Length/Construction

Drill Type	Screw Machine	Jobber Length	Extended Shank	Taper Length	Extra Length	Taper Shank	Extra Length Taper Shank
High-Performance							
parabolic	2175	2075	—	2575	—	—	—
	2165	2065	—	2565	—	—	—
coolant feed	—	1980	—	—	—	—	—
material-specific	—	1981SJL	—	—	—	—	—
	—	1982SJL	—	—	—	—	—
General Application							
general-purpose	2120	2001G	—	2510	950E	2410	940E
	—	2002G	—	—	—	2411	—
	—	2001	—	—	—	2412	—
	—	2002	—	—	—	—	—
high helix	—	2012	—	2550	—	—	—
low helix	—	2020	—	—	—	—	—
left-hand	—	2006	—	—	—	—	—
cobalt heavy-duty	2133	2213	—	2513	—	2440	—
solid carbide	—	1727	—	—	—	—	—
carbide-tipped heavy duty	—	2727	—	2745	—	2740	—
cotter pin	—	2011	—	—	—	—	—
aircraft NAS 907 Rev. 14							
short flute	—	3780	3780-6	—	—	—	—
general-purpose	2331G	2228	—	—	—	—	—
heavy-duty	2330	2222	3957-6	—	—	—	—
	—	—	3957-12	—	—	—	—
cobalt heavy-duty	—	2213	3722-6	—	—	—	—
coolant feed	—	2590	—	—	—	2480	927E
	—	2580	—	—	—	2490	—
armour-piercing	—	—	—	—	—	3740	—
automotive tang	—	—	—	2540	—	—	—
core drill	—	—	2560	—	—	2470	—
	—	—	2570	—	—	—	—
spotting and centering							
cobalt	Short	Long	—	—	—	—	—
	2636	2646	—	—	—	—	—
HSS	2635	2645	—	—	—	—	—

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Surface Treatments for Drills

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Surface Treatment	Recommended Applications	Precautions
TiN (Titanium Nitride)	For ferrous and non-metallic materials: free-machining steels and irons, high tensile steels, tough machining steels, plastics, hard rubber, and fiber. The hard, smooth finish increases tool life, improves finish, and allows higher speeds.	Avoid titanium and titanium alloys due to tendency to gall.
TiCN (Titanium Carbonitride)	For ferrous and non-ferrous materials: cast iron, aluminum, stainless steel, brass, abrasive materials, high-silicon automotive aluminum, glass-filled plastics, and composites. The hard, smooth finish increases tool life and improves finish.	Use with caution in titanium, titanium alloys, and aluminum die casting due to tendency to gall.
TiAlN (Titanium Aluminum Nitride)	For ferrous materials, high-temperature alloys, and titanium: stainless steels, gray cast irons or nodular irons, and steels containing high-nickel, cobalt, chromium, and tungsten. Most effective where higher speeds are available.	Avoid in most non-ferrous materials.
CrN (Chromium Nitride)	For non-ferrous materials: brass, bronze, zinc alloys, and magnesium alloys. CrN is medium-hard and has a lower wear resistance than TiN, TiCN, and TiAlN. However, unlike these coatings, CrN does not gall in non-ferrous materials.	Ineffective in ferrous materials.

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Special Drills

If you know the specs for your special tool, please send a blueprint and/or provide this information:

- Material/hardness to be drilled
- D = shank diameter or size
If standard taper shank is ordered, specify as No. 2 American National Standard Taper, No. 3 American National Standard Taper, etc. If taper shank is special, give diameter at small end, length of shank, diameter at large end, taper per foot, and furnish a sample of gauge if possible. If tang is special, give thickness and length.
- B = body length
- D1 = diameter of fluted section. For multiple diameter drills, indicated the diameter of the large fluted section
- L1 = flute length
- L = overall length. When ordering extra-length drills, specify: type of material being drilled, depth of hole, whether drilling in a vertical or horizontal position, and whether feed is intermittent or with only occasional withdrawals.
- L3 = neck length
- LS = shank length

For multiple-diameter drills, provide:

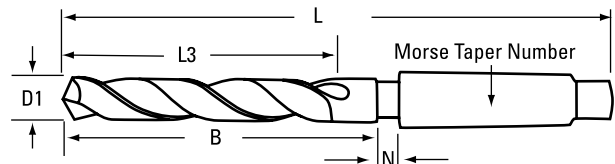
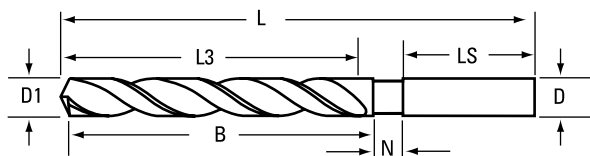
- the diameter of the small, fluted section
- the included angle of cutting shoulder Note that this is measured as an angle between the two cutting edges (included angle) and not as an angle with the center line.
- the length of small diameter. Note that this is measured from the outer corner of the point to the bottom or inner corner of the cutting shoulder.

For special accuracy requirements, give tolerances on the important dimensions.

For assistance in designing your special tool, provide

- Workpiece material hardness
- Depth of hole
- Shank type
- Step length if necessary
- Hole diameter
- Thru hole or blind hole
- Coolant or non-coolant
- Step angle

Make sure that suitable allowance has been made for resharpening and for clearance for the spindle above the drill-brushings. If a particular style of flute-construction is desired, it should be specified by reference to the regular drill of the required flute-style.





High-Performance Drills

Q-Cobalt™ Wide Land Parabolic

Jobber Length • Screw Machine Length • Taper Length

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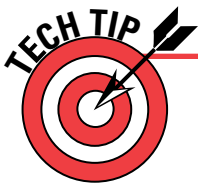
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Operating Parameters

Material	Hardness	Speeds (SFM)				Feed Rate (IPR) increase by 25% for TiCN			
		Straw	Drill Finish			1/8"	1/4"	3/8"	1/2"
			TiN	TiCN	TiAlN	3.17mm	6.35mm	9.52mm	12.70mm
Ferrous									
low carbon steel	85-125 Bhn	90	125	135	-	.0040	.0065	.0080	.0100
medium carbon steel	125-175 Bhn	90	125	135	-	.0040	.0065	.0080	.0100
high carbon steel	175-225 Bhn	90	125	135	-	.0030	.0050	.0065	.0080
alloyed steel	200-300 Bhn	60	80	90	-	.0025	.0040	.0050	.0065
heat-treatable steel and forgings	370-420 Bhn	40	50	60	70	.0025	.0040	.0050	.0065
tool steels	< 24 HRc	60	80	90	110	.0030	.0050	.0065	.0080
	> 24-30 HRc	30	40	45	55	.0025	.0040	.0050	.0065
high-speed steels	14-30 HRc	35	50	55	60	.0025	.0040	.0050	.0065
gray cast iron	240 Bhn	115	160	175	-	.0050	.0080	.0100	.0125
	<300 Bhn	90	125	135	-	.0050	.0080	.0100	.0125
malleable cast iron	<300 Bhn	70	95	105	-	.0050	.0080	.0100	.0125
chilled cast iron	<350 Bhn	25	35	40	-	.0025	.0040	.0050	.0065
stainless steel									
300 series (Austenitic)	120-200 Bhn	60	80	90	100	.0025	.0040	.0050	.0065
400 series (Martensitic)	200-300 Bhn	40	50	60	80	.0025	.0040	.0050	.0065
sulphurized	> 25 HRc	45	65	70	80	.0025	.0040	.0050	.0065
spring steel	400 Bhn	25	35	40	45	.0020	.0030	.0040	.0050
Nonferrous									
aluminum and aluminum alloys	40-100 Bhn	180	-	-	-	.0050	.0080	.0100	.0125
cast aluminum									
< 10% Si	200 Bhn	200	275	-	-	.0050	.0080	.0100	.0125
> 10% Si	200 Bhn	180	225	-	250	.0040	.0065	.0080	.0100
brass, long chipping	190-210 Bhn	150	-	-	-	.0040	.0065	.0080	.0100
bronze, long chipping	150-200 Bhn	90	115	-	130	.0030	.0050	.0065	.0080
copper, low alloy	65-100 Bhn	120	145	-	-	.0040	.0065	.0080	.0100
plastics, duraplastics	N/A	55	75	80	-	.0030	.0050	.0065	.0080

The speeds and feeds listed here are conservative recommendations for initial setup. In actual use, depending on the machine environment and workpiece material, significantly higher speeds and feeds may be achievable. Use these

speeds and feeds as a starting point. Cutting conditions can be gradually adjusted until the optimum settings for the application are found. Questions? Contact Technical Support at 800.892.4281.



Q-Cobalt Drills

- Deliver close hole tolerance for high-precision work.
- Use higher speeds and feeds for increased productivity.
- Ideal for deep-hole drilling in a wide range of materials.



High-Performance Drills Q-Cobalt™ Wide Land Parabolic

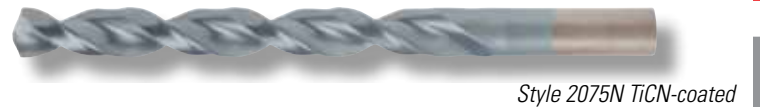
Styles 2075, 2075T, 2075N, 2075A • Jobber Length

FEATURES

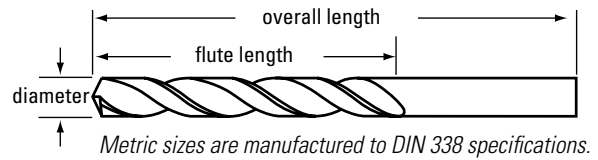
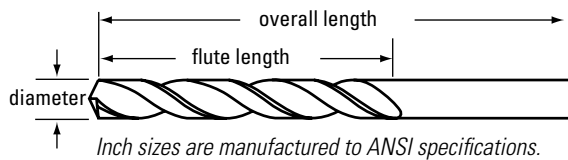
ANSI SIZES	M42 COBALT SUBSTRATE
DIN 338	STRAW OXIDE
HIGH PERFORMANCE	TiN
135° MOD	TiCN
38°	TiAlN
SHANK	

APPLICATIONS

STAINLESS STEEL	ALUMINUM
TOOL STEEL	BRASS
HIGH CARBON STEEL	PLASTIC
MED CARBON STEEL	NICKEL ALLOYS
LOW CARBON STEEL	
CAST IRON	



Operating parameters on page 6.



Drill Diameter Fract	Wire/Let	Decimal mm	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number			
					in	mm	in	mm	Straw Oxide	TiN	TiCN	TiAlN
1/16		1.5	.0591	1.50	.709	18.00	1.575	40.00	C16584	C16696	–	C11360
		1.55	.0610	1.55	.787	20.00	1.693	43.00	C15540	–	–	–
		1.6	.0625	1.59	.875	22.23	1.875	47.63	C16555	C16667	C16942	C16972
		1.6	.0630	1.60	.787	20.00	1.693	43.00	C15541	–	–	C11361
5/64	52	1.65	.0635	1.61	.875	22.23	1.875	47.63	C16554	C16666	–	C11452
		1.65	.0650	1.65	.787	20.00	1.693	43.00	C15542	–	–	–
	51	1.75	.0670	1.70	1.000	25.40	2.000	50.80	C16553	C16665	–	C11451
		1.75	.0689	1.75	.866	22.00	1.811	46.00	C15543	–	–	–
5/64	50	1.8	.0700	1.78	1.000	25.40	2.000	50.80	C16552	C16664	–	C11450
		1.8	.0709	1.80	.866	22.00	1.811	46.00	C15544	–	–	–
	49	1.9	.0730	1.85	1.000	25.40	2.000	50.80	C16551	C16663	–	C11449
		1.9	.0748	1.90	.866	22.00	1.811	46.00	C15545	–	–	–
5/64	48	2.0	.0760	1.93	1.000	25.40	2.000	50.80	C16550	C16661	–	C11448
		2.0	.0781	1.98	1.000	25.40	2.000	50.80	C16556	C16668	C16943	C16973
	47	2.0	.0785	1.99	1.000	25.40	2.000	50.80	C16549	C16660	–	C11447
		2.0	.0787	2.00	.945	24.00	1.929	49.00	C16585	C16697	–	C11362
5/64	46	2.05	.0807	2.05	.945	24.00	1.929	49.00	C15546	–	–	–
		2.05	.0810	2.06	1.125	28.58	2.125	53.98	C16548	C16659	–	C11446
	45	2.1	.0820	2.08	1.125	28.58	2.125	53.98	C16547	C16658	–	C11445
		2.1	.0827	2.10	.945	24.00	1.929	49.00	C15547	–	–	–
5/64	44	2.15	.0846	2.15	1.063	27.00	2.087	53.00	C15548	–	–	–
		2.15	.0860	2.18	1.125	28.58	2.125	53.98	C16546	C16657	–	C11444
		2.2	.0866	2.20	1.063	27.00	2.087	53.00	C15549	–	–	–
		2.25	.0886	2.25	1.063	27.00	2.087	53.00	C15550	–	–	–
5/64	43	2.3	.0890	2.26	1.250	31.75	2.250	57.15	C16545	C16656	C16944	C16974
		2.3	.0906	2.30	1.063	27.00	2.087	53.00	C15551	C16455	–	–
		2.35	.0925	2.35	1.063	27.00	2.087	53.00	C15552	–	–	–
	42	2.35	.0935	2.38	1.250	31.75	2.250	57.15	C16544	C16655	–	C11442

continued on next page

Q-Cobalt™ Wide Land Parabolic

Styles 2075, 2075T, 2075N, 2075A • Jobber Length (continued)

Fract	Drill Diameter		Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number			
	Wire/Let	mm			in	mm	in	mm	Straw Oxide	TiN	TiCN	TiAlN
3/32			.0938	2.38	1.250	31.75	2.250	57.15	C16557	C16669	C16945	C16975
		2.4	.0945	2.40	1.181	30.00	2.244	57.00	C15553	–	–	–
	41		.0960	2.44	1.375	34.93	2.375	60.33	C16543	C16654	C16946	C16976
	40		.0980	2.49	1.375	34.93	2.375	60.33	C16542	C16652	C16947	C16977
		2.5	.0984	2.50	1.181	30.00	2.244	57.00	C16586	C16698	–	C11363
	39		.0995	2.53	1.375	34.93	2.375	60.33	C16541	C16651	C16948	C16978
	38		.1015	2.58	1.438	36.51	2.500	63.50	C16540	C16650	–	C11438
		2.6	.1024	2.60	1.181	30.00	2.244	57.00	C15554	–	–	–
	37		.1040	2.64	1.438	36.51	2.500	63.50	C16539	C16649	–	C11437
	36		.1065	2.71	1.438	36.51	2.500	63.50	C16538	C16648	C16949	C16979
7/64			.1094	2.78	1.500	38.10	2.625	66.68	C16558	C16670	C16950	C16980
		35	.1100	2.79	1.500	38.10	2.625	66.68	C16537	C16647	–	C11435
		2.8	.1102	2.80	1.299	33.00	2.402	61.00	C15555	–	–	C11364
	34		.1110	2.82	1.500	38.10	2.625	66.68	C16536	C16646	–	C11434
	33		.1130	2.87	1.500	38.10	2.625	66.68	C16535	C16645	–	C11433
		2.9	.1142	2.90	1.299	33.00	2.402	61.00	C15556	–	–	C11365
	32		.1160	2.95	1.625	41.28	2.750	69.85	C16534	C16644	–	C11432
		3.0	.1181	3.00	1.299	33.00	2.402	61.00	C16587	C16699	–	C11366
	31		.1200	3.05	1.625	41.28	2.750	69.85	C16533	C16643	–	C11431
		3.1	.1220	3.10	1.417	36.00	2.559	65.00	C15557	C16456	–	–
1/8			.1250	3.18	1.625	41.28	2.750	69.85	C16559	C16671	C16951	C16981
		32	.1260	3.20	1.417	36.00	2.559	65.00	C15558	C16457	–	–
	30		.1285	3.26	1.625	41.28	2.750	69.85	C16532	C16642	C16952	C16982
		3.3	.1299	3.30	1.417	36.00	2.559	65.00	C15559	–	–	C11367
		3.4	.1339	3.40	1.535	39.00	2.756	70.00	C15560	–	–	–
	29		.1360	3.45	1.750	44.45	2.875	73.03	C16531	C16641	C16953	C16983
		3.5	.1378	3.50	1.535	39.00	2.756	70.00	C16588	C16700	–	C11368
	28		.1405	3.57	1.750	44.45	2.875	73.03	C16530	C16640	–	C11428
9/64			.1406	3.57	1.750	44.45	2.875	73.03	C16560	C16672	–	C11400
		27	.1440	3.66	1.875	47.63	3.000	76.20	C16529	C16639	–	C11427
		3.7	.1457	3.70	1.535	39.00	2.756	70.00	C15561	–	–	C11369
	26		.1470	3.73	1.875	47.63	3.000	76.20	C16528	C16638	–	C11426
	25		.1495	3.80	1.875	47.63	3.000	76.20	C16527	C16637	–	C11425
	24		.1520	3.86	2.000	50.80	3.125	79.38	C16526	C16636	–	C11424
	23		.1540	3.91	2.000	50.80	3.125	79.38	C16525	C16635	–	C11423
5/32			.1562	3.97	2.000	50.80	3.125	79.38	C16561	C16673	C16954	C16984
		22	.1570	3.99	2.000	50.80	3.125	79.38	C16524	C16634	–	C11422
		4.0	.1575	4.00	1.693	43.00	2.953	75.00	C16589	C16701	–	C11370
	21		.1590	4.04	2.313	58.74	3.500	88.90	C16523	C16633	C16955	C16985
	20		.1610	4.09	2.125	53.98	3.250	82.55	C16522	C16632	–	C11420
		4.1	.1614	4.10	1.693	43.00	2.953	75.00	C15562	–	–	–
		4.2	.1654	4.20	1.693	43.00	2.953	75.00	C15563	–	–	C11371
	19		.1660	4.22	2.125	53.98	3.250	82.55	C16521	C16631	–	C11419
		4.3	.1693	4.30	1.850	47.00	3.150	80.00	C15580	–	–	–
	18		.1695	4.31	2.125	53.98	3.250	82.55	C16520	C16630	–	C11418
11/64			.1719	4.37	2.125	53.98	3.250	82.55	C16562	C16674	–	C11404
		17	.1730	4.39	2.188	55.56	3.375	85.73	C16519	C16629	–	C11417
		4.4	.1732	4.40	1.850	47.00	3.150	80.00	C15581	–	–	C11372
	16		.1770	4.50	2.188	55.56	3.375	85.73	C16518	C16628	–	C11416
		4.5	.1772	4.50	1.850	47.00	3.150	80.00	C16590	C16702	–	C11373
	15		.1800	4.57	2.188	55.56	3.375	85.73	C16517	C16626	–	C11415
	14		.1820	4.62	2.188	55.56	3.375	85.73	C16516	C16625	–	C11414

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High-Performance Drills

Q-Cobalt™ Wide Land Parabolic

Styles 2075, 2075T, 2075N, 2075A • Jobber Length (continued)

Fract	Drill Diameter		Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number			
	Wire/Let	mm			in	mm	in	mm	Straw Oxide	TiN	TiCN	TiAlN
3/16	13		.1850	4.70	2.313	58.74	3.500	88.90	C16515	C16624	–	C11413
			.1875	4.76	2.313	58.74	3.500	88.90	C16563	C16675	C16956	C16986
	4.8		.1890	4.80	2.047	52.00	3.386	86.00	C15564	–	–	–
			.1890	4.80	2.313	58.74	3.500	88.90	C16514	C16623	–	C11412
	12		.1910	4.85	2.313	58.74	3.500	88.90	C16513	C16622	–	C11411
			.1935	4.92	2.438	61.91	3.625	92.08	C16512	C16621	–	C11410
	9		.1960	4.98	2.438	61.91	3.625	92.08	C16511	C16620	–	C11409
			.1969	5.00	2.047	52.00	3.386	86.00	C16591	C16703	–	C11374
	8		.1990	5.06	2.438	61.91	3.625	92.08	C16510	C16619	–	C11408
			.2008	5.10	2.047	52.00	3.386	86.00	C15565	–	–	–
13/64	7		.2010	5.11	2.438	61.91	3.625	92.08	C16509	C16618	C16957	C16987
			.2031	5.16	2.438	61.91	3.625	92.08	C16564	C16676	C16958	C16988
	6		.2040	5.18	2.500	63.50	3.750	95.25	C16508	C16617	C16959	C16989
			.2047	5.20	2.047	52.00	3.386	86.00	C16592	C16704	–	–
	5		.2055	5.22	2.500	63.50	3.750	95.25	C16507	C16616	–	C11405
			.2090	5.31	2.500	63.50	3.750	95.25	C16506	C16615	C16960	C16990
	4		.2130	5.41	2.500	63.50	3.750	95.25	C16505	C16614	–	C11403
			.2165	5.50	2.244	57.00	3.661	93.00	C16593	C16705	–	C11375
7/32			.2188	5.56	2.500	63.50	3.750	95.25	C16565	C16677	C16961	C16991
			.2205	5.60	2.244	57.00	3.661	93.00	C16594	C16706	–	–
	2		.2210	5.61	2.625	66.68	3.875	98.43	C16504	C16613	–	C11402
			.2244	5.70	2.244	57.00	3.661	93.00	C15566	–	–	–
	1		.2280	5.79	2.625	66.68	3.875	98.43	C16503	C16612	–	C11401
			.2283	5.80	2.244	57.00	3.661	93.00	C15582	–	–	C11376
15/64	A		.2340	5.94	2.625	66.68	3.875	98.43	C15650	–	C16430	–
			.2344	5.95	2.625	66.68	3.875	98.43	C16566	C16678	C16962	C16992
	6.0		.2362	6.00	2.244	57.00	3.661	93.00	C16595	C16707	–	C11377
			.2380	6.05	2.750	69.85	4.000	101.60	C15651	–	C16431	–
	B		.2420	6.15	2.750	69.85	4.000	101.60	C15652	–	C16432	–
			.2460	6.25	2.750	69.85	4.000	101.60	C15653	–	C16433	–
1/4	E		.2500	6.35	2.750	69.85	4.000	101.60	C16567	C16679	C16963	C16993
			.2520	6.40	2.480	63.00	3.976	101.00	C15567	–	–	–
	6.5		.2559	6.50	2.480	63.00	3.976	101.00	C16596	C16708	–	C11378
			.2570	6.53	2.875	73.03	4.125	104.78	C15654	–	C16434	–
	F		.2598	6.60	2.480	63.00	3.976	101.00	C15568	–	–	–
			.2610	6.63	2.875	73.03	4.125	104.78	C15655	–	C16435	–
17/64	6.7		.2638	6.70	2.480	63.00	3.976	101.00	C15569	–	–	–
			.2656	6.75	2.875	73.03	4.125	104.78	C16568	C16680	C16964	C16994
	H		.2660	6.76	2.875	73.03	4.125	104.78	C15656	–	C16436	–
			.2677	6.80	2.717	69.00	4.291	109.00	C16597	C16709	–	C11379
	I		.2720	6.91	2.875	73.03	4.125	104.78	C15657	–	C16437	–
			.2756	7.00	2.717	69.00	4.291	109.00	C16598	C16710	C16965	C16995
	J		.2770	7.04	2.875	73.03	4.125	104.78	C15658	–	C16438	–
			.2810	7.14	2.938	74.61	4.250	107.95	C15659	–	C16439	–
9/32			.2812	7.14	2.938	74.61	4.250	107.95	C16569	C16681	C16966	C16996
			.2835	7.20	2.717	69.00	4.291	109.00	C15570	–	–	–
	L		.2900	7.37	2.938	74.61	4.250	107.95	C15660	–	C16440	–
			.2913	7.40	2.717	69.00	4.291	109.00	C15571	–	–	–
	M		.2950	7.49	3.063	77.79	4.375	111.13	C15661	–	C16441	–
			.2953	7.50	2.717	69.00	4.291	109.00	C16599	C16711	–	C11380
19/64			.2969	7.54	3.063	77.79	4.375	111.13	C16570	C16682	–	–
			.3020	7.67	3.063	77.79	4.375	111.13	C15662	–	C16442	–

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DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

High-Performance Drills

Q-Cobalt™ Wide Land Parabolic

Styles 2075, 2075T, 2075N, 2075A • Jobber Length

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Fract	Drill Diameter		Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number			
	Wire/Let	mm			in	mm	in	mm	Straw Oxide	TiN	TiCN	TiAlN
5/16			.3125	7.94	3.188	80.96	4.500	114.30	C16571	C16683	C16967	C16997
		8.0	.3150	8.00	2.953	75.00	4.606	117.00	C16600	C16712	–	C11381
	O		.3160	8.03	3.188	80.96	4.500	114.30	C15663	–	C16443	–
		8.1	.3189	8.10	2.953	75.00	4.606	117.00	C15572	–	–	–
21/64		8.2	.3228	8.20	2.953	75.00	4.606	117.00	C16601	C16713	–	–
	P		.3230	8.20	3.313	84.14	4.625	117.48	C15664	–	C16444	–
			.3281	8.33	3.313	84.14	4.625	117.48	C16572	C16684	–	–
	Q		.3320	8.43	3.438	87.31	4.750	120.65	C15665	–	C16445	–
11/32		8.5	.3346	8.50	2.953	75.00	4.606	117.00	C16602	C16714	–	C11382
		8.6	.3386	8.60	3.189	81.00	4.921	125.00	C16603	C16715	–	–
	R		.3390	8.61	3.438	87.31	4.750	120.65	C15666	–	C16446	–
		8.7	.3425	8.70	3.189	81.00	4.921	125.00	C15573	–	–	–
23/64			.3438	8.73	3.438	87.31	4.750	120.65	C16573	C16685	C16968	C16998
	S		.3480	8.84	3.500	88.90	4.875	123.83	C15667	–	C16447	–
		9.0	.3543	9.00	3.189	81.00	4.921	125.00	C16604	C16716	–	C11383
	T		.3580	9.09	3.500	88.90	4.875	123.83	C15668	–	C16448	–
3/8			.3594	9.13	3.500	88.90	4.875	123.83	C16574	C16686	–	–
	U		.3680	9.35	3.625	92.08	5.000	127.00	C15669	–	C16449	–
		9.5	.3740	9.50	3.189	81.00	4.921	125.00	C16605	C16717	–	–
	V		.3750	9.53	3.625	92.08	5.000	127.00	C16575	C16687	C16969	C16999
25/64			.3770	9.58	3.625	92.08	5.000	127.00	C15670	–	C16450	–
	W		.3860	9.80	3.750	95.25	5.125	130.18	C15671	–	C16451	–
		10.0	.3906	9.92	3.750	95.25	5.125	130.18	C16576	C16688	–	–
	X		.3937	10.00	3.425	87.00	5.236	133.00	C16606	C16718	–	C11384
13/32		10.2	.3970	10.08	3.750	95.25	5.125	130.18	C15672	–	C16452	–
			.4016	10.20	3.425	87.00	5.236	133.00	C15574	–	–	–
	Y		.4040	10.26	3.875	98.43	5.250	133.35	C15673	–	C16453	–
	Z		.4062	10.32	3.875	98.43	5.250	133.35	C16577	C16689	–	–
27/64		10.5	.4130	10.49	3.875	98.43	5.250	133.35	C15674	–	C16454	–
			.4134	10.50	3.425	87.00	5.236	133.00	C16607	C16719	–	–
		10.8	.4219	10.72	3.938	100.01	5.375	136.53	C16578	C16690	–	–
		10.8	.4252	10.80	3.701	94.00	5.591	142.00	C15575	–	–	–
7/16		11.0	.4331	11.00	3.701	94.00	5.591	142.00	C16608	C16720	–	C11385
			.4375	11.11	4.063	103.19	5.500	139.70	C16579	C16691	C16970	C17000
		11.2	.4409	11.20	3.701	94.00	5.591	142.00	C15576	–	–	–
		11.5	.4528	11.50	3.701	94.00	5.591	142.00	C16609	C16721	–	–
29/64			.4531	11.51	4.188	106.36	5.625	142.88	C16580	C16692	–	–
	15/32		.4688	11.91	4.313	109.54	5.750	146.05	C16581	C16693	–	–
		12.0	.4724	12.00	3.976	101.00	5.945	151.00	C16610	C16722	–	C11386
		12.25	.4823	12.25	3.976	101.00	5.945	151.00	C15577	–	–	–
31/64			.4844	12.30	4.375	111.13	5.875	149.23	C16582	C16694	–	–
		12.5	.4921	12.50	3.976	101.00	5.945	151.00	C16611	C16723	–	–
			.5000	12.70	4.500	114.30	6.000	152.40	C16583	C16695	C16971	C17001
	1/2		.5118	13.00	3.976	101.00	5.945	151.00	C15583	–	–	C11387

Sets

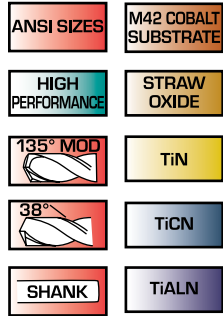
No. of Pieces	Drill Style	Finish	Size Range	Set Order Number
15	2075	straw oxide	1/16" through 1/2" x 1/32"	C00901
29	2075	straw oxide	1/16" through 1/2" x 1/64"	C00902



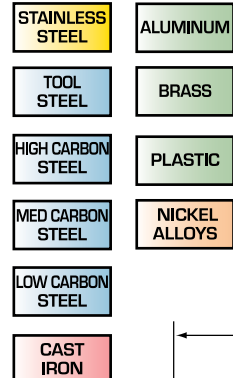
High-Performance Drills Q-Cobalt™ Wide Land Parabolic

Styles 2175, 2175T, 2175N, 2175A • Screw Machine Length

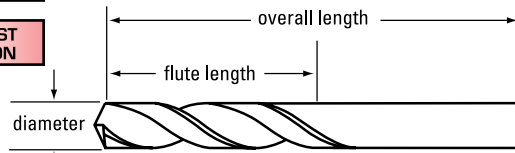
FEATURES



APPLICATIONS



Operating parameters on page 6.



Drill Diameter Fract	Wire/Let	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number			
				in	mm	in	mm	Straw Oxide	TiN	TiCN	TiAlN
1/16		.0625	1.59	.625	15.88	1.625	41.28	C14200	C14321	C15250	C15050
	52	.0635	1.61	.688	17.46	1.688	42.86	C14318	C14439	—	—
	51	.0670	1.70	.688	17.46	1.688	42.86	C14317	C14438	—	—
	50	.0700	1.78	.688	17.46	1.688	42.86	C14316	C14437	—	—
	49	.0730	1.85	.688	17.46	1.688	42.86	C14315	C14436	—	—
5/64	48	.0760	1.93	.688	17.46	1.688	42.86	C14314	C14435	—	—
		.0781	1.98	.688	17.46	1.688	42.86	C14201	C14322	C15251	C15051
	47	.0785	1.99	.750	19.05	1.750	44.45	C14313	C14434	—	—
	46	.0810	2.06	.750	19.05	1.750	44.45	C14312	C14433	—	—
	45	.0820	2.08	.750	19.05	1.750	44.45	C14311	C14432	—	—
3/32	44	.0860	2.18	.750	19.05	1.750	44.45	C14310	C14431	—	—
	43	.0890	2.26	.750	19.05	1.750	44.45	C14309	C14430	—	—
	42	.0935	2.38	.750	19.05	1.750	44.45	C14308	C14429	—	—
		.0938	2.38	.750	19.05	1.750	44.45	C14202	C14323	C15252	C15052
	41	.0960	2.44	.813	20.64	1.813	46.04	C14307	C14428	—	—
	40	.0980	2.49	.813	20.64	1.813	46.04	C14280	C14402	C15330	C15130
	39	.0995	2.53	.813	20.64	1.813	46.04	C14279	C14401	C15329	C15129
7/64	38	.1015	2.58	.813	20.64	1.813	46.04	C14278	C14400	C15328	C15128
	37	.1040	2.64	.813	20.64	1.813	46.04	C14277	C14399	C15327	C15127
	36	.1065	2.71	.813	20.64	1.813	46.04	C14276	C14398	C15326	C15126
		.1094	2.78	.813	20.64	1.813	46.04	C14203	C14324	C15253	C15053
	35	.1100	2.79	.875	22.23	1.875	47.63	C14275	C14397	C15325	C15125
	34	.1110	2.82	.875	22.23	1.875	47.63	C14274	C14396	C15324	C15124
	33	.1130	2.87	.875	22.23	1.875	47.63	C14273	C14395	C15323	C15123
1/8	32	.1160	2.95	.875	22.23	1.875	47.63	C14272	C14393	C15322	C15122
	31	.1200	3.05	.875	22.23	1.875	47.63	C14271	C14392	C15321	C15121
		.1250	3.18	.875	22.23	1.875	47.63	C14204	C14325	C15254	C15054
	30	.1285	3.26	.938	23.81	1.938	49.21	C14270	C14391	C15320	C15120
	29	.1360	3.45	.938	23.81	1.938	49.21	C14269	C14390	C15319	C15119
9/64	28	.1405	3.57	.938	23.81	1.938	49.21	C14268	C14389	C15318	C15118
		.1406	3.57	.938	23.81	1.938	49.21	C14205	C14326	C15255	C15055
	27	.1440	3.66	1.000	25.40	2.063	52.39	C14267	C14388	C15317	C15117

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Q-Cobalt™ Wide Land Parabolic

Styles 2175, 2175T, 2175N, 2175A • Screw Machine Length (continued)

Drill Diameter Fract	Wire/Let	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Straw Oxide	Order Number			
				in	mm	in	mm		TiN	TiCN	TiAlN	
	26	.1470	3.73	1.000	25.40	2.063	52.39	C14266	C14387	C15316	C15116	
	25	.1495	3.80	1.000	25.40	2.063	52.39	C14265	C14386	C15315	C15115	
	24	.1520	3.86	1.000	25.40	2.063	52.39	C14264	C14385	C15314	C15114	
	23	.1540	3.91	1.000	25.40	2.063	52.39	C14263	C14384	C15313	C15113	
5/32		.1562	3.97	1.000	25.40	2.063	52.39	C14206	C14327	C15256	C15056	
	22	.1570	3.99	1.063	26.99	2.125	53.98	C14262	C14383	C15312	C15112	
	21	.1590	4.04	1.063	26.99	2.125	53.98	C14261	C14382	C15311	C15111	
	20	.1610	4.09	1.063	26.99	2.125	53.98	C14260	C14381	C15310	C15110	
	19	.1660	4.22	1.063	26.99	2.125	53.98	C14259	C14380	C15309	C15109	
	18	.1695	4.31	1.063	26.99	2.125	53.98	C14258	C14379	C15308	C15108	
11/64		.1719	4.37	1.063	26.99	2.125	53.98	C14207	C14328	C15257	C15057	
	17	.1730	4.39	1.125	28.58	2.188	55.56	C14257	C14378	C15307	C15107	
	16	.1770	4.50	1.125	28.58	2.188	55.56	C14256	C14377	C15306	C15106	
	15	.1800	4.57	1.125	28.58	2.188	55.56	C14255	C14376	C15305	C15105	
	14	.1820	4.62	1.125	28.58	2.188	55.56	C14254	C14375	C15304	C15104	
	13	.1850	4.70	1.125	28.58	2.188	55.56	C14253	C14374	C15303	C15103	
3/16		.1875	4.76	1.125	28.58	2.188	55.56	C14208	C14329	C15258	C15058	
	12	.1890	4.80	1.188	30.16	2.250	57.15	C14252	C14373	C15302	C15102	
	11	.1910	4.85	1.188	30.16	2.250	57.15	C14251	C14372	C15301	C15101	
	10	.1935	4.92	1.188	30.16	2.250	57.15	C14250	C14371	C15300	C15100	
	9	.1960	4.98	1.188	30.16	2.250	57.15	C14249	C14370	C15299	C15099	
	8	.1990	5.06	1.188	30.16	2.250	57.15	C14248	C14369	C15298	C15098	
	7	.2010	5.11	1.188	30.16	2.250	57.15	C14247	C14368	C15297	C15097	
13/64		.2031	5.16	1.188	30.16	2.250	57.15	C14209	C14330	C15259	C15059	
	6	.2040	5.18	1.250	31.75	2.375	60.33	C14246	C14367	C15296	C15096	
	5	.2055	5.22	1.250	31.75	2.375	60.33	C14245	C14366	C15295	C15095	
	4	.2090	5.31	1.250	31.75	2.375	60.33	C14244	C14365	C15294	C15094	
	3	.2130	5.41	1.250	31.75	2.375	60.33	C14243	C14364	C15293	C15093	
7/32		.2188	5.56	1.250	31.75	2.375	60.33	C14210	C14331	C15260	C15060	
	2	.2210	5.61	1.313	33.34	2.438	61.91	C14242	C14363	C15292	C15092	
	1	.2280	5.79	1.313	33.34	2.438	61.91	C14241	C14362	C15291	C15091	
	A	.2340	5.94	1.313	33.34	2.438	61.91	C14281	C14403	C15331	C15131	
15/64		.2344	5.95	1.313	33.34	2.438	61.91	C14211	C14332	C15261	C15061	
	B	.2380	6.05	1.375	34.93	2.500	63.50	C14282	C14404	C15332	C15132	
	C	.2420	6.15	1.375	34.93	2.500	63.50	C14283	C14405	C15333	C15133	
	D	.2460	6.25	1.375	34.93	2.500	63.50	C14284	C14406	C15334	C15134	
1/4		.2500	6.35	1.375	34.93	2.500	63.50	C14212	C14333	C15262	C15062	
	F	.2570	6.53	1.438	36.51	2.625	66.68	C14286	C14407	C15335	C15135	
	G	.2610	6.63	1.438	36.51	2.625	66.68	C14287	C14408	C15336	C15136	
17/64		.2656	6.75	1.438	36.51	2.625	66.68	C14213	C14334	C15263	C15063	
	H	.2660	6.76	1.500	38.10	2.688	68.26	C14288	C14409	C15337	C15137	
	I	.2720	6.91	1.500	38.10	2.688	68.26	C14289	C14410	C15338	C15138	
	J	.2770	7.04	1.500	38.10	2.688	68.26	C14290	C14411	C15339	C15139	
	K	.2810	7.14	1.500	38.10	2.688	68.26	C14291	C14412	C15340	C15140	
9/32		.2812	7.14	1.500	38.10	2.688	68.26	C14214	C14335	C15264	C15064	
	L	.2900	7.37	1.563	39.69	2.750	69.85	C14292	C14413	C15341	C15141	
	M	.2950	7.49	1.563	39.69	2.750	69.85	C14293	C14414	C15342	C15142	
19/64		.2969	7.54	1.563	39.69	2.750	69.85	C14215	C14336	C15265	C15065	
	N	.3020	7.67	1.625	41.28	2.813	71.44	C14294	C14415	C15343	C15143	
5/16		.3125	7.94	1.625	41.28	2.813	71.44	C14216	C14337	C15266	C15066	

continued on next page



High-Performance Drills
Q-Cobalt™ Wide Land Parabolic

Styles 2175, 2175T, 2175N, 2175A • Screw Machine Length (continued)

Drill Diameter Fract	Wire/Let	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Straw Oxide	Order Number		
				in	mm	in	mm		TiN	TiCN	TiAlN
	O	.3160	8.03	1.688	42.86	2.938	74.61	C14295	C14416	C15344	C15144
	P	.3230	8.20	1.688	42.86	2.938	74.61	C14296	C14417	C15345	C15145
21/64		.3281	8.33	1.688	42.86	2.938	74.61	C14217	C14338	C15267	C15067
	Q	.3320	8.43	1.688	42.86	3.000	76.20	C14297	C14418	C15346	C15146
11/32	R	.3390	8.61	1.688	42.86	3.000	76.20	C14298	C14419	C15347	C15147
		.3438	8.73	1.688	42.86	3.000	76.20	C14218	C14339	C15268	C15068
	S	.3480	8.84	1.750	44.45	3.063	77.79	C14299	C14420	C15348	C15148
	T	.3580	9.09	1.750	44.45	3.063	77.79	C14300	C14421	C15349	C15149
23/64		.3594	9.13	1.750	44.45	3.063	77.79	C14219	C14340	C15269	C15069
	U	.3680	9.35	1.813	46.04	3.125	79.38	C14301	C14422	C15350	C15150
3/8		.3750	9.53	1.813	46.04	3.125	79.38	C14220	C14341	C15270	C15070
	V	.3770	9.58	1.875	47.63	3.250	82.55	C14302	C14423	C15351	C15151
	W	.3860	9.80	1.875	47.63	3.250	82.55	C14303	C14424	C15352	C15152
25/64		.3906	9.92	1.875	47.63	3.250	82.55	C14221	C14342	C15271	C15071
	X	.3970	10.08	1.938	49.21	3.313	84.14	C14304	C14425	C15353	C15153
	Y	.4040	10.26	1.938	49.21	3.313	84.14	C14305	C14426	C15354	C15154
13/32		.4062	10.32	1.938	49.21	3.313	84.14	C14222	C14343	C15272	C15072
	Z	.4130	10.49	2.000	50.80	3.375	85.73	C14306	C14427	C15355	C15155
27/64		.4219	10.72	2.000	50.80	3.375	85.73	C14223	C14344	C15273	C15073
7/16		.4375	11.11	2.063	52.39	3.438	87.31	C14224	C14345	C15274	C15074
29/64		.4531	11.51	2.125	53.98	3.563	90.49	C14225	C14346	C15275	C15075
15/32		.4688	11.91	2.125	53.98	3.625	92.08	C14226	C14347	C15276	C15076
31/64		.4844	12.30	2.188	55.56	3.688	93.66	C14227	C14348	C15277	C15077
1/2		.5000	12.70	2.250	57.15	3.750	95.25	C14228	C14349	C15278	C15078
33/64		.5156	13.10	2.375	60.33	3.875	98.43	C14229	C14350	C15279	C15079
17/32		.5312	13.49	2.375	60.33	3.875	98.43	C14230	C14351	C15280	C15080
35/64		.5469	13.89	2.500	63.50	4.000	101.60	C14231	C14352	C15281	C15081
9/16		.5625	14.29	2.500	63.50	4.000	101.60	C14232	C14353	C15282	C15082
37/64		.5781	14.68	2.625	66.68	4.125	104.78	C14233	C14354	C15283	C15083
19/32		.5938	15.08	2.625	66.68	4.125	104.78	C14234	C14355	C15284	C15084
39/64		.6094	15.48	2.750	69.85	4.250	107.95	C14235	C14356	C15285	C15085
5/8		.6250	15.88	2.750	69.85	4.250	107.95	C14236	C14357	C15286	C15086
41/64		.6406	16.27	2.875	73.03	4.500	114.30	C14237	C14358	C15287	C15087
21/32		.6562	16.67	2.875	73.03	4.500	114.30	C14238	C14359	C15288	C15088
43/64		.6719	17.07	2.875	73.03	4.625	117.48	C14239	C14360	C15289	C15089
11/16		.6875	17.46	2.875	73.03	4.625	117.48	C14240	C14361	C15290	C15090

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS



Q-Cobalt™ Wide Land Parabolic

Styles 2575, 2575T • Taper Length

DRILLING

FEATURES

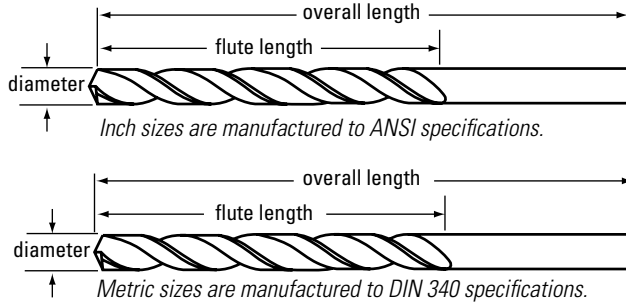
ANSI SIZES	M42 COBALT SUBSTRATE
DIN 338	STRAW OXIDE
HIGH PERFORMANCE	TiN
135° MOD	
38°	
SHANK	

APPLICATIONS

STAINLESS STEEL	ALUMINUM
TOOL STEEL	BRASS
HIGH CARBON STEEL	PLASTIC
MED CARBON STEEL	NICKEL ALLOYS
LOW CARBON STEEL	
CAST IRON	



HOLE FINISHING



Operating parameters on page 6.

THREADING

MILLING

OTHER TOOLS

Drill Diameter Fract	Wire	mm	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number	
					in	mm	in	mm	Straw Oxide	TiN
1/16		1.5	.0591	1.500	1.732	44.00	2.992	76.00	C16805	C16914
			.0625	1.588	1.750	44.45	3.000	76.20	C16776	C16885
	52		.0635	1.613	2.000	50.80	3.750	95.25	C16775	C16884
	51		.0670	1.702	2.000	50.80	3.750	95.25	C16774	C16883
	50		.0700	1.778	2.000	50.80	3.750	95.25	C16773	C16882
5/64	49		.0730	1.854	2.000	50.80	3.750	95.25	C16772	C16881
	48		.0760	1.930	2.000	50.80	3.750	95.25	C16771	C16880
			.0781	1.984	2.000	50.80	3.750	95.25	C16777	C16886
	47		.0785	1.994	2.250	57.15	4.250	107.95	C16770	C16879
		2.0	.0787	2.000	2.244	57.00	4.252	108.00	C16806	C16915
3/32	46		.0810	2.057	2.250	57.15	4.250	107.95	C16769	C16878
	45		.0820	2.083	2.250	57.15	4.250	107.95	C16768	C16877
	44		.0860	2.184	2.250	57.15	4.250	107.95	C16767	C16876
	43		.0890	2.261	2.250	57.15	4.250	107.95	C16766	C16875
	42		.0935	2.375	2.250	57.15	4.250	107.95	C16765	C16874
			.0938	2.381	2.250	57.15	4.250	107.95	C16778	C16887
	41		.0960	2.438	2.500	63.50	4.625	117.48	C16764	C16873
7/64	40		.0980	2.489	2.500	63.50	4.625	117.48	C16763	C16872
		2.5	.0984	2.500	2.520	64.00	4.606	117.00	C16807	C16916
	39		.0995	2.527	2.500	63.50	4.625	117.48	C16762	C16871
	38		.1015	2.578	2.500	63.50	4.625	117.48	C16761	C16870
	37		.1040	2.642	2.500	63.50	4.625	117.48	C16760	C16869
	36		.1065	2.705	2.500	63.50	4.625	117.48	C16759	C16868
			.1094	2.778	2.500	63.50	4.625	117.48	C16779	C16888
31	35		.1100	2.794	2.750	69.85	5.125	130.18	C16758	C16867
	34		.1110	2.819	2.750	69.85	5.125	130.18	C16757	C16866
	33		.1130	2.870	2.750	69.85	5.125	130.18	C16756	C16865
	32		.1160	2.946	2.750	69.85	5.125	130.18	C16755	C16864
		3.0	.1181	3.000	2.756	70.00	5.118	130.00	C16808	C16917
		.1200	3.048	2.750	69.85	5.125	130.18	C16754	C16863	

continued on next page



High-Performance Drills

Q-Cobalt™ Wide Land Parabolic

Styles 2575, 2575T • Taper Length (continued)

Drill Diameter		Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number	
Fract	Wire			mm	in	mm	in	mm	Straw Oxide
1/8		.1250	3.175	2.750	69.85	5.125	130.18	C16780	C16889
	30	.1285	3.264	3.000	76.20	5.375	136.53	C16753	C16862
	29	.1360	3.454	3.000	76.20	5.375	136.53	C16752	C16861
	3.5	.1378	3.500	2.992	76.00	5.394	137.00	C16809	C16918
9/64	28	.1405	3.569	3.000	76.20	5.375	136.53	C16751	C16860
		.1406	3.572	3.000	76.20	5.375	136.53	C16781	C16890
	27	.1440	3.658	3.000	76.20	5.375	136.53	C16750	C16859
	26	.1470	3.734	3.000	76.20	5.375	136.53	C16749	C16858
	25	.1495	3.797	3.000	76.20	5.375	136.53	C16748	C16857
	24	.1520	3.861	3.000	76.20	5.375	136.53	C16747	C16856
5/32	23	.1540	3.912	3.000	76.20	5.375	136.53	C16746	C16855
		.1562	3.969	3.000	76.20	5.375	136.53	C16782	C16891
	22	.1570	3.988	3.375	85.73	5.750	146.05	C16745	C16854
	4.0	.1575	4.000	3.386	86.00	5.748	146.00	C16810	C16919
	21	.1590	4.039	3.375	85.73	5.750	146.05	C16744	C16853
	20	.1610	4.089	3.375	85.73	5.750	146.05	C16743	C16852
	19	.1660	4.216	3.375	85.73	5.750	146.05	C16742	C16851
	18	.1695	4.305	3.375	85.73	5.750	146.05	C16741	C16850
11/64		.1719	4.366	3.375	85.73	5.750	146.05	C16783	C16892
	17	.1730	4.394	3.375	85.73	5.750	146.05	C16740	C16849
	16	.1770	4.496	3.375	85.73	5.750	146.05	C16739	C16848
	4.5	.1772	4.500	3.386	86.00	5.748	146.00	C16811	C16920
	15	.1800	4.572	3.375	85.73	5.750	146.05	C16738	C16847
	14	.1820	4.623	3.375	85.73	5.750	146.05	C16737	C16846
3/16	13	.1850	4.699	3.375	85.73	5.750	146.05	C16736	C16845
		.1875	4.763	3.375	85.73	5.750	146.05	C16784	C16893
	12	.1890	4.801	3.625	92.08	6.000	152.40	C16735	C16844
	11	.1910	4.851	3.625	92.08	6.000	152.40	C16734	C16843
	10	.1935	4.915	3.625	92.08	6.000	152.40	C16733	C16842
	9	.1960	4.978	3.625	92.08	6.000	152.40	C16732	C16841
	5.0	.1969	5.000	3.622	92.00	5.984	152.00	C16812	C16921
	8	.1990	5.055	3.625	92.08	6.000	152.40	C16731	C16840
13/64	7	.2010	5.105	3.625	92.08	6.000	152.40	C16730	C16839
		.2031	5.159	3.625	92.08	6.000	152.40	C16785	C16894
	6	.2040	5.182	3.625	92.08	6.000	152.40	C16729	C16838
	5.2	.2047	5.200	3.622	92.00	5.984	152.00	C16813	C16922
	5	.2055	5.220	3.625	92.08	6.000	152.40	C16728	C16837
	4	.2090	5.309	3.625	92.08	6.000	152.40	C16727	C16836
	3	.2130	5.410	3.625	92.08	6.000	152.40	C16726	C16835
	5.5	.2165	5.500	3.622	92.00	5.984	152.00	C16814	C16923
7/32		.2188	5.556	3.625	92.08	6.000	152.40	C16786	C16895
	5.6	.2205	5.600	3.740	95.00	6.142	156.00	C16815	C16924
	2	.2210	5.613	3.750	95.25	6.125	155.58	C16725	C16834
	1	.2280	5.791	3.750	95.25	6.125	155.58	C16724	C16833
15/64		.2344	5.953	3.750	95.25	6.125	155.58	C16787	C16896
	6.0	.2362	6.000	3.740	95.00	6.142	156.00	C16816	C16925
1/4		.2500	6.350	3.750	95.25	6.125	155.58	C16788	C16897
	6.5	.2559	6.500	3.858	98.00	6.260	159.00	C16817	C16926
17/64		.2656	6.747	3.875	98.43	6.250	158.75	C16789	C16898
	6.8	.2677	6.800	3.858	98.00	6.260	159.00	C16818	C16927
	7.0	.2756	7.000	3.858	98.00	6.260	159.00	C16819	C16928
	9/32	.2812	7.144	3.875	98.43	6.250	158.75	C16790	C16899

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Q-Cobalt™ Wide Land Parabolic

Styles 2575, 2575T • Taper Length (continued)

DRILLING

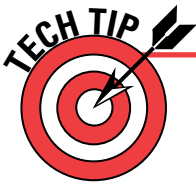
HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Drill Diameter		Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number	
Fract	Wire			in	mm	in	mm	Straw Oxide	TiN
19/64	5/16	.2953	7.500	4.016	102.00	6.378	162.00	C16820	C16929
		.2969	7.541	4.000	101.60	6.375	161.93	C16791	C16900
21/64	5/16	.3125	7.938	4.000	101.60	6.375	161.93	C16792	C16901
		.3150	8.000	4.134	105.00	6.496	165.00	C16821	C16930
21/64	5/16	.3228	8.200	4.134	105.00	6.496	165.00	C16822	C16931
		.3281	8.334	4.125	104.78	6.500	165.10	C16793	C16902
11/32	5/16	.3346	8.500	4.134	105.00	6.496	165.00	C16823	C16932
		.3386	8.600	4.134	105.00	6.496	165.00	C16824	C16933
23/64	5/16	.3438	8.731	4.125	104.78	6.500	165.10	C16794	C16903
		.3543	9.000	4.252	108.00	6.732	171.00	C16825	C16934
23/64	5/16	.3594	9.128	4.250	107.95	6.750	171.45	C16795	C16904
		.3740	9.500	4.252	108.00	6.732	171.00	C16826	C16935
25/64	3/8	.3750	9.525	4.250	107.95	6.750	171.45	C16796	C16905
		.3906	9.922	4.375	111.13	7.000	177.80	C16797	C16906
13/32	10.0	.3937	10.000	4.370	111.00	7.008	178.00	C16827	C16936
		.4062	10.319	4.375	111.13	7.000	177.80	C16798	C16907
27/64	10.5	.4134	10.500	4.606	117.00	7.244	184.00	C16828	C16937
		.4219	10.716	4.625	117.48	7.250	184.15	C16799	C16908
7/16	11.0	.4331	11.000	4.606	117.00	7.244	184.00	C16829	C16938
		.4375	11.113	4.625	117.48	7.250	184.15	C16800	C16909
29/64	11.5	.4528	11.500	4.764	121.00	7.480	190.00	C16830	C16939
		.4531	11.509	4.750	120.65	7.500	190.50	C16801	C16910
15/32	12.0	.4688	11.906	4.750	120.65	7.500	190.50	C16802	C16911
		.4724	12.000	4.764	121.00	7.480	190.00	C16831	C16940
31/64	12.5	.4844	12.303	4.750	120.65	7.750	196.85	C16803	C16912
		.4921	12.500	4.764	121.00	7.480	190.00	C16832	C16941
1/2		.5000	12.700	4.750	120.65	7.750	196.85	C16804	C16913



Coatings and Their Applications

- TiN (titanium nitride, gold color) coating offers added lubricity and hardness resulting in improved chip flow,, significantly improved wear life, and better finished hole quality. TiN coatings are used in a broad range of materials, especially ferrous materials, typically at as much as 35% greater drilling speeds than uncoated tools.
- TiCN (titanium carbonitride, blue-gray color) is harder, tougher, and more wear-resistant than TiN. It is engineered for very aggressive machining in a broad range of materials, including ferrous and nonferrous materials, under conditions of moderate cutting temperatures. TiCN may be run at 50% higher cutting speeds than uncoated tools.
- TiAlN (titanium aluminum nitride, violet color) coating is designed for very aggressive machining of stainless steels, high-alloy carbon steels, nickel-based high temp alloys, and titanium alloys. TiAlN-coated tools can run at 100% greater speeds than uncoated drills, and offer improved wear life, especially in conditions where high temperatures can be generated. Use with caution in nonferrous materials because of tendency to gall.



Styles 2065, 2065TN • Jobber Length

FEATURES

ANSI SIZES	HSS SUBSTRATE
DIN 338	BRIGHT
HIGH PERFORMANCE	TiN
SHANK	118° KNOTCH
38°	

APPLICATIONS

LOW CARBON STEEL	FREE-MACH STAINLESS
SOFT ALLOY STEEL	
NON-FERROUS MATERIALS	
ALUMINUM	
COPPER ALLOYS	

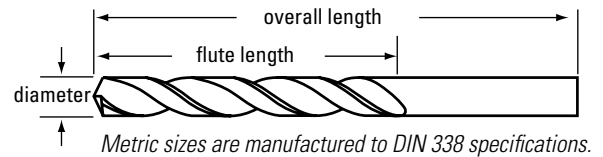
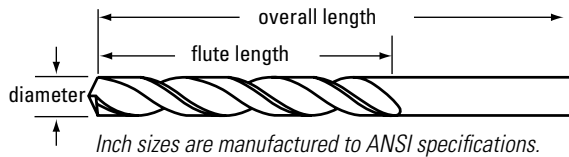


Style 2065 Bright



Style 2065TN TiN-coated

Drills up to 14 diameters deep.



Adjust the operating parameters on page 6 as follows:
double the given feed rate.

Drill Diameter Fract	Wire	mm	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number	
					in	mm	in	mm	Bright	TiN
1/16			.0625	1.59	.875	22.23	1.875	47.63	C16029	C03705
	52		.0635	1.61	.875	22.23	1.875	47.63	C16219	-
	51		.0670	1.70	1.000	25.40	2.000	50.80	C16218	-
	50		.0700	1.78	1.000	25.40	2.000	50.80	-	C03708
5/64	49		.0730	1.85	1.000	25.40	2.000	50.80	C16216	-
			.0781	1.98	1.000	25.40	2.000	50.80	C16030	C03711
	47		.0785	1.99	1.000	25.40	2.000	50.80	C16214	-
		2.0	.0787	2.00	.945	24.00	1.929	49.00	C03174	C03279
3/32	45		.0820	2.08	1.125	28.58	2.125	53.98	C16212	-
	43		.0890	2.26	1.250	31.75	2.250	57.15	C16210	-
	42		.0935	2.37	1.250	31.75	2.250	57.15	C16209	-
		2.4	.0938	2.38	1.250	31.75	2.250	57.15	C16031	C03718
7/64			.0945	2.40	1.181	30.00	2.244	57.00	C03182	-
	41		.0960	2.44	1.375	34.93	2.375	60.33	C16208	-
	40		.0980	2.49	1.375	34.93	2.375	60.33	C16207	C03720
		2.5	.0984	2.50	1.181	30.00	2.244	57.00	C03184	-
1/8	39		.0995	2.53	1.375	34.93	2.375	60.33	C16206	-
	38		.1015	2.58	1.438	36.51	2.500	63.50	C16205	C03722
	36		.1065	2.71	1.438	36.51	2.500	63.50	C16203	C03724
		2.9	.1094	2.78	1.500	38.10	2.625	66.68	C16032	C03725
1/8	33		.1130	2.87	1.500	38.10	2.625	66.68	C16200	C03728
		3.0	.1142	2.90	1.299	33.00	2.402	61.00	C03188	-
	32		.1160	2.95	1.625	41.28	2.750	69.85	C16199	-
		3.1	.1181	3.00	1.299	33.00	2.402	61.00	C03189	-
1/8	31		.1200	3.05	1.625	41.28	2.750	69.85	C16198	C03730
		3.2	.1220	3.10	1.417	36.00	2.559	65.00	C03190	C03295
			.1250	3.18	1.625	41.28	2.750	69.85	C16033	C03731
			.1260	3.20	1.457	37.00	2.598	66.00	C03191	-

continued on next page

High-Performance Drills

HSS Parabolic

Styles 2065, 2065TN • Jobber Length (continued)

Fract	Drill Diameter		Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number	
	Wire/Let	mm			in	mm	in	mm	Bright	TiN
		30	.1285	3.26	1.625	41.28	2.750	69.85	C16197	C03732
			3.3	.1299	3.30	1.496	38.00	2.638	67.00	C03192
		29	.1360	3.45	1.750	44.45	2.875	73.03	C16196	C03733
			3.5	.1378	3.50	1.535	39.00	2.756	70.00	C03194
9/64		28	.1405	3.57	1.750	44.45	2.875	73.03	C16195	–
				.1406	3.57	1.750	44.45	2.875	73.03	C16034
		27	.1440	3.66	1.875	47.63	3.000	76.20	C16194	–
		26	.1470	3.73	1.875	47.63	3.000	76.20	C16193	–
5/32		25	.1495	3.80	1.875	47.63	3.000	76.20	C16192	C03738
				.1562	3.97	2.000	50.80	3.125	79.38	C16035
		22	.1570	3.99	2.000	50.80	3.125	79.38	C16189	C03742
			4.0	.1575	4.00	1.693	43.00	2.953	75.00	C03199
		21	.1590	4.04	2.313	58.74	3.500	88.90	C16188	C03743
		20	.1610	4.09	2.125	53.98	3.250	82.55	C16187	–
11/64		19	.1695	4.31	2.125	53.98	3.250	82.55	C16186	C03745
				.1719	4.37	2.125	53.98	3.250	82.55	C16036
		17	.1730	4.39	2.188	55.56	3.375	85.73	C16184	–
		16	.1770	4.50	2.188	55.56	3.375	85.73	C16183	–
		15	.1800	4.57	2.188	55.56	3.375	85.73	–	C03750
		14	.1820	4.62	2.188	55.56	3.375	85.73	C16181	C03751
3/16		13	.1850	4.70	2.313	58.74	3.500	88.90	C16180	C03752
				.1875	4.76	2.313	58.74	3.500	88.90	C16037
		12	.1890	4.80	2.313	58.74	3.500	88.90	C16179	–
		11	.1910	4.85	2.313	58.74	3.500	88.90	C16178	–
		10	.1935	4.91	2.438	61.91	3.625	92.08	C16177	C03756
		9	.1960	4.98	2.438	61.91	3.625	92.08	C16176	–
		8	.1969	5.00	2.047	52.00	3.386	86.00	C03209	–
				.1990	5.05	2.438	61.91	3.625	92.08	C16175
13/64		7	.2010	5.11	2.438	61.91	3.625	92.08	C16174	–
				.2031	5.16	2.438	61.91	3.625	92.08	C16038
		6	.2040	5.18	2.500	63.50	3.750	95.25	C16173	C03761
		5	.2055	5.22	2.500	63.50	3.750	95.25	C16172	C03762
		4	.2090	5.31	2.500	63.50	3.750	95.25	C16171	–
		3	.2130	5.41	2.500	63.50	3.750	95.25	C16170	C03764
7/32		5.5	.2165	5.50	2.244	57.00	3.661	93.00	C03214	–
				.2188	5.56	2.500	63.50	3.750	95.25	C16039
		2	.2210	5.61	2.625	66.68	3.875	98.43	C16169	–
		1	.2280	5.79	2.625	66.68	3.875	98.43	C16168	–
15/64			.2344	5.95	2.625	66.68	3.875	98.43	C16040	–
			6.0	.2362	6.00	2.244	57.00	3.661	93.00	C03219
1/4	E		.2500	6.35	2.750	69.85	4.000	101.60	C16041	C03773
			6.4	.2520	6.40	2.480	63.00	3.976	101.00	C03223
			.2559	6.50	2.480	63.00	3.976	101.00	C03224	C03329
			F	.2570	6.35	2.875	69.85	4.125	101.60	C03380
17/64			.2656	6.75	2.875	73.03	4.125	104.78	C16042	C03776
			7.0	.2756	7.00	2.717	69.00	4.291	109.00	C03229
9/32			.2812	7.14	2.938	74.61	4.250	107.95	C16043	C03781
			7.2	.2835	7.20	2.717	69.00	4.291	109.00	C03231
			.2913	7.40	2.717	69.00	4.291	109.00	C03233	–
			7.4	.2913	7.40	2.717	69.00	4.291	109.00	C03233
			.2953	7.50	2.717	69.00	4.291	109.00	C03234	–
			7.5	.2953	7.50	2.717	69.00	4.291	109.00	C03234
19/64			.2969	7.54	3.063	77.79	4.375	111.13	C16044	C03784
5/16			.3125	7.94	3.188	80.96	4.500	114.30	C16045	C03786

continued on next page



Styles 2065, 2065TN • Jobber Length (continued)

Drill Diameter		mm	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number	
Fract	Wire/Let				in	mm	in	mm	Bright	TiN
21/64		8.0	.3150	8.00	2.953	75.00	4.606	117.00	C03239	–
			.3281	8.33	3.313	84.14	4.625	117.48	C16046	–
11/32		8.5	.3346	8.50	2.953	75.00	4.606	117.00	C03244	–
			.3438	8.73	3.438	87.31	4.750	120.65	C16047	–
23/64		9.0	.3543	9.00	3.189	81.00	4.921	125.00	C03249	–
			.3594	9.13	3.500	88.90	4.875	123.83	C16048	–
3/8		9.5	.3740	9.50	3.189	81.00	4.921	125.00	C03254	–
			.3750	9.53	3.625	92.08	5.000	127.00	C16049	–
25/64		10.0	.3906	9.92	3.750	95.25	5.125	130.18	C16050	–
			.3937	10.00	3.425	87.00	5.236	133.00	C03259	–
13/32		10.5	.4062	10.32	3.875	98.43	5.250	133.35	C16051	C03801
			.4134	10.50	3.425	87.00	5.236	133.00	C03262	–
27/64		11.0	.4219	10.72	3.938	100.01	5.375	136.53	C16052	–
			.4331	11.00	3.701	94.00	5.591	142.00	C03264	–
7/16		11.5	.4375	11.11	4.063	103.19	5.500	139.70	C16053	C03804
			.4528	11.50	3.701	94.00	5.591	142.00	C03266	–
29/64		12.0	.4531	11.51	4.188	106.36	5.625	142.88	C16054	–
			.4688	11.91	4.313	109.54	5.750	146.05	C16055	C03806
15/32		12.5	.4724	12.00	3.976	101.00	5.945	151.00	C03268	–
			.4844	12.30	4.375	111.13	5.875	149.23	C16056	C03807
31/64		12.5	.4921	12.50	3.976	101.00	5.945	151.00	C03270	–
			.5000	12.70	4.500	114.30	6.000	152.40	C16057	–

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

HSS Parabolic

Styles 2165, 2165TN • Screw Machine Length

DRILLING

FEATURES

ANSI SIZES	HSS SUBSTRATE
HIGH PERFORMANCE	BRIGHT
SHANK	TiN
38°	118° KNOTCH

APPLICATIONS

LOW CARBON STEEL	FREE-MACH STAINLESS
SOFT ALLOY STEEL	
NON-FERROUS MATERIALS	
ALUMINUM	
COPPER ALLOYS	

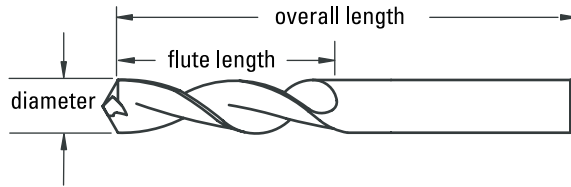
Drills up to 4 diameters deep.



Style 2165 Bright



Style 2165TN TiN-coated



Adjust the operating parameters on page 6 as follows:
double the given feed rate.

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Drill Diameter Fract	Wire	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number	
				in	mm	in	mm	Bright	TiN
1/16		.0625	1.59	.625	15.88	1.625	41.28	C16087	–
	50	.0700	1.78	.688	17.46	1.688	42.86	C16321	–
	44	.0860	2.18	.750	19.05	1.750	44.45	C16315	–
	43	.0890	2.26	.750	19.05	1.750	44.45	C16314	–
3/32		.0938	2.38	.750	19.05	1.750	44.45	C16089	–
	41	.0960	2.44	.813	20.64	1.813	46.04	–	C16156
	38	.1015	2.58	.813	20.64	1.813	46.04	C16309	–
	36	.1065	2.71	.813	20.64	1.813	46.04	C16307	–
1/8	31	.1200	3.05	.875	22.23	1.875	47.63	C16302	–
		.1250	3.18	.875	22.23	1.875	47.63	C16091	C16004
	30	.1285	3.26	.938	23.81	1.938	49.21	C16301	–
5/32	25	.1495	3.80	1.000	25.40	2.063	52.39	C16296	–
		.1562	3.97	1.000	25.40	2.063	52.39	C16093	C16006
	20	.1610	4.09	1.063	26.99	2.125	53.98	C16291	–
	19	.1660	4.22	1.063	26.99	2.125	53.98	C16290	–
3/16	14	.1820	4.62	1.125	28.58	2.188	55.56	C16285	–
		.1875	4.76	1.125	28.58	2.188	55.56	C16095	–
	9	.1960	4.98	1.288	32.70	2.250	57.15	C16280	–
7/32		.2188	5.56	1.250	31.75	2.375	60.33	C16097	–
	1/4	.2500	6.35	1.375	34.93	2.500	63.50	C16099	–
9/32		.2812	7.14	1.500	38.10	2.688	68.26	C16101	–
	5/16	.3125	7.94	1.625	41.28	2.813	71.44	C16103	C16016
11/32		.3438	8.73	1.688	42.86	3.000	76.20	C16105	–
	3/8	.3750	9.53	1.813	46.04	3.125	79.38	C16107	–
13/32		.4062	10.32	1.938	49.21	3.313	84.14	C16109	–
	7/16	.4375	11.11	2.063	52.39	3.438	87.31	C16111	–
15/32		.4688	11.91	2.125	53.98	3.625	92.08	C16113	–
	1/2	.5000	12.70	2.250	57.15	3.750	95.25	C16115	–



Styles 2565, 2565TN • Taper Length

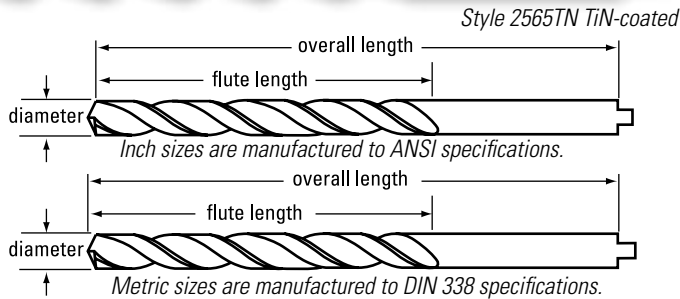
FEATURES

- ANSI SIZES**
- HSS SUBSTRATE**
- MM SIZES**
- BRIGHT**
- HIGH PERFORMANCE**
- TiN**
- SHANK**
- 118° KNOTCH**
- 38°**

APPLICATIONS

- LOW CARBON STEEL**
- FREE-MACH STAINLESS**
- SOFT ALLOY STEEL**
- NON-FERROUS MATERIALS**
- ALUMINUM**
- COPPER ALLOYS**

Drills up to 14 diameters deep.



Adjust the operating parameters on page 6 as follows:
double the given feed rate.

Drill Diameter Fract	Wire/Let	Decimal mm	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number	
					in	mm	in	mm	Bright	TiN
1/16	1.6	.0625	1.59	1.750	44.45	3.000	76.20	C16058	C05105	
		.0630	1.60	2.008	51.00	3.750	95.00	C03810	-	
	52	.0635	1.61	2.000	50.80	3.750	95.25	C16271	-	
	51	.0670	1.70	2.000	50.80	3.750	95.25	C16270	-	
5/64	2.35	.0700	1.78	2.000	50.80	3.750	95.25	C16269	-	
		.0781	1.98	2.000	50.80	3.750	95.25	C16059	-	
		.0785	1.99	2.250	57.15	4.250	107.95	C16266	-	
	2.4	.0820	2.08	2.250	57.15	4.250	107.95	C16264	-	
		.0860	2.18	2.250	57.15	4.250	107.95	C16263	-	
		.0890	2.26	2.250	57.15	4.250	107.95	C16262	-	
3/32	2.35	.0925	2.35	2.244	57.00	4.252	108.00	C03825	-	
		.0935	2.37	2.250	57.15	4.250	107.95	C16261	-	
		.0938	2.38	2.250	57.15	4.250	107.95	C16060	C05118	
	2.4	.0945	2.40	2.520	64.00	4.606	117.00	C03826	-	
		.0960	2.44	2.500	63.50	4.625	117.48	C16260	-	
		.0980	2.49	2.500	63.50	4.625	117.48	-	C05120	
7/64	3.0	.1040	2.64	2.500	63.50	4.625	117.48	C16256	C05123	
		.1065	2.71	2.500	63.50	4.625	117.48	C16255	-	
		.1094	2.78	2.500	63.50	4.625	117.48	C16061	-	
	3.3	.1100	2.79	2.750	69.85	5.125	130.18	C16254	-	
		.1130	2.87	2.750	69.85	5.125	130.18	C16252	-	
		.1160	2.95	2.750	69.85	5.125	130.18	C16251	-	
1/8	3.0	.1181	3.00	2.756	70.00	5.118	130.00	C03833	C03940	
		.1200	3.05	2.750	69.85	5.125	130.18	C16250	-	
		.1250	3.18	2.750	69.85	5.125	130.18	C16062	C05131	
	3.3	.1285	3.26	3.000	76.20	5.375	136.53	C16249	-	
		.1299	3.30	2.992	76.00	5.394	137.00	C03836	C03943	
		.1360	3.45	3.000	76.20	5.375	136.53	C16248	-	
9/64	3.3	.1405	3.57	3.000	76.20	5.375	136.53	C16247	-	
		.1406	3.57	3.000	76.20	5.375	136.53	C16063	-	
		.1440	3.66	3.000	76.20	5.375	136.53	C16246	-	
	4.0	.1470	3.73	3.000	76.20	5.375	136.53	C16245	-	
		.1495	3.80	3.000	76.20	5.375	136.53	C16244	-	
		.1520	3.86	3.000	76.20	5.375	136.53	C16243	-	
5/32	4.0	.1562	3.97	3.000	76.20	5.375	136.53	C16064	C05141	
		.1575	4.00	3.386	86.00	5.748	146.00	C03843	C03950	
	21	.1590	4.04	3.375	85.73	5.750	146.05	C16240	-	
	20	.1610	4.09	3.375	85.73	5.750	146.05	C16239	-	

continued on next page



DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

High-Performance Drills

HSS Parabolic

Styles 2565, 2565TN • Taper Length (continued)

Drill Diameter Fract	Wire/Let mm	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number		
				in	mm	in	mm	Bright	TiN	
	19	.1660	4.22	3.375	85.73	5.750	146.05	C16238	–	
	18	.1695	4.31	3.375	85.73	5.750	146.05	C16237	–	
11/64		.1719	4.37	3.375	85.73	5.750	146.05	C16065	–	
	16	.1730	4.39	3.375	85.73	5.750	146.05	C16235	–	
	15	.1770	4.50	3.375	85.73	5.750	146.05	C16234	–	
	14	.1800	4.57	3.375	85.73	5.750	146.05	C16233	–	
3/16		.1820	4.62	3.375	85.73	5.750	146.05	C16232	C05152	
	13	.1875	4.76	3.375	85.73	5.750	146.05	C16066	C05153	
	12	.1890	4.80	3.625	92.08	6.000	152.40	C16231	C05154	
	11	.1910	4.85	3.625	92.08	6.000	152.40	C16230	–	
	10	.1935	4.91	3.625	92.08	6.000	152.40	C16229	–	
	9	.1960	4.98	3.625	92.08	6.000	152.40	C16228	–	
		5.0	.1969	5.00	3.622	92.00	5.984	152.00	C03855	C03960
	7	.2010	5.11	3.625	92.08	6.000	152.40	C16226	–	
13/64		.2031	5.16	3.625	92.08	6.000	152.40	C16067	C05160	
	6	.2040	5.18	3.625	92.08	6.000	152.40	C16225	–	
	5	.2055	5.22	3.625	92.08	6.000	152.40	C16224	–	
	4	.2090	5.31	3.625	92.08	6.000	152.40	C16223	–	
7/32		.2130	5.41	3.625	92.08	6.000	152.40	C16222	–	
	3	.2188	5.56	3.625	92.08	6.000	152.40	C16068	C05165	
	2	.2210	5.61	3.750	95.25	6.125	155.58	C16221	–	
		5.7	.2244	5.70	3.740	95.00	6.142	156.00	C03862	–
15/64		.2280	5.79	3.750	95.25	6.125	155.58	C16220	–	
	1	.2344	5.95	3.750	95.25	6.125	155.58	C16069	–	
1/4	D	.2460	6.25	3.750	95.25	6.125	155.58	C03429	C03976	
	E	.2500	6.35	3.750	95.25	6.125	155.58	C16070	C05173	
		6.5	.2559	6.50	3.858	98.00	6.260	159.00	C03870	–
	F	.2570	6.53	3.750	95.25	6.125	155.58	C03430	C03980	
17/64		.2610	6.63	3.750	95.25	6.125	155.58	C03431	C03982	
	G	.2656	6.75	3.875	98.43	6.250	158.75	C16071	C05176	
9/32		.2720	6.91	3.875	98.43	6.250	158.75	C03433	C03987	
	I	.2812	7.14	3.875	98.43	6.250	158.75	C16072	C05181	
	L	.2900	7.37	3.875	98.43	6.250	158.75	C03436	–	
	M	.2950	7.49	4.000	101.60	6.375	161.93	C03437	–	
19/64		.2969	7.54	4.000	101.60	6.375	161.93	C16073	C05184	
5/16		.3125	7.94	4.000	101.60	6.375	161.93	C16074	–	
21/64	P	.3230	8.20	4.000	101.60	6.375	161.93	C03440	–	
		.3281	8.33	4.125	104.78	6.500	165.10	C16075	C05187	
		8.6	.3386	8.60	4.134	105.00	6.496	165.00	–	C04012
	R	.3390	8.61	4.125	104.78	6.500	165.10	C03442	C04013	
11/32		.3438	8.73	4.125	104.78	6.500	165.10	C16076	C05190	
	T	.3580	9.09	4.250	107.95	6.750	171.45	C03444	–	
23/64		.3594	9.13	4.250	107.95	6.750	171.45	C16077	C05193	
3/8		.3750	9.53	4.250	107.95	6.750	171.45	C16078	C05195	
25/64		.3906	9.92	4.375	111.13	7.000	177.80	C16079	C05198	
13/32		.4062	10.32	4.375	111.13	7.000	177.80	C16080	C05201	
	Z	.4130	10.49	4.625	117.48	7.250	184.15	C03450	–	
27/64		.4219	10.72	4.625	117.48	7.250	184.15	C16081	C05203	
7/16		.4375	11.11	4.625	117.48	7.250	184.15	C16082	C05204	
29/64		.4531	11.51	4.750	120.65	7.500	190.50	C16083	C05205	
15/32		.4688	11.91	4.750	120.65	7.500	190.50	C16084	C05206	
31/64		.4844	12.30	4.750	120.65	7.750	196.85	C16085	C05207	
1/2		.5000	12.70	4.750	120.65	7.750	196.85	C16086	–	

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS



Styles 1980, 1981S JL • Q-PM Jobber Length Powder Metal

Operating Parameters

Material	Hardness (Br)	Speeds (SFM) TiCN finish	Feed Rate (IPR)			
			1/4" 6.35mm	3/8" 9.52mm	1/2" 12.70mm	3/4" 19.05mm
plain carbon steel	150-225	120	.010	.014	.018	.024
medium carbon steel	230-325	95	.008	.011	.014	.020
high carbon steel	330-425	70	.006	.008	.010	.014
alloy steel	150-225	110	.012	.016	.020	.028
	230-325	85	.008	.011	.014	.018
	330-425	50	.006	.007	.008	.014
tool steels	150-250	100	.008	.011	.014	.020
	255-0375	70	.006	.008	.010	.014
stainless steel free machining	100-240	170	.012	.016	.020	.028
	250-325	100	.010	.012	.014	.018
	330-425	75	.006	.008	.010	.014
stainless steel work hardening and PH	150-325	85	.008	.011	.014	.016
	330-375	60	.008	.010	.012	.014
	380-425	40	.004	.005	.006	.008

Style 1982S JL • Q-PM Jobber Length Powder Metal

Operating Parameters

Material	Hardness (Br)	Speeds (SFM) TiCN finish	Feed Rate (IPR)			
			1/4" 6.35mm	3/8" 9.52mm	1/2" 12.70mm	3/4" 19.05mm
cast iron	150-225	120	.010	.014	.018	.024
	230-325	95	.008	.011	.014	.020
	330-425	70	.006	.008	.010	.014

The speeds and feeds listed here are conservative recommendations for initial setup. In actual use, depending on the machine environment and workpiece material, significantly higher speeds and feeds may be achievable. Use these

speeds and feeds as a starting point. Cutting conditions can be gradually adjusted until the optimum settings for the application are found. Questions? Contact Technical Support at 800.892.4281.

Optimum drill performance can be achieved by:

- Very rigid machine set up such as NC/CNC machining centers or similar types of equipment (not recommended for manual drill presses).
- Use of high-quality water-soluble synthetic coolant.
- Coolant pressure of 70-100 psi.
- Choosing the proper coolant delivery techniques and/or systems. Contact Cleveland technical support for suggestions.
- Properly reground and recoated tools. Properly reground tools without recoating will require a reduction in surface speed.



High-Performance Drills

Q-PM™ Coolant Feed

Style 1980 • Q-PM Jobber Length Powder Metal

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

FEATURES

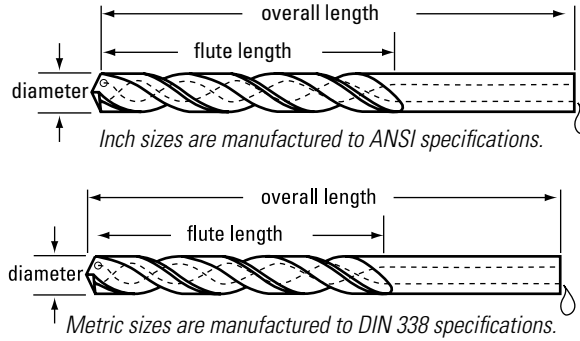
ANSI SIZES	POWDER METAL SUBSTRATE
DIN 338	TiCN
HIGH PERFORMANCE	140°
COOLANT FEED	40°
SHANK	

APPLICATIONS

MED CARBON STEEL
LOW CARBON STEEL
TOOL STEEL
CAST IRON
STAINLESS STEEL



Style 1980 TiCN-coated



Drill Diameter	Fract Wire/Let	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number
				in	mm	in	mm	
7		.2010	5.11	1.750	44.45	4.250	107.95	C50250
	13/64	.2031	5.16	1.750	44.45	4.250	107.95	C16342
6		.2040	5.18	1.750	44.45	4.250	107.95	C50251
	5		.2055	5.22	1.750	44.45	4.250	107.95
4			.2090	5.31	1.750	44.45	4.250	107.95
	3		.2130	5.41	1.750	44.45	4.250	107.95
7/32		5.5	.2165	5.50	1.750	44.45	4.250	107.95
	2		.2188	5.56	1.750	44.45	4.250	107.95
1		5.7	.2210	5.61	1.750	44.45	4.250	107.95
	15/64		.2244	5.70	1.750	44.45	4.250	107.95
C		6.0	.2280	5.79	1.750	44.45	4.250	107.95
	D		.2344	5.95	1.750	44.45	4.250	107.95
1/4		6.2	.2362	6.00	1.750	44.45	4.250	107.95
	I		.2420	6.15	1.750	44.45	4.250	107.95
9/32		6.4	.2441	6.20	1.750	44.45	4.250	107.95
	L		.2460	6.25	1.750	44.45	4.250	107.95
N		6.5	.2500	6.35	1.750	44.45	4.250	107.95
	5/16		.2520	6.40	1.875	47.63	4.375	111.13
I			.2559	6.50	1.875	47.63	4.375	111.13
	L		.2598	6.60	1.875	47.63	4.375	111.13
N			.2638	6.70	1.875	47.63	4.375	111.13
	7.0		.2656	6.75	1.875	47.63	4.375	111.13
L			.2720	6.91	2.000	50.80	4.500	114.30
	N		.2756	7.00	2.000	50.80	4.500	114.30
7.2			.2812	7.14	2.000	50.80	4.500	114.30
	7.5		.2835	7.20	2.000	50.80	4.500	114.30
7.5			.2900	7.37	2.000	50.80	4.500	114.30
	7.5		.2953	7.50	2.000	50.80	4.500	114.30
7.5			.2969	7.54	2.000	50.80	4.500	114.30
	7.5		.3020	7.67	2.188	55.58	4.750	120.65
7.5			.3125	7.94	2.188	55.58	4.750	120.65

continued on next page

Style 1980 • Q-PM Jobber Length Powder Metal (continued)

Fract	Drill Diameter		Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number
	Wire/Let	mm			in	mm	in	mm	
21/64	O	8.0	.3150	8.00	2.250	57.15	4.750	120.65	C16347
			.3160	8.03	2.250	57.15	4.750	120.65	C50262
	P	8.0	.3230	8.20	2.250	57.15	4.750	120.65	C50263
			.3281	8.33	2.250	57.15	4.750	120.65	C50232
21/64	Q	8.0	.3320	8.43	2.250	57.15	4.750	120.65	C50264
			.3346	8.50	2.375	60.33	4.875	123.83	C16348
11/32	R	8.5	.3390	8.61	2.375	60.33	4.875	123.83	C50265
			.3425	8.70	2.375	60.33	4.875	123.83	C16388
23/64	U	9.0	.3438	8.73	2.375	60.33	4.875	123.83	C50233
			.3543	9.00	2.500	63.50	5.000	127.00	C16389
3/8		9.5	.3594	9.13	2.500	63.50	5.000	127.00	C50234
			.3680	9.35	2.625	66.68	5.125	130.18	C16349
25/64		9.5	.3740	9.50	2.625	66.68	5.125	130.18	C16390
			.3750	9.53	2.625	66.68	5.125	130.18	C50235
13/32		10.0	.3906	9.92	2.750	69.85	5.375	136.53	C50236
			.3937	10.00	2.875	73.03	5.500	139.70	C16392
27/64		10.2	.4016	10.20	2.875	73.03	5.500	139.70	C16393
			.4062	10.32	2.875	73.03	5.500	139.70	C50237
7/16		10.5	.4134	10.50	3.000	76.20	5.625	142.88	C16394
			.4219	10.72	3.000	76.20	5.625	142.88	C50238
29/64		11.0	.4331	11.00	3.000	76.20	5.625	142.88	C16396
			.4375	11.11	3.000	76.20	5.625	142.88	C50239
15/32		11.2	.4409	11.20	3.125	79.38	5.750	146.05	C16397
			.4528	11.50	3.125	79.38	5.750	146.05	C16398
31/64		11.5	.4531	11.51	3.125	79.38	5.750	146.05	C50240
			.4688	11.91	3.250	82.55	5.875	149.23	C50241
1/2		12.0	.4724	12.00	3.375	85.73	6.000	152.40	C16350
			.4814	12.23	3.375	85.73	6.000	152.40	C16399
33/64		12.25	.4844	12.30	3.375	85.73	6.000	152.40	C50242
			.4921	12.50	3.500	88.90	6.000	152.40	C16351
17/32		12.5	.5000	12.70	3.500	88.90	6.000	152.40	C50243
			.5118	13.00	3.875	98.43	6.250	158.75	C16352
35/64		13.0	.5156	13.10	3.875	98.43	6.250	158.75	C16362
			.5312	13.49	3.875	98.43	6.250	158.75	C16363
9/16		13.5	.5315	13.50	3.875	98.43	6.250	158.75	C16353
			.5469	13.89	3.875	98.43	6.250	158.75	C16364
37/64		14.0	.5512	14.00	3.875	98.43	6.250	158.75	C16354
			.5625	14.29	3.875	98.43	6.250	158.75	C50244
19/32		14.5	.5709	14.50	4.375	111.13	6.750	171.45	C16355
			.5781	14.68	4.375	111.13	6.750	171.45	C16365
5/8		15.5	.5938	15.08	4.375	111.13	6.750	171.45	C16366
			.6102	15.50	4.375	111.13	6.750	171.45	C16356
21/32		16.5	.6250	15.88	4.375	111.13	6.750	171.45	C50245
			.6496	16.50	4.625	117.48	7.375	187.33	C16357
		17.5	.6562	16.67	4.625	117.48	7.375	187.33	C16358
			.6890	17.50	4.875	123.83	7.625	193.68	C16359

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS



Q-PM™ for Steel

Style 1981SJL • Q-PM Jobber Length Powder Metal for Steel

DRILLING

FEATURES

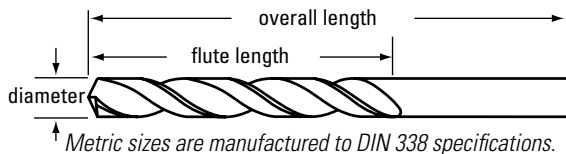
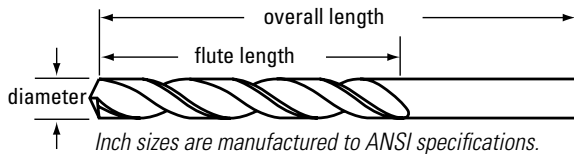
- ANSI SIZES**
- POWDER METAL SUBSTRATE**
- MM SIZES**
- TiCN**
- HIGH PERFORMANCE**
- 140°**
- SHANK**
- 30°**

APPLICATIONS

- MED CARBON STEEL**
- LOW CARBON STEEL**



Style 1981SJL TiCN-coated



HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Drill Diameter	Fract Wire/Let	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number
				in	mm	in	mm	
3/32		.0938	2.38	1.250	31.75	2.250	57.15	C52716
	41	.0960	2.44	1.375	34.93	2.375	60.33	C52561
40		.0980	2.49	1.375	34.93	2.375	60.33	C52562
	39	.0995	2.53	1.375	34.93	2.375	60.33	C52563
38		.1015	2.58	1.438	36.51	2.500	63.50	C52564
	37	.1040	2.64	1.438	36.51	2.500	63.50	C52565
36		.1065	2.71	1.438	36.51	2.500	63.50	C52566
	7/64	.1094	2.78	1.500	38.10	2.625	66.68	C52717
35		.1100	2.79	1.500	38.10	2.625	66.68	C52567
	34	.1110	2.82	1.500	38.10	2.625	66.68	C52568
33		.1130	2.87	1.500	38.10	2.625	66.68	C52569
	32	.1160	2.95	1.625	41.28	2.750	69.85	C52570
31	3.0	.1181	3.00	1.299	33.00	2.402	61.00	C52633
		.1200	3.05	1.625	41.28	2.750	69.85	C52571
1/8	3.1	.1220	3.10	1.417	36.00	2.559	65.00	C52634
		.1250	3.18	1.625	41.28	2.750	69.85	C52718
30	3.2	.1260	3.20	1.417	36.00	2.559	65.00	C52635
		.1285	3.26	1.625	41.28	2.750	69.85	C52572
29	3.3	.1299	3.30	1.417	36.00	2.559	65.00	C52636
	3.4	.1339	3.40	1.535	39.00	2.756	70.00	C52637
28	3.5	.1360	3.45	1.750	44.45	2.875	73.03	C52573
		.1378	3.50	1.535	39.00	2.756	70.00	C52638
9/64		.1405	3.57	1.750	44.45	2.875	73.03	C52574
		.1406	3.57	1.750	44.45	2.875	73.03	C52719
27	3.7	.1440	3.66	1.875	47.63	3.000	76.20	C52575
		.1457	3.70	1.535	39.00	2.756	70.00	C52640
26		.1470	3.73	1.875	47.63	3.000	76.20	C52576
		.1495	3.80	1.875	47.63	3.000	76.20	C52577
25		.1520	3.86	2.000	50.80	3.125	79.38	C52578
		.1540	3.91	2.000	50.80	3.125	79.38	C52579
5/32		.1562	3.97	2.000	50.80	3.125	79.38	C52720
	22	.1570	3.99	2.000	50.80	3.125	79.38	C52580

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Style 1981SJL • Q-PM Jobber Length Powder Metal for Steel (continued)

Fract	Drill Diameter		Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number
	Wire/Let	mm			in	mm	in	mm	
21		4.0	.1575	4.00	1.693	43.00	2.953	75.00	C52643
			.1590	4.04	2.313	58.74	3.500	88.90	C52581
20		4.2	.1610	4.09	2.125	53.98	3.250	82.55	C52582
			.1654	4.20	1.693	43.00	2.953	75.00	C52645
11/64		4.2	.1660	4.22	2.125	53.98	3.250	82.55	C52583
			.1695	4.31	2.125	53.98	3.250	82.55	C52584
17		4.2	.1719	4.37	2.125	53.98	3.250	82.55	C52721
			.1730	4.39	2.188	55.56	3.375	85.73	C52585
16		4.5	.1770	4.50	2.188	55.56	3.375	85.73	C52586
			.1772	4.50	1.850	47.00	3.150	80.00	C52648
15		4.5	.1800	4.57	2.188	55.56	3.375	85.73	C52587
			.1820	4.62	2.188	55.56	3.375	85.73	C52588
3/16		4.5	.1850	4.70	2.313	58.74	3.500	88.90	C52589
			.1875	4.76	2.313	58.74	3.500	88.90	C52722
12		4.5	.1890	4.80	2.313	58.74	3.500	88.90	C52590
			.1910	4.85	2.313	58.74	3.500	88.90	C52591
10		4.5	.1935	4.91	2.438	61.91	3.625	92.08	C52592
			.1960	4.98	2.438	61.91	3.625	92.08	C52593
8		5.0	.1969	5.00	2.047	52.00	3.386	86.00	C52653
			.1990	5.05	2.438	61.91	3.625	92.08	C52594
13/64		5.0	.2010	5.11	2.438	61.91	3.625	92.08	C52595
			.2031	5.16	2.438	61.91	3.625	92.08	C52723
6		5.0	.2040	5.18	2.500	63.50	3.750	95.25	C52596
			.2055	5.22	2.500	63.50	3.750	95.25	C52597
4		5.0	.2090	5.31	2.500	63.50	3.750	95.25	C52598
			.2130	5.41	2.500	63.50	3.750	95.25	C52599
7/32		5.5	.2165	5.50	2.244	57.00	3.661	93.00	C52657
			.2188	5.56	2.500	63.50	3.750	95.25	C52724
2		5.5	.2210	5.61	2.625	66.68	3.875	98.43	C52600
			.2244	5.70	2.244	57.00	3.661	93.00	C52659
15/64		5.5	.2280	5.79	2.625	66.68	3.875	98.43	C52601
			.2344	5.95	2.625	66.68	3.875	98.43	C52725
C		6.0	.2362	6.00	2.244	57.00	3.661	93.00	C52662
			.2420	6.15	2.750	69.85	4.000	101.60	C52604
D		6.0	.2460	6.25	2.750	69.85	4.000	101.60	C52605
			.2500	6.35	2.750	69.85	4.000	101.60	C52726
1/4		6.4	.2520	6.40	2.480	63.00	3.976	101.00	C52666
			.2559	6.50	2.480	63.00	3.976	101.00	C52667
F		6.4	.2570	6.53	2.875	73.03	4.125	104.78	C52606
			.2610	6.63	2.875	73.03	4.125	104.78	C52607
G		6.5	.2638	6.70	2.480	63.00	3.976	101.00	C52669
			.2656	6.75	2.875	73.03	4.125	104.78	C52727
17/64		6.5	.2720	6.91	2.875	73.03	4.125	104.78	C52609
			.2756	7.00	2.717	69.00	4.291	109.00	C52672
9/32		7.0	.2812	7.14	2.938	74.61	4.250	107.95	C52728
			.2835	7.20	2.717	69.00	4.291	109.00	C52674
L		7.0	.2900	7.37	2.938	74.61	4.250	107.95	C52611
			.2953	7.50	2.717	69.00	4.291	109.00	C52677
19/64		7.5	.2969	7.54	3.063	77.79	4.375	111.13	C52729
			.3020	7.67	3.063	77.79	4.375	111.13	C52613
N		7.5							

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Q-PM™ for Steel

Style 1981SJL • Q-PM Jobber Length Powder Metal for Steel (continued)

DRILLING

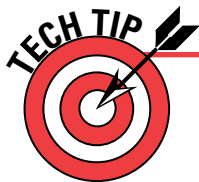
HOLE FINISHING

THREADING

MILLING

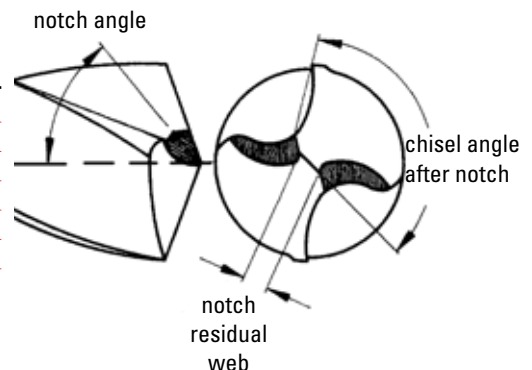
OTHER TOOLS

Fract	Drill Diameter		Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number
	Wire/Let	mm			in	mm	in	mm	
5/16		8.0	.3125	7.94	3.188	80.96	4.500	114.30	C52730
			.3150	8.00	2.953	75.00	4.606	117.00	C52682
	O	.3160	8.03	3.188	80.96	4.500	114.30	C52614	
	P	.3230	8.20	3.313	84.14	4.625	117.48	C52615	
21/64		8.5	.3281	8.33	3.313	84.14	4.625	117.48	C52731
	Q		.3320	8.43	3.438	87.31	4.750	120.65	C52616
	R	.3346	8.50	2.953	75.00	4.606	117.00	C52687	
11/32		8.7	.3390	8.61	3.438	87.31	4.750	120.65	C52617
			.3425	8.70	3.189	81.00	4.921	125.00	C52689
		.3438	8.73	3.438	87.31	4.750	120.65	C52732	
23/64		9.0	.3543	9.00	3.189	81.00	4.921	125.00	C52692
			.3594	9.13	3.500	88.90	4.875	123.83	C52733
	U	.3680	9.35	3.625	92.08	5.000	127.00	C52620	
3/8		9.5	.3740	9.50	3.189	81.00	4.921	125.00	C52697
			.3750	9.53	3.625	92.08	5.000	127.00	C52734
	25/64	.3906	9.92	3.750	95.25	5.125	130.18	C52735	
13/32		10.0	.3937	10.00	3.425	87.00	5.236	133.00	C52702
			.4016	10.20	3.425	87.00	5.236	133.00	C52703
		.4062	10.32	3.875	98.43	5.250	133.35	C52736	
27/64		10.5	.4134	10.50	3.425	87.00	5.236	133.00	C52704
			.4219	10.72	3.938	100.01	5.375	136.53	C52737
		.4331	11.00	3.701	94.00	5.591	142.00	C52706	
7/16		11.0	.4375	11.11	4.063	103.19	5.500	139.70	C52738
			.4409	11.20	3.701	94.00	5.591	142.00	C52707
	29/64	.4531	11.51	4.188	106.36	5.625	142.88	C52739	
15/32		11.2	.4688	11.91	4.313	109.54	5.750	146.05	C52740
			.4724	12.00	3.976	101.00	5.945	151.00	C52709
	31/64	.4844	12.30	4.375	111.13	5.875	149.23	C52741	
1/2		12.0	.4921	12.50	3.976	101.00	5.945	151.00	C52711
			.5000	12.70	4.500	114.30	6.000	152.40	C52742
		.5118	13.00	3.976	101.00	5.945	151.00	C52712	
33/64	.5156	13.10	4.813	122.24	6.625	168.28	C52743		
17/32		13.0	.5312	13.49	4.813	122.24	6.625	168.28	C52744
			.5469	13.89	4.813	122.24	6.625	168.28	C52745
	9/16	.5625	14.29	4.813	122.24	6.625	168.28	C52746	
19/32		13.5	.5938	15.08	5.188	131.76	7.125	180.98	C52747
	5/8		.6250	15.88	5.188	131.76	7.125	180.98	C52748



Retrinding Instructions for Q-PM 140° Point

Drill Diameter	Lip Relief	Notch Rake Angle (positive)	Chisel Angle After Notch	Notch Residual Web
1/4	11°	7°	130°	.022
5/16	10°	7°	130°	.028
3/8	8°	7°	130°	.034
7/16	7°	7°	130°	.039
1/2	6°	7°	130°	.044
5/8	6°	7°	130°	.055



Style 1982SJL • Q-PM Jobber Length Powder Metal for Cast Iron

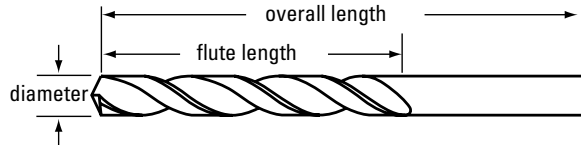
FEATURES



APPLICATIONS



Style 1982SJL TiAlN-coated



Drill Diameter Fract	Wire/Let	Decimal Equiv.	Metric Equiv.	Flute Length in	mm	Overall Length in	mm	Order Number
3/32		.0938	2.38	1.250	31.75	2.250	57.15	C56716
	41	.0960	2.44	1.375	34.93	2.375	60.33	C56561
	40	.0980	2.49	1.375	34.93	2.375	60.33	C56562
	39	.0995	2.53	1.375	34.93	2.375	60.33	C56563
	38	.1015	2.58	1.438	36.51	2.500	63.50	C56564
7/64	37	.1040	2.64	1.438	36.51	2.500	63.50	C56565
	36	.1065	2.71	1.438	36.51	2.500	63.50	C56566
	35	.1100	2.79	1.500	38.10	2.625	66.68	C56567
	34	.1110	2.82	1.500	38.10	2.625	66.68	C56568
1/8	33	.1130	2.87	1.500	38.10	2.625	66.68	C56569
	32	.1160	2.95	1.625	41.28	2.750	69.85	C56570
	31	.1200	3.05	1.625	41.28	2.750	69.85	C56571
	30	.1250	3.18	1.625	41.28	2.750	69.85	C56718
	29	.1285	3.26	1.625	41.28	2.750	69.85	C56572
9/64	28	.1360	3.45	1.750	44.45	2.875	73.03	C56573
	27	.1405	3.57	1.750	44.45	2.875	73.03	C56574
	26	.1406	3.57	1.750	44.45	2.875	73.03	C56719
	25	.1440	3.66	1.875	47.63	3.000	76.20	C56575
	24	.1470	3.73	1.875	47.63	3.000	76.20	C56576
5/32	23	.1495	3.80	1.875	47.63	3.000	76.20	C56577
	22	.1520	3.86	2.000	50.80	3.125	79.38	C56578
	21	.1540	3.91	2.000	50.80	3.125	79.38	C56579
	20	.1562	3.97	2.000	50.80	3.125	79.38	C56720
	19	.1570	3.99	2.000	50.80	3.125	79.38	C56580
11/64	18	.1590	4.04	2.313	58.74	3.500	88.90	C56581
	17	.1610	4.09	2.125	53.98	3.250	82.55	C56582
	16	.1660	4.22	2.125	53.98	3.250	82.55	C56583
	15	.1695	4.31	2.125	53.98	3.250	82.55	C56584
	14	.1719	4.37	2.125	53.98	3.250	82.55	C56721
	13	.1730	4.39	2.188	55.56	3.375	85.73	C56585
	12	.1770	4.50	2.188	55.56	3.375	85.73	C56586
	11	.1800	4.57	2.188	55.56	3.375	85.73	C56587
	10	.1820	4.62	2.188	55.56	3.375	85.73	C56588

continued on next page

Q-PM™ for Cast Iron

Style 1982SJL • Q-PM Jobber Length Powder Metal for Cast Iron (continued)

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Drill Diameter Fract	Wire/Let	Decimal	Metric	Flute Length		Overall Length		Order Number
		Equiv.	Equiv.	in	mm	in	mm	
3/16	13	.1850	4.70	2.313	58.74	3.500	88.90	C56589
		.1875	4.76	2.313	58.74	3.500	88.90	C56722
	12	.1890	4.80	2.313	58.74	3.500	88.90	C56590
	11	.1910	4.85	2.313	58.74	3.500	88.90	C56591
	10	.1935	4.91	2.438	61.91	3.625	92.08	C56592
	9	.1960	4.98	2.438	61.91	3.625	92.08	C56593
	8	.1990	5.05	2.438	61.91	3.625	92.08	C56594
	7	.2010	5.11	2.438	61.91	3.625	92.08	C56595
13/64		.2031	5.16	2.438	61.91	3.625	92.08	C56723
		.2040	5.18	2.500	63.50	3.750	95.25	C56596
	5	.2055	5.22	2.500	63.50	3.750	95.25	C56597
	4	.2090	5.31	2.500	63.50	3.750	95.25	C56598
	3	.2130	5.41	2.500	63.50	3.750	95.25	C56599
		.2188	5.56	2.500	63.50	3.750	95.25	C56724
	2	.2210	5.61	2.625	66.68	3.875	98.43	C56600
	1	.2280	5.79	2.625	66.68	3.875	98.43	C56601
15/64	D	.2344	5.95	2.625	66.68	3.875	98.43	C56725
		.2460	6.25	2.750	69.85	4.000	101.60	C56605
1/4	F	.2500	6.35	2.750	69.85	4.000	101.60	C56726
		.2570	6.53	2.875	73.03	4.125	104.78	C56606
17/64	G	.2610	6.63	2.875	73.03	4.125	104.78	C56607
		.2656	6.75	2.875	73.03	4.125	104.78	C56727
9/32	I	.2720	6.91	2.875	73.03	4.125	104.78	C56609
		.2812	7.14	2.938	74.61	4.250	107.95	C56728
19/64	L	.2900	7.37	2.938	74.61	4.250	107.95	C56611
		.2969	7.54	3.063	77.79	4.375	111.13	C56729
5/16	N	.3020	7.67	3.063	77.79	4.375	111.13	C56613
		.3125	7.94	3.188	80.96	4.500	114.30	C56730
21/64	O	.3160	8.03	3.188	80.96	4.500	114.30	C56614
		.3281	8.33	3.313	84.14	4.625	117.48	C56731
	Q	.3320	8.43	3.438	87.31	4.750	120.65	C56616
	R	.3390	8.61	3.438	87.31	4.750	120.65	C56617
11/32		.3438	8.73	3.438	87.31	4.750	120.65	C56732
23/64		.3594	9.13	3.500	88.90	4.875	123.83	C56733
3/8	U	.3680	9.35	3.625	92.08	5.000	127.00	C56620
		.3750	9.53	3.625	92.08	5.000	127.00	C56734
25/64		.3906	9.92	3.750	95.25	5.125	130.18	C56735
13/32		.4062	10.32	3.875	98.43	5.250	133.35	C56736
27/64		.4219	10.72	3.938	100.01	5.375	136.53	C56737
7/16		.4375	11.11	4.063	103.19	5.500	139.70	C56738
29/64		.4531	11.51	4.188	106.36	5.625	142.88	C56739
15/32		.4688	11.91	4.313	109.54	5.750	146.05	C56740
31/64		.4844	12.30	4.375	111.13	5.875	149.23	C56741
1/2		.5000	12.70	4.500	114.30	6.000	152.40	C56742
33/64		.5156	13.10	4.813	122.24	6.625	168.28	C56743
17/32		.5312	13.49	4.813	122.24	6.625	168.28	C56744
35/64		.5469	13.89	4.813	122.24	6.625	168.28	C56745
9/16		.5625	14.29	4.813	122.24	6.625	168.28	C56746
19/32		.5938	15.08	5.188	131.76	7.125	180.98	C56747
5/8		.6250	15.88	5.188	131.76	7.125	180.98	C56748





General Application Drills

General Application Drills

Technical Information

Jobber Length • Screw Machine Length • Taper Length

Operating Parameters – General Application Cobalt and HSS Drills

Material	Hardness	Speeds (SFM) Drill Finish				Feed Rate (IPR)			
		Bright or Steam Oxide	Straw	TiN	TiCN TiAlN	1/8" 3.17mm	1/4" 6.35mm	3/8" 9.52mm	1/2" 12.70mm
Ferrous									
low carbon steel	85-125 Bhn	90	125	135	-	.0040	.0065	.0080	.0100
medium carbon steel	125-175 Bhn	90	125	135	-	.0040	.0065	.0080	.0100
high carbon steel	175-225 Bhn	90	125	135	-	.0030	.0050	.0065	.0080
alloyed steel	200-300 Bhn	60	80	90	-	.0025	.0040	.0050	.0065
heat-treatable steel and forgings	370-420 Bhn	40	50	60	70	.0025	.0040	.0050	.0065
tool steels	< 24 HRc	60	80	90	110	.0030	.0050	.0065	.0080
	> 24-30 HRc	30	40	45	55	.0025	.0040	.0050	.0065
high-speed steels	14-30 HRc	35	50	55	60	.0025	.0040	.0050	.0065
gray cast iron	240 Bhn	115	160	175	-	.0050	.0080	.0100	.0125
	<300 Bhn	90	125	135	-	.0050	.0080	.0100	.0125
mallable cast iron	<300 Bhn	70	95	105	-	.0050	.0080	.0100	.0125
chilled cast iron	<350 Bhn	25	35	40	-	.0025	.0040	.0050	.0065
stainless steel									
300 series (Austenitic)	120-200 Bhn	60	80	90	100	.0025	.0040	.0050	.0065
400 series (Martensitic)	200-300 Bhn	40	50	60	80	.0025	.0040	.0050	.0065
sulphurized	> 25 HRc	45	65	70	80	.0025	.0040	.0050	.0065
spring steel	400 Bhn	25	35	40	45	.0020	.0030	.0040	.0050
Nonferrous									
aluminum and aluminum alloys	40-100 Bhn	180	-	-	-	.0050	.0080	.0100	.0125
cast aluminum									
< 10% Si	200 Bhn	200	275	-	-	.0050	.0080	.0100	.0125
> 10% Si	200 Bhn	180	225	-	250	.0040	.0065	.0080	.0100
brass, long chipping	190-210 Bhn	150	-	-	-	.0040	.0065	.0080	.0100
bronze, long chipping	150-200 Bhn	90	115	-	130	.0030	.0050	.0065	.0080
copper, low alloy	65-100 Bhn	120	145	-	-	.0040	.0065	.0080	.0100
plastics, duraplastics	N/A	55	75	80	-	.0030	.0050	.0065	.0080

The speeds and feeds listed here are conservative recommendations for initial setup. In actual use, depending on the machine environment and workpiece material, significantly higher speeds and feeds may be achievable. Use these

speeds and feeds as a starting point. Cutting conditions can be gradually adjusted until the optimum settings for the application are found. Questions? Contact Technical Support at 800.892.4281.

Drill Definitions

- RPM = revolutions per minute
- SFM = surface feet per minute
- FR = feed rate in inches per minute
- IPR = inches per revolution

Drill Formulas

- $RPM = 3.82 \times SFM / \text{drill diameter}$
- $SFM = .262 \times RPM \times \text{drill diameter}$
- $FR = RPM \times IPR$



Jobber Length

Operating Parameters – Solid Carbide Drills

Material	Hardness	Speeds (SFM)		Feed Rate (IPR) for drill diameter					
		Uncoated		.0625"	.1250"	.2500"	.5000"	.7500"	1.0000"
low carbon steel, annealed	85-125 Bhn	85-150	LOW	.0005	.0010	.0020	.0040	.0050	.0060
			HIGH	.0015	.0030	.0050	.0090	.0100	.0120
medium carbon steel	275-425 Bhn	65-120	LOW	.0005	.0010	.0020	.0030	.0040	.0040
			HIGH	.0010	.0020	.0040	.0080	.0900	.0100
hardened steel	48-52 Rc C	30-90	LOW	.0005	.0010	.0020	.0030	.0040	.0040
			HIGH	.0010	.0030	.0030	.0050	.0060	.0070
stainless steel (soft)	135-275 Bhn	50-150	LOW	.0005	.0005	.0020	.0040	.0050	.0060
			HIGH	.0010	.0030	.0060	.0060	.0080	.0100
stainless steel (hard)	275-425 Bhn	30-90	LOW	.0005	.0005	.0010	.0015	.0020	.0025
			HIGH	.0010	.0020	.0030	.0040	.0060	.0070
cast iron (soft)	120-220 Bhn	100-300	LOW	.0010	.0020	.0040	.0050	.0070	.0090
			HIGH	.0020	.0040	.0080	.0100	.0120	.0140
cast iron (hard)	220-320 Bhn	60-200	LOW	.0015	.0010	.0020	.0030	.0040	.0050
			HIGH	.0020	.0030	.0040	.0070	.0080	.0100
ductile iron		70-250	LOW	.0010	.0020	.0030	.0050	.0060	.0070
			HIGH	.0020	.0040	.0060	.0080	.0090	.0150
malleable iron		80-250	LOW	.0010	.0020	.0030	.0050	.0060	.0070
			HIGH	.0020	.0050	.0060	.0120	.0140	.0150
high-temp alloys, nickel-based		30-90	LOW	.0005	.0005	.0010	.0015	.0020	.0025
			HIGH	.0010	.0030	.0040	.0050	.0600	.0070
monel, high nickel steels		30-90	LOW	.0005	.0005	.0010	.0015	.0020	.0025
			HIGH	.0010	.0020	.0030	.0040	.0050	.0060
titanium (soft)		60-200	LOW	.0005	.0020	.0040	.0050	.0060	.0070
			HIGH	.0010	.0030	.0060	.0060	.0080	.0100
titanium (hard)		45-200	LOW	.0005	.0010	.0020	.0040	.0040	.0050
			HIGH	.0020	.0040	.0070	.0090	.0100	.0120
refractory alloys		50-200	LOW	.0005	.0005	.0020	.0040	.0050	.0050
			HIGH	.0010	.0030	.0060	.0100	.0120	.0120
aluminum, aluminum alloys		150-400	LOW	.0010	.0020	.0030	.0050	-	-
			HIGH	.0020	.0040	.0070	.0130	-	-
brass, bronze		100-300	LOW	.0005	.0010	.0020	.0040	-	-
			HIGH	.0015	.0030	.0040	.0100	-	-
copper, copper alloys		150-400	LOW	.0010	.0030	.0050	.0060	-	-
			HIGH	.0030	.0050	.0120	.0140	-	-
magnesium, magnesium alloys		200-650	LOW	.0015	.0030	.0050	.0080	-	-
			HIGH	.0030	.0070	.0120	.0150	-	-
plastics, glass filled		150-300	LOW	.0010	.0020	.0030	.0050	-	-
			HIGH	.0020	.0040	.0060	.0120	-	-
plastics		250-600	LOW	.0015	.0030	.0040	.0060	-	-
			HIGH	.0030	.0050	.0120	.0160	-	-

Higher feed and speed values should be favored for softer materials; lower feed and speed values should be used for harder materials. The above recommendations are for hole depths up to 2 drill diameters. When hole depths

run 3 to 6 diameters, speeds should be reduced 10% to 35% respectively, and feeds should be reduced 10% to 20% respectively.

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS



Jobber Length

Styles 2002G, 2001G, 2002G-TC • CLE-MAX™ Jobber Drill

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

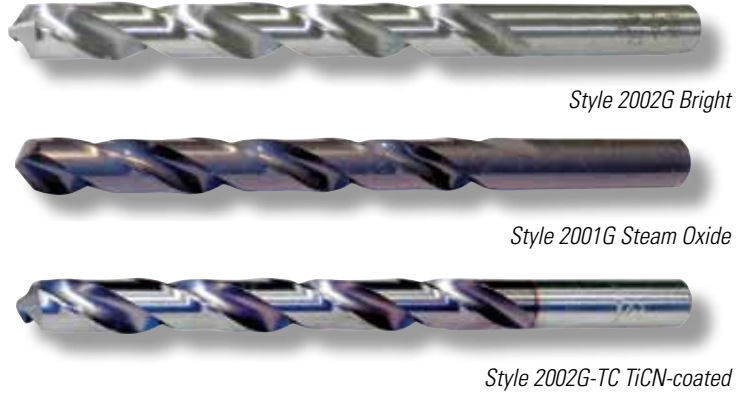
FEATURES

ANSI SIZES	PREM HSS SUBSTRATE
DIN 338	BRIGHT
GENERAL PURPOSE	STEAM OXIDE
SHANK	TiCN
38°	118°

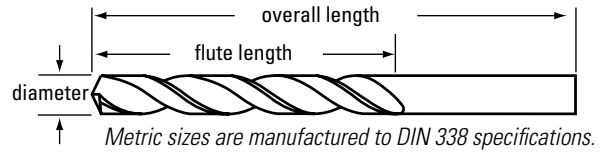
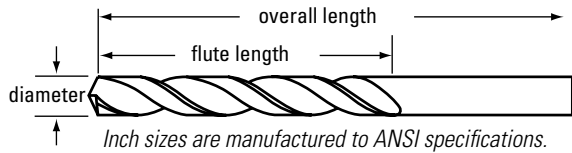
APPLICATIONS

LOW CARBON STEEL
CAST IRON
ALUMINUM
COPPER ALLOYS

- Improved geometry.
- Premium substrate for better wear life.



Operating parameters on page 32.



Drill Diameter Fract Wire/Let	mm	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number		
				in	mm	in	mm	Uncoated	Steam Oxide	TiCN
60	1.0	.0394	1.00	.472	12.00	1.339	34.00	C72200	C71200	C73200
		.0400	1.02	.688	17.48	1.625	41.28	C72160	C71160	-
59		.0410	1.04	.688	17.48	1.625	41.28	C72159	C71159	-
	1.05	.0413	1.05	.472	12.00	1.339	34.00	-	C71201	-
58		.0420	1.07	.688	17.48	1.625	41.28	C72158	C71158	-
	57	.0430	1.09	.750	19.05	1.750	44.45	C72157	C71157	-
56	1.1	.0433	1.10	.551	14.00	1.417	36.00	C72202	C71202	-
		.0453	1.15	.551	14.00	1.417	36.00	-	C71203	-
3/64		.0465	1.18	.750	19.05	1.750	44.45	C72156	C71156	-
		.0469	1.19	.750	19.05	1.750	44.45	C72003	C71003	C73003
55	1.2	.0472	1.20	.630	16.00	1.496	38.00	C72204	C71204	-
		.0492	1.25	.630	16.00	1.496	38.00	-	C71205	-
54	1.3	.0512	1.30	.630	16.00	1.496	38.00	C72206	C71206	-
		.0520	1.32	.875	22.23	1.875	47.63	C72155	C71155	-
53	1.35	.0531	1.35	.709	18.00	1.575	40.00	-	C71207	-
		.0550	1.40	.875	22.23	1.875	47.63	C72154	C71154	-
52	1.4	.0551	1.40	.709	18.00	1.575	40.00	C72208	C71208	-
		.0571	1.45	.709	18.00	1.575	40.00	-	C71209	-
51	1.5	.0591	1.50	.709	18.00	1.575	40.00	C72210	C71210	C73210
		.0595	1.51	.875	22.23	1.875	47.63	C72153	C71153	-
1/16	1.55	.0610	1.55	.787	20.00	1.693	43.00	-	C71211	-
		.0625	1.59	.875	22.23	1.875	47.63	C72004	C71004	C73004
50	1.6	.0630	1.60	.787	20.00	1.693	43.00	C72212	C71212	C73212
		.0635	1.61	.875	22.23	1.875	47.63	C72152	C71152	C73152
49	1.65	.0650	1.65	.787	20.00	1.693	43.00	-	C71213	-
		.0669	1.70	.787	20.00	1.693	43.00	C72214	C71214	-

continued on next page



General Application Drills

Jobber Length

Styles 2002G, 2001G, 2002G-TC • CLE-MAX™ Jobber Drill (continued)

Drill Diameter Fract Wire/Let	mm	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Uncoated	Order Number		TiCN
				in	mm	in	mm		Steam Oxide		
51		.0670	1.70	1.000	25.40	2.000	50.80	C72151	C71151	C73151	
	1.75	.0689	1.75	.866	22.00	1.811	46.00	–	C71215	–	
50		.0700	1.78	1.000	25.40	2.000	50.80	C72150	C71150	C73150	
	1.8	.0709	1.80	.866	22.00	1.811	46.00	C72216	C71216	–	
49		.0728	1.85	.866	22.00	1.811	46.00	–	C71217	–	
	1.85	.0730	1.85	1.000	25.40	2.000	50.80	C72149	C71149	C73149	
48		.0748	1.90	.866	22.00	1.811	46.00	C72218	C71218	–	
	1.9	.0760	1.93	1.000	25.40	2.000	50.80	C72148	C71148	C73148	
5/64	1.95	.0767	1.95	.945	24.00	1.929	49.00	–	C71219	–	
		.0781	1.98	1.000	25.40	2.000	50.80	C72005	C71005	C73005	
	2.0	.0785	1.99	1.000	25.40	2.000	50.80	C72147	C71147	C73147	
47	2.05	.0787	2.00	.945	24.00	1.929	49.00	C72220	C71220	C73220	
		.0807	2.05	.945	24.00	1.929	49.00	–	C71221	–	
	2.1	.0810	2.06	1.125	28.58	2.125	53.98	C72146	C71146	C73146	
46		.0820	2.08	1.125	28.58	2.125	53.98	C72145	C71145	C73145	
	2.1	.0827	2.10	.945	24.00	1.929	49.00	C72222	C71222	–	
45	2.15	.0846	2.15	1.063	27.00	2.087	53.00	–	C71223	–	
		.0860	2.18	1.125	28.58	2.125	53.98	C72144	C71144	C73144	
	2.2	.0866	2.20	1.063	27.00	2.087	53.00	C72224	C71224	–	
44	2.25	.0886	2.25	1.063	27.00	2.087	53.00	–	C71225	–	
		.0890	2.26	1.250	31.75	2.250	57.15	C72143	C71143	C73143	
43	2.3	.0906	2.30	1.063	27.00	2.087	53.00	C72226	C71226	–	
		.0925	2.35	1.063	27.00	2.087	53.00	–	C71227	–	
	2.35	.0935	2.37	1.250	31.75	2.250	57.15	C72142	C71142	C73142	
3/32		.0938	2.38	1.250	31.75	2.250	57.15	C72006	C71006	C73006	
	2.4	.0945	2.40	1.181	30.00	2.244	57.00	C72228	C71228	C73228	
41		.0960	2.44	1.375	34.93	2.375	60.33	C72141	C71141	C73141	
	2.45	.0964	2.45	1.181	30.00	2.244	57.00	–	C71229	–	
40		.0980	2.49	1.375	34.93	2.375	60.33	C72140	C71140	C73140	
	2.5	.0984	2.50	1.181	30.00	2.244	57.00	C72230	C71230	C73230	
39		.0995	2.53	1.375	34.93	2.375	60.33	C72139	C71139	C73139	
38		.1015	2.58	1.438	36.53	2.500	63.50	C72138	C71138	C73138	
	2.6	.1024	2.60	1.181	30.00	2.244	57.00	C72231	C71231	–	
37		.1040	2.64	1.438	36.53	2.500	63.50	C72137	C71137	C73137	
	2.7	.1062	2.70	1.299	33.00	2.402	61.00	C72232	C71232	–	
7/64	36	.1065	2.71	1.438	36.53	2.500	63.50	C72136	C71136	C73136	
		.1094	2.78	1.500	38.10	2.625	66.68	C72007	C71007	C73007	
	35	.1100	2.79	1.500	38.10	2.625	66.68	C72135	C71135	C73135	
34	2.8	.1102	2.80	1.299	33.00	2.402	61.00	C72233	C71233	–	
		.1110	2.82	1.500	38.10	2.625	66.68	C72134	C71134	C73134	
33		.1130	2.87	1.500	38.10	2.625	66.68	C72133	C71133	C73133	
	2.9	.1142	2.90	1.299	33.00	2.402	61.00	C72234	C71234	–	
32		.1160	2.95	1.625	41.28	2.750	69.85	C72132	C71132	C73132	
	3.0	.1181	3.00	1.299	33.00	2.402	61.00	C72235	C71235	C73235	
31		.1200	3.05	1.625	41.28	2.750	69.85	C72131	C71131	C73131	
	3.1	.1220	3.10	1.417	36.00	2.559	65.00	C72236	C71236	–	
1/8		.1250	3.18	1.625	41.28	2.750	69.85	C72008	C71008	C73008	
	3.2	.1260	3.20	1.457	37.00	2.598	66.00	C72237	C71237	C73237	
30		.1285	3.26	1.625	41.28	2.750	69.85	C72130	C71130	C73130	
	3.3	.1299	3.30	1.496	38.00	2.638	67.00	C72238	C71238	C73238	
29		.1339	3.40	1.535	39.00	2.756	70.00	C72239	C71239	–	
	3.4	.1360	3.45	1.750	44.45	2.875	73.03	C72129	C71129	C73129	

continued on next page



DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Jobber Length

Styles 2002G, 2001G, 2002G-TC • CLE-MAX™ Jobber Drill (continued)

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Drill Diameter Fract Wire/Let	mm	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Uncoated	Order Number		TiCN
				in	mm	in	mm		Steam Oxide		
28	3.5	.1378	3.50	1.535	39.00	2.756	70.00	C72240	C71240	C73240	
		.1405	3.57	1.750	44.45	2.875	73.03	C72128	C71128	C73128	
9/64	3.6	.1406	3.57	1.750	44.45	2.875	73.03	C72009	C71009	C73009	
		.1417	3.60	1.535	39.00	2.756	70.00	C72241	C71241	C73241	
27	3.7	.1440	3.66	1.875	47.63	3.000	76.20	C72127	C71127	C73127	
		.1457	3.70	1.535	39.00	2.756	70.00	C72242	C71242	–	
26	3.8	.1470	3.73	1.875	47.63	3.000	76.20	C72126	C71126	C73126	
		.1495	3.80	1.875	47.63	3.000	76.20	C72125	C71125	C73125	
24	3.9	.1496	3.80	1.693	43.00	2.953	75.00	C72243	C71243	–	
		.1520	3.86	2.000	50.80	3.125	79.38	C72124	C71124	C73124	
23	4.0	.1535	3.90	1.693	43.00	2.953	75.00	C72244	C71244	–	
		.1540	3.91	2.000	50.80	3.125	79.38	C72123	C71123	C73123	
5/32	4.1	.1562	3.97	2.000	50.80	3.125	79.38	C72010	C71010	C73010	
		.1570	3.99	2.000	50.80	3.125	79.38	C72122	C71122	C73122	
21	4.2	.1575	4.00	1.693	43.00	2.953	75.00	C72245	C71245	C73245	
		.1590	4.04	2.125	53.98	3.250	82.55	C72121	C71121	C73121	
20	4.3	.1610	4.09	2.125	53.98	3.250	82.55	C72120	C71120	C73120	
		.1614	4.10	1.693	43.00	2.953	75.00	C72246	C71246	C73246	
19	4.4	.1654	4.20	1.693	43.00	2.953	75.00	C72247	C71247	C73247	
		.1660	4.22	2.125	53.98	3.250	82.55	C72119	C71119	C73119	
18	4.5	.1692	4.30	1.850	47.00	3.150	80.00	C72248	C71248	C73248	
		.1695	4.31	2.125	53.98	3.250	82.55	C72118	C71118	C73118	
11/64	4.6	.1719	4.37	2.125	53.98	3.250	82.55	C72011	C71011	C73011	
		.1730	4.39	2.188	55.58	3.375	85.73	C72117	C71117	C73117	
16	4.7	.1732	4.40	1.850	47.00	3.150	80.00	C72249	C71249	–	
		.1770	4.50	2.188	55.58	3.375	85.73	C72116	C71116	C73116	
15	4.8	.1772	4.50	1.850	47.00	3.150	80.00	C72250	C71250	C73250	
		.1800	4.57	2.188	55.58	3.375	85.73	C72115	C71115	C73115	
14	4.9	.1811	4.60	1.850	47.00	3.150	80.00	C72251	C71251	–	
		.1820	4.62	2.188	55.58	3.375	85.73	C72114	C71114	C73114	
13	5.0	.1850	4.70	2.313	58.75	3.500	88.90	C72113	C71113	C73113	
		.1850	4.70	1.850	47.00	3.150	80.00	C72252	C71252	–	
3/16	5.1	.1875	4.76	2.313	58.75	3.500	88.90	C72012	C71012	C73012	
		.1890	4.80	2.313	58.75	3.500	88.90	C72112	C71112	C73112	
12	5.2	.1890	4.80	2.047	52.00	3.386	86.00	C72253	C71253	C73253	
		.1910	4.85	2.313	58.75	3.500	88.90	C72111	C71111	C73111	
11	5.3	.1929	4.90	2.047	52.00	3.386	86.00	C72254	C71254	C73254	
		.1935	4.91	2.438	61.93	3.625	92.08	C72110	C71110	C73110	
9	5.4	.1960	4.98	2.438	61.93	3.625	92.08	C72109	C71109	C73109	
		.1969	5.00	2.047	52.00	3.386	86.00	C72255	C71255	C73255	
8	5.5	.1990	5.05	2.438	61.93	3.625	92.08	C72108	C71108	C73108	
		.2008	5.10	2.047	52.00	3.386	86.00	C72256	C71256	C73256	
7	5.6	.2010	5.11	2.438	61.93	3.625	92.08	C72107	C71107	C73107	
		.2031	5.16	2.438	61.93	3.625	92.08	C72013	C71013	C73013	
13/64	5.7	.2040	5.18	2.500	63.50	3.750	95.25	C72106	C71106	C73106	
		.2047	5.20	2.047	52.00	3.386	86.00	C72257	C71257	C73257	
5	5.8	.2055	5.22	2.500	63.50	3.750	95.25	C72105	C71105	C73105	
		.2090	5.31	2.500	63.50	3.750	95.25	C72104	C71104	C73104	
4	5.9	.2125	5.40	2.244	57.00	3.661	93.00	C72259	C71259	–	
		.2130	5.41	2.500	63.50	3.750	95.25	C72103	C71103	C73103	
3	6.0	.2165	5.50	2.244	57.00	3.661	93.00	C72260	C71260	C73260	
		.2188	5.56	2.500	63.50	3.750	95.25	C72014	C71014	C73014	
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Styles 2002G, 2001G, 2002G-TC • CLE-MAX™ Jobber Drill (continued)

Drill Diameter Fract Wire/Let	mm	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Uncoated	Order Number		TiCN
				in	mm	in	mm		Steam Oxide		
2	5.6	.2205	5.60	2.244	57.00	3.661	93.00	C72261	C71261	-	
		.2210	5.61	2.625	66.68	3.875	98.43	C72102	C71102	C73102	
1	5.7	.2244	5.70	2.244	57.00	3.661	93.00	C72262	C71262	-	
		.2280	5.79	2.625	66.68	3.875	98.43	C72101	C71101	C73101	
15/64	5.9	.2322	5.90	2.244	57.00	3.661	93.00	C72264	C71264	-	
		.2340	5.94	2.625	66.68	3.875	98.43	C72071	C71071	C73071	
A	6.0	.2344	5.95	2.625	66.68	3.875	98.43	C72015	C71015	C73015	
		.2362	6.00	2.244	57.00	3.661	93.00	C72265	C71265	C73265	
B	6.1	.2380	6.05	2.750	69.85	4.000	101.60	C72072	C71072	C73072	
		.2401	6.10	2.480	63.00	3.976	101.00	C72266	C71266	-	
C	6.2	.2420	6.15	2.750	69.85	4.000	101.60	C72073	C71073	C73073	
		.2440	6.20	2.480	63.00	3.976	101.00	C72267	C71267	-	
D	6.3	.2460	6.25	2.750	69.85	4.000	101.60	C72074	C71074	C73074	
		.2480	6.30	2.480	63.00	3.976	101.00	C72268	C71268	-	
1/4	6.4	.2500	6.35	2.750	69.85	4.000	101.60	C72016	C71016	C73016	
		.2520	6.40	2.480	63.00	3.976	101.00	C72269	C71269	-	
E	6.5	.2559	6.50	2.480	63.00	3.976	101.00	C72270	C71270	C73270	
		.2570	6.53	2.875	73.03	4.125	104.78	C72076	C71076	C73075	
F	6.6	.2598	6.60	2.480	63.00	3.976	101.00	C72271	C71271	-	
		.2610	6.63	2.875	73.03	4.125	104.78	C72077	C71077	C73076	
17/64	6.7	.2638	6.70	2.480	63.00	3.976	101.00	C72272	C71272	-	
		.2656	6.75	2.875	73.03	4.125	104.78	C72017	C71017	C73017	
H	6.8	.2660	6.76	2.875	73.03	4.125	104.78	C72078	C71078	C73077	
		.2677	6.80	2.717	69.00	4.291	109.00	C72273	C71273	C73273	
I	6.9	.2717	6.90	2.717	69.00	4.291	109.00	C72274	C71274	-	
		.2720	6.91	2.875	73.03	4.125	104.78	C72079	C71079	C73078	
J	7.0	.2756	7.00	2.717	69.00	4.291	109.00	C72275	C71275	C73275	
		.2770	7.04	2.875	73.03	4.125	104.78	C72080	C71080	C73079	
9/32	7.1	.2795	7.10	2.717	69.00	4.291	109.00	C72276	C71276	-	
		.2812	7.14	2.938	74.63	4.250	107.95	C72018	C71018	C73018	
K	7.2	.2812	7.14	2.938	74.63	4.250	107.95	C72081	C71081	C73080	
		.2835	7.20	2.717	69.00	4.291	109.00	C72277	C71277	-	
L	7.3	.2874	7.30	2.717	69.00	4.291	109.00	C72278	C71278	-	
		.2900	7.37	2.938	74.63	4.250	107.95	C72082	C71082	C73081	
M	7.4	.2913	7.40	2.717	69.00	4.291	109.00	C72279	C71279	-	
		.2950	7.49	3.063	77.80	4.375	111.13	C72083	C71083	C73082	
19/64	7.5	.2953	7.50	2.717	69.00	4.291	109.00	C72280	C71280	C73280	
		.2969	7.54	3.063	77.80	4.375	111.13	C72019	C71019	C73019	
N	7.7	.3020	7.67	3.063	77.80	4.375	111.13	C72084	C71084	C73083	
		.3031	7.70	2.953	75.00	4.606	117.00	C72282	C71282	-	
5/16	7.8	.3070	7.80	2.953	75.00	4.606	117.00	C72283	C71283	-	
		.3110	7.90	2.953	75.00	4.606	117.00	C72284	C71284	-	
O	8.0	.3125	7.94	3.188	80.98	4.500	114.30	C72020	C71020	C73020	
		.3150	8.00	2.953	75.00	4.606	117.00	C72285	C71285	C73285	
P	8.1	.3160	8.03	3.188	80.98	4.500	114.30	C72085	C71085	C73084	
		.3189	8.10	2.953	75.00	4.606	117.00	C72286	C71286	-	
21/64	8.2	.3228	8.20	2.953	75.00	4.606	117.00	C72287	C71287	-	
		.3230	8.20	3.313	84.15	4.625	117.48	C72086	C71086	C73085	
Q	8.4	.3281	8.33	3.313	84.15	4.625	117.48	C72021	C71021	C73021	
		.3307	8.40	2.953	75.00	4.606	117.00	C72289	C71289	-	
8.5	8.5	.3320	8.43	3.438	87.33	4.750	120.65	C72087	C71087	C73086	
		.3346	8.50	2.953	75.00	4.606	117.00	C72290	C71290	C73290	

continued on next page



DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Jobber Length

Styles 2002G, 2001G, 2002G-TC • CLE-MAX™ Jobber Drill (continued)

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Drill Diameter Fract Wire/Let	mm	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Uncoated	Order Number		TiCN
				in	mm	in	mm		Steam Oxide		
R	8.7	.3390	8.61	3.438	87.33	4.750	120.65	C72088	C71088	C73087	
		.3425	8.70	3.189	81.00	4.921	125.00	C72292	C71292	-	
11/32	8.8	.3438	8.73	3.438	87.33	4.750	120.65	C72022	C71022	C73022	
		.3464	8.80	3.189	81.00	4.921	125.00	C72293	C71293	-	
S	9.0	.3480	8.84	3.500	88.90	4.875	123.83	C72089	C71089	C73088	
		.3543	9.00	3.189	81.00	4.921	125.00	C72295	C71295	C73295	
T	9.2	.3580	9.09	3.500	88.90	4.875	123.83	C72090	C71090	C73089	
		.3594	9.13	3.500	88.90	4.875	123.83	C72023	C71023	C73023	
		.3622	9.20	3.189	81.00	4.921	125.00	C72297	C71297	-	
U	9.3	.3661	9.30	3.189	81.00	4.921	125.00	C72298	C71298	-	
		.3680	9.35	3.625	92.08	5.000	127.00	C72091	C71091	C73090	
3/8	9.4	.3700	9.40	3.189	81.00	4.921	125.00	C72299	C71299	-	
		.3740	9.50	3.189	81.00	4.921	125.00	C72300	C71300	C73300	
		.3750	9.53	3.625	92.08	5.000	127.00	C72024	C71024	C73024	
V	9.5	.3770	9.58	3.625	92.08	5.000	127.00	C72092	C71092	C73091	
		.3779	9.60	3.425	87.00	5.236	133.00	C72301	C71301	-	
		.3817	9.70	3.425	87.00	5.236	133.00	C72302	C71302	-	
		.3858	9.80	3.425	87.00	5.236	133.00	C72303	C71303	-	
W	9.6	.3860	9.80	3.750	95.25	5.125	130.18	C72093	C71093	C73092	
		.3906	9.92	3.750	95.25	5.125	130.18	C72025	C71025	C73025	
X	10.0	.3937	10.00	3.425	87.00	5.236	133.00	C72305	C71305	C73305	
		.3970	10.08	3.750	95.25	5.125	130.18	C72094	C71094	C73093	
Y	10.2	.4016	10.20	3.425	87.00	5.236	133.00	C72306	C71306	C73306	
		.4040	10.26	3.875	98.43	5.250	133.35	C72095	C71095	C73094	
13/32	10.5	.4062	10.32	3.875	98.43	5.250	133.35	C72026	C71026	C73026	
		.4130	10.49	3.875	98.43	5.250	133.35	C72096	C71096	C73095	
27/64	10.8	.4134	10.50	3.425	87.00	5.236	133.00	C72308	C71308	C73308	
		.4219	10.72	3.938	100.03	5.375	136.53	C72027	C71027	C73027	
		.4252	10.80	3.701	94.00	5.591	142.00	C72309	C71309	-	
7/16	11.0	.4331	11.00	3.701	94.00	5.591	142.00	C72310	C71310	C73310	
		.4375	11.11	4.063	103.20	5.500	139.70	C72028	C71028	C73028	
		.4409	11.20	3.701	94.00	5.591	142.00	C72311	C71311	-	
29/64	11.5	.4527	11.50	3.701	94.00	5.591	142.00	C72312	C71312	C73312	
		.4531	11.51	4.188	106.38	5.625	142.88	C72029	C71029	C73029	
15/32	12.0	.4688	11.91	4.313	109.55	5.750	146.05	C72030	C71030	C73030	
		.4724	12.00	3.976	101.00	5.945	151.00	C72314	C71314	C73314	
31/64	12.2	.4803	12.20	3.976	101.00	5.945	151.00	C72315	C71315	-	
		.4844	12.30	4.375	111.13	5.875	149.23	C72031	C71031	C73031	
1/2	12.5	.4921	12.50	3.976	101.00	5.945	151.00	C72316	C71316	C73316	
		.5000	12.70	4.500	114.30	6.000	152.40	C72032	C71032	C73032	
33/64	13.0	.5118	13.00	3.976	101.00	5.945	151.00	C72319	C71319	C73319	
		.5156	13.10	4.813	122.25	6.625	168.28	-	C71033	-	
17/32	13.5	.5312	13.49	4.813	122.25	6.625	168.28	-	C71034	-	
		.5315	13.50	4.252	108.00	6.299	160.00	C72321	C71321	-	
35/64	14.0	.5469	13.89	4.813	122.25	6.625	168.28	-	C71035	-	
		.5512	14.00	4.252	108.00	6.299	160.00	C72323	C71323	C73323	
9/16	14.5	.5625	14.29	4.813	122.25	6.625	168.28	-	C71036	-	
		.5709	14.50	4.488	114.00	6.654	169.00	C72325	C71325	-	
37/64	15.0	.5781	14.68	4.813	122.25	6.625	168.28	-	C71037	-	
		.5906	15.00	4.488	114.00	6.654	169.00	C72327	C71327	C73327	
19/32		.5938	15.08	5.188	131.78	7.125	180.98	-	C71038	-	
39/64		.6094	15.48	5.188	131.78	7.125	180.98	-	C71039	-	

continued on next page



Styles 2002G, 2001G, 2002G-TC • CLE-MAX™ Jobber Drill (continued)

Drill Diameter Fract Wire/Let	mm	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Uncoated	Order Number		TiCN
				in	mm	in	mm		Steam Oxide		
5/8	15.5	.6102	15.50	4.724	120.00	7.008	178.00	C72329	C71329	–	
		.6250	15.88	5.188	131.78	7.125	180.98	–	C71040	–	
41/64	16.0	.6299	16.00	4.724	120.00	7.008	178.00	C72331	C71331	C73331	
		.6406	16.27	5.188	131.78	7.125	180.98	–	C71041	–	
21/32	16.5	.6496	16.50	4.724	120.00	7.244	184.00	C72333	C71333	–	
		.6562	16.67	5.188	131.78	7.125	180.98	–	C71042	–	
43/64	17.0	.6693	17.00	4.724	120.00	7.244	184.00	C72335	C71335	C73335	
		.6719	17.07	5.625	142.88	7.625	193.68	–	C71043	–	
11/16	17.5	.6875	17.46	5.625	142.88	7.625	193.68	–	C71044	–	
		.6890	17.50	5.118	130.00	7.520	191.00	C72337	C71337	–	

Sets

No. of Pieces	Drill Style	Finish	Size Range	Set Order Number
15	2002G	bright	1/16" through 1/2" x 1/32"	C72199
29	2002G	bright	1/16" through 1/2" x 1/64"	C72198
26	2002G	bright	letter A through Z	C00939
60	2002G	bright	wire gauge #1 through #60	C00934
115	2002G	bright	1/16" through 1/2", letter A through Z, and wire gage #1 through #60	C01330
25	2002G	bright	1 mm through 13 mm x 0.5 mm	C72000
29	2001G	steam oxide	1/16" through 1/2" x 1/64"	C72197
25	2001G	steam oxide	1 mm through 13 mm x 0.5 mm	C71000
50	2001G	steam oxide	1 mm through 5.9 mm x 0.1 mm	C00960

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS



Jobber Length

Styles 2001, 2002 • General Purpose Jobber Drill

DRILLING

FEATURES

ANSI SIZES	HSS SUBSTRATE
DIN 338	BRIGHT
GENERAL PURPOSE	STEAM OXIDE
SHANK	118°
30°	

APPLICATIONS

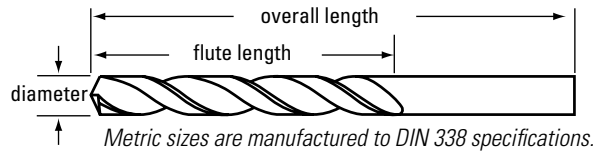
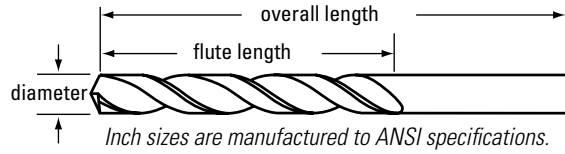
ALLOY-TOOL STEEL
CARBON STEEL
CAST IRON
ALUMINUM



Style 2002 Bright



Style 2001 Steam Oxide



Operating parameters on page 32.

All sizes feature uncleared diameter.

HOLE FINISHING

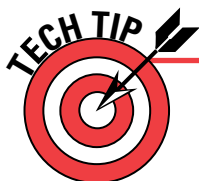
THREADING

MILLING

Drill Diameter			Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number	
Fract	Wire	mm			in	mm	in	mm	Bright	Steam Oxide
	97		.0059	0.15	.063	1.59	.750	19.05	C01771	-
	96		.0063	0.16	.063	1.59	.750	19.05	C01773	-
	95		.0067	0.17	.063	1.59	.750	19.05	C01775	-
	94		.0071	0.18	.063	1.59	.750	19.05	C01777	-
	93		.0075	0.19	.063	1.59	.750	19.05	C01779	-
	92		.0079	0.20	.063	1.59	.750	19.05	C01781	-
	91		.0083	0.21	.078	1.98	.750	19.05	C01783	-
	90		.0087	0.22	.078	1.98	.750	19.05	C01784	-
	89		.0091	0.23	.078	1.98	.750	19.05	C01786	-
	88		.0095	0.24	.078	1.98	.750	19.05	C01787	-
	87		.0100	0.25	.078	1.98	.750	19.05	C01789	-
	86		.0105	0.27	.094	2.38	.750	19.05	C01790	-
	85		.0110	0.28	.094	2.38	.750	19.05	C01791	-
	84		.0115	0.29	.094	2.38	.750	19.05	C01793	-
	83		.0120	0.30	.094	2.38	.750	19.05	C01795	-
	82		.0125	0.32	.094	2.38	.750	19.05	C01796	-
	81		.0130	0.33	.094	2.38	.750	19.05	C01798	-
	80		.0135	0.34	.125	3.18	.750	19.05	C01012	C01799
		0.35	.0138	0.35	.118	3.00	.748	19.00	C01013	-
	79		.0145	0.37	.188	4.76	.750	19.05	C01014	C01801
		0.38	.0150	0.38	.157	4.00	.748	19.00	C01015	-
1/64			.0156	0.40	.188	4.76	.750	19.05	C01016	C01803
		0.4	.0157	0.40	.197	5.00	.787	20.00	C01017	-
	78		.0160	0.41	.188	4.76	.875	22.23	C01018	C01805

continued on next page

OTHER TOOLS



Bright versus Coated Tools

- Uncoated (bright) series are used in non-ferrous materials.
- Steam oxide drills provide better wear life in ferrous materials.



Styles 2001, 2002 • General Purpose Jobber Drill (continued)

Drill Diameter		Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Uncoated	Order Number	
Fract	Wire			mm	in	mm	in		mm	Steam Oxide
		0.42	.0165	0.42	.197	5.00	.787	20.00	C01019	–
		0.45	.0177	0.45	.197	5.00	.787	20.00	C01020	–
	77		.0180	0.46	.188	4.76	.875	22.23	C01021	C01808
		0.48	.0189	0.48	.197	5.00	.787	20.00	C01022	–
		0.5	.0197	0.50	.236	6.00	.866	22.00	C01023	–
	76		.0200	0.51	.188	4.76	.875	22.23	C01024	C01811
	75		.0210	0.53	.250	6.35	1.000	25.40	C01025	C01812
		0.55	.0217	0.55	.276	7.00	.945	24.00	C01026	–
	74		.0225	0.57	.250	6.35	1.000	25.40	C01027	C01814
		0.6	.0236	0.60	.276	7.00	.945	24.00	C01028	–
	73		.0240	0.61	.313	7.94	1.125	28.58	C01029	C01816
	72		.0250	0.64	.313	7.94	1.125	28.58	C01030	C01817
		0.65	.0256	0.65	.315	8.00	1.024	26.00	C01031	–
	71		.0260	0.66	.375	9.53	1.250	31.75	C01032	C01819
		0.7	.0276	0.70	.354	9.00	1.102	28.00	C01033	–
	70		.0280	0.71	.375	9.53	1.250	31.75	C01034	C01821
	69		.0292	0.74	.500	12.70	1.375	34.93	C01035	C01822
		0.75	.0295	0.75	.354	9.00	1.102	28.00	C01036	–
	68		.0310	0.79	.500	12.70	1.375	34.93	C01037	C01824
1/32			.0312	0.79	.500	12.70	1.375	34.93	C01038	C01825
		0.8	.0315	0.80	.394	10.00	1.181	30.00	C01039	–
	67		.0320	0.81	.500	12.70	1.375	34.93	C01040	C01827
	66		.0330	0.84	.500	12.70	1.375	34.93	C01041	C01828
		0.85	.0335	0.85	.394	10.00	1.181	30.00	C01042	–
	65		.0350	0.89	.625	15.88	1.500	38.10	C01043	C01830
		0.9	.0354	0.90	.433	11.00	1.260	32.00	C01044	–
	64		.0360	0.91	.625	15.88	1.500	38.10	C01045	C01832
	63		.0370	0.94	.625	15.88	1.500	38.10	C01046	C01833
		0.95	.0374	0.95	.433	11.00	1.260	32.00	C01047	–
	62		.0380	0.97	.625	15.88	1.500	38.10	C01048	C01835
	61		.0390	0.99	.688	17.46	1.500	38.10	C01049	C01836
		5.3	.2087	5.30	2.520	64.00	3.740	95.00	C01181	–
		5.8	.2283	5.80	2.638	67.00	3.858	98.00	C01192	–
		7.6	.2992	7.60	3.071	78.00	4.370	111.00	C01231	–
		8.3	.3268	8.30	3.307	84.00	4.606	117.00	C01244	–
		8.6	.3386	8.60	3.425	87.00	4.764	121.00	C01249	–
		8.9	.3504	8.90	3.504	89.00	4.882	124.00	C01256	–
		9.1	.3583	9.10	3.622	92.00	4.882	124.00	C01259	–
		9.9	.3898	9.90	3.740	95.00	5.118	130.00	C01274	–
		11.8	.4646	11.80	4.331	110.00	5.748	146.00	C01291	–

Set

No. of Pieces	Drill Style	Finish	Size Range	Set Order Number
20	2002	bright	#61-#80	C00937



Jobber Length

Style 2012 • High-Helix

DRILLING

FEATURES

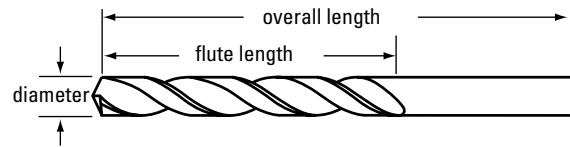
ANSI SIZES	HSS SUBSTRATE
GENERAL PURPOSE	BRIGHT
SHANK	118°
	38°

APPLICATIONS

LOW CARBON STEEL
ALUMINUM
COPPER ALLOYS
PLASTIC



Style 2012 Bright



Improved chip lifting in soft materials.

Operating parameters on page 32.

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Diameter Fract	Decimal Wire	Metric Equiv.	Metric Equiv.	Flute Length in	Flute Length mm	Overall Length in	Overall Length mm	Order Number
80	.0135	0.34	.188	4.76	.750	19.05	C02881	
79	.0145	0.37	.188	4.76	.750	19.05	C02883	
78	.0160	0.41	.188	4.76	.875	22.23	C02887	
77	.0180	0.46	.188	4.76	.875	22.23	C02890	
76	.0200	0.51	.188	4.76	.875	22.23	C02893	
75	.0210	0.53	.250	6.35	1.000	25.40	C02894	
74	.0225	0.57	.250	6.35	1.000	25.40	C02896	
73	.0240	0.61	.313	7.94	1.125	28.58	C02898	
72	.0250	0.64	.313	7.94	1.125	28.58	C02899	
71	.0260	0.66	.375	9.53	1.250	31.75	C02901	
70	.0280	0.71	.375	9.53	1.250	31.75	C02903	
69	.0292	0.74	.500	12.70	1.375	34.93	C02904	
68	.0310	0.79	.500	12.70	1.375	34.93	C02906	
1/32	.0312	0.79	.500	12.70	1.375	34.93	C02907	
67	.0320	0.81	.500	12.70	1.375	34.93	C02909	
66	.0330	0.84	.500	12.70	1.375	34.93	C02910	
65	.0350	0.89	.625	15.88	1.500	38.10	C02912	
64	.0360	0.91	.625	15.88	1.500	38.10	C02914	
63	.0370	0.94	.625	15.88	1.500	38.10	C02915	
62	.0380	0.97	.625	15.88	1.500	38.10	C02917	
61	.0390	0.99	.688	17.46	1.625	41.28	C02918	
60	.0400	1.02	.688	17.46	1.625	41.28	C02920	
59	.0410	1.04	.688	17.46	1.625	41.28	C02921	
58	.0420	1.07	.688	17.46	1.625	41.28	C02923	
57	.0430	1.09	.750	19.05	1.750	44.45	C02924	
56	.0465	1.18	.750	19.05	1.750	44.45	C02927	
3/64	.0469	1.19	.750	19.05	1.750	44.45	C02928	
55	.0520	1.32	.875	22.23	1.875	47.63	C02932	
54	.0550	1.40	.875	22.23	1.875	47.63	C02934	
53	.0595	1.51	.875	22.23	1.875	47.63	C02938	
1/16	.0625	1.59	.875	22.23	1.875	47.63	C02940	
52	.0635	1.61	.875	22.23	1.875	47.63	C02942	
51	.0670	1.70	1.000	25.40	2.000	50.80	C02945	
50	.0700	1.78	1.000	25.40	2.000	50.80	C02947	

Diameter Fract	Decimal Wire	Metric Equiv.	Metric Equiv.	Flute Length in	Flute Length mm	Overall Length in	Overall Length mm	Order Number
49	.0730	1.85	1.000	25.40	2.000	50.80	C02950	
48	.0760	1.93	1.000	25.40	2.000	50.80	C02952	
5/64	.0781	1.98	1.000	25.40	2.000	50.80	C02954	
47	.0785	1.99	1.000	25.40	2.000	50.80	C02955	
46	.0810	2.06	1.125	28.58	2.125	53.98	C02958	
45	.0820	2.08	1.125	28.58	2.125	53.98	C02959	
44	.0860	2.18	1.125	28.58	2.125	53.98	C02962	
43	.0890	2.26	1.250	31.75	2.250	57.15	C02965	
42	.0935	2.38	1.250	31.75	2.250	57.15	C02968	
3/32	.0938	2.38	1.250	31.75	2.250	57.15	C02969	
41	.0960	2.44	1.375	34.93	2.375	60.33	C02971	
40	.0980	2.49	1.375	34.93	2.375	60.33	C02973	
39	.0995	2.53	1.375	34.93	2.375	60.33	C02975	
38	.1015	2.58	1.438	36.51	2.500	63.50	C02976	
37	.1040	2.64	1.438	36.51	2.500	63.50	C02978	
36	.1065	2.71	1.438	36.51	2.500	63.50	C02980	
7/64	.1094	2.78	1.500	38.10	2.625	66.68	C02982	
35	.1100	2.79	1.500	38.10	2.625	66.68	C02983	
34	.1110	2.82	1.500	38.10	2.625	66.68	C02985	
33	.1130	2.87	1.500	38.10	2.625	66.68	C02986	
32	.1160	2.95	1.625	41.28	2.750	69.85	C02988	
31	.1200	3.05	1.625	41.28	2.750	69.85	C02990	
	.1250	3.18	1.625	41.28	2.750	69.85	C02992	
30	.1285	3.26	1.625	41.28	2.750	69.85	C02995	
29	.1360	3.45	1.750	44.45	2.875	73.03	C02998	
28	.1405	3.57	1.750	44.45	2.875	73.03	C03000	
9/64	.1406	3.57	1.750	44.45	2.875	73.03	C03001	
27	.1440	3.66	1.875	47.63	3.000	76.20	C03003	
26	.1470	3.73	1.875	47.63	3.000	76.20	C03005	
25	.1495	3.80	1.875	47.63	3.000	76.20	C03007	
24	.1520	3.86	2.000	50.80	3.125	79.38	C03009	
23	.1540	3.91	2.000	50.80	3.125	79.38	C03011	
5/32	.1562	3.97	2.000	50.80	3.125	79.38	C03012	
22	.1570	3.99	2.000	50.80	3.125	79.38	C03013	

continued on next page



Style 2012 • High-Helix (continued)

Diameter Fract	W/L	Decimal Equiv.	Metric Equiv.	Flute Length in	mm	Overall Length in	mm	Order Number
	21	.1590	4.04	2.125	53.98	3.250	82.55	C03015
	20	.1610	4.09	2.125	53.98	3.250	82.55	C03016
	19	.1660	4.22	2.125	53.98	3.250	82.55	C03019
	18	.1695	4.31	2.125	53.98	3.250	82.55	C03022
11/64		.1719	4.37	2.125	53.98	3.250	82.55	C03023
	17	.1730	4.39	2.188	55.56	3.375	85.73	C03024
	16	.1770	4.50	2.188	55.56	3.375	85.73	C03026
	15	.1800	4.57	2.188	55.56	3.375	85.73	C03028
	14	.1820	4.62	2.188	55.56	3.375	85.73	C03030
	13	.1850	4.70	2.313	58.74	3.500	88.90	C03031
3/16		.1875	4.76	2.313	58.74	3.500	88.90	C03034
	12	.1890	4.80	2.313	58.74	3.500	88.90	C03035
	11	.1910	4.85	2.313	58.74	3.500	88.90	C03037
	10	.1935	4.92	2.438	61.91	3.625	92.08	C03039
	9	.1960	4.98	2.438	61.91	3.625	92.08	C03040
	8	.1990	5.06	2.438	61.91	3.625	92.08	C03042
	7	.2010	5.11	2.438	61.91	3.625	92.08	C03044
13/64		.2031	5.16	2.438	61.91	3.625	92.08	C03045
	6	.2040	5.18	2.500	63.50	3.750	95.25	C03046
	5	.2055	5.22	2.500	63.50	3.750	95.25	C03048
	4	.2090	5.31	2.500	63.50	3.750	95.25	C03051
	3	.2130	5.41	2.500	63.50	3.750	95.25	C03053
7/32		.2188	5.56	2.500	63.50	3.750	95.25	C03055
	2	.2210	5.61	2.625	66.68	3.875	98.43	C03057
	1	.2280	5.79	2.625	66.68	3.875	98.43	C03060
	A	.2340	5.94	2.625	66.68	3.875	98.43	C03063
15/64		.2344	5.95	2.625	66.68	3.875	98.43	C03064
	B	.2380	6.05	2.750	69.85	4.000	101.60	C03066
	C	.2420	6.15	2.750	69.85	4.000	101.60	C03068
	D	.2460	6.25	2.750	69.85	4.000	101.60	C03070
1/4		.2500	6.35	2.750	69.85	4.000	101.60	C03073
	F	.2570	6.53	2.875	73.03	4.125	104.78	C03077
	G	.2610	6.63	2.875	73.03	4.125	104.78	C03079
17/64		.2656	6.75	2.875	73.03	4.125	104.78	C03081

Diameter Fract	W/L	Decimal Equiv.	Metric Equiv.	Flute Length in	mm	Overall Length in	mm	Order Number
	H	.2660	6.76	2.875	73.03	4.125	104.78	C03083
	I	.2720	6.91	2.875	73.03	4.125	104.78	C03086
	J	.2770	7.04	2.875	73.03	4.125	104.78	C03088
	L	.2900	7.37	2.938	74.61	4.250	107.95	C03094
9/32		.2812	7.14	2.938	74.61	4.250	107.95	C03095
	M	.2950	7.49	3.063	77.79	4.375	111.13	C03097
19/64		.2969	7.54	3.063	77.79	4.375	111.13	C03099
	N	.3020	7.67	3.063	77.79	4.375	111.13	C03101
5/16		.3125	7.94	3.188	80.96	4.500	114.30	C03106
	O	.3160	8.03	3.188	80.96	5.750	146.05	C03108
	P	.3230	8.20	3.313	84.14	4.625	117.48	C03111
21/64		.3281	8.33	3.313	84.14	4.625	117.48	C03114
	Q	.3320	8.43	3.438	87.31	4.750	120.65	C03116
	R	.3390	8.61	3.438	87.31	4.750	120.65	C03119
11/32		.3438	8.73	3.438	87.31	4.750	120.65	C03121
	S	.3480	8.84	3.500	88.90	4.875	123.83	C03124
	T	.3580	9.09	3.500	88.90	4.875	123.83	C03127
23/64		.3594	9.13	3.500	88.90	4.875	123.83	C03129
	U	.3680	9.35	3.625	92.08	5.000	127.00	C03133
3/8		.3750	9.53	3.625	92.08	5.000	127.00	C03136
	V	.3770	9.58	3.625	92.08	5.000	127.00	C03137
	W	.3860	9.80	3.750	95.25	5.125	130.18	C03142
25/64		.3906	9.92	3.750	95.25	5.125	130.18	C03144
	X	.3970	10.08	3.750	95.25	5.125	130.18	C03146
	Y	.4040	10.26	3.875	98.43	5.250	133.35	C03148
13/32		.4062	10.32	3.875	98.43	5.250	133.35	C03149
	Z	.4130	10.49	3.875	98.43	5.250	133.35	C03150
27/64		.4219	10.72	3.938	100.01	5.375	136.53	C03152
7/16		.4375	11.11	4.063	103.19	5.500	139.70	C03155
29/64		.4531	11.51	4.188	106.36	5.625	142.88	C03158
15/32		.4688	11.91	4.313	109.54	5.750	146.05	C03160
31/64		.4844	12.30	4.375	111.13	5.875	149.23	C03163
1/2		.5000	12.70	4.500	114.30	6.000	152.40	C03165

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS



Jobber Length

Style 2020 • Low-Helix

DRILLING

FEATURES

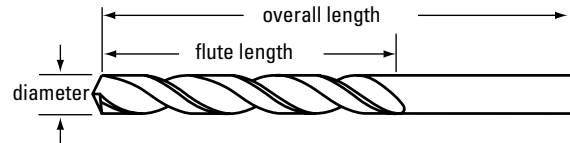
ANSI SIZES	HSS SUBSTRATE
GENERAL PURPOSE	BRIGHT
SHANK	118°
	15°

APPLICATIONS

BRASS	PLASTIC
BRONZE	COPPER ALLOYS
ALUMINUM	



Style 2020 Bright



Good chip removal in horizontal applications.

Operating parameters on page 32.

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Diameter Fract	Decimal Wire	Metric Equiv.	Metric Equiv.	Flute Length in	Flute Length mm	Overall Length in	Overall Length mm	Order Number
60	.0400	1.02	.688	17.46	1.625	41.28	C03457	
59	.0410	1.04	.688	17.46	1.625	41.28	C03458	
58	.0420	1.07	.688	17.46	1.625	41.28	C03460	
57	.0430	1.09	.750	19.05	1.750	44.45	C03461	
56	.0465	1.18	.750	19.05	1.750	44.45	C03464	
55	.0520	1.32	.875	22.23	1.875	47.63	C03469	
54	.0550	1.40	.875	22.23	1.875	47.63	C03471	
53	.0595	1.51	.875	22.23	1.875	47.63	C03475	
1/16	.0625	1.59	.875	22.23	1.875	47.63	C03477	
52	.0635	1.61	.875	22.23	1.875	47.63	C03479	
51	.0670	1.70	1.000	25.40	2.000	50.80	C03482	
50	.0700	1.78	1.000	25.40	2.000	50.80	C03484	
49	.0730	1.85	1.000	25.40	2.000	50.80	C03487	
48	.0760	1.93	1.000	25.40	2.000	50.80	C03489	
5/64	.0781	1.98	1.000	25.40	2.000	50.80	C03491	
47	.0785	1.99	1.000	25.40	2.000	50.80	C03492	
46	.0810	2.06	1.125	28.58	2.125	53.98	C03495	
45	.0820	2.08	1.125	28.58	2.125	53.98	C03496	
44	.0860	2.18	1.125	28.58	2.125	53.98	C03499	
43	.0890	2.26	1.250	31.75	2.250	57.15	C03502	
42	.0935	2.38	1.250	31.75	2.250	57.15	C03505	
3/32	.0938	2.38	1.250	31.75	2.250	57.15	C03506	
41	.0960	2.44	1.375	34.93	2.375	60.33	C03508	
40	.0980	2.49	1.375	34.93	2.375	60.33	C03510	
39	.0995	2.53	1.375	34.93	2.375	60.33	C03512	
38	.1015	2.58	1.438	36.51	2.500	63.50	C03513	
37	.1040	2.64	1.438	36.51	2.500	63.50	C03515	
36	.1065	2.71	1.438	36.51	2.500	63.50	C03517	
7/64	.1094	2.78	1.500	38.10	2.625	66.68	C03519	
35	.1100	2.79	1.500	38.10	2.625	66.68	C03520	
34	.1110	2.82	1.500	38.10	2.625	66.68	C03522	
33	.1130	2.87	1.500	38.10	2.625	66.68	C03523	
32	.1160	2.95	1.625	41.28	2.750	69.85	C03525	
31	.1200	3.05	1.625	41.28	2.750	69.85	C03527	

Diameter Fract	Decimal Wire	Metric Equiv.	Metric Equiv.	Flute Length in	Flute Length mm	Overall Length in	Overall Length mm	Order Number
1/8	.1250	3.18	1.625	41.28	2.750	69.85	C03529	
30	.1285	3.26	1.625	41.28	2.750	69.85	C03532	
29	.1360	3.45	1.750	44.45	2.875	73.03	C03535	
28	.1405	3.57	1.750	44.45	2.875	73.03	C03537	
9/64	.1406	3.57	1.750	44.45	2.875	73.03	C03538	
27	.1440	3.66	1.875	47.63	3.000	76.20	C03540	
26	.1470	3.73	1.875	47.63	3.000	76.20	C03542	
25	.1495	3.80	1.875	47.63	3.000	76.20	C03544	
24	.1520	3.86	2.000	50.80	3.125	79.38	C03546	
23	.1540	3.91	2.000	50.80	3.125	79.38	C03548	
5/32	.1562	3.97	2.000	50.80	3.125	79.38	C03549	
22	.1570	3.99	2.000	50.80	3.125	79.38	C03550	
21	.1590	4.04	2.125	53.98	3.250	82.55	C03552	
20	.1610	4.09	2.125	53.98	3.250	82.55	C03553	
19	.1660	4.22	2.125	53.98	3.250	82.55	C03556	
18	.1695	4.31	2.125	53.98	3.250	82.55	C03559	
11/64	.1719	4.37	2.125	53.98	3.250	82.55	C03560	
17	.1730	4.39	2.188	55.56	3.375	85.73	C03561	
16	.1770	4.50	2.188	55.56	3.375	85.73	C03563	
15	.1800	4.57	2.188	55.56	3.375	85.73	C03565	
14	.1820	4.62	2.188	55.56	3.375	85.73	C03567	
13	.1850	4.70	2.313	58.74	3.500	88.90	C03568	
3/16	.1875	4.76	2.313	58.74	3.500	88.90	C03571	
12	.1890	4.80	2.313	58.74	3.500	88.90	C03572	
11	.1910	4.85	2.313	58.74	3.500	88.90	C03574	
10	.1935	4.92	2.438	61.91	3.625	92.08	C03576	
9	.1960	4.98	2.438	61.91	3.625	92.08	C03577	
8	.1990	5.06	2.438	61.91	3.625	92.08	C03579	
7	.2010	5.11	2.438	61.91	3.625	92.08	C03581	
13/64	.2031	5.16	2.438	61.91	3.625	92.08	C03582	
6	.2040	5.18	2.500	63.50	3.750	95.25	C03583	
5	.2055	5.22	2.500	63.50	3.750	95.25	C03585	
4	.2090	5.31	2.500	63.50	3.750	95.25	C03588	
3	.2130	5.41	2.500	63.50	3.750	95.25	C03590	

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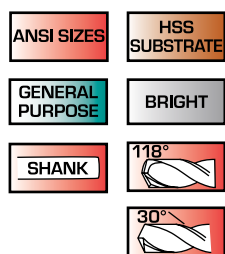
Style 2020 • Low-Helix (continued)

Diameter Fract Wire	Decimal Equiv.	Metric Equiv.	Flute Length in mm	Overall Length in mm	Order Number
7/32	.2188	5.56	2.500 63.50	3.750 95.25	C03592
2	.2210	5.61	2.625 66.68	3.875 98.43	C03594
1	.2280	5.79	2.625 66.68	3.875 98.43	C03597
15/64	.2344	5.95	2.625 66.68	3.875 98.43	C03601
1/4	.2500	6.35	2.750 69.85	4.000 101.60	C03610
17/64	.2656	6.75	2.875 73.03	4.125 104.78	C03618
9/32	.2812	7.14	2.938 74.61	4.250 107.95	C03632
19/64	.2969	7.54	3.063 77.79	4.375 111.13	C03636
5/16	.3125	7.94	3.188 80.96	4.500 114.30	C03643
21/64	.3281	8.33	3.313 84.14	4.625 117.48	C03651

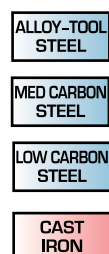
Diameter Fract Wire	Decimal Equiv.	Metric Equiv.	Flute Length in mm	Overall Length in mm	Order Number
11/32	.3438	8.73	3.438 87.31	4.750 120.65	C03658
3/8	.3750	9.53	3.625 92.08	5.000 127.00	C03673
25/64	.3906	9.92	3.750 95.25	5.125 130.18	C03681
13/32	.4062	10.32	3.875 98.43	5.250 133.35	C03686
27/64	.4219	10.72	3.938 100.01	5.375 136.53	C03689
7/16	.4375	11.11	4.063 103.19	5.500 139.70	C03692
29/64	.4531	11.51	4.188 106.36	5.625 142.88	C03695
15/32	.4688	11.91	4.313 109.54	5.750 146.05	C03697
1/2	.5000	12.70	4.500 114.30	6.000 152.40	C03702

Style 2006 • Left-Hand

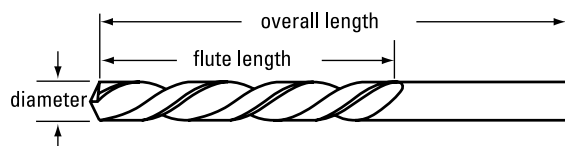
FEATURES



APPLICATIONS



Style 2006 Bright



Operating parameters on page 32.

Drill Diameter	Decimal Equiv.	Metric Equiv.	Flute Length in mm	Overall Length in mm	Order Number
1/16	.0625	1.59	.875 22.23	1.875 47.63	C01401
5/64	.0781	1.98	1.000 25.40	2.000 50.80	C01415
3/32	.0938	2.38	1.250 31.75	2.250 57.15	C01430
7/64	.1094	2.78	1.500 38.10	2.625 66.68	C01443
1/8	.1250	3.18	1.625 41.28	2.750 69.85	C01453
9/64	.1406	3.57	1.750 44.45	2.875 73.03	C01462
5/32	.1562	3.97	2.000 50.80	3.125 79.38	C01473
11/64	.1719	4.37	2.125 53.98	3.250 82.55	C01484

Drill Diameter	Decimal Equiv.	Metric Equiv.	Flute Length in mm	Overall Length in mm	Order Number
3/16	.1875	4.76	2.313 58.74	3.500 88.90	C01495
13/64	.2031	5.16	2.438 61.91	3.875 98.43	C01506
7/32	.2188	5.56	2.500 63.50	3.750 95.25	C01516
1/4	.2500	6.35	2.750 69.85	4.000 101.60	C01532
17/64	.2656	6.75	2.875 73.03	4.125 104.78	C01538
9/32	.2812	7.14	2.938 74.61	4.250 107.95	C01551
5/16	.3125	7.94	3.188 80.96	4.500 114.30	C01561
3/8	.3750	9.53	3.625 92.08	5.000 127.00	C01588
13/32	.4062	10.32	3.875 98.43	5.250 133.35	C01600

Solid Carbide

Style 1727 • Solid Carbide Heavy-Duty Jobber Length

DRILLING

FEATURES

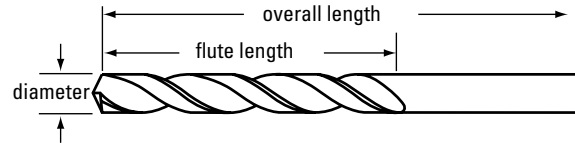
- ANSI SIZES
- CARBIDE SUBSTRATE
- HEAVY DUTY
- BRIGHT
- SHANK
- 118° 4-FACET
- LOW-HELIX

APPLICATIONS

- CAST IRON
- NON-FERROUS MATERIALS
- STAINLESS STEEL



Style 1727 Bright



Operating parameters on page 33.

Run at 2-3 times sfm for HSS drills.

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Drill Diameter Fractional	Wire	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number Uncoated
				in	mm	in	mm	
1/64		.0156	0.40	.250	6.35	1.250	31.75	C47464
	60	.0400	1.02	.625	15.88	1.500	38.10	C47499
	53	.0595	1.51	.750	19.05	1.500	38.10	C47517
1/16		.0625	1.59	.750	19.05	1.500	38.10	C47519
	52	.0635	1.61	.750	19.05	1.500	38.10	C47521
	51	.0670	1.70	.750	19.05	1.500	38.10	C47524
5/64		.0700	1.78	.875	22.23	1.750	44.45	C47526
		.0781	1.98	.875	22.23	1.750	44.45	C47533
	44	.0860	2.18	1.000	25.40	2.000	50.80	C47541
3/32		.0935	2.37	1.000	25.40	2.000	50.80	C47547
		.0938	2.38	1.000	25.40	2.000	50.80	C47548
	41	.0960	2.44	1.000	25.40	2.000	50.80	C47550
7/64		.0980	2.49	1.000	25.40	2.000	50.80	C47552
		.1040	2.64	1.250	31.75	2.250	57.15	C47557
	40	.1094	2.78	1.250	31.75	2.250	57.15	C47561
1/8		.1130	2.87	1.250	31.75	2.250	57.15	C47565
		.1250	3.18	1.250	31.75	2.250	57.15	C47571
	30	.1285	3.26	1.250	31.75	2.250	57.15	C47574
9/64		.1406	3.57	1.375	34.93	2.500	63.50	C47580
		.1440	3.66	1.375	34.93	2.500	63.50	C47582
	27	.1562	3.97	1.375	34.93	2.500	63.50	C47591
5/32		.1590	4.04	1.375	34.93	2.500	63.50	C47594
		.1660	4.22	1.625	41.28	2.750	69.85	C47598
	19	.1719	4.37	1.625	41.28	2.750	69.85	C47602
11/64		.1770	4.50	1.625	41.28	2.750	69.85	C47605
		.1875	4.76	1.625	41.28	2.750	69.85	C47613
	10	.1935	4.91	1.625	41.28	2.750	69.85	C47618
13/64		.2010	5.11	1.750	44.45	3.000	76.20	C47623
		.2031	5.16	1.750	44.45	3.000	76.20	C47624
	6	.2040	5.18	1.750	44.45	3.000	76.20	C47625
7/32		.2055	5.22	1.750	44.45	3.000	76.20	C47627
		.2188	5.56	1.750	44.45	3.000	76.20	C47634
	5	.2344	5.95	2.000	50.80	3.000	76.20	C47642
15/64		.2500	6.35	2.000	50.80	3.250	82.55	C47648
		.2812	7.14	2.188	55.56	3.500	88.90	C47662
	9/32	.3125	7.94	2.375	60.33	3.750	95.25	C47671
5/16		.3281	8.33	2.500	63.50	4.000	101.60	C47677
		.3438	8.73	2.500	63.50	4.000	101.60	C47682
	21/64							
11/32								

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Solid Carbide and Carbide-Tipped

Style 1727 • Solid Carbide Heavy-Duty Jobber Length (continued)

Drill Diameter Fractional Wire	Decimal Equiv.	Metric Equiv.	Flute Length in mm	Overall Length in mm	Order Number Uncoated
3/8	.3750	9.53	2.750 69.85	4.250 107.95	C47694
27/64	.4219	10.72	2.875 73.03	4.500 114.30	C47705
7/16	.4375	11.11	2.875 73.03	4.500 114.30	C47708
1/2	.5000	12.70	3.000 76.20	4.750 120.65	C47718

Style 2727 • Carbide-Tipped Jobber Length

FEATURES

- ANSI SIZES**
- CARBIDE-TIPPED HSS**
- HEAVY DUTY**
- BRIGHT**
- SHANK**
- 118°**
- 30°**

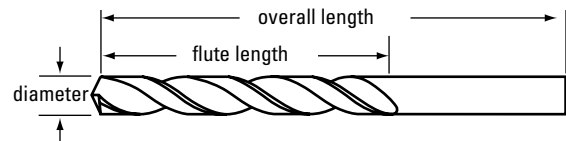
APPLICATIONS

- LOW CARBON STEEL**
- NON-FERROUS MATERIALS**
- CAST IRON**



Style 2727 Bright

- Run at carbide speeds.
- HSS shank and body for extra strength.



Operating parameters on page 33.

Drill Diameter fract wire/letter	Decimal Equiv.	Metric Equiv.	Flute Length in mm	Overall Length in mm	Order Number
1/8	.1250	3.18	1.625 41.28	2.750 69.85	C48655
9/64	.1406	3.57	1.750 44.45	2.875 73.03	C48664
5/32	.1562	3.97	2.000 50.80	3.125 79.38	C48675
18	.1695	4.31	2.125 53.98	3.250 82.55	C48685
11/64	.1719	4.37	2.125 53.98	3.250 82.55	C48686
3/16	.1875	4.76	2.313 58.74	3.500 88.90	C48697
7	.2010	5.11	2.438 61.91	3.625 92.08	C48707
13/64	.2031	5.16	2.438 61.91	3.625 92.08	C48708
7/32	.2188	5.56	2.500 63.50	3.750 95.25	C48718
15/64	.2344	5.95	2.625 66.68	3.875 98.43	C48727
1/4	.2500	6.35	2.750 69.85	4.000 101.60	C48736
F	.2570	6.53	2.875 73.03	4.125 104.78	C48740
17/64	.2656	6.75	2.875 73.03	4.125 104.78	C48744
9/32	.2812	7.14	2.938 74.61	4.250 107.95	C48758
19/64	.2969	7.54	3.063 77.79	4.375 111.13	C48762
5/16	.3125	7.94	3.188 80.96	4.500 114.30	C48769
P	.3230	8.20	3.313 84.14	4.625 117.48	C48774
21/64	.3281	8.33	3.313 84.14	4.625 117.48	C48777
11/32	.3438	8.73	3.438 87.31	4.750 120.65	C48784
23/64	.3594	9.13	3.500 88.90	4.875 123.83	C48792
3/8	.3750	9.53	3.625 92.08	5.000 127.00	C48799
25/64	.3906	9.92	3.750 95.25	5.125 130.18	C48807
13/32	.4062	10.32	3.875 98.43	5.250 133.35	C48812
27/64	.4219	10.72	3.938 100.01	5.375 136.53	C48815
7/16	.4375	11.11	4.063 103.19	5.500 139.70	C48818
15/32	.4688	11.91	4.313 109.54	5.750 146.05	C48823
1/2	.5000	12.70	4.500 114.30	6.000 152.40	C48828



DRILLING
 HOLE FINISHING
 THREADING
 MILLING
 OTHER TOOLS

Jobber Length

Styles 2011 • Heavy-Duty Cotter Pin Jobber Length

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

FEATURES

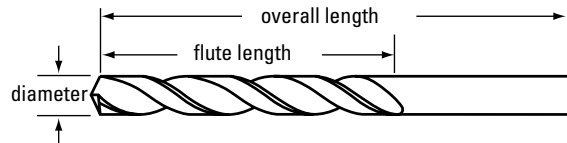
- ANSI SIZES**
- HSS SUBSTRATE**
- HEAVY DUTY**
- STEAM OXIDE**
- SHANK**
- 135° SPLIT**
- 30°**

APPLICATIONS

- ALLOY-TOOL STEEL**
- FREE-MACH STAINLESS**
- CAST IRON**



Style 2011 Black Oxide



Point penetrates more easily.

Constant parallel web for easy regrinds.

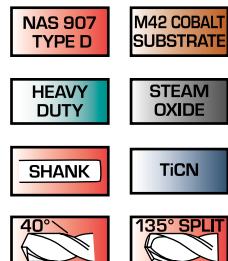
Operating parameters shown on page 32.

Drill Diameter Fract	Wire/Let	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number
				in	mm	in	mm	
	80	.0135	0.34	.125	3.18	.750	19.05	C02593
	54	.0550	1.40	.875	22.23	1.875	47.63	C02646
1/16		.0625	1.59	.875	22.23	1.875	47.63	C02652
	52	.0635	1.61	1.000	25.40	1.875	47.63	C02654
	50	.0700	1.78	1.000	25.40	2.000	50.80	C02659
5/64		.0781	1.98	1.000	25.40	2.000	50.80	C02666
	47	.0785	1.99	1.000	25.40	2.000	50.80	C02667
	45	.0820	2.08	1.125	28.58	2.125	53.98	C02671
3/32		.0938	2.38	1.250	31.75	2.250	57.15	C02681
	40	.0980	2.49	1.375	34.93	2.375	60.33	C02685
	37	.1040	2.64	1.438	36.53	2.500	63.50	C02690
7/64		.1094	2.78	1.500	38.10	2.625	66.68	C02694
	32	.1160	2.95	1.625	41.28	2.750	69.85	C02700
	31	.1200	3.05	1.625	41.28	2.750	69.85	C02702
1/8		.1250	3.18	1.625	41.28	2.750	69.85	C02704
	30	.1285	3.26	1.625	41.28	2.750	69.85	C02707
	29	.1360	3.45	1.750	44.45	2.875	73.03	C02710
9/64		.1406	3.57	1.750	44.45	2.875	73.03	C02713
	25	.1495	3.80	1.875	47.63	3.000	76.20	C02719
5/32		.1562	3.97	2.000	50.80	3.125	79.38	C02724
11/64		.1719	4.37	2.000	50.80	3.125	79.38	C02735
3/16		.1875	4.76	2.313	58.74	3.500	88.90	C02746
7/32		.2188	5.56	2.500	63.50	3.750	95.25	C02767
15/64		.2344	5.95	2.625	66.68	3.875	98.43	C02776
1/4	E	.2500	6.35	2.750	69.85	4.000	101.60	C02785
9/32		.2812	7.14	2.938	74.61	4.250	107.95	C02807
19/64		.2969	7.54	3.063	77.79	4.375	111.13	C02811
5/16		.3125	7.94	3.188	80.96	4.500	114.30	C02818
11/32		.3438	8.73	3.188	80.96	4.750	120.65	C02833
3/8		.3750	9.53	3.625	92.08	5.000	127.00	C02848
13/32		.4062	10.32	3.875	98.43	5.250	133.35	C02861
7/16		.4375	11.11	4.063	103.19	5.500	139.70	C02867
15/32		.4688	11.91	4.313	109.54	5.750	146.05	C02872
1/2		.5000	12.70	4.500	114.30	6.000	152.40	C02877

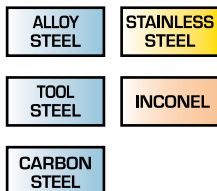


Styles 3780, 3780TC • Short Flute Jobber Length Type D AMD

FEATURES

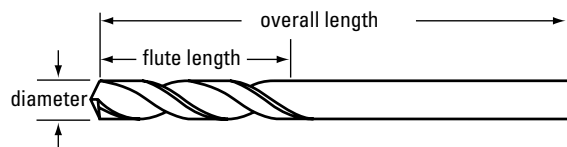


APPLICATIONS



Operating parameters on page 32.

- High helix for efficient chip removal.
- Extra heavy web for improved rigidity.
- Preferred point for work-hardening stainless.



Drill Diameter Fract	Wire/Let	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number	
				in	mm	in	mm	Steam Oxide	TiCN
	60	.0400	1.02	.500	12.70	1.625	41.28	C15880	C19880
	59	.0410	1.04	.500	12.70	1.625	41.28	C15881	–
	58	.0420	1.07	.500	12.70	1.625	41.28	C15882	C19882
	57	.0430	1.09	.500	12.70	1.750	44.45	C15883	–
	56	.0465	1.18	.500	12.70	1.750	44.45	C15884	–
3/64		.0469	1.19	.500	12.70	1.750	44.45	C15885	C19885
	55	.0520	1.32	.625	15.88	1.750	44.45	C15886	–
	54	.0550	1.40	.625	15.88	1.875	47.63	C15887	–
	53	.0595	1.51	.625	15.88	1.875	47.63	C15888	–
1/16		.0625	1.59	.625	15.88	1.875	47.63	C15889	C19889
	52	.0635	1.61	.688	17.46	1.875	47.63	C15890	C19890
	51	.0670	1.70	.688	17.46	2.000	50.80	C15891	–
	50	.0700	1.78	.688	17.46	2.000	50.80	C15892	C19892
	49	.0730	1.85	.688	17.46	2.000	50.80	C15893	–
	48	.0760	1.93	.688	17.46	2.000	50.80	C15894	–
5/64		.0781	1.98	.688	17.46	2.000	50.80	C15895	C19895
	47	.0785	1.99	.688	17.46	2.000	50.80	C15896	C19896
	46	.0810	2.06	.750	19.05	2.125	53.98	C15897	–
	45	.0820	2.08	.750	19.05	2.125	53.98	C15898	–
	44	.0860	2.18	.750	19.05	2.125	53.98	C15899	–
	43	.0890	2.26	.750	19.05	2.250	57.15	C15900	C19900
	42	.0935	2.37	.750	19.05	2.250	57.15	C15901	C19901
3/32		.0938	2.38	.750	19.05	2.250	57.15	C15902	C19902
	41	.0960	2.44	.813	20.64	2.375	60.33	C15903	C19903
	40	.0980	2.49	.813	20.64	2.375	60.33	C15904	C19904
	39	.0995	2.53	.813	20.64	2.375	60.33	C15905	–
	38	.1015	2.58	.813	20.64	2.500	63.50	C15906	–
	37	.1040	2.64	.813	20.64	2.500	63.50	C15907	–
	36	.1065	2.71	.813	20.64	2.500	63.50	C15908	–
7/64		.1094	2.78	.813	20.64	2.625	66.68	C15909	C19909
	35	.1100	2.79	.875	22.23	2.625	66.68	C15910	–
	34	.1110	2.82	.875	22.23	2.625	66.68	C15911	–
	33	.1130	2.87	.875	22.23	2.625	66.68	C15912	–
	32	.1160	2.95	.875	22.23	2.750	69.85	C15913	–

continued on next page

Q-AMD™ Aircraft Maintenance

Styles 3780, 3780TC • Short Flute Jobber Length Type D AMD (continued)

Drill Diameter Fract	Wire/Let	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number		
				in	mm	in	mm	Steam Oxide	TiCN	
1/8	31	.1200	3.05	.875	22.23	2.750	69.85	C15914	–	
		.1250	3.18	.875	22.23	2.750	69.85	C15915	C19915	
	30	.1285	3.26	.938	23.81	2.750	69.85	C15916	C19916	
9/64	29	.1360	3.45	.938	23.81	2.875	73.03	C15917	C19917	
		28	.1405	3.57	.938	23.81	2.875	73.03	C15918	–
		.1406	3.57	.938	23.81	2.875	73.03	C15919	C19919	
5/32	27	.1440	3.66	1.000	25.40	3.000	76.20	C15920	C19920	
	26	.1470	3.73	1.000	25.40	3.000	76.20	C15921	C19921	
	25	.1495	3.80	1.000	25.40	3.000	76.20	C15922	C19922	
	24	.1520	3.86	1.000	25.40	3.125	79.38	C15923	–	
	23	.1540	3.91	1.000	25.40	3.125	79.38	C15924	–	
		.1562	3.97	1.000	25.40	3.125	79.38	C15925	C19925	
11/64	22	.1570	3.99	1.063	26.99	3.125	79.38	C15926	–	
	21	.1590	4.04	1.063	26.99	3.250	82.55	C15927	C19927	
	20	.1610	4.09	1.063	26.99	3.250	82.55	C15928	C19928	
	19	.1660	4.22	1.063	26.99	3.250	82.55	C15929	C19929	
	18	.1695	4.31	1.063	26.99	3.250	82.55	C15930	C19930	
		.1719	4.37	1.063	26.99	3.250	82.55	C15931	C19931	
3/16	17	.1730	4.39	1.125	28.58	3.375	85.73	C15932	–	
	16	.1770	4.50	1.125	28.58	3.375	85.73	C15933	C19933	
	15	.1800	4.57	1.125	28.58	3.375	85.73	C15934	–	
	14	.1820	4.62	1.125	28.58	3.375	85.73	C15935	–	
	13	.1850	4.70	1.125	28.58	3.500	88.90	C15936	–	
		.1875	4.76	1.125	28.58	3.500	88.90	C15937	C19937	
7/32	12	.1890	4.80	1.188	30.16	3.500	88.90	C15938	–	
	11	.1910	4.85	1.188	30.16	3.500	88.90	C15939	C19939	
	10	.1935	4.91	1.188	30.16	3.625	92.08	C15940	C19940	
	9	.1960	4.98	1.188	30.16	3.625	92.08	C15941	–	
	8	.1990	5.05	1.188	30.16	3.625	92.08	C15942	C19942	
	7	.2010	5.11	1.188	30.16	3.625	92.08	C15943	–	
13/64	6	.2031	5.16	1.188	30.16	3.625	92.08	C15944	C19944	
		.2040	5.18	1.250	31.75	3.750	95.25	C15945	–	
	5	.2055	5.22	1.250	31.75	3.750	95.25	C15946	–	
	4	.2090	5.31	1.250	31.75	3.750	95.25	C15947	–	
	3	.2130	5.41	1.250	31.75	3.750	95.25	C15948	–	
		.2188	5.56	1.250	31.75	3.750	95.25	C15949	C19949	
15/64	2	.2210	5.61	1.313	33.34	3.875	98.43	C15950	–	
	1	.2280	5.79	1.313	33.34	3.875	98.43	C15951	C19951	
	A	.2340	5.94	1.313	33.34	3.875	98.43	C15952	–	
		.2344	5.95	1.313	33.34	3.875	98.43	C15953	C19953	
	B	.2380	6.05	1.375	34.93	4.000	101.60	C15954	–	
	C	.2420	6.15	1.375	34.93	4.000	101.60	C15955	C19955	
1/4	D	.2460	6.25	1.375	34.93	4.000	101.60	C15956	C19956	
	E	.2500	6.35	1.375	34.93	4.000	101.60	C15957	C19957	
	F	.2570	6.53	1.438	36.51	4.125	104.78	C15958	C19958	
	G	.2610	6.63	1.438	36.51	4.125	104.78	C15959	C19959	
	17/64		.2656	6.75	1.438	36.51	4.125	104.78	C15960	C19960
	H	.2660	6.76	1.500	38.10	4.125	104.78	C15961	–	
9/32	I	.2720	6.91	1.500	38.10	4.125	104.78	C15962	C19962	
	J	.2770	7.04	1.500	38.10	4.125	104.78	C15963	–	
	K	.2810	7.14	1.500	38.10	4.250	107.95	C15964	–	
		.2812	7.14	1.500	38.10	4.250	107.95	C15965	C19965	

continued on next page



Q-AMD™ Aircraft Maintenance**Styles 3780, 3780TC • Short Flute Jobber Length Type D AMD (continued)**

Drill Fract	Diameter Wire/Let	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number	
				in	mm	in	mm	Steam Oxide	TiCN
	L	.2900	7.37	1.563	39.69	4.250	107.95	C15966	–
	M	.2950	7.49	1.563	39.69	4.375	111.13	C15967	–
19/64		.2969	7.54	1.563	39.69	4.375	111.13	C15968	C19968
	N	.3020	7.67	1.625	41.28	4.375	111.13	C15969	C19969
5/16		.3125	7.94	1.625	41.28	4.500	114.30	C15970	C19970
	O	.3160	8.03	1.688	42.86	4.500	114.30	C15971	C19971
	P	.3230	8.20	1.688	42.86	4.625	117.48	C15972	–
21/64		.3281	8.33	1.688	42.86	4.625	117.48	C15973	–
	Q	.3320	8.43	1.688	42.86	4.750	120.65	C15974	C19974
	R	.3390	8.61	1.688	42.86	4.750	120.65	C15975	–
11/32		.3438	8.73	1.688	42.86	4.750	120.65	C15976	C19976
	S	.3480	8.84	1.750	44.45	4.875	123.83	C15977	–
	T	.3580	9.09	1.750	44.45	4.875	123.83	C15978	–
23/64		.3594	9.13	1.750	44.45	4.875	123.83	C15979	–
	U	.3680	9.35	1.813	46.04	5.000	127.00	C15980	–
3/8		.3750	9.53	1.813	46.04	5.000	127.00	C15981	C19981
	V	.3770	9.58	1.875	47.63	5.000	127.00	C15982	–
	W	.3860	9.80	1.875	47.63	5.125	130.18	C15983	–
25/64		.3906	9.92	1.875	47.63	5.125	130.18	C15984	–
	X	.3970	10.08	1.938	49.21	5.125	130.18	C15985	–
	Y	.4040	10.26	1.938	49.21	5.250	133.35	C15986	–
13/32		.4062	10.32	1.938	49.21	5.250	133.35	C15987	C19987
	Z	.4130	10.49	2.000	50.80	5.250	133.35	C15988	–
27/64		.4219	10.72	2.000	50.80	5.375	136.53	C15989	–
7/16		.4375	11.11	2.063	52.39	5.500	139.70	C15990	–
29/64		.4531	11.51	2.125	53.98	5.625	142.88	C15991	–
15/32		.4688	11.91	2.125	53.98	5.750	146.05	C15992	–
31/64		.4844	12.30	2.188	55.56	5.875	149.23	C15993	–
1/2		.5000	12.70	2.250	57.15	6.000	152.40	C15994	C19994
33/64		.5156	13.10	2.500	63.50	6.625	168.28	C15995	–
17/32		.5312	13.49	2.500	63.50	6.625	168.28	C15996	–
9/16		.5625	14.29	2.500	63.50	6.625	168.28	C15997	–
5/8		.6250	15.88	2.750	69.85	7.125	168.28	C15998	–

Sets

No. of Pieces	Drill Style	Finish	Size Range	Set Order Number
15	3780	steam oxide	1/16" through 1/2" x 1/32"	C14495
29	3780	steam oxide	1/16" through 1/2" x 1/64"	C14499
26	3780	steam oxide	letter A through letter Z	C14496
40	3780	steam oxide	#1 through #40	C14500
60	3780	steam oxide	#1 through #60	C14497
115	3780	steam oxide	1/16" through 1/2" x 1/64", A through Z, #1 through #60	C14498

Q-AMD™ Aircraft Maintenance

Style 3780-6 • Short Flute 6" Overall Length AMD

DRILLING

FEATURES

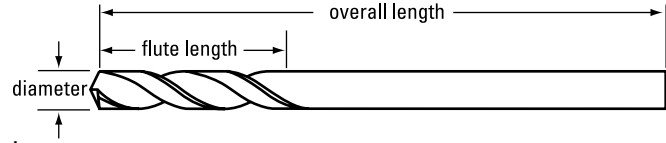
ANSI SIZES
M42 COBALT SUBSTRATE
HEAVY DUTY
STEAM OXIDE
SHANK
TiCN
40°
135° SPLIT

APPLICATIONS

ALLOY STEEL
STAINLESS STEEL
TOOL STEEL
INCONEL
CARBON STEEL



Style 3780 Steam Oxide



HOLE FINISHING

Operating parameters on page 32.

- High helix for efficient chip removal.
- Extra heavy web for improved rigidity.
- Preferred point for work-hardening stainless.

THREADING

Drill Diameter Wire	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number uncoated
			in	mm	in	mm	
50	.0700	1.78	.688	17.46	6.000	152.40	C19800
40	.0980	2.49	.813	20.64	6.000	152.40	C19812
30	.1285	3.26	.938	23.81	6.000	152.40	C19824
29	.1360	3.45	.938	23.81	6.000	152.40	C19825
26	.1470	3.73	1.000	25.40	6.000	152.40	C19829
21	.1590	4.04	1.063	26.99	6.000	152.40	C19835
20	.1610	4.09	1.063	26.99	6.000	152.40	C19836
19	.1660	4.22	1.063	26.99	6.000	152.40	C19837
16	.1770	4.50	1.125	28.58	6.000	152.40	C19841
13	.1850	4.70	1.125	28.58	6.000	152.40	C19844
11	.1910	4.85	1.188	30.16	6.000	152.40	C19847
10	.1935	4.91	1.188	30.16	6.000	152.40	C19848
9	.1960	4.98	1.188	30.16	6.000	152.40	C19849
8	.1990	5.05	1.188	30.16	6.000	152.40	C19850

MILLING

OTHER TOOLS



Style 2228 • General Purpose Jobber Length

FEATURES

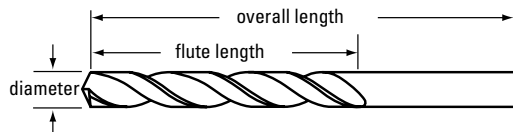
NAS 907 TYPE A	HSS SUBSTRATE
DIN 338	BRIGHT
GENERAL PURPOSE	118° SPLIT
SHANK	30°

APPLICATIONS

MED CARBON STEEL	STAINLESS STEEL
LOW CARBON STEEL	MAGNESIUM
ALUMINUM	



Style 2228 Bright



Split point for reduced thrust and easy penetration.

Operating parameters on page 32.

Drill Diameter Frac	Wire Met	Dec Equiv.	Metric Equiv.	Flute Length in	mm	Overall Length in	mm	Order Number
1/16		.0625	1.59	.875	22.23	1.875	47.63	C73400
	1.6	.0630	1.60	.787	20.00	1.693	43.00	C73550
	52	.0635	1.61	.875	22.23	1.875	47.63	C73480
	1.7	.0669	1.70	.787	20.00	1.693	43.00	C73551
	51	.0670	1.70	1.000	25.40	2.000	50.80	C73479
	50	.0700	1.78	1.000	25.40	2.000	50.80	C73478
	1.8	.0709	1.80	.866	22.00	1.811	46.00	C73552
	49	.0730	1.85	1.000	25.40	2.000	50.80	C73477
	1.9	.0748	1.90	.866	22.00	1.811	46.00	C73553
	48	.0760	1.93	1.000	25.40	2.000	50.80	C73476
5/64		.0781	1.98	1.000	25.40	2.000	50.80	C73401
	47	.0785	1.99	1.000	25.40	2.000	50.80	C73475
	2.0	.0787	2.00	.945	24.00	1.929	49.00	C73554
	46	.0810	2.06	1.125	28.58	2.125	53.98	C73474
	45	.0820	2.08	1.125	28.58	2.125	53.98	C73473
	2.1	.0827	2.10	.945	24.00	1.929	49.00	C73555
	44	.0860	2.18	1.125	28.58	2.125	53.98	C73472
	2.2	.0866	2.20	1.063	27.00	2.087	53.00	C73556
	43	.0890	2.26	1.250	31.75	2.250	57.15	C73471
	2.3	.0906	2.30	1.063	27.00	2.087	53.00	C73557
	42	.0935	2.37	1.250	31.75	2.250	57.15	C73470
3/32		.0938	2.38	1.250	31.75	2.250	57.15	C73402
	2.4	.0945	2.40	1.181	30.00	2.244	57.00	C73558
	41	.0960	2.44	1.375	34.93	2.375	60.33	C73469
	40	.0980	2.49	1.375	34.93	2.375	60.33	C73468
	2.5	.0984	2.50	1.181	30.00	2.244	57.00	C73559
	39	.0995	2.53	1.375	34.93	2.375	60.33	C73467
	38	.1015	2.58	1.438	36.51	2.500	63.50	C73466
	2.6	.1024	2.60	1.181	30.00	2.244	57.00	C73560
	37	.1040	2.64	1.438	36.51	2.500	63.50	C73465
	2.7	.1063	2.70	1.299	33.00	2.402	61.00	C73561
	36	.1065	2.71	1.438	36.51	2.500	63.50	C73464
7/64		.1094	2.78	1.500	38.10	2.625	66.68	C73403
	35	.1100	2.79	1.500	38.10	2.625	66.68	C73463

Drill Diameter Frac	Wire Met	Dec Equiv.	Metric Equiv.	Flute Length in	mm	Overall Length in	mm	Order Number
	2.8	.1102	2.80	1.299	33.00	2.402	61.00	C73562
	34	.1110	2.82	1.500	38.10	2.625	66.68	C73462
	33	.1130	2.87	1.500	38.10	2.625	66.68	C73461
	2.9	.1142	2.90	1.299	33.00	2.402	61.00	C73563
	32	.1160	2.95	1.625	41.28	2.750	69.85	C73460
	3.0	.1181	3.00	1.299	33.00	2.402	61.00	C73564
	31	.1200	3.05	1.625	41.28	2.750	69.85	C73459
	3.1	.1220	3.10	1.417	36.00	2.559	65.00	C73565
1/8		.1250	3.18	1.625	41.28	2.750	69.85	C73404
	3.2	.1260	3.20	1.417	36.00	2.559	65.00	C73566
	30	.1285	3.26	1.625	41.28	2.750	69.85	C73458
	3.3	.1299	3.30	1.417	36.00	2.559	65.00	C73567
	3.4	.1339	3.40	1.535	39.00	2.756	70.00	C73568
	29	.1360	3.45	1.750	44.45	2.875	73.03	C73457
	3.5	.1378	3.50	1.535	39.00	2.756	70.00	C73569
	28	.1405	3.57	1.750	44.45	2.875	73.03	C73456
9/64		.1406	3.57	1.750	44.45	2.875	73.03	C73405
	3.6	.1417	3.60	1.535	39.00	2.756	70.00	C73570
	27	.1440	3.66	1.875	47.63	3.000	76.20	C73455
	3.7	.1457	3.70	1.535	39.00	2.756	70.00	C73571
	26	.1470	3.73	1.875	47.63	3.000	76.20	C73454
	25	.1495	3.80	1.875	47.63	3.000	76.20	C73453
	3.8	.1496	3.80	1.693	43.00	2.953	75.00	C73572
	24	.1520	3.86	2.000	50.80	3.125	79.38	C73452
	3.9	.1535	3.90	1.693	43.00	2.953	75.00	C73573
	23	.1540	3.91	2.000	50.80	3.125	79.38	C73451
5/32		.1562	3.97	2.000	50.80	3.125	79.38	C73406
	22	.1570	3.99	2.000	50.80	3.125	79.38	C73450
	4.0	.1575	4.00	1.693	43.00	2.953	75.00	C73574
	21	.1590	4.04	2.125	53.98	3.250	82.55	C73449
	20	.1610	4.09	2.125	53.98	3.250	82.55	C73448
	4.1	.1614	4.10	1.693	43.00	2.953	75.00	C73575
	4.2	.1654	4.20	1.693	43.00	2.953	75.00	C73576
	19	.1660	4.22	2.125	53.98	3.250	82.55	C73447

continued on next page

DRILLING
HOLE FINISHING
THREADING
MILLING
OTHER TOOLS

Aircraft NAS 907 Rev. 14 Type A

Style 2228 • General Purpose Jobber Length (continued)

DRILLING

Drill Diameter Frac	Wire Met	Dec Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number
				in	mm	in	mm	
18	4.3	.1693	4.30	1.850	47.00	3.150	80.00	C73577
		.1695	4.31	2.125	53.98	3.250	82.55	C73446
11/64		.1719	4.37	2.125	53.98	3.250	82.55	C73407
17		.1730	4.39	2.188	55.56	3.375	85.73	C73445
16	4.4	.1732	4.40	1.850	47.00	3.150	80.00	C73578
		.1770	4.50	2.188	55.56	3.375	85.73	C73444
15	4.5	.1772	4.50	1.850	47.00	3.150	80.00	C73579
		.1800	4.57	2.188	55.56	3.375	85.73	C73443
14	4.6	.1811	4.60	1.850	47.00	3.150	80.00	C73580
		.1820	4.62	2.188	55.56	3.375	85.73	C73442
3/16	13	.1850	4.70	2.313	58.74	3.500	88.90	C73441
		.1875	4.76	2.313	58.74	3.500	88.90	C73408
12		.1890	4.80	2.313	58.74	3.500	88.90	C73440
11	4.8	.1890	4.80	2.047	52.00	3.386	86.00	C73582
		.1910	4.85	2.313	58.74	3.500	88.90	C73439
10	4.9	.1929	4.90	2.047	52.00	3.386	86.00	C73583
		.1935	4.91	2.438	61.91	3.625	92.08	C73438
9		.1960	4.98	2.438	61.91	3.625	92.08	C73437
	5.0	.1969	5.00	2.047	52.00	3.386	86.00	C73584
8		.1990	5.05	2.438	61.91	3.625	92.08	C73436
	5.1	.2008	5.10	2.047	52.00	3.386	86.00	C73585
7		.2010	5.11	2.438	61.91	3.625	92.08	C73435
	13/64	.2031	5.16	2.438	61.91	3.625	92.08	C73409
6		.2040	5.18	2.500	63.50	3.750	95.25	C73434
	5.2	.2047	5.20	2.047	52.00	3.386	86.00	C73586
5		.2055	5.22	2.500	63.50	3.750	95.25	C73433
	5.3	.2087	5.30	2.047	52.00	3.386	86.00	C73587
4		.2090	5.31	2.500	63.50	3.750	95.25	C73432
	3	.2130	5.41	2.500	63.50	3.750	95.25	C73431
5.5		.2165	5.50	2.244	57.00	3.661	93.00	C73589
	7/32	.2188	5.56	2.500	63.50	3.750	95.25	C73410
5.6		.2205	5.60	2.244	57.00	3.661	93.00	C73590
	2	.2210	5.61	2.625	66.68	3.875	98.43	C73430
5.7		.2244	5.70	2.244	57.00	3.661	93.00	C73591
	1	.2280	5.79	2.625	66.68	3.875	98.43	C73429
5.8		.2283	5.80	2.244	57.00	3.661	93.00	C73592
	15/64	.2344	5.95	2.625	66.68	3.875	98.43	C73411
6.0		.2362	6.00	2.244	57.00	3.661	93.00	C73594
	6.1	.2402	6.10	2.480	63.00	3.976	101.00	C73595
6.2		.2441	6.20	2.480	63.00	3.976	101.00	C73596
	1/4	.2500	6.35	2.750	69.85	4.000	101.60	C73412
6.4		.2520	6.40	2.480	63.00	3.976	101.00	C73598

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Drill Diameter Frac	Wire Met	Dec Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number
				in	mm	in	mm	
6.5	.2559	6.50	2.480	63.00	3.976	101.00	C73599	
	6.6	.2598	6.60	2.480	63.00	3.976	101.00	C73600
17/64	.2656	6.75	2.875	73.03	4.125	104.78	C73413	
	6.8	.2677	6.80	2.717	69.00	4.291	109.00	C73602
7.0	.2756	7.00	2.717	69.00	4.291	109.00	C73604	
	.2812	7.14	2.938	74.61	4.250	107.95	C73414	
9/32	7.2	.2835	7.20	2.717	69.00	4.291	109.00	C73606
	7.4	.2913	7.40	2.717	69.00	4.291	109.00	C73608
7.5	.2953	7.50	2.717	69.00	4.291	109.00	C73609	
	19/64	.2969	7.54	3.063	77.79	4.375	111.13	C73415
7.9	.3110	7.90	2.953	75.00	4.606	117.00	C73613	
	5/16	.3125	7.94	3.188	80.96	4.500	114.30	C73416
8.0	.3150	8.00	2.953	75.00	4.606	117.00	C73614	
	8.1	.3189	8.10	2.953	75.00	4.606	117.00	C73615
21/64	.3281	8.33	3.313	84.14	4.625	117.48	C73417	
	8.5	.3346	8.50	2.953	75.00	4.606	117.00	C73619
11/32	.3438	8.73	3.438	87.31	4.750	120.65	C73418	
	8.8	.3465	8.80	3.189	81.00	4.921	125.00	C73622
9.0	.3543	9.00	3.189	81.00	4.921	125.00	C73624	
	23/64	.3594	9.13	3.500	88.90	4.875	123.83	C73419
9.5	.3740	9.50	3.189	81.00	4.921	125.00	C73629	
	3/8	.3750	9.53	3.625	92.08	5.000	127.00	C73420
25/64	.3906	9.92	3.750	95.25	5.125	130.18	C73421	
	10.0	.3937	10.00	3.425	87.00	5.236	133.00	C73634
10.2	.4016	10.20	3.425	87.00	5.236	133.00	C73636	
	13/32	.4063	10.32	3.875	98.43	5.250	133.35	C73422
10.5	.4134	10.50	3.425	87.00	5.236	133.00	C73639	
	27/64	.4219	10.72	3.938	100.01	5.375	136.53	C73423
10.8	.4252	10.80	3.701	94.00	5.591	142.00	C73642	
	11.0	.4331	11.00	3.701	94.00	5.591	142.00	C73644
7/16	.4375	11.11	4.063	103.19	5.500	139.70	C73424	
	11.2	.4409	11.20	3.701	94.00	5.591	142.00	C73646
11.5	.4528	11.50	3.701	94.00	5.591	142.00	C73649	
	29/64	.4531	11.51	4.188	106.36	5.625	142.88	C73425
11.8	.4646	11.80	3.701	94.00	5.591	142.00	C73652	
	15/32	.4688	11.91	4.313	109.54	5.750	146.05	C73426
12.0	.4724	12.00	3.976	101.00	5.945	151.00	C73654	
	12.2	.4803	12.20	3.976	101.00	5.945	151.00	C73656
31/64	.4844	12.30	4.375	111.13	5.875	149.23	C73427	
	12.5	.4921	12.50	3.976	101.00	5.945	151.00	C73659
1/2	.5000	12.70	4.500	114.30	6.000	152.40	C73428	
	13.0	.5118	13.00	3.976	101.00	5.945	151.00	C73660



Styles 3957-6, 3957-12 • 6" and 12" Extended Length

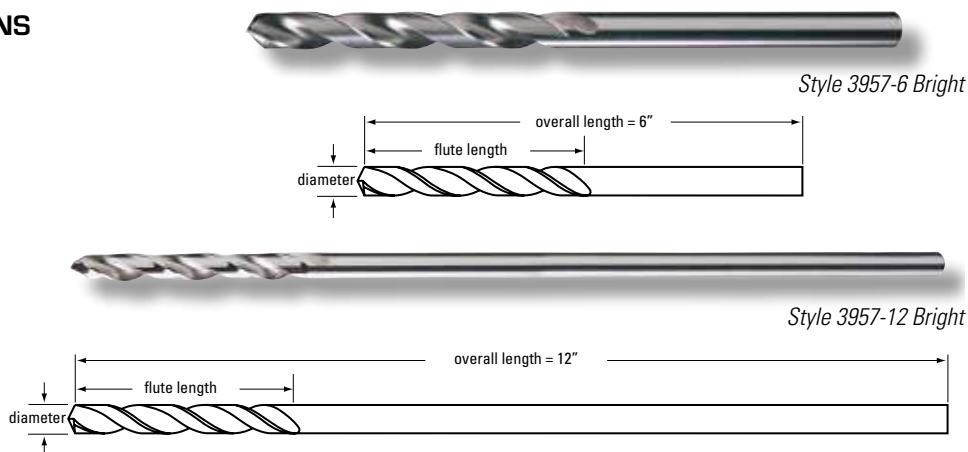
FEATURES


NAS 907 TYPE A	HSS SUBSTRATE
HEAVY DUTY	BRIGHT
SHANK	135° SPLIT
	30°

APPLICATIONS

FREE-MACH STAINLESS
CARBON STEEL
NON-FERROUS MATERIALS
ALUMINUM

Operating parameters shown on page 30.



 Ideal for long reach applications.

Drill Diameter Fract Wire/Let	Decimal Equiv.	Metric Equiv.	Flute Length		Order Number		
			in	mm	6" OAL (152.4mm)	12" OAL (304.8mm)	
3/64	.0469	1.19	.750	19.05	C13100	—	
1/16	.0625	1.59	.875	22.23	C13101	C13176	
	52	.0635	1.61	.875	22.23	C13174	—
	51	.0670	1.70	1.000	25.40	C13173	—
	50	.0700	1.78	1.000	25.40	C13172	—
	49	.0730	1.85	1.000	25.40	C13171	—
	48	.0760	1.93	1.000	25.40	C13170	—
5/64	.0781	1.98	1.000	25.40	C13102	C13177	
	47	.0785	1.99	1.125	28.58	C13169	—
	46	.0810	2.06	1.125	28.58	C13168	—
	45	.0820	2.08	1.125	28.58	C13167	—
	44	.0860	2.18	1.250	31.75	C13166	—
	43	.0890	2.26	1.250	31.75	C13165	—
	42	.0935	2.37	1.250	31.75	C13164	—
3/32	.0938	2.38	1.250	31.75	C13103	C13178	
	41	.0960	2.44	1.375	34.93	C13163	—
	40	.0980	2.49	1.375	34.93	C13162	C13244
	39	.0995	2.53	1.375	34.93	C13161	C13243
	38	.1015	2.58	1.438	36.51	C13160	—
	37	.1040	2.64	1.438	36.51	C13159	—
	36	.1065	2.71	1.438	36.51	C13158	—
7/64	.1094	2.78	1.500	38.10	C13104	C13179	
	35	.1100	2.79	1.500	38.10	C13157	—
	34	.1110	2.82	1.500	38.10	C13156	—
	33	.1130	2.87	1.500	38.10	C13155	—
	32	.1160	2.95	1.625	41.28	C13154	—
	31	.1200	3.05	1.625	41.28	C13153	C13242
1/8	.1250	3.18	1.625	41.28	C13105	C13180	
	30	.1285	3.26	1.625	41.28	C13152	C13241
	29	.1360	3.45	1.750	44.45	C13151	C13240
	28	.1405	3.57	1.750	44.45	C13150	C13239
9/64	.1406	3.57	1.750	44.45	C13106	C13181	
	27	.1440	3.66	1.875	47.63	C13149	C13238
	26	.1470	3.73	1.875	47.63	C13148	C13237

continued on next page

DRILLING
HOLE FINISHING
THREADING
MILLING
OTHER TOOLS

Aircraft NAS 907 Rev. 14 Type B

Styles 3957-6, 3957-12 • 6" and 12" Extended Length (continued)

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Drill Diameter Fract	Wire/Let	Decimal Equiv.	Metric Equiv.	Flute Length		Order Number	
				in	mm	6" OAL (154.4mm)	12" OAL (304.8mm)
	25	.1495	3.80	1.875	47.63	C13147	C13236
	24	.1520	3.86	2.000	50.80	C13146	C13235
5/32	23	.1540	3.91	2.000	50.80	C13145	—
		.1562	3.97	2.000	50.80	C13107	C13182
	22	.1570	3.99	2.000	50.80	C13144	—
	21	.1590	4.04	2.125	53.98	C13143	C13234
	20	.1610	4.09	2.125	53.98	C13142	C13233
	19	.1660	4.22	2.125	53.98	C13141	C13232
11/64	18	.1695	4.31	2.125	53.98	C13140	—
		.1719	4.37	2.125	53.98	C13108	C13183
	17	.1730	4.39	2.188	55.56	C13139	—
	16	.1770	4.50	2.188	55.56	C13138	C13231
	15	.1800	4.57	2.188	55.56	C13137	C13230
	13	.1850	4.70	2.313	58.74	C13135	C13229
3/16		.1875	4.76	2.313	58.74	C13109	C13184
	12	.1890	4.80	2.313	58.74	C13134	C13228
	11	.1910	4.85	2.313	58.74	C13133	C13227
	10	.1935	4.91	2.438	61.91	C13132	C13226
	9	.1960	4.98	2.438	61.91	C13131	C13225
	8	.1990	5.05	2.438	61.91	C13130	C13224
13/64	7	.2010	5.11	2.438	61.91	C13129	C13223
		.2031	5.16	2.438	61.91	C13110	C13185
	6	.2040	5.18	2.500	63.50	C13128	C13222
	5	.2055	5.22	2.500	63.50	C13127	C13221
	4	.2090	5.31	2.500	63.50	C13126	—
	3	.2130	5.41	2.500	63.50	C13125	C13220
7/32		.2188	5.56	2.500	63.50	C13111	C13186
	2	.2210	5.61	2.625	66.68	C13124	C13219
	1	.2280	5.79	2.625	66.68	C13123	C13218
15/64		.2344	5.95	2.625	66.68	C13112	C13187
1/4	E	.2500	6.35	2.750	66.68	C13113	C13188
	F	.2570	6.53	2.875	73.03	C13122	—
17/64		.2656	6.75	2.625	66.68	—	C13189
9/32		.2812	7.14	3.063	77.79	C13114	C13190
19/64		.2969	7.54	3.063	77.79	—	C13191
5/16		.3125	7.94	3.188	80.96	C13115	C13192
21/64	0	.3160	8.03	3.438	87.31	—	C13211
		.3281	8.33	3.438	87.31	—	C13193
11/32		.3438	8.73	3.438	87.31	C13116	C13194
23/64		.3594	9.13	3.500	88.90	—	C13195
3/8		.3750	9.53	3.625	98.43	C13117	C13196
25/64		.3906	9.92	3.750	95.25	—	C13197
13/32		.4062	10.32	3.750	95.25	C13118	C13198
27/64		.4219	10.72	3.938	100.01	—	C13199
7/16		.4375	11.11	4.063	103.19	C13119	C13200
29/64		.4531	11.51	4.188	106.36	—	C13201
15/32		.4688	11.91	4.313	109.54	C13120	C13202
31/64		.4844	12.30	4.375	111.13	—	C13203
1/2		.5000	12.70	4.500	114.30	C13121	C13204




Style 2222 • Heavy-Duty Aircraft Jobber Length

FEATURES

NAS 907 TYPE B	HSS SUBSTRATE
HEAVY DUTY	BRIGHT
SHANK	135° SPLIT
	30°

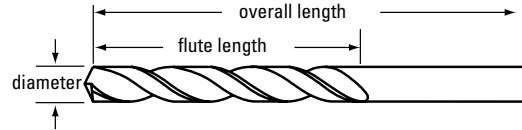
APPLICATIONS

STAINLESS STEEL	ALUMINUM
ALLOY STEEL	
CARBON STEEL	
IRON-BASED ALLOYS	

 Designed for tougher materials.



Style 2222 Bright



Operating parameters on page 32.

Drill Diameter	Decimal	Metric	Flute Length		Overall Length		Order Number
Fract Wire/Let	Equiv.	Equiv.	in	mm	in	mm	uncoated
3/64	.0469	1.19	.750	19.05	1.750	44.45	C11600
1/16	.0625	1.59	.875	22.23	1.875	47.63	C11601
	.0635	1.61	.875	22.23	1.875	47.63	C11706
	.0670	1.70	1.000	25.40	2.000	50.80	C11705
	.0700	1.78	1.000	25.40	2.000	50.80	C11704
	.0730	1.85	1.000	25.40	2.000	50.80	C11703
	.0760	1.93	1.000	25.40	2.000	50.80	C11702
5/64	.0781	1.98	1.000	25.40	2.000	50.80	C11602
	.0785	1.99	1.000	25.40	2.000	50.80	C11701
	.0810	2.06	1.125	28.58	2.125	53.98	C11700
	.0820	2.08	1.125	28.58	2.125	53.98	C11699
	.0860	2.18	1.125	28.58	2.125	53.98	C11698
	.0890	2.26	1.250	31.75	2.250	57.15	C11697
	.0935	2.37	1.250	31.75	2.250	57.15	C11696
3/32	.0938	2.38	1.250	31.75	2.250	57.15	C11603
	.0960	2.44	1.375	34.93	2.375	60.33	C11695
	.0980	2.49	1.375	34.93	2.375	60.33	C11694
	.0995	2.53	1.375	34.93	2.375	60.33	C11693
	.1015	2.58	1.438	36.51	2.500	63.50	C11692
	.1040	2.64	1.438	36.51	2.500	63.50	C11691
	.1065	2.71	1.438	36.51	2.500	63.50	C11690
7/64	.1094	2.78	1.500	38.10	2.625	66.68	C11604
	.1100	2.79	1.500	38.10	2.625	66.68	C11689
	.1110	2.82	1.500	38.10	2.625	66.68	C11688
	.1130	2.87	1.500	38.10	2.625	66.68	C11687
	.1160	2.95	1.625	41.28	2.750	69.85	C11686
	.1200	3.05	1.625	41.28	2.750	69.85	C11685
1/8	.1250	3.18	1.625	41.28	2.750	69.85	C11605
	.1285	3.26	1.625	41.28	2.750	69.85	C11684
	.1360	3.45	1.750	44.45	2.875	73.03	C11683
	.1405	3.57	1.750	44.45	2.875	73.03	C11682
9/64	.1406	3.57	1.750	44.45	2.875	73.03	C11606
	.1440	3.66	1.875	47.63	3.000	76.20	C11681
	.1470	3.73	1.875	47.63	3.000	76.20	C11680
	.1495	3.80	1.875	47.63	3.000	76.20	C11679
	.1520	3.86	2.000	50.80	3.125	79.38	C11678

continued on next page

Aircraft NAS 907 Rev. 14 Type B

Style 2222 • Heavy-Duty Aircraft Jobber Length (continued)

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Drill Diameter Fract	Wire/Let	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number uncoated
				in	mm	in	mm	
5/32	23	.1540	3.91	2.000	50.80	3.125	79.38	C11677
		.1562	3.97	2.000	50.80	3.125	79.38	C11607
	22	.1570	3.99	2.000	50.80	3.125	79.38	C11676
	21	.1590	4.04	2.125	53.98	3.250	82.55	C11675
	20	.1610	4.09	2.125	53.98	3.250	82.55	C11674
11/64	19	.1660	4.22	2.125	53.98	3.250	82.55	C11673
	18	.1695	4.31	2.125	53.98	3.250	82.55	C11672
		.1719	4.37	2.125	53.98	3.250	82.55	C11608
	17	.1730	4.39	2.188	55.56	3.375	85.73	C11671
	16	.1770	4.50	2.188	55.56	3.375	85.73	C11670
3/16	15	.1800	4.57	2.188	55.56	3.375	85.73	C11669
	14	.1820	4.62	2.188	55.56	3.375	85.73	C11668
	13	.1850	4.70	2.313	58.74	3.500	88.90	C11667
		.1875	4.76	2.313	58.74	3.500	88.90	C11609
	12	.1890	4.80	2.313	58.74	3.500	88.90	C11666
13/64	11	.1910	4.85	2.313	58.74	3.500	88.90	C11665
	10	.1935	4.91	2.438	61.91	3.625	92.08	C11664
	9	.1960	4.98	2.438	61.91	3.625	92.08	C11663
	8	.1990	5.05	2.438	61.91	3.625	92.08	C11662
	7	.2010	5.11	2.438	61.91	3.625	92.08	C11661
7/32	6	.2031	5.16	2.438	61.91	3.625	92.08	C11610
		.2040	5.18	2.500	63.50	3.750	95.25	C11660
	5	.2055	5.22	2.500	63.50	3.750	95.25	C11659
	4	.2090	5.31	2.500	63.50	3.750	95.25	C11658
	3	.2130	5.41	2.500	63.50	3.750	95.25	C11657
15/64	2	.2188	5.56	2.500	63.50	3.750	95.25	C11611
	1	.2210	5.61	2.625	66.68	3.875	98.43	C11656
	A	.2280	5.79	2.625	66.68	3.875	98.43	C11655
		.2340	5.94	2.625	66.68	3.875	98.43	C11630
	B	.2344	5.95	2.625	66.68	3.875	98.43	C11612
1/4	C	.2380	6.05	2.750	69.85	4.000	101.60	C11631
	D	.2420	6.15	2.750	69.85	4.000	101.60	C11632
	E	.2460	6.25	2.750	69.85	4.000	101.60	C11633
	F	.2500	6.35	2.750	69.85	4.000	101.60	C11613
	G	.2570	6.53	2.875	73.03	4.125	104.78	C11634
17/64	H	.2610	6.63	2.875	73.03	4.125	104.78	C11635
		.2656	6.75	2.875	73.03	4.125	104.78	C11614
	I	.2660	6.76	2.875	73.03	4.125	104.78	C11636
	J	.2720	6.91	2.875	73.03	4.125	104.78	C11637
	K	.2770	7.04	2.875	73.03	4.125	104.78	C11638
9/32	L	.2810	7.14	2.938	74.61	4.250	107.95	C11639
		.2812	7.14	2.938	74.61	4.250	107.95	C11615
	M	.2900	7.37	2.938	74.61	4.250	107.95	C11640
	N	.2950	7.49	3.063	77.79	4.375	111.13	C11641
	19/64		.2969	7.54	3.063	77.79	4.375	111.13
5/16	O	.3020	7.67	3.063	77.79	4.375	111.13	C11642
		.3125	7.94	3.188	80.96	4.500	114.30	C11617
	P	.3160	8.03	3.188	80.96	4.500	114.30	C11643
		.3230	8.20	3.188	80.96	4.625	117.48	C11644
	21/64		.3281	8.33	3.188	80.96	4.625	117.48

continued on next page



Style 2222 • Heavy-Duty Aircraft Jobber Length (continued)

Drill Diameter Fract	Wire/Let	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number uncoated
				in	mm	in	mm	
	Q	.3320	8.43	3.438	87.31	4.750	120.65	C11645
	R	.3390	8.61	3.438	87.31	4.750	120.65	C11646
11/32		.3438	8.73	3.438	87.31	4.750	120.65	C11619
	S	.3480	8.84	3.500	88.90	4.875	123.83	C11647
	T	.3580	9.09	3.500	88.90	4.875	123.83	C11648
23/64		.3594	9.13	3.500	88.90	4.875	123.83	C11620
	U	.3680	9.35	3.625	92.08	5.000	127.00	C11649
3/8		.3750	9.53	3.625	92.08	5.000	127.00	C11621
	V	.3770	9.58	3.625	92.08	5.000	127.00	C11650
	W	.3860	9.80	3.750	95.25	5.125	130.18	C11651
25/64		.3906	9.92	3.750	95.25	5.125	130.18	C11622
	X	.3970	10.08	3.750	95.25	5.125	130.18	C11652
	Y	.4040	10.26	3.875	98.43	5.250	133.35	C11653
13/32		.4062	10.32	3.875	98.43	5.250	133.35	C11623
	Z	.4130	10.49	3.875	98.43	5.250	133.35	C11654
27/64		.4219	10.72	3.938	100.01	5.375	136.53	C11624
7/16		.4375	11.11	4.063	103.19	5.500	139.70	C11625
29/64		.4531	11.51	4.188	106.36	5.625	142.88	C11626
15/32		.4688	11.91	4.313	109.54	5.750	146.05	C11627
31/64		.4844	12.30	4.375	111.13	5.875	149.23	C11628
1/2		.5000	12.70	4.500	114.30	6.000	152.40	C11629

Sets

No. of Pieces	Drill Style	Finish	Size Range	Set Order Number
29	2222	uncoated	1/16" through 1/2" x 1/64"	C70371

Aircraft NAS 907 Rev. 14 Type J

Style 2213 • Cobalt Heavy-Duty Jobber Length

DRILLING

FEATURES

NAS 907 TYPE J **M42 COBALT SUBSTRATE**

HEAVY DUTY **STRAW OXIDE**

SHANK **135° SPLIT**

90°

APPLICATIONS

ALUMINUM **TOOL STEEL**

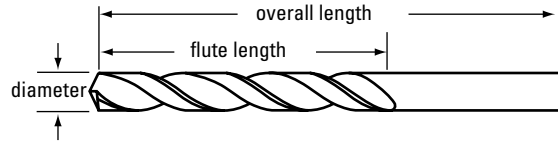
COPPER ALLOYS **DIE STEEL**

INCONEL **STRUCTURAL STEEL**

TITANIUM ALLOYS **PRECIP-HRD STAINLESS**



Style 2213 Straw Oxide



HOLE FINISHING

Operating parameters on page 32.

High red hardness for extended wear life in high heat conditions.

THREADING

MILLING

OTHER TOOLS

Fract	Drill Diameter		Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number
	Wire/Ltr	Metric			in	mm	in	mm	
	80		.0135	0.34	.125	3.18	.750	19.05	C70213
	79		.0145	0.37	.125	3.18	.750	19.05	C70212
1/64			.0156	0.40	.188	4.76	.750	19.05	C70000
	78		.0160	0.41	.188	4.76	.875	22.23	C70211
	77		.0180	0.46	.188	4.76	.875	22.23	C70210
	76		.0200	0.51	.188	4.76	.875	22.23	C70209
	75		.0210	0.53	.250	6.35	1.000	25.40	C70208
	74		.0225	0.57	.250	6.35	1.000	25.40	C70207
	73		.0240	0.61	.313	7.94	1.125	28.58	C70206
	72		.0250	0.64	.313	7.94	1.125	28.58	C70205
	71		.0260	0.66	.375	9.53	1.250	31.75	C70204
	70		.0280	0.71	.375	9.53	1.250	31.75	C70203
	69		.0292	0.74	.500	12.70	1.375	34.93	C70202
	68		.0310	0.79	.500	12.70	1.375	34.93	C70201
1/32			.0312	0.79	.500	12.70	1.375	34.93	C70001
	67		.0320	0.81	.500	12.70	1.375	34.93	C70200
	66		.0330	0.84	.500	12.70	1.375	34.93	C70199
	65		.0350	0.89	.625	15.88	1.500	38.10	C70198
	64		.0360	0.91	.625	15.88	1.500	38.10	C70197
	63		.0370	0.94	.625	15.88	1.500	38.10	C70196
	62		.0380	0.97	.625	15.88	1.500	38.10	C70195
	61		.0390	0.99	.688	17.46	1.625	41.28	C70194
		1.0	.0394	1.00	.472	12.00	1.339	34.00	C70057
	60		.0400	1.02	.688	17.46	1.625	41.28	C70193
	59		.0410	1.04	.688	17.46	1.625	41.28	C70192
	58		.0420	1.07	.688	17.46	1.625	41.28	C70191
	57		.0430	1.09	.750	19.05	1.750	44.45	C70190
		1.1	.0433	1.10	.551	14.00	1.417	36.00	C70058
	56		.0465	1.18	.750	19.05	1.750	44.45	C70189
3/64			.0469	1.19	.750	19.05	1.750	44.45	C70002
		1.2	.0472	1.20	.630	16.00	1.500	38.00	C70059
		1.3	.0512	1.30	.630	16.00	1.500	38.00	C70060
	55		.0520	1.32	.875	22.23	1.875	47.63	C70188
	54		.0550	1.40	.875	22.23	1.875	47.63	C70187
		1.4	.0551	1.40	.709	18.00	1.570	40.00	C70061
		1.5	.0591	1.50	.709	18.00	1.570	40.00	C70062

continued on next page



Style 2213 • Cobalt Heavy-Duty Jobber Length (continued)

Fract	Drill Diameter		Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number
	Wire/Ltr	Metric			in	mm	in	mm	
1/16	53		.0595	1.51	.875	22.23	1.875	47.63	C70186
			.0625	1.59	.875	22.23	1.875	47.63	C70003
	52	1.6	.0630	1.60	.787	20.00	1.690	43.00	C70063
			.0635	1.61	.875	22.23	1.875	47.63	C70185
	51	1.7	.0669	1.70	.787	20.00	1.690	43.00	C70064
			.0670	1.70	1.000	25.40	2.000	50.80	C70184
50	1.8	.0700	1.78	1.000	25.40	2.000	50.80	C70183	
		.0709	1.80	.866	22.00	1.810	46.00	C70065	
5/64	49	1.9	.0730	1.85	1.000	25.40	2.000	50.80	C70182
			.0748	1.90	.866	22.00	1.810	46.00	C70220
	48		.0760	1.93	1.000	25.40	2.000	50.80	C70181
			.0781	1.98	1.000	25.40	2.000	50.80	C70004
	47	2.0	.0785	1.99	1.000	25.40	2.000	50.80	C70180
			.0787	2.00	.945	24.00	1.930	49.00	C70067
46		.0810	2.06	1.125	28.58	2.125	53.98	C70179	
3/32	45	2.1	.0820	2.08	1.125	28.58	2.125	53.98	C70178
			.0827	2.10	.945	24.00	1.930	49.00	C70068
	44	2.2	.0860	2.18	1.125	28.58	2.125	53.98	C70177
			.0866	2.20	1.063	27.00	2.090	53.00	C70221
	43	2.3	.0890	2.26	1.250	31.75	2.250	57.15	C70176
			.0906	2.30	1.063	27.00	2.090	53.00	C70070
7/64	42	2.4	.0935	2.37	1.250	31.75	2.250	57.15	C70175
			.0938	2.38	1.250	31.75	2.250	57.15	C70005
	41	2.5	.0945	2.40	1.181	30.00	2.240	57.00	C70071
			.0960	2.44	1.375	34.93	2.375	60.33	C70174
	40	2.6	.0980	2.49	1.375	34.93	2.375	60.33	C70173
			.0984	2.50	1.181	30.00	2.240	57.00	C70072
1/8	39	2.7	.0995	2.53	1.375	34.93	2.375	60.33	C70172
			.1015	2.58	1.438	36.51	2.500	63.50	C70171
	38	2.8	.1024	2.60	1.181	30.00	2.240	57.00	C70073
			.1040	2.64	1.438	36.51	2.500	63.50	C70170
	37	2.9	.1063	2.70	1.299	33.00	2.400	61.00	C70074
			.1065	2.71	1.438	36.51	2.500	63.50	C70169
9/64	36	3.0	.1094	2.78	1.500	38.10	2.625	66.68	C70006
			.1100	2.79	1.500	38.10	2.625	66.68	C70168
	35	3.1	.1102	2.80	1.299	33.00	2.400	61.00	C70222
			.1110	2.82	1.500	38.10	2.625	66.68	C70167
	34	3.2	.1130	2.87	1.500	38.10	2.625	66.68	C70166
			.1142	2.90	1.299	33.00	2.400	61.00	C70076
1/4	33	3.3	.1160	2.95	1.625	41.28	2.750	69.85	C70165
			.1181	3.00	1.299	33.00	2.400	61.00	C70077
	32	3.4	.1200	3.05	1.625	41.28	2.750	69.85	C70164
			.1220	3.10	1.417	36.00	2.560	65.00	C70078
	31	3.5	.1250	3.18	1.625	41.28	2.750	69.85	C70007
			.1260	3.20	1.417	36.00	2.560	65.00	C70079
3/8	30	3.6	.1285	3.26	1.625	41.28	2.750	69.85	C70163
			.1299	3.30	1.417	36.00	2.560	65.00	C70080
	29	3.7	.1339	3.40	1.535	39.00	2.760	70.00	C70081
			.1360	3.45	1.750	44.45	2.875	73.03	C70162
	28	3.8	.1378	3.50	1.535	39.00	2.760	70.00	C70082
			.1405	3.57	1.750	44.45	2.875	73.03	C70161
9/16		.1406	3.57	1.750	44.45	2.875	73.03	C70008	

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DRILLING
 HOLE FINISHING
 THREADING
 MILLING
 OTHER TOOLS

Aircraft NAS 907 Rev. 14 Type J

Style 2213 • Cobalt Heavy-Duty Jobber Length (continued)

DRILLING

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THREADING

MILLING

OTHER TOOLS

Fract	Drill Diameter		Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number
	Wire/Ltr	Metric			in	mm	in	mm	
27		3.6	.1417	3.60	1.535	39.00	2.760	70.00	C70083
			.1440	3.66	1.875	47.63	3.000	76.20	C70160
26		3.7	.1457	3.70	1.535	39.00	2.760	70.00	C70223
			.1470	3.73	1.875	47.63	3.000	76.20	C70159
25		3.8	.1495	3.80	1.875	47.63	3.000	76.20	C70158
			.1496	3.80	1.693	43.00	2.950	75.00	C70085
24		3.9	.1520	3.86	2.000	50.80	3.125	79.38	C70157
			.1535	3.90	1.693	43.00	2.950	75.00	C70086
5/32		4.0	.1540	3.91	2.000	50.80	3.125	79.38	C70156
			.1562	3.97	2.000	50.80	3.125	79.38	C70009
22		4.1	.1570	3.99	2.000	50.80	3.125	79.38	C70155
			.1575	4.00	1.693	43.00	2.950	75.00	C70087
21		4.2	.1590	4.04	2.125	53.98	3.250	82.55	C70154
			.1610	4.09	2.125	53.98	3.250	82.55	C70153
19		4.3	.1614	4.10	1.693	43.00	2.950	75.00	C70088
			.1654	4.20	1.693	43.00	2.950	75.00	C70089
18		4.4	.1660	4.22	2.125	53.98	3.250	82.55	C70152
			.1693	4.30	1.850	47.00	3.150	80.00	C70090
11/64		4.5	.1695	4.31	2.125	53.98	3.250	82.55	C70151
			.1719	4.37	2.125	53.98	3.250	82.55	C70010
17		4.6	.1730	4.39	2.188	55.56	3.375	85.73	C70150
			.1732	4.40	1.850	47.00	3.150	80.00	C70091
16		4.7	.1770	4.50	2.188	55.56	3.375	85.73	C70149
			.1772	4.50	1.850	47.00	3.150	80.00	C70092
15		4.8	.1800	4.57	2.188	55.56	3.375	85.73	C70148
			.1811	4.60	1.850	47.00	3.150	80.00	C70224
14		4.9	.1820	4.62	2.188	55.56	3.375	85.73	C70147
			.1850	4.70	2.313	58.74	3.500	88.90	C70146
3/16		5.0	.1850	4.70	1.850	47.00	3.150	80.00	C70094
			.1875	4.76	2.313	58.74	3.500	88.90	C70011
12		5.1	.1890	4.80	2.313	58.74	3.500	88.90	C70145
			.1890	4.80	2.047	52.00	3.390	86.00	C70095
11		5.2	.1910	4.85	2.313	58.74	3.500	88.90	C70144
			.1929	4.90	2.047	52.00	3.390	86.00	C70096
10		5.3	.1935	4.91	2.438	61.91	3.625	92.08	C70143
			.1960	4.98	2.438	61.91	3.625	92.08	C70142
8		5.4	.1968	5.00	2.047	52.00	3.390	86.00	C70097
			.1990	5.05	2.438	61.91	3.625	92.08	C70141
7		5.5	.2008	5.10	2.047	52.00	3.390	86.00	C70098
			.2010	5.11	2.438	61.91	3.625	92.08	C70140
13/64		5.6	.2031	5.16	2.438	61.91	3.625	92.08	C70012
			.2040	5.18	2.500	63.50	3.750	95.25	C70139
5		5.7	.2047	5.20	2.047	52.00	3.390	86.00	C70099
			.2055	5.22	2.500	63.50	3.750	95.25	C70138
4		5.8	.2087	5.30	2.047	52.00	3.390	86.00	C70100
			.2090	5.31	2.500	63.50	3.750	95.25	C70137
3		5.9	.2126	5.40	2.244	57.00	3.660	93.00	C70101
			.2130	5.41	2.500	63.50	3.750	95.25	C70136
7/32		6.0	.2165	5.50	2.244	57.00	3.660	93.00	C70102
			.2188	5.56	2.500	63.50	3.750	95.25	C70013
2		6.1	.2205	5.60	2.244	57.00	3.660	93.00	C70225
			.2210	5.61	2.625	66.68	3.875	98.43	C70135

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Style 2213 • Cobalt Heavy-Duty Jobber Length (continued)

Fract	Drill Diameter		Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number
	Wire/Ltr	Metric			in	mm	in	mm	
1		5.7	.2244	5.70	2.244	57.00	3.660	93.00	C70104
			.2280	5.79	2.625	66.68	3.875	98.43	C70134
A		5.8	.2283	5.80	2.244	57.00	3.660	93.00	C70226
			.2340	5.94	2.625	66.68	3.875	98.43	C70032
15/64		6.0	.2344	5.95	2.625	66.68	3.875	98.43	C70014
			.2362	6.00	2.244	57.00	3.660	93.00	C70106
B		6.1	.2380	6.05	2.750	69.85	4.000	101.60	C70033
			.2402	6.10	2.480	63.00	3.980	101.00	C70107
C		6.2	.2420	6.15	2.750	69.85	4.000	101.60	C70034
			.2441	6.20	2.480	63.00	3.980	101.00	C70108
D		6.3	.2460	6.25	2.750	69.85	4.000	101.60	C70035
			.2480	6.30	2.480	63.00	3.980	101.00	C70109
1/4		6.4	.2500	6.35	2.750	69.85	4.000	101.60	C70015
			.2500	6.35	2.750	69.85	4.000	101.60	C70015
E		6.5	.2520	6.40	2.480	63.00	3.980	101.00	C70110
			.2559	6.50	2.480	63.00	3.980	101.00	C70111
F		6.6	.2570	6.53	2.875	73.03	4.125	104.78	C70036
			.2598	6.60	2.480	63.00	3.980	101.00	C70112
G		6.7	.2610	6.63	2.875	73.03	4.125	104.78	C70037
			.2638	6.70	2.480	63.00	3.980	101.00	C70113
17/64		6.8	.2656	6.75	2.875	73.03	4.125	104.78	C70016
			.2660	6.76	2.875	73.03	4.125	104.78	C70038
I		7.0	.2677	6.80	2.717	69.00	4.290	109.00	C70114
			.2720	6.91	2.875	73.03	4.125	104.78	C70039
J		7.0	.2756	7.00	2.717	69.00	4.290	109.00	C70115
			.2770	7.04	2.875	73.03	4.125	104.78	C70040
9/32		7.2	.2812	7.14	2.938	74.61	4.250	107.95	C70017
			.2812	7.14	2.938	74.61	4.250	107.95	C70041
K		7.2	.2835	7.20	2.717	69.00	4.290	109.00	C70116
			.2900	7.37	2.938	74.61	4.250	107.95	C70042
L		7.5	.2950	7.49	3.063	77.79	4.375	111.13	C70043
			.2953	7.50	2.717	69.00	4.290	109.00	C70117
19/64		7.5	.2969	7.54	3.063	77.79	4.375	111.13	C70018
			.3020	7.67	3.063	77.79	4.375	111.13	C70044
N		7.8	.3071	7.80	2.953	75.00	4.610	117.00	C70118
			.3125	7.94	3.188	80.96	4.500	114.30	C70019
5/16		8.0	.3150	8.00	2.953	75.00	4.610	117.00	C70119
			.3160	8.03	3.188	80.96	4.500	114.30	C70045
O		8.1	.3189	8.10	2.953	75.00	4.610	117.00	C70120
			.3230	8.20	3.313	84.14	4.625	117.48	C70046
21/64		8.1	.3281	8.33	3.313	84.14	4.625	117.48	C70020
			.3320	8.43	3.438	87.31	4.750	120.65	C70047
P		8.5	.3346	8.50	2.953	75.00	4.610	117.00	C70122
			.3390	8.61	3.438	87.31	4.750	120.65	C70048
11/32		8.5	.3438	8.73	3.438	87.31	4.750	120.65	C70021
			.3480	8.84	3.500	88.90	4.875	123.83	C70049
Q		9.0	.3543	9.00	3.189	81.00	4.920	125.00	C70124
			.3580	9.09	3.500	88.90	4.875	123.83	C70050
23/64		9.0	.3594	9.13	3.500	88.90	4.875	123.83	C70022
			.3680	9.35	3.625	92.08	5.000	127.00	C70051
R		9.5	.3740	9.50	3.189	81.00	4.920	125.00	C70125
			.3750	9.53	3.625	92.08	5.000	127.00	C70023
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Aircraft NAS 907 Rev. 14 Type J

Style 2213 • Cobalt Heavy-Duty Jobber Length (continued)

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Fract	Drill Diameter		Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number
	Wire/Ltr	Metric			in	mm	in	mm	
25/64	V		.3770	9.58	3.625	92.08	5.000	127.00	C70052
	W		.3860	9.80	3.750	95.25	5.125	130.18	C70053
			.3906	9.92	3.750	95.25	5.125	130.18	C70024
		10.0	.3937	10.00	3.425	87.00	5.240	133.00	C70126
13/32	X		.3970	10.08	3.720	94.49	5.125	130.18	C70054
		10.2	.4016	10.20	3.425	87.00	5.240	133.00	C70127
	Y		.4040	10.26	3.875	98.43	5.250	133.35	C70055
			.4063	10.32	3.875	98.43	5.250	133.35	C70025
27/64	Z		.4130	10.49	3.875	98.43	5.250	133.35	C70056
		10.5	.4134	10.50	3.425	87.00	5.240	133.00	C70128
			.4219	10.72	3.938	100.01	5.375	136.53	C70026
		11.0	.4331	11.00	3.701	94.00	5.590	142.00	C70129
7/16		.4375	11.11	4.063	103.19	5.500	139.70	C70027	
	11.5	.4528	11.50	3.701	94.00	5.590	142.00	C70130	
29/64		.4531	11.51	4.188	106.36	5.625	142.88	C70028	
15/32		.4688	11.91	4.313	109.54	5.750	146.05	C70029	
31/64		12.0	.4724	12.00	3.976	101.00	5.940	151.00	C70131
			.4844	12.30	4.375	111.12	5.875	149.23	C70030
1/2		12.5	.4921	12.50	3.976	101.00	5.940	151.00	C70132
			.5000	12.70	4.500	114.30	6.000	152.40	C70031
		13.0	.5118	13.00	3.976	101.00	5.940	151.00	C70133

Sets

No. of Pieces	Drill Style	Finish	Size Range	Set Order Number
29	2213	straw oxide	1/16" through 1/2" x 1/64"	C70365
26	2213	straw oxide	A through Z letter	C00986
60	2213	straw oxide	#1 through #60 wire gauge	C70366
115	2213	straw oxide	1/16" through 1/2" x 1/64", A through Z and #1 through #60	C70367



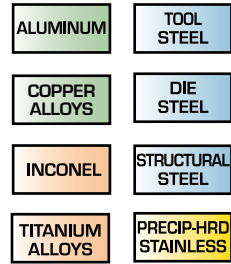
General Application Drills Aircraft NAS 907 Rev. 14 Type J

Style 3722-6 • Cobalt Heavy-Duty 6" Extended Shank

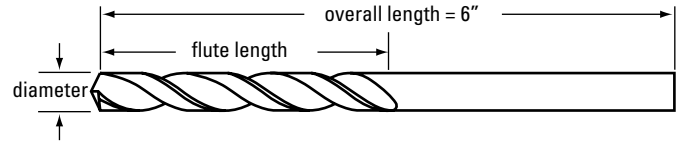
FEATURES



APPLICATIONS



Style 3722-6 Straw Oxide



High red hardness for extended wear life in high heat conditions.

Operating parameters on page 32.

Drill Diameter Fract	Wire	Decimal Equiv.	Metric Equiv.	Flute Length in	mm	Overall Length in	mm	Order Number
1/8	40	.0980	2.49	1.375	34.93	6.000	152.40	C08144
		.1250	3.18	1.625	41.28	6.000	152.40	C08115
5/32	30	.1285	3.26	1.625	41.28	6.000	152.40	C08142
	27	.1440	3.66	1.875	47.63	6.000	152.40	C08140
		.1562	3.97	2.000	50.80	6.000	152.40	C08117
3/16	21	.1590	4.04	2.000	50.80	6.000	152.40	C08138
		.1610	4.09	2.125	53.98	6.000	152.40	C08137
	16	.1770	4.50	2.188	55.56	6.000	152.40	C08135
	13	.1850	4.70	2.313	58.74	6.000	152.40	C08134
7/32		.1875	4.76	2.313	58.74	6.000	152.40	C08119
	11	.1910	4.85	2.313	58.74	6.000	152.40	C08133
	10	.1935	4.91	2.438	61.91	6.000	152.40	C08132
1/4	8	.1990	5.05	2.438	61.91	6.000	152.40	C08130
		.2188	5.56	2.500	63.50	6.000	152.40	C08121
		.2500	6.35	2.750	69.85	6.000	152.40	C08123

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

General Application Drills

Screw Machine Length

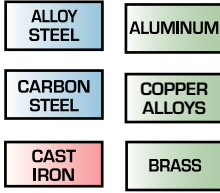
Style 2120 • General Purpose Screw Machine Length

DRILLING

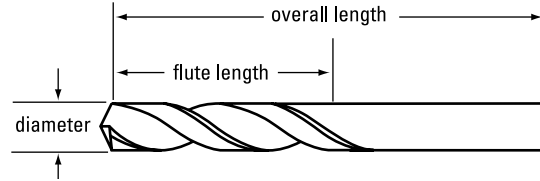
FEATURES



APPLICATIONS



Style 2120 Bright



Operating parameters on page 32.

HOLE FINISHING

THREADING

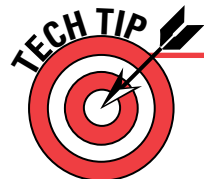
MILLING

OTHER TOOLS

Diameter Fract	Decimal	Metric	Flute Length		Overall Length		Order
Wi/Lt	Eqiv.	Eqiv.	in	mm	in	mm	Number
60	.0400	1.02	.500	12.70	1.375	34.93	C04356
59	.0410	1.04	.500	12.70	1.375	34.93	C04357
58	.0420	1.07	.500	12.70	1.375	34.93	C04359
57	.0430	1.09	.500	12.70	1.375	34.93	C04360
56	.0465	1.18	.500	12.70	1.375	34.93	C04363
3/64	.0469	1.19	.500	12.70	1.375	34.93	C04364
55	.0520	1.32	.625	15.88	1.625	41.28	C04368
54	.0550	1.40	.625	15.88	1.625	41.28	C04370
53	.0595	1.51	.625	15.88	1.625	41.28	C04374
1/16	.0625	1.59	.625	15.88	1.625	41.28	C04376
52	.0635	1.61	.688	17.46	1.688	42.86	C04378
51	.0670	1.70	.688	17.46	1.688	42.86	C04381
50	.0700	1.78	.688	17.46	1.688	42.86	C04383
49	.0730	1.85	.688	17.46	1.688	42.86	C04386
48	.0760	1.93	.688	17.46	1.688	42.86	C04388
5/64	.0781	1.98	.688	17.46	1.688	42.86	C04390
47	.0785	1.99	.750	19.05	1.750	44.45	C04391
46	.0810	2.06	.750	19.05	1.750	44.45	C04394
45	.0820	2.08	.750	19.05	1.750	44.45	C04395
44	.0860	2.18	.750	19.05	1.750	44.45	C04398
43	.0890	2.26	.750	19.05	1.750	44.45	C04401
42	.0935	2.38	.750	19.05	1.750	44.45	C04404
3/32	.0938	2.38	.750	19.05	1.750	44.45	C04405
41	.0960	2.44	.813	20.64	1.813	46.04	C04407
40	.0980	2.49	.813	20.64	1.813	46.04	C04409
39	.0995	2.53	.813	20.64	1.813	46.04	C04411
38	.1015	2.58	.813	20.64	1.813	46.04	C04412
37	.1040	2.64	.813	20.64	1.813	46.04	C04414
36	.1065	2.71	.813	20.64	1.813	46.04	C04416
7/64	.1094	2.78	.813	20.64	1.813	46.04	C04418
35	.1100	2.79	.875	22.23	1.875	47.63	C04419
34	.1110	2.82	.875	22.23	1.875	47.63	C04421
33	.1130	2.87	.875	22.23	1.875	47.63	C04422
32	.1160	2.95	.875	22.23	1.875	47.63	C04424

Diameter Fract	Decimal	Metric	Flute Length		Overall Length		Order
Wi/Lt	Eqiv.	Eqiv.	in	mm	in	mm	Number
31	.1200	3.05	.875	22.23	1.875	47.63	C04426
1/8	.1250	3.18	.875	22.23	1.875	47.63	C04428
30	.1285	3.26	.938	23.81	1.938	49.21	C04431
29	.1360	3.45	.938	23.81	1.938	49.21	C04434
28	.1405	3.57	.938	23.81	1.938	49.21	C04436
9/64	.1406	3.57	.938	23.81	1.938	49.21	C04437
27	.1440	3.66	1.000	25.40	2.063	52.39	C04439
26	.1470	3.73	1.000	25.40	2.063	52.39	C04441
25	.1495	3.80	1.000	25.40	2.063	52.39	C04443
24	.1520	3.86	1.000	25.40	2.063	52.39	C04445
23	.1540	3.91	1.000	25.40	2.063	52.39	C04447
5/32	.1562	3.97	1.000	25.40	2.063	52.39	C04448
22	.1570	3.99	1.063	26.99	2.125	53.98	C04449
21	.1590	4.04	1.063	26.99	2.125	53.98	C04451
20	.1610	4.09	1.063	26.99	2.125	53.98	C04452
19	.1660	4.22	1.063	26.99	2.125	53.98	C04455
18	.1695	4.31	1.063	26.99	2.125	53.98	C04458
11/64	.1719	4.37	1.063	26.99	2.125	53.98	C04459
17	.1730	4.39	1.125	28.58	2.188	55.56	C04460
16	.1770	4.50	1.125	28.58	2.188	55.56	C04462
15	.1800	4.57	1.125	28.58	2.188	55.56	C04464
14	.1820	4.62	1.125	28.58	2.188	55.56	C04466
13	.1850	4.70	1.125	28.58	2.188	55.56	C04467
3/16	.1875	4.76	1.125	28.58	2.188	55.56	C04470
12	.1890	4.80	1.188	30.16	2.250	57.15	C04471
11	.1910	4.85	1.188	30.16	2.250	57.15	C04473
10	.1935	4.92	1.188	30.16	2.250	57.15	C04475
9	.1960	4.98	1.188	30.16	2.250	57.15	C04476
8	.1990	5.06	1.188	30.16	2.250	57.15	C04478
7	.2010	5.11	1.188	30.16	2.250	57.15	C04480
13/64	.2031	5.16	1.188	30.16	2.250	57.15	C04481
6	.2040	5.18	1.250	31.75	2.375	60.33	C04482
5	.2055	5.22	1.250	31.75	2.375	60.33	C04484
4	.2090	5.31	1.250	31.75	2.375	60.33	C04487

continued on next page



Advantages of Short Flute Length Drills

- Offers enhanced rigidity
- Maintains better drill accuracy



Style 2120 • General Purpose Screw Machine Length (continued)

Diameter Fract Wire	Decimal Equiv.	Metric Equiv.	Flute Length in mm	Overall Length in mm	Order Number
7/32	3	.2130	5.41	1.250 31.75	2.375 60.33 C04489
		.2188	5.56	1.250 31.75	2.375 60.33 C04491
15/64	2	.2210	5.61	1.313 33.34	2.438 61.91 C04493
	1	.2280	5.79	1.313 33.34	2.438 61.91 C04496
15/64	A	.2340	5.94	1.313 33.34	2.438 61.91 C04499
		.2344	5.95	1.313 33.34	2.438 61.91 C04500
1/4	B	.2380	6.05	1.375 34.93	2.500 63.50 C04502
	C	.2420	6.15	1.375 34.93	2.500 63.50 C04504
1/4	D	.2460	6.25	1.375 34.93	2.500 63.50 C04506
	E	.2500	6.35	1.375 34.93	2.500 63.50 C04509
17/64	F	.2570	6.53	1.438 36.51	2.625 66.68 C04513
	G	.2610	6.63	1.438 36.51	2.625 66.68 C04515
17/64		.2656	6.75	1.438 36.51	2.625 66.68 C04517
	H	.2660	6.76	1.500 38.10	2.688 68.26 C04519
9/32	I	.2720	6.91	1.500 38.10	2.688 68.26 C04522
	J	.2770	7.04	1.500 38.10	2.688 68.26 C04524
9/32	K	.2810	7.14	1.500 38.10	2.688 68.26 C04526
		.2812	7.14	1.500 38.10	2.688 68.26 C04531
19/64	L	.2900	7.37	1.563 39.69	2.750 69.85 C04530
	M	.2950	7.49	1.563 39.69	2.750 69.85 C04533
19/64		.2969	7.54	1.563 39.69	2.750 69.85 C04535
	N	.3020	7.67	1.625 41.28	2.813 71.44 C04537
5/16		.3125	7.94	1.625 41.28	2.813 71.44 C04542
	O	.3160	8.03	1.688 42.86	2.938 74.61 C04544
21/64	P	.3230	8.20	1.688 42.86	2.938 74.61 C04547
		.3281	8.33	1.688 42.86	2.938 74.61 C04550
11/32	Q	.3320	8.43	1.688 42.86	3.000 76.20 C04552
	R	.3390	8.61	1.688 42.86	3.000 76.20 C04555
11/32		.3438	8.73	1.688 42.86	3.000 76.20 C04557
	S	.3480	8.84	1.750 44.45	3.063 77.79 C04560
23/64	T	.3580	9.09	1.750 44.45	3.063 77.79 C04563
		.3594	9.13	1.750 44.45	3.063 77.79 C04565
3/8	U	.3680	9.35	1.813 46.04	3.125 79.38 C04569
		.3750	9.53	1.813 46.04	3.125 79.38 C04572
25/64	V	.3770	9.58	1.875 47.63	3.250 82.55 C04573
	W	.3860	9.80	1.875 47.63	3.250 82.55 C04578
25/64		.3906	9.92	1.875 47.63	3.250 82.55 C04580
	X	.3970	10.08	1.938 49.21	3.313 84.14 C04582
13/32	Y	.4040	10.26	1.938 49.21	3.313 84.14 C04584
		.4062	10.32	1.938 49.21	3.313 84.14 C04585
27/64	Z	.4130	10.49	2.000 50.80	3.375 85.73 C04586
		.4219	10.72	2.000 50.80	3.375 85.73 C04588
7/16		.4375	11.11	2.063 52.39	3.438 87.31 C04591
29/64		.4531	11.51	2.125 53.98	3.563 90.49 C04594
15/32		.4688	11.91	2.125 53.98	3.625 92.08 C04596
31/64		.4844	12.30	2.188 55.56	3.688 93.66 C04599

Diameter Fract Wire	Decimal Equiv.	Metric Equiv.	Flute Length in mm	Overall Length in mm	Order Number
1/2	.5000	12.70	2.250 57.15	3.750 95.25	C04601
33/64	.5156	13.10	2.375 60.33	3.875 98.43	C04604
17/32	.5312	13.49	2.375 60.33	3.875 98.43	C04606
35/64	.5469	13.89	2.500 63.50	4.000 101.60	C04609
9/16	.5625	14.29	2.500 63.50	4.000 101.60	C04612
37/64	.5781	14.68	2.625 66.68	4.125 104.78	C04614
19/32	.5938	15.08	2.625 66.68	4.125 104.78	C04617
39/64	.6094	15.48	2.750 69.85	4.250 107.95	C04619
5/8	.6250	15.88	2.750 69.85	4.250 107.95	C04622
41/64	.6406	16.27	2.875 73.03	4.500 114.30	C04625
21/32	.6562	16.67	2.875 73.03	4.500 114.30	C04627
43/64	.6719	17.07	2.875 73.03	4.625 117.48	C04630
11/16	.6875	17.46	2.875 73.03	4.625 117.48	C04632
45/64	.7031	17.86	3.000 76.20	4.750 120.65	C04634
23/32	.7188	18.26	3.000 76.20	4.750 120.65	C04636
47/64	.7344	18.65	3.125 79.38	5.000 127.00	C04638
3/4	.7500	19.05	3.125 79.38	5.000 127.00	C04640
49/64	.7656	19.45	3.250 82.55	5.125 130.18	C04641
25/32	.7812	19.84	3.250 82.55	5.125 130.18	C04643
51/64	.7969	20.24	3.375 85.73	5.250 133.35	C04645
13/16	.8125	20.64	3.375 85.73	5.250 133.35	C04647
53/64	.8281	21.03	3.500 88.90	5.375 136.53	C04649
27/32	.8438	21.43	3.500 88.90	5.375 136.53	C04650
55/64	.8594	21.83	3.500 88.90	5.500 139.70	C04652
7/8	.8750	22.23	3.500 88.90	5.500 139.70	C04654
57/64	.8906	22.62	3.625 92.08	5.625 142.88	C04656
29/32	.9062	23.02	3.625 92.08	5.625 142.88	C04658
59/64	.9219	23.42	3.750 95.25	5.750 146.05	C04659
15/16	.9375	23.81	3.750 95.25	5.750 146.05	C04661
61/64	.9531	24.21	3.875 98.43	5.875 149.23	C04663
31/32	.9688	24.61	3.875 98.43	5.875 149.23	C04665
63/64	.9844	25.00	4.000 101.60	6.000 152.40	C04667
1	1.0000	25.40	4.000 101.60	6.000 152.40	C04668
1-1/16*	1.0625	26.99	4.000 101.60	6.250 158.75	C04675
1-1/8*	1.1250	28.58	4.000 101.60	6.375 161.93	C04683
1-3/16*	1.1875	30.16	4.250 107.95	6.625 168.28	C04690
1-1/4*	1.2500	31.75	4.375 111.13	6.750 171.45	C04697
1-5/16*	1.3125	33.34	4.375 111.13	7.000 177.80	C04704
1-3/8*	1.3750	34.93	4.500 114.30	7.125 180.98	C04711
1-7/16*	1.4375	36.51	4.750 120.65	7.375 187.33	C04719
1-1/2*	1.5000	38.10	4.875 123.83	7.500 190.50	C04726
1-9/16*	1.5625	39.69	4.875 123.83	7.750 196.85	C04733
1-5/8*	1.6250	41.28	4.875 123.83	7.750 196.85	C04740
1-11/16*	1.6875	42.86	5.125 130.18	8.000 203.20	C04747
1-3/4*	1.7500	44.45	5.125 130.18	8.000 203.20	C04754

* 1" through 1-1/4" drills have 1" shank.
1-5/16" through 1-1/2" drills have 1-1/4" shank.
1-9/16" through 1-3/4" drills have 1-1/2" shank.

Sets

No. of Pieces	Drill Style	Finish	Size Range	Set Order Number
29	2120	bright	1/16" through 1/2" x 1/64"	C00980
26	2120	bright	letter A through Z	C01332

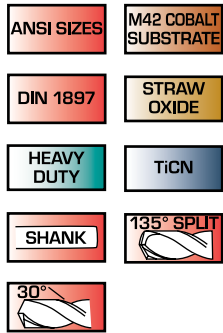
General Application Drills

Screw Machine Length

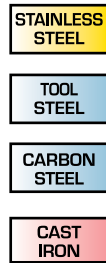
Style 2133 • Cobalt Heavy-Duty Screw Machine Length

DRILLING

FEATURES



APPLICATIONS



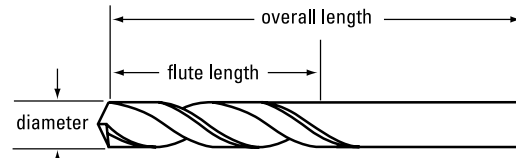
High red hardness for extended wear life in high heat conditions.



Style 2133 Straw Oxide



Style 2133-TC TiCN-coated



Operating parameters on page 32.

HOLE FINISHING

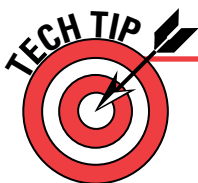
THREADING

MILLING

Drill Diameter Fract Wire/Let	Decimal Metric	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number	
				in	mm	in	mm	Straw	TiCN
60		.0400	1.02	.500	12.70	1.375	34.93	C14501	—
59		.0410	1.04	.500	12.70	1.375	34.93	C14502	—
58		.0420	1.07	.500	12.70	1.375	34.93	C14504	—
57		.0430	1.09	.500	12.70	1.375	34.93	C14505	—
56		.0465	1.18	.500	12.70	1.375	34.93	C14508	—
3/64		.0469	1.19	.500	12.70	1.375	34.93	C14509	—
	1.2	.0472	1.20	.315	8.00	1.181	30.00	C14835	—
55		.0520	1.32	.625	15.88	1.625	41.28	C14513	—
54		.0550	1.40	.625	15.88	1.625	41.28	C14515	—
1/16	1.5	.0591	1.50	.354	9.00	1.260	32.00	C14838	—
		.0595	1.51	.625	15.88	1.625	41.28	C14519	—
53		.0625	1.59	.625	15.88	1.625	41.28	C14521	C14846
	1.6	.0630	1.60	.394	10.00	1.339	34.00	C14748	—
52		.0635	1.61	.688	17.46	1.688	42.86	C14523	—
51		.0670	1.70	.688	17.46	1.688	42.86	C14526	—
50		.0700	1.78	.688	17.46	1.688	42.86	C14528	—
49		.0730	1.85	.688	17.46	1.688	42.86	C14531	—
48		.0760	1.93	.688	17.46	1.688	42.86	C14533	—
5/64		.0781	1.98	.688	17.46	1.688	42.86	C14535	—
	47		.0785	1.99	.750	19.05	1.750	44.45	C14536
46	2.0	.0787	2.00	.472	12.00	1.496	38.00	C14800	C14749
		.0810	2.06	.750	19.05	1.750	44.45	C14539	—
45		.0820	2.08	.750	19.05	1.750	44.45	C14540	—
44		.0860	2.18	.750	19.05	1.750	44.45	C14543	—
43		.0890	2.26	.750	19.05	1.750	44.45	C14546	—
42		.0935	2.38	.750	19.05	1.750	44.45	C14549	—
3/32		.0938	2.38	.750	19.05	1.750	44.45	C14550	C14848
	2.4	.0945	2.40	.551	14.00	1.693	43.00	C14790	—

continued on next page

OTHER TOOLS



Benefits of 2133 Cobalt Screw Machine Drill

- Cobalt provides high heat resistance for tough applications.
- Short flutes provide enhanced rigidity and drill more accurate holes.

Style 2133 • Cobalt Heavy-Duty Screw Machine Length (continued)

Drill Diameter		Decimal	Metric	Flute Length		Overall Length		Order Number	
Fract	Wire/Let	Equiv.	Equiv.	in	mm	in	mm	Straw	TiCN
	41	.0960	2.44	.813	20.64	1.813	46.04	C14552	–
	40	.0980	2.49	.813	20.64	1.813	46.04	C14554	–
		2.5	.0984	2.50	.551	14.00	1.693	43.00	C14820 C14750
	39	.0995	2.53	.813	20.64	1.813	46.04	C14556	–
	39	.1015	2.58	.813	20.64	1.813	46.04	C14557	–
		2.6	.1024	2.60	.551	14.00	1.693	43.00	C14840 C14730
	37	.1040	2.64	.813	20.64	1.813	46.04	C14559	–
	36	.1065	2.71	.813	20.64	1.813	46.04	C14561	–
7/64		.1094	2.78	.813	20.64	1.813	46.04	C14562	–
	35	.1100	2.79	.875	22.23	1.875	47.63	C14563	–
		2.8	.1102	2.80	.630	16.00	1.811	46.00	C14841 –
	34	.1110	2.82	.875	22.23	1.875	47.63	C14565	–
	33	.1130	2.87	.875	22.23	1.875	47.63	C14566	–
	32	.1160	2.95	.875	22.23	1.875	47.63	C14568	–
		3.0	.1181	3.00	.630	16.00	1.811	46.00	C14821 C14751
	31	.1200	3.05	.875	22.23	1.875	47.63	C14570	–
		3.1	.1220	3.10	.709	18.00	1.929	49.00	C14822 C14752
1/8		.1250	3.18	.875	22.23	1.875	47.63	C14572	C14850
		3.2	.1260	3.20	.709	18.00	1.929	49.00	C14801 C14753
	30	.1285	3.26	.938	23.81	1.938	49.21	C14574	–
		3.3	.1299	3.30	.709	18.00	1.929	49.00	C14802 C14754
	29	.1360	3.45	.938	23.81	1.938	49.21	C14577	–
		3.5	.1378	3.50	.787	20.00	2.047	52.00	C14803 C14755
	28	.1405	3.57	.938	23.81	1.938	49.21	C14579	–
9/64		.1406	3.57	.938	23.81	1.938	49.21	C14580	–
	27	.1440	3.66	1.000	25.40	2.063	52.39	C14582	–
		3.7	.1457	3.70	.787	20.00	2.047	52.00	C14823 –
	26	.1470	3.73	1.000	25.40	2.063	52.39	C14584	–
	25	.1495	3.80	1.000	25.40	2.063	52.39	C14585	–
	24	.1520	3.86	1.000	25.40	2.063	52.39	C14587	–
	23	.1540	3.91	1.000	25.40	2.063	52.39	C14589	–
5/32		.1562	3.97	1.000	25.40	2.063	52.39	C14590	C14852
	22	.1570	3.99	1.063	26.99	2.125	53.98	C14591	–
		4.0	.1575	4.00	.866	22.00	2.165	55.00	C14824 C14756
	21	.1590	4.04	1.063	26.99	2.125	53.98	C14593	–
	20	.1610	4.09	1.063	26.99	2.125	53.98	C14594	–
		4.1	.1614	4.10	.866	22.00	2.165	55.00	C14825 C14757
		4.2	.1654	4.20	.866	22.00	2.165	55.00	C14804 C14758
	19	.1660	4.22	1.063	26.99	2.125	53.98	C14597	–
	18	.1695	4.31	1.063	26.99	2.125	53.98	C14599	–
11/64		.1719	4.37	1.063	26.99	2.125	53.98	C14600	–
	17	.1730	4.39	1.125	28.58	2.188	55.56	C14601	–
	16	.1770	4.50	1.125	28.58	2.188	55.56	C14603	–
		4.5	.1772	4.50	.945	24.00	2.283	58.00	C14805 C14759
	15	.1800	4.57	1.125	28.58	2.188	55.56	C14605	–
		4.6	.1811	4.60	.945	24.00	2.283	58.00	C14842 C14728
	14	.1820	4.62	1.125	28.58	2.188	55.56	C14607	–
	13	.1850	4.70	1.125	28.58	2.188	55.56	C14608	–
3/16		.1875	4.76	1.125	28.58	2.188	55.56	C14610	C14854
		4.8	.1890	4.80	1.024	26.00	2.441	62.00	C14806 C14760
	12	.1890	4.80	1.188	30.16	2.250	57.15	C14611	–
	11	.1910	4.85	1.188	30.16	2.250	57.15	C14613	–

continued on next page

Screw Machine Length

Style 2133 • Cobalt Heavy-Duty Screw Machine Length (continued)

Fract	Drill Diameter		Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number	
	Wire/Let	Metric			in	mm	in	mm	Straw	TiCN
10		4.9	.1929	4.90	1.024	26.00	2.441	62.00	C14826	–
			.1935	4.92	1.188	30.16	2.250	57.15	C14615	–
9		5.0	.1960	4.98	1.188	30.16	2.250	57.15	C14616	–
			.1969	5.00	1.024	26.00	2.441	62.00	C14827	C14761
8		5.1	.1990	5.06	1.188	30.16	2.250	57.15	C14618	–
			.2008	5.10	1.024	26.00	2.441	62.00	C14807	C14762
13/64		7	.2010	5.11	1.188	30.16	2.250	57.15	C14620	–
			.2031	5.16	1.188	30.16	2.250	57.15	C14621	–
6		5	.2040	5.18	1.250	31.75	2.375	60.33	C14622	–
			.2055	5.22	1.250	31.75	2.375	60.33	C14624	–
4		3	.2090	5.31	1.250	31.75	2.375	60.33	C14626	–
			.2130	5.41	1.250	31.75	2.375	60.33	C14628	–
7/32		5.5	.2165	5.50	1.102	28.00	2.598	66.00	C14828	C14786
			.2188	5.56	1.250	31.75	2.375	60.33	C14630	C14856
2		5.6	.2205	5.60	1.102	28.00	2.598	66.00	C14843	–
			.2210	5.61	1.313	33.34	2.438	61.91	C14632	–
1		5.7	.2244	5.70	1.102	28.00	2.598	66.00	C14844	–
			.2280	5.79	1.313	33.34	2.438	61.91	C14634	–
15/64		A	.2340	5.94	1.313	33.34	2.438	61.91	C14637	–
			.2344	5.95	1.313	33.34	2.438	61.91	C14638	–
6.0		B	.2362	6.00	1.102	28.00	1.102	28.00	C14829	C14763
			.2380	6.05	1.375	34.93	2.500	63.50	C14640	–
6.1		C	.2402	6.10	1.220	31.00	2.756	70.00	C14869	–
			.2420	6.15	1.375	34.93	2.500	63.50	C14642	–
1/4, E		D	.2460	6.25	1.375	34.93	2.500	63.50	C14644	–
			.2500	6.35	1.375	34.93	2.500	63.50	C14646	C14858
6.5		E	.2559	6.50	1.220	31.00	2.756	70.00	C14808	C14764
			.2570	6.53	1.438	36.51	2.625	66.68	C14649	–
6.6		G	.2598	6.60	1.220	31.00	2.756	70.00	C14809	–
			.2610	6.63	1.438	36.51	2.625	66.68	C14651	–
17/64		H	.2656	6.75	1.438	36.51	2.625	66.68	C14653	–
			.2660	6.76	1.500	38.10	2.688	68.26	C14654	–
6.8		I	.2677	6.80	1.339	34.00	2.913	74.00	C14810	C14765
			.2720	6.91	1.500	38.10	2.688	68.26	C14657	–
7.0		J	.2756	7.00	1.339	34.00	2.913	74.00	C14830	C14766
			.2770	7.04	1.500	38.10	2.688	68.26	C14659	–
9/32		K	.2810	7.14	1.500	38.10	2.688	68.26	C14661	–
			.2812	7.14	1.500	38.10	2.688	68.26	C14664	C14860
L		7.4	.2900	7.37	1.563	39.69	2.750	69.85	C14665	–
			.2913	7.40	1.339	34.00	2.913	74.00	C14811	–
M		7.5	.2950	7.49	1.563	39.69	2.750	69.85	C14667	–
			.2953	7.50	1.339	34.00	2.913	74.00	C14831	C14787
19/64		N	.2969	7.54	1.563	39.69	2.750	69.85	C14669	–
			.3020	7.67	1.625	41.28	2.813	71.44	C14671	–
5/16		8.0	.3125	7.94	1.625	41.28	2.813	71.44	C14675	C14861
			.3150	8.00	1.457	37.00	3.110	79.00	C14812	C14767
O		8.1	.3160	8.03	1.688	42.86	2.938	74.61	C14677	–
			.3189	8.10	1.457	37.00	3.110	79.00	C14670	–
P		8.2	.3230	8.20	1.688	42.86	2.938	74.61	C14680	–
			.3281	8.33	1.688	42.86	2.938	74.61	C14682	–
21/64		Q	.3320	8.43	1.688	42.86	3.000	76.20	C14684	–
			.3346	8.50	1.457	37.00	3.110	79.00	C14813	C14768

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Style 2133 • Cobalt Heavy-Duty Screw Machine Length (continued)

Drill Diameter		Decimal	Metric	Flute Length		Overall Length		Order Number		
Fract	Letter	Equiv.	Equiv.	in	mm	in	mm	Straw	TiCN	
11/32	R	.3390	8.61	1.688	42.86	3.000	76.20	C14687	–	
		.3438	8.73	1.688	42.86	3.000	76.20	C14689	C14862	
23/64	S	9.0	.3480	8.84	1.750	44.45	3.063	77.79	C14691	–
			.3543	9.00	1.575	40.00	3.307	84.00	C14814	C14769
			.3580	9.09	1.750	44.45	3.063	77.79	C14694	–
3/8	T	9.5	.3594	9.13	1.750	44.45	3.063	77.79	C14696	–
			.3680	9.35	1.813	46.04	3.125	79.38	C14699	–
25/64	U	10.0	.3740	9.50	1.575	40.00	3.307	84.00	–	C14770
			.3750	9.53	1.813	46.04	3.125	79.38	C14702	C14863
			.3770	9.58	1.875	47.63	3.250	82.55	C14703	–
7/16	V		.3860	9.80	1.875	47.63	3.250	82.55	C14707	–
			.3906	9.92	1.875	47.63	3.250	82.55	C14709	–
13/32	W	11.0	.3937	10.00	1.693	43.00	3.504	89.00	C14815	C14771
			.3970	10.08	1.938	49.21	3.313	84.14	C14711	–
			.4040	10.26	1.938	49.21	3.313	84.14	C14713	–
27/64	X	11.5	.4062	10.32	1.938	49.21	3.313	84.14	C14715	C14864
			.4130	10.49	2.000	50.80	3.375	85.73	C14716	–
1/2	Y	12.0	.4134	10.50	1.693	43.00	3.504	89.00	C14816	C14788
			.4219	10.72	2.000	50.80	3.375	85.73	C14718	–
			.4331	11.00	1.850	47.00	3.740	95.00	C14817	C14772
31/64	Z	12.5	.4375	11.11	2.063	52.39	3.438	87.31	C14721	C14865
			.4528	11.50	1.850	47.00	3.740	95.00	C14832	C14773
33/64			.4531	11.51	2.125	53.98	3.563	90.49	C14724	–
			.4688	11.91	2.125	53.98	3.625	92.08	C14726	C14867
17/32		12.0	.4724	12.00	2.008	51.00	4.016	102.00	C14818	C14774
			.4844	12.30	2.188	55.56	3.688	93.66	C14729	–
35/64		12.5	.4921	12.50	2.008	51.00	4.016	102.00	C14819	C14775
			.5000	12.70	2.250	57.15	3.750	95.25	C14731	C14866
9/16			.5156	13.10	2.375	60.33	3.875	98.43	C14732	–
			.5312	13.49	2.375	60.33	3.875	98.43	C14733	–
19/32			.5469	13.89	2.500	63.50	4.000	101.60	C14734	–
			.5625	14.29	2.500	63.50	4.000	101.60	C14735	–
5/8			.5938	15.08	2.625	66.68	4.125	104.78	C14737	–
			.6250	15.88	2.750	69.85	4.250	107.95	C14739	–

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS



General Application Drills

Screw Machine Length

Style 2331G • CLE-MAX Stub Length

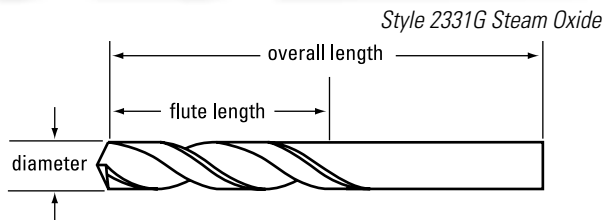
DRILLING

FEATURES

- NAS 907-C GEOMETRY**
- PREM HSS SUBSTRATE**
- DIN 1897**
- STEAM OXIDE**
- HEAVY DUTY**
- 135° SPLIT**
- SHANK**
- 30°**

APPLICATIONS

- CARBON STEEL**
- AUSTENITIC STAINLESS STEEL**
- STRUCTURAL STEEL**
- CAST IRON**
- TOOL STEEL**
- DIE STEEL**



Improved geometry.

Premium substrate for better wear life.

Operating parameters shown on page 32.

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Drill Diameter		Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number	
Fract	Wire Metric			in	mm	in	mm		
	60	.0400	1.02	0.500	12.70	1.375	34.93	C74509	
	59	.0410	1.04	0.500	12.70	1.375	34.93	C74508	
	58	.0420	1.07	0.500	12.70	1.375	34.93	C74507	
	57	.0430	1.09	0.500	12.70	1.375	34.93	C74506	
	56	.0465	1.18	0.500	12.70	1.375	34.93	C74505	
	55	.0520	1.32	0.625	15.88	1.625	41.28	C74504	
	54	.0550	1.40	0.625	15.88	1.625	41.28	C74503	
	53	.0595	1.51	0.625	15.88	1.625	41.28	C74502	
1/16		.0625	1.59	0.625	15.88	1.625	41.28	C74360	
	52	.0635	1.61	0.688	17.46	1.688	42.86	C74501	
	51	.0670	1.70	0.688	17.46	1.688	42.86	C74500	
	50	.0700	1.78	0.688	17.46	1.688	42.86	C74499	
	49	.0730	1.85	0.688	17.46	1.688	42.86	C74498	
	48	.0760	1.93	0.688	17.46	1.688	42.86	C74497	
5/64		.0781	1.98	0.688	17.46	1.688	42.86	C74361	
	47	.0785	1.99	0.750	19.05	1.750	44.45	C74496	
		2.0	.0787	2.00	0.472	12.00	1.496	38.00	C74560
	46	.0810	2.06	0.750	19.05	1.750	44.45	C74495	
	45	.0820	2.08	0.750	19.05	1.750	44.45	C74494	
	44	.0860	2.18	0.750	19.05	1.750	44.45	C74493	
	43	.0890	2.26	0.750	19.05	1.750	44.45	C74492	
	42	.0935	2.37	0.750	19.05	1.750	44.45	C74491	
3/32		.0938	2.38	0.750	19.05	1.750	44.45	C74362	
	41	.0960	2.44	0.813	20.64	1.813	46.04	C74490	
	40	.0980	2.49	0.813	20.64	1.813	46.04	C74489	
		2.5	.0984	2.50	0.551	14.00	1.693	43.00	C74561
	39	.0995	2.53	0.813	20.64	1.813	46.04	C74488	
	38	.1015	2.58	0.813	20.64	1.813	46.04	C74487	
	37	.1040	2.64	0.813	20.64	1.813	46.04	C74486	
	36	.1065	2.71	0.813	20.64	1.813	46.04	C74485	
7/64		.1094	2.78	0.813	20.64	1.813	46.04	C74363	
	35	.1100	2.79	0.875	22.23	1.875	47.63	C74484	
	34	.1110	2.82	0.875	22.23	1.875	47.63	C74483	
	33	.1130	2.87	0.875	22.23	1.875	47.63	C74482	
	32	.1160	2.95	0.875	22.23	1.875	47.63	C74481	
		3.0	.1181	3.00	0.630	16.00	1.811	46.00	C74562

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Style 2331G • CLE-MAX Stub Length (continued)

Drill Diameter			Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number
Fract	Wire	Metric			in	mm	in	mm	
1/8	31		.1200	3.05	0.875	22.23	1.875	47.63	C74480
			.1250	3.18	0.875	22.23	1.875	47.63	C74364
	3.2	.1260	3.20	0.709	18.00	1.929	49.00	C74563	
30			.1285	3.26	0.938	23.81	1.938	49.21	C74479
	3.3	.1299	3.30	0.709	18.00	1.929	49.00	C74564	
29			.1360	3.45	0.938	23.81	1.938	49.21	C74478
9/64	35		.1378	3.50	0.787	20.00	2.047	52.00	C74565
			.1405	3.57	0.938	23.81	1.938	49.21	C74477
	27		.1406	3.57	0.938	23.81	1.938	49.21	C74365
5/32	26		.1440	3.66	1.000	25.40	2.063	52.39	C74476
			.1470	3.73	1.000	25.40	2.063	52.39	C74475
			.1495	3.80	1.000	25.40	2.063	52.39	C74474
	24		.1520	3.86	1.000	25.40	2.063	52.39	C74473
			.1540	3.91	1.000	25.40	2.063	52.39	C74472
		22		.1562	3.97	1.000	25.40	2.063	52.39
11/64	21		.1570	3.99	1.063	26.99	2.125	53.98	C74471
		4.0	.1575	4.00	0.866	22.00	2.165	55.00	C74566
	20		.1590	4.04	1.063	26.99	2.125	53.98	C74470
		4.1	.1610	4.09	1.063	26.99	2.125	53.98	C74469
	19		.1614	4.10	0.866	22.00	2.165	55.00	C74567
		4.2	.1654	4.20	0.866	22.00	2.165	55.00	C74568
		18		.1660	4.22	1.063	26.99	2.125	53.98
3/16	18		.1693	4.30	0.945	24.00	2.283	58.00	C74569
			.1695	4.31	1.063	26.99	2.125	53.98	C74467
	17		.1719	4.37	1.063	26.99	2.125	53.98	C74367
			.1730	4.39	1.125	28.58	2.188	55.56	C74466
	16		.1770	4.50	1.125	28.58	2.188	55.56	C74465
		4.5	.1772	4.50	0.945	24.00	2.283	58.00	C74570
7/32	15		.1800	4.57	1.125	28.58	2.188	55.56	C74464
			.1820	4.62	1.125	28.58	2.188	55.56	C74463
	14		.1850	4.70	1.125	28.58	2.188	55.56	C74462
		4.7	.1850	4.70	0.945	24.00	2.283	58.00	C74571
	13		.1875	4.76	1.125	28.58	2.188	55.56	C74368
		12		.1890	4.80	1.188	30.16	2.250	57.15
	11	4.8	.1890	4.80	1.024	26.00	2.441	62.00	C74572
			.1910	4.85	1.188	30.16	2.250	57.15	C74460
13/64	10		.1929	4.90	1.024	26.00	2.441	62.00	C74573
			.1935	4.91	1.188	30.16	2.250	57.15	C74459
	9		.1960	4.98	1.188	30.16	2.250	57.15	C74458
		5.0	.1968	5.00	1.024	26.00	2.441	62.00	C74574
	8		.1990	5.05	1.188	30.16	2.250	57.15	C74457
		7		.2010	5.11	1.188	30.16	2.250	57.15
5/16	6		.2031	5.16	1.188	30.16	2.250	57.15	C74369
			.2040	5.18	1.250	31.75	2.375	60.33	C74455
	5.2	.2047	5.20	1.024	26.00	2.441	62.00	C74575	
	5		.2055	5.22	1.250	31.75	2.375	60.33	C74454
3/8	4		.2090	5.31	1.250	31.75	2.375	60.33	C74453
	3		.2130	5.41	1.250	31.75	2.375	60.33	C74452
	5.5	.2165	5.50	1.102	28.00	2.598	66.00	C74576	
7/32		.2188	5.56	1.250	31.75	2.375	60.33	C74370	

continued on next page



Screw Machine Length

Style 2331G • CLE-MAX Stub Length (continued)

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

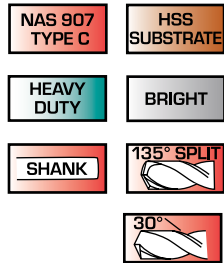
Drill Diameter			Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number
Fract	Wire	Metric			in	mm	in	mm	
	2		.2210	5.61	1.313	33.34	2.438	61.91	C74451
		5.7	.2244	5.70	1.102	28.00	2.598	66.00	C74577
	1		.2280	5.79	1.313	33.34	2.738	69.53	C74450
15/64			.2344	5.95	1.313	33.34	2.738	69.53	C74371
		6.0	.2362	6.00	1.102	28.00	2.598	66.00	C74578
		6.1	.2402	6.10	1.220	31.00	2.756	70.00	C74579
1/4			.2500	6.35	1.375	34.93	2.500	63.50	C74372
		6.5	.2559	6.50	1.220	31.00	2.756	70.00	C74580
17/64			.2656	6.75	1.438	36.51	2.625	66.68	C74373
		6.8	.2677	6.80	1.339	34.00	2.913	74.00	C74581
		7.0	.2756	7.00	1.339	34.00	2.913	74.00	C74582
9/32			.2812	7.14	1.500	38.10	2.688	68.26	C74374
		7.5	.2953	7.50	1.339	34.00	2.913	74.00	C74583
19/64			.2969	7.54	1.563	39.69	2.750	69.85	C74375
5/16			.3125	7.94	1.625	41.28	2.813	71.44	C74376
		8.0	.3150	8.00	1.457	37.00	3.110	79.00	C74584
21/64			.3281	8.33	1.688	42.86	2.938	74.61	C74377
		8.5	.3346	8.50	1.457	37.00	3.110	79.00	C74585
11/32			.3438	8.73	1.688	42.86	3.000	76.20	C74378
23/64			.3594	9.13	1.750	44.45	3.063	77.79	C74379
3/8			.3750	9.53	1.813	46.04	3.125	79.38	C74380
25/64			.3906	9.92	1.875	47.63	3.250	82.55	C74381
13/32			.4063	10.32	1.938	49.21	3.313	84.14	C74382
27/64			.4219	10.72	2.000	50.80	3.625	92.08	C74383
7/16			.4375	11.11	2.063	52.39	3.438	87.31	C74384
29/64			.4531	11.51	2.125	53.98	3.563	90.49	C74385
15/32			.4688	11.91	2.125	53.98	3.625	92.08	C74386
31/64			.4844	12.30	2.188	55.56	3.688	93.66	C74387
1/2			.5000	12.70	2.250	57.15	3.750	95.25	C74388



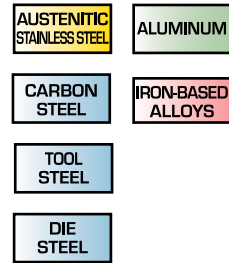
General Application Drills Aircraft NAS 907 Rev. 14 Type C

Style 2330 • Heavy-Duty Screw Machine Length

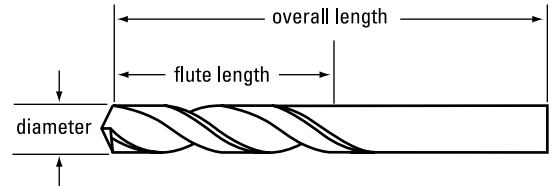
FEATURES



APPLICATIONS



Style 2330 Bright



Operating parameters on page 32.

Drill Diameter Fract	Wire	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number
				in	mm	in	mm	
3/64		.0469	1.19	.500	12.70	1.375	34.93	C70250
	1/16	.0625	1.59	.625	15.88	1.625	41.28	C70251
5/64	52	.0635	1.61	.688	17.46	1.688	42.86	C70356
	51	.0670	1.70	.688	17.46	1.688	42.86	C70355
	50	.0700	1.78	.688	17.46	1.688	42.86	C70354
	49	.0730	1.85	.688	17.46	1.688	42.86	C70353
	48	.0760	1.93	.688	17.46	1.688	42.86	C70352
	47	.0785	1.99	.750	19.05	1.750	44.45	C70351
3/32	46	.0810	2.06	.750	19.05	1.750	44.45	C70350
	45	.0820	2.08	.750	19.05	1.750	44.45	C70349
	44	.0860	2.18	.750	19.05	1.750	44.45	C70348
	43	.0890	2.26	.750	19.05	1.750	44.45	C70347
	42	.0935	2.37	.750	19.05	1.750	44.45	C70346
	41	.0960	2.44	.813	20.64	1.813	46.04	C70253
7/64	40	.0980	2.49	.813	20.64	1.813	46.04	C70345
	39	.0995	2.53	.813	20.64	1.813	46.04	C70344
	38	.1015	2.58	.813	20.64	1.813	46.04	C70343
	37	.1040	2.64	.813	20.64	1.813	46.04	C70342
	36	.1065	2.71	.813	20.64	1.813	46.04	C70341
	35	.1094	2.78	.813	20.64	1.813	46.04	C70340
1/8	34	.1100	2.79	.875	22.23	1.875	47.63	C70254
	33	.1110	2.82	.875	22.23	1.875	47.63	C70339
	32	.1130	2.87	.875	22.23	1.875	47.63	C70338
	31	.1160	2.95	.875	22.23	1.875	47.63	C70337
	30	.1200	3.05	.875	22.23	1.875	47.63	C70336
	29	.1250	3.18	.875	22.23	1.875	47.63	C70335
9/64	28	.1285	3.26	.938	23.81	1.938	49.21	C70340
	27	.1360	3.45	.938	23.81	1.938	49.21	C70339
	26	.1405	3.57	.938	23.81	1.938	49.21	C70338
	25	.1406	3.57	.938	23.81	1.938	49.21	C70337
	24	.1440	3.66	1.000	25.40	2.063	52.39	C70336
	23	.1470	3.73	1.000	25.40	2.063	52.39	C70335
	22	.1495	3.80	1.000	25.40	2.063	52.39	C70334
	21	.1520	3.86	1.000	25.40	2.063	52.39	C70333

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Aircraft NAS 907 Rev. 14 Type C

Style 2330 • Heavy-Duty Screw Machine Length (continued)

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Drill Diameter Fract	Wire/Let	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number
				in	mm	in	mm	
5/32	23	.1540	3.91	1.000	25.40	2.063	52.39	C70327
		.1562	3.97	1.000	25.40	2.063	52.39	C70257
	22	.1570	3.99	1.063	26.99	2.125	53.98	C70326
	21	.1590	4.04	1.063	26.99	2.125	53.98	C70325
11/64	20	.1610	4.09	1.063	26.99	2.125	53.98	C70324
	19	.1660	4.22	1.063	26.99	2.125	53.98	C70323
	18	.1695	4.31	1.063	26.99	2.125	53.98	C70322
		.1719	4.37	1.063	26.99	2.125	53.98	C70258
	17	.1730	4.39	1.125	28.58	2.188	55.56	C70321
	16	.1770	4.50	1.125	28.58	2.188	55.56	C70320
3/16	15	.1800	4.57	1.125	28.58	2.188	55.56	C70319
	14	.1820	4.62	1.125	28.58	2.188	55.56	C70318
	13	.1850	4.70	1.125	28.58	2.188	55.56	C70317
		.1875	4.76	1.125	28.58	2.188	55.56	C70259
	12	.1890	4.80	1.188	30.16	2.250	57.15	C70316
	11	.1910	4.85	1.188	30.16	2.250	57.15	C70315
13/64	10	.1935	4.91	1.188	30.16	2.250	57.15	C70314
	9	.1960	4.98	1.188	30.16	2.250	57.15	C70313
	8	.1990	5.05	1.188	30.16	2.250	57.15	C70312
	7	.2010	5.11	1.188	30.16	2.250	57.15	C70311
		.2031	5.16	1.188	30.16	2.250	57.15	C70260
	6	.2040	5.18	1.250	31.75	2.375	60.33	C70310
7/32	5	.2055	5.22	1.250	31.75	2.375	60.33	C70309
	4	.2090	5.31	1.250	31.75	2.375	60.33	C70308
	3	.2130	5.41	1.250	31.75	2.375	60.33	C70307
		.2188	5.56	1.250	31.75	2.375	60.33	C70261
	2	.2210	5.61	1.313	33.34	2.438	61.91	C70306
	1	.2280	5.79	1.313	33.34	2.438	61.91	C70305
15/64	A	.2340	5.94	1.313	33.34	2.438	61.91	C70280
		.2344	5.95	1.313	33.34	2.438	61.91	C70262
	B	.2380	6.05	1.375	34.93	2.500	63.50	C70281
	C	.2420	6.15	1.375	34.93	2.500	63.50	C70282
1/4	D	.2460	6.25	1.375	34.93	2.500	63.50	C70283
	E	.2500	6.35	1.375	34.93	2.500	63.50	C70263
	F	.2570	6.53	1.438	36.51	2.625	66.68	C70284
	G	.2610	6.63	1.438	36.51	2.625	66.68	C70285
17/64		.2656	6.75	1.438	36.51	2.625	66.68	C70264
	H	.2660	6.76	1.500	38.10	2.688	68.26	C70286
	I	.2720	6.91	1.500	38.10	2.688	68.26	C70287
	J	.2770	7.04	1.500	38.10	2.688	68.26	C70288
9/32		.2812	7.14	1.500	38.10	2.688	68.26	C70265
	K	.2812	7.14	1.500	38.10	2.688	68.26	C70289
	L	.2900	7.37	1.563	39.69	2.750	69.85	C70290
	M	.2950	7.49	1.563	39.69	2.750	69.85	C70291
19/64		.2969	7.54	1.563	39.69	2.750	69.85	C70266
	N	.3020	7.67	1.625	41.28	2.813	71.44	C70292
5/16		.3125	7.94	1.625	41.28	2.813	71.44	C70267
	O	.3160	8.03	1.688	42.86	2.813	71.44	C70293
21/64	P	.3230	8.20	1.688	42.86	2.813	71.44	C70294
		.3281	8.33	1.688	42.86	2.813	71.44	C70268
	Q	.3320	8.43	1.688	42.86	3.000	76.20	C70295
	R	.3390	8.61	1.688	42.86	3.000	76.20	C70296

continued on next page



Style 2330 • Heavy-Duty Screw Machine Length (continued)

Drill Diameter Fract	Letter	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number
				in	mm	in	mm	
11/32		.3438	8.73	1.688	42.86	3.000	76.20	C70269
	S	.3480	8.84	1.750	44.45	3.063	77.79	C70297
	T	.3580	9.09	1.750	44.45	3.063	77.79	C70298
23/64		.3594	9.13	1.750	44.45	3.063	77.79	C70270
	U	.3680	9.35	1.813	46.04	3.125	79.38	C70299
3/8		.3750	9.53	1.813	46.04	3.125	79.38	C70271
	V	.3770	9.58	1.875	47.63	3.250	82.55	C70300
	W	.3860	9.80	1.875	47.63	3.250	82.55	C70301
25/64		.3906	9.92	1.875	47.63	3.250	82.55	C70272
	X	.3970	10.08	1.938	49.21	3.313	84.14	C70302
	Y	.4040	10.26	1.938	49.21	3.313	84.14	C70303
13/32		.4063	10.32	1.938	49.21	3.313	84.14	C70273
	Z	.4130	10.49	2.000	50.80	3.375	85.73	C70304
27/64		.4219	10.72	2.000	50.80	3.375	85.73	C70274
7/16		.4375	11.11	2.063	52.39	3.438	87.31	C70275
29/64		.4531	11.51	2.125	53.98	3.563	90.49	C70276
15/32		.4688	11.91	2.125	53.98	2.625	66.68	C70277
31/64		.4844	12.30	2.188	55.56	3.688	93.66	C70278
1/2		.5000	12.70	2.250	57.15	3.750	95.25	C70279

Sets

No. of Pieces	Drill Style	Finish	Size Range	Set Order Number
15	2330	bright	1/16" through 1/2" x 1/32"	C70370
21	2330	bright	1/16" through 3/8" x 1/64"	C70369
29	2330	bright	1/16" through 1/2" x 1/64"	C70368

Taper Length

Style 2510 • General Purpose Taper Length

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

FEATURES

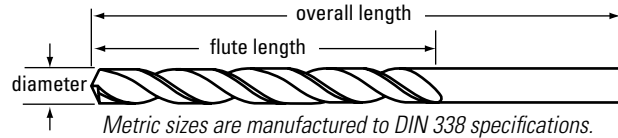
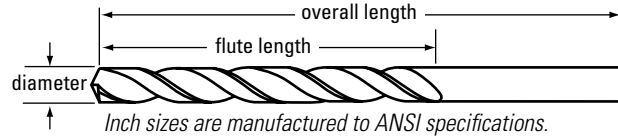
- ANSI SIZES**
- HSS SUBSTRATE**
- DIN 340**
- STEAM OXIDE**
- GENERAL PURPOSE**
- 118°**
- SHANK**
- 30°**

APPLICATIONS

- ALLOY STEEL**
- CARBON STEEL**
- CAST IRON**



Style 2510 Steam Oxide



Operating parameters are on page 32.

Drill Diameter	Decimal	Metric	Flute Length	Overall Length	Order Number
Fract Wire	mm	Eqiv.	in	mm	Steam Oxide
1.0	.0394	1.00	1.299	33.00	2.205 56.00 C08592
60	.0400	1.02	1.125	28.58	2.250 57.15 C08593
59	.0410	1.04	1.125	28.58	2.250 57.15 C08594
58	.0420	1.07	1.125	28.58	2.250 57.15 C08596
57	.0430	1.09	1.125	28.58	2.250 57.15 C08597
56	.0465	1.18	1.125	28.58	2.250 57.15 C08600
3/64	.0469	1.19	1.125	28.58	2.250 57.15 C08601
1.25	.0492	1.25	1.614	41.00	2.559 65.00 C08603
55	.0520	1.32	1.750	44.45	3.000 76.20 C08605
54	.0550	1.40	1.750	44.45	3.000 76.20 C08607
53	.0595	1.51	1.750	44.45	3.000 76.20 C08611
1.55	.0610	1.55	1.772	45.00	2.756 70.00 C08612
1/16	.0625	1.59	1.750	44.45	3.000 76.20 C08613
52	.0635	1.61	2.000	50.80	3.750 95.25 C08615
51	.0670	1.70	2.000	50.80	3.750 95.25 C08618
50	.0700	1.78	2.000	50.80	3.750 95.25 C08620
49	.0730	1.85	2.000	50.80	3.750 95.25 C08623
48	.0760	1.93	2.000	50.80	3.750 95.25 C08625
5/64	.0781	1.98	2.000	50.80	3.750 95.25 C08627
47	.0785	1.99	2.250	57.15	4.250 107.95 C08628
2.0	.0787	2.00	2.205	56.00	3.346 85.00 C08629
46	.0810	2.06	2.250	57.15	4.250 107.95 C08631
45	.0820	2.08	2.250	57.15	4.250 107.95 C08632
44	.0860	2.18	2.250	57.15	4.250 107.95 C08635
43	.0890	2.26	2.250	57.15	4.250 107.95 C08638
2.35	.0925	2.35	2.323	59.00	3.543 90.00 C08640
42	.0935	2.37	2.250	57.15	4.250 107.95 C08641
3/32	.0938	2.38	2.250	57.15	4.250 107.95 C08642
2.4	.0945	2.40	2.441	62.00	3.740 95.00 C08643
41	.0960	2.44	2.500	63.50	4.625 117.48 C08644
40	.0980	2.49	2.500	63.50	4.625 117.48 C08646
39	.0995	2.53	2.500	63.50	4.625 117.48 C08648
38	.1015	2.58	2.500	63.50	4.625 117.48 C08649
37	.1040	2.64	2.500	63.50	4.625 117.48 C08651

continued on next page



Style 2510 • General Purpose Taper Length (continued)

Fract	Drill Diameter		Metric Equiv.	Flute Length		Overall Length		Order Number Steam Oxide	
	Wire	mm		Decimal Equiv.	in	mm	in		mm
7/64	36		.1065	2.71	2.500	63.50	4.625	117.48	C08653
			.1094	2.78	2.500	63.50	4.625	117.48	C08655
	35		.1100	2.79	2.750	69.85	5.125	130.18	C08656
		2.8	.1102	2.80	2.598	66.00	3.937	100.00	C08578
	34		.1110	2.82	2.750	69.85	5.125	130.18	C08658
	33		.1130	2.87	2.750	69.85	5.125	130.18	C08659
	32		.1160	2.95	2.750	69.85	5.125	130.18	C08661
		3.0	.1181	3.00	2.598	66.00	5.125	100.00	C08662
1/8	31		.1200	3.05	2.750	69.85	5.125	130.18	C08663
			.1250	3.18	2.750	69.85	5.125	130.18	C08665
		3.2	.1260	3.20	2.717	69.00	4.173	106.00	C08666
	30		.1285	3.26	3.000	76.20	5.375	136.53	C08668
		3.3	.1299	3.30	2.717	69.00	4.173	106.00	C08669
	29		.1360	3.45	3.000	76.20	5.375	136.53	C08671
		3.5	.1378	3.50	2.874	73.00	4.409	112.00	C08582
9/64	28		.1405	3.57	3.000	76.20	5.375	136.53	C08673
			.1406	3.57	3.000	76.20	5.375	136.53	C08674
	27		.1440	3.66	3.000	76.20	5.375	136.53	C08676
	26		.1470	3.73	3.000	76.20	5.375	136.53	C08678
	25		.1495	3.80	3.000	76.20	5.375	136.53	C08680
	24		.1520	3.86	3.000	76.20	5.375	136.53	C08682
5/32	23		.1540	3.91	3.000	76.20	5.375	136.53	C08684
			.1562	3.97	3.000	76.20	5.375	136.53	C08685
	22		.1570	3.99	3.375	85.73	5.750	146.05	C08686
		4.0	.1575	4.00	3.071	78.00	4.685	119.00	C08687
	21		.1590	4.04	3.375	85.73	5.750	146.05	C08688
	20		.1610	4.09	3.375	85.73	5.750	146.05	C08689
		4.2	.1654	4.20	3.071	78.00	4.685	119.00	C08587
	19		.1660	4.22	3.375	85.73	5.750	146.05	C08692
11/64	18		.1695	4.31	3.375	85.73	5.750	146.05	C08695
			.1719	4.37	3.375	85.73	5.750	146.05	C08696
	17		.1730	4.39	3.375	85.73	5.750	146.05	C08697
	16		.1770	4.50	3.375	85.73	5.750	146.05	C08699
	15		.1800	4.57	3.375	85.73	5.750	146.05	C08701
	14		.1820	4.62	3.375	85.73	5.750	146.05	C08703
3/16	13		.1850	4.70	3.375	85.73	5.750	146.05	C08704
			.1875	4.76	3.375	85.73	5.750	146.05	C08707
	12		.1890	4.80	3.625	92.08	6.000	152.40	C08708
	11		.1910	4.85	3.625	92.08	6.000	152.40	C08710
	10		.1935	4.91	3.625	92.08	6.000	152.40	C08712
	9		.1960	4.98	3.625	92.08	6.000	152.40	C08713
		5.0	.1969	5.00	3.425	87.00	5.197	132.00	C08714
	8		.1990	5.05	3.625	92.08	6.000	152.40	C08715
13/64	7		.2010	5.11	3.625	92.08	6.000	152.40	C08717
			.2031	5.16	3.625	92.08	6.000	152.40	C08718
	6		.2040	5.18	3.625	92.08	6.000	152.40	C08719
	5		.2055	5.22	3.625	92.08	6.000	152.40	C08721
	4		.2090	5.31	3.625	92.08	6.000	152.40	C08724
7/32	3		.2130	5.41	3.625	92.08	6.000	152.40	C08726
			.2188	5.56	3.625	92.08	6.000	152.40	C08728
	2		.2210	5.61	3.750	95.25	6.125	155.58	C08730
	1		.2280	5.79	3.750	95.25	6.125	155.58	C08733

continued on next page

General Application Drills

Taper Length

Style 2510 • General Purpose Taper Length (continued)

Drill Diameter Fract Let	mm	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number Steam Oxide
				in	mm	in	mm	
	5.8	.2283	5.80	3.583	91.00	5.472	139.00	C08608
	5.9	.2323	5.90	3.583	91.00	5.472	139.00	C08735
15/64		.2344	5.95	3.750	95.25	6.125	155.58	C08737
	6.0	.2362	6.00	3.583	91.00	5.472	139.00	C08738
	D	.2460	6.25	3.750	95.25	6.125	155.58	C08743
	6.3	.2480	6.30	3.819	97.00	5.827	148.00	C08745
1/4	E	.2500	6.35	3.750	95.25	6.125	155.58	C08746
	6.5	.2559	6.50	3.819	97.00	5.827	148.00	C08749
	F	.2570	6.53	3.875	98.43	6.250	158.75	C08750
17/64		.2656	6.75	3.875	98.43	6.250	158.75	C08752
	6.8	.2677	6.80	4.016	102.00	6.142	156.00	C08755
	I	.2720	6.91	3.875	98.43	6.250	158.75	C08757
	7.0	.2756	7.00	4.016	102.00	6.142	156.00	C08758
	J	.2770	7.04	3.875	98.43	6.250	158.75	C08759
9/32		.2812	7.14	3.875	98.43	6.250	158.75	C08766
	7.5	.2953	7.50	4.016	102.00	6.142	156.00	C08609
19/64		.2969	7.54	4.000	101.60	6.375	161.93	C08770
	N	.3020	7.67	4.000	101.60	6.375	161.93	C08772
5/16		.3125	7.94	4.000	101.60	6.375	161.93	C08777
	8.0	.3150	8.00	4.291	109.00	6.496	165.00	C08778
	O	.3160	8.03	4.125	104.78	6.500	165.10	C08779
	P	.3230	8.20	4.125	104.78	6.500	165.10	C08782
21/64		.3281	8.33	4.125	104.78	6.500	165.10	C08785
	Q	.3320	8.43	4.125	104.78	6.500	165.10	C08787
	8.5	.3346	8.50	4.291	109.00	6.496	165.00	C08788
	R	.3390	8.61	4.125	104.78	6.500	165.10	C08790
11/32		.3438	8.73	4.125	104.78	6.500	165.10	C08792
	9.0	.3543	9.00	4.528	115.00	6.890	175.00	C08797
23/64		.3594	9.13	4.250	107.95	6.750	171.45	C08800
3/8		.3750	9.53	4.250	107.95	6.750	171.45	C08807
	V	.3770	9.58	4.375	111.13	7.000	177.80	C08808
25/64		.3906	9.92	4.375	111.13	7.000	177.80	C08815
	10.0	.3937	10.00	4.764	121.00	7.244	184.00	C08816
	10.2	.4016	10.20	4.764	121.00	7.244	184.00	C08818
13/32		.4062	10.32	4.375	111.13	7.000	177.80	C08821
	10.5	.4134	10.50	4.764	121.00	7.244	184.00	C08823
27/64		.4219	10.72	4.625	117.48	7.250	184.15	C08824
	11.0	.4331	11.00	5.039	128.00	7.677	195.00	C08826
7/16		.4375	11.11	4.625	117.48	7.250	184.15	C08827
	11.2	.4409	11.20	5.039	128.00	7.677	195.00	C08828
29/64		.4531	11.51	4.750	120.65	7.500	190.50	C08830
15/32		.4688	11.91	4.750	120.65	7.500	190.50	C08832
	12.0	.4724	12.00	5.276	134.00	8.071	205.00	C08833
31/64		.4844	12.30	4.750	120.65	7.750	196.85	C08835
	12.5	.4921	12.50	5.276	134.00	8.071	205.00	C08610
1/2		.5000	12.70	4.750	120.65	7.750	196.85	C08837
	13.0	.5118	13.00	5.276	134.00	8.071	205.00	C08839
33/64		.5156	13.10	4.750	120.65	8.000	203.20	C08840
17/32		.5312	13.49	4.750	120.65	8.000	203.20	C08842
35/64		.5469	13.89	4.875	123.83	8.250	209.55	C08845
	14.0	.5512	14.00	5.512	140.00	8.425	214.00	C08846
9/16		.5625	14.29	4.875	123.83	8.250	209.55	C08848

continued on next page



Style 2510 • General Purpose Taper Length (continued)

Drill Diameter Fract	Decimal mm	Metric Equiv.	Metric Equiv.	Flute Length in	Flute Length mm	Overall Length in	Overall Length mm	Order Number Steam Oxide
37/64		.5781	14.68	4.875	123.83	8.750	222.25	C08850
	15.0	.5906	15.00	5.669	144.00	8.661	220.00	C08852
19/32		.5938	15.08	4.875	123.83	8.750	222.25	C08853
39/64		.6094	15.48	4.875	123.83	8.750	222.25	C08855
5/8		.6250	15.88	4.875	123.83	8.750	222.25	C08858
	16.0	.6299	16.00	5.866	149.00	8.937	227.00	C08859
41/64		.6406	16.27	5.125	130.18	9.000	228.60	C08861
21/32		.6562	16.67	5.125	130.18	9.000	228.60	C08863
	17.0	.6693	17.00	5.866	149.00	9.252	235.00	C08865
43/64		.6719	17.07	5.375	136.53	9.250	234.95	C08866
11/16		.6875	17.46	5.375	136.53	9.250	234.95	C08868
45/64		.7031	17.86	5.625	142.88	9.500	241.30	C08870
	18.0	.7087	18.00	5.630	143.00	9.488	241.00	C08871
23/32		.7188	18.26	5.625	142.88	9.500	241.30	C08872
47/64		.7344	18.65	5.875	149.23	9.750	247.65	C08874
3/4		.7500	19.05	5.875	149.23	9.750	247.65	C08876
49/64		.7656	19.45	6.000	152.40	9.875	250.83	C08877
25/32		.7812	19.84	6.000	152.40	9.875	250.83	C08879
	20.0	.7874	20.00	6.142	156.00	10.000	254.00	C08880
51/64		.7969	20.24	6.125	155.58	10.000	254.00	C08881
13/16		.8125	20.64	6.125	155.58	10.000	254.00	C08883
53/64		.8281	21.03	6.125	155.58	10.000	254.00	C08885
27/32		.8438	21.43	6.125	155.58	10.000	254.00	C08886
55/64		.8594	21.83	6.125	155.58	10.000	254.00	C08888
7/8		.8750	22.23	6.125	155.58	10.000	254.00	C08890
57/64		.8906	22.62	6.125	155.58	10.000	254.00	C08892
29/32		.9062	23.02	6.125	155.58	10.000	254.00	C08894
59/64		.9219	23.42	6.125	155.58	10.750	273.05	C08895
15/16		.9375	23.81	6.125	155.58	10.750	273.05	C08897
61/64		.9531	24.21	6.375	161.93	11.000	279.40	C08899
31/32		.9688	24.61	6.375	161.93	11.000	279.40	C08901
63/64		.9844	25.00	6.375	161.93	11.000	279.40	C08903
1		1.0000	25.40	6.375	161.93	11.000	279.40	C08904
1-1/64		1.0156	25.80	6.500	165.10	11.125	282.58	C08906
1-1/32		1.0312	26.19	6.500	165.10	11.125	282.58	C08908
1-3/64		1.0469	26.59	6.625	168.28	11.250	285.75	C08910
1-1/16		1.0625	26.99	6.625	168.28	11.250	285.75	C08911
1-1/8		1.1250	28.58	7.125	180.98	11.750	298.45	C08919
1-1/4		1.2500	31.75	7.875	200.03	12.500	317.50	C08933

Sets

No. of Pieces	Drill Style	Finish	Size Range	Set Order Number
29	2510	steam oxide	1/16" through 1/2" x 1/64"	C00962



Taper Length

Style 2550 • High-Helix Taper Length

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

FEATURES

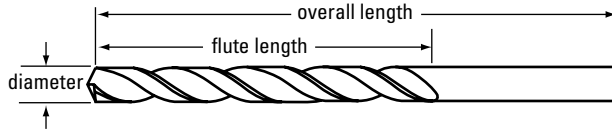
ANSI SIZES	HSS SUBSTRATE
GENERAL PURPOSE	BRIGHT
SHANK	118°
	38°

APPLICATIONS

ALLOY STEEL
ALUMINUM
COPPER ALLOYS
PLASTIC



Style 2550 Bright



Improved chip lifting in soft materials.

Operating parameters on page 32.

Diameter Fract	Decimal Wire	Metric Equiv.	Metric Equiv.	Flute Length in	Flute Length mm	Overall Length in	Overall Length mm	Order Number
1/32	.0312	0.79	.750	19.05	1.625	41.28	C09060	
60	.0400	1.02	1.125	28.58	2.250	57.15	C09062	
59	.0410	1.04	1.125	28.58	2.250	57.15	C09063	
58	.0420	1.07	1.125	28.58	2.250	57.15	C09065	
57	.0430	1.09	1.125	28.58	2.250	57.15	C09066	
56	.0465	1.18	1.125	28.58	2.250	57.15	C09069	
3/64	.0469	1.19	1.125	28.58	2.250	57.15	C09070	
55	.0520	1.32	1.750	44.45	3.000	76.20	C09074	
54	.0550	1.40	1.750	44.45	3.000	76.20	C09076	
53	.0595	1.51	1.750	44.45	3.000	76.20	C09080	
1/16	.0625	1.59	1.750	44.45	3.000	76.20	C09082	
52	.0635	1.61	2.000	50.80	3.750	95.25	C09084	
51	.0670	1.70	2.000	50.80	3.750	95.25	C09087	
50	.0700	1.78	2.000	50.80	3.750	95.25	C09089	
49	.0730	1.85	2.000	50.80	3.750	95.25	C09092	
48	.0760	1.93	2.000	50.80	3.750	95.25	C09094	
5/64	.0781	1.98	2.000	50.80	3.750	95.25	C09096	
47	.0785	1.99	2.250	57.15	4.250	107.95	C09097	
46	.0810	2.06	2.250	57.15	4.250	107.95	C09100	
45	.0820	2.08	2.250	57.15	4.250	107.95	C09101	
44	.0860	2.18	2.250	57.15	4.250	107.95	C09104	
43	.0890	2.26	2.250	57.15	4.250	107.95	C09107	
42	.0935	2.37	2.250	57.15	4.250	107.95	C09110	
3/32	.0938	2.38	2.250	57.15	4.250	107.95	C09111	
41	.0960	2.44	2.500	63.50	4.625	117.48	C09113	
40	.0980	2.49	2.500	63.50	4.625	117.48	C09115	
39	.0995	2.53	2.500	63.50	4.625	117.48	C09117	
38	.1015	2.58	2.500	63.50	4.625	117.48	C09118	
37	.1040	2.64	2.500	63.50	4.625	117.48	C09120	
36	.1065	2.71	2.500	63.50	4.625	117.48	C09122	
7/64	.1094	2.78	2.500	63.50	4.625	117.48	C09124	
35	.1100	2.79	2.750	69.85	5.125	130.18	C09125	
34	.1110	2.82	2.750	69.85	5.125	130.18	C09127	
33	.1130	2.87	2.750	69.85	5.125	130.18	C09128	

Diameter Fract	Decimal Wire	Metric Equiv.	Metric Equiv.	Flute Length in	Flute Length mm	Overall Length in	Overall Length mm	Order Number
32	.1160	2.95	2.750	69.85	5.125	130.18	C09130	
31	.1200	3.05	2.750	69.85	5.125	130.18	C09132	
1/8	.1250	3.18	2.750	69.85	5.125	130.18	C09134	
30	.1285	3.26	3.000	76.20	5.375	136.53	C09137	
29	.1360	3.45	3.000	76.20	5.375	136.53	C09140	
28	.1405	3.57	3.000	76.20	5.375	136.53	C09142	
9/64	.1406	3.57	3.000	76.20	5.375	136.53	C09143	
27	.1440	3.66	3.000	76.20	5.375	136.53	C09145	
26	.1470	3.73	3.000	76.20	5.375	136.53	C09147	
25	.1495	3.80	3.000	76.20	5.375	136.53	C09149	
24	.1520	3.86	3.000	76.20	5.375	136.53	C09151	
23	.1540	3.91	3.000	76.20	5.375	136.53	C09153	
5/32	.1562	3.97	3.000	76.20	5.375	136.53	C09154	
22	.1570	3.99	3.375	85.73	5.750	146.05	C09155	
21	.1590	4.04	3.375	85.73	5.750	146.05	C09157	
20	.1610	4.09	3.375	85.73	5.750	146.05	C09158	
19	.1660	4.22	3.375	85.73	5.750	146.05	C09161	
18	.1695	4.31	3.375	85.73	5.750	146.05	C09164	
11/64	.1719	4.37	3.375	85.73	5.750	146.05	C09165	
17	.1730	4.39	3.375	85.73	5.750	146.05	C09166	
16	.1770	4.50	3.375	85.73	5.750	146.05	C09168	
15	.1800	4.57	3.375	85.73	5.750	146.05	C09170	
14	.1820	4.62	3.375	85.73	5.750	146.05	C09172	
13	.1850	4.70	3.375	85.73	5.750	146.05	C09173	
3/16	.1875	4.76	3.375	85.73	5.750	146.05	C09176	
12	.1890	4.80	3.625	92.08	6.000	152.40	C09177	
11	.1910	4.85	3.625	92.08	6.000	152.40	C09179	
10	.1935	4.91	3.625	92.08	6.000	152.40	C09181	
9	.1960	4.98	3.625	92.08	6.000	152.40	C09182	
8	.1990	5.05	3.625	92.08	6.000	152.40	C09184	
7	.2010	5.11	3.625	92.08	6.000	152.40	C09186	
13/64	.2031	5.16	3.625	92.08	6.000	152.40	C09187	
6	.2040	5.18	3.625	92.08	6.000	152.40	C09188	
5	.2055	5.22	3.625	92.08	6.000	152.40	C09190	

continued on next page



Style 2550 • High-Helix Taper Length (continued)

Diameter Fract	Decimal Wire	Metric Equiv.	Flute Length in	mm	Overall Length in	mm	Order Number
4	.2090	5.31	3.625	92.08	6.000	152.40	C09193
3	.2130	5.41	3.625	92.08	6.000	152.40	C09195
7/32	.2188	5.56	3.625	92.08	6.000	152.40	C09197
2	.2210	5.61	3.750	95.25	6.125	155.58	C09199
1	.2280	5.79	3.750	95.25	6.125	155.58	C09202
15/64	.2344	5.95	3.750	95.25	6.125	155.58	C09205
1/4	.2500	6.35	3.750	95.25	6.125	155.58	C09211
17/64	.2656	6.75	3.875	98.43	6.250	158.75	C09216
9/32	.2812	7.14	3.875	98.43	6.250	158.75	C09225
19/64	.2969	7.54	4.000	101.60	6.375	161.93	C09228

Diameter Fract	Decimal Equiv.	Metric Equiv.	Flute Length in	mm	Overall Length in	mm	Order Number
5/16	.3125	7.94	4.000	101.60	6.375	161.93	C09234
21/64	.3281	8.33	4.125	104.78	6.500	165.10	C09240
11/32	.3438	8.73	4.125	104.78	6.500	165.10	C09245
23/64	.3594	9.13	4.250	107.95	6.750	171.45	C09251
3/8	.3750	9.53	4.250	107.95	6.750	171.45	C09257
13/32	.4062	10.32	4.375	111.13	7.000	177.80	C09266
7/16	.4375	11.11	4.625	117.48	7.250	184.15	C09271
15/32	.4688	11.91	4.750	120.65	7.750	196.85	C09276
1/2	.5000	12.70	4.750	120.65	7.750	196.85	C09281

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Style 2513 • Cobalt Heavy-Duty Taper Length

FEATURES

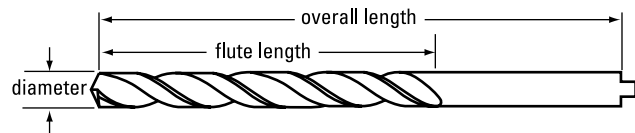
- ANSI SIZES
- M42 COBALT SUBSTRATE
- HEAVY DUTY
- STRAW OXIDE
- SHANK
- 118° KNOTCH
- 30°

APPLICATIONS

- STAINLESS STEEL
- CARBON STEEL
- CAST IRON



Style 2513 Straw Oxide



Operating parameters on page 32.
Tang specifications on page 85.

High red hardness for extended wear life in high heat conditions.

Drill Diameter	Decimal Equiv.	Metric Equiv.	Flute Length in	mm	Overall Length in	mm	Order Number
1/8	.1250	3.18	3.375	85.73	5.125	130.18	C14873
9/64	.1406	3.57	3.625	92.08	5.375	136.53	C14882
5/32	.1562	3.97	3.750	95.25	5.375	136.53	C14893
3/16	.1875	4.76	4.125	104.78	5.750	146.05	C14915
7/32	.2188	5.56	4.375	111.13	6.000	152.40	C14935
1/4	.2500	6.35	4.813	122.24	6.125	155.58	C14954
9/32	.2812	7.14	5.000	127.00	6.250	158.75	C14973
5/16	.3125	7.94	5.125	130.18	6.375	161.93	C14984
11/32	.3438	8.73	5.250	133.35	6.500	165.10	C14999
23/64	.3594	9.13	5.375	136.53	6.750	171.45	C15007

Drill Diameter	Decimal Equiv.	Metric Equiv.	Flute Length in	mm	Overall Length in	mm	Order Number
3/8	.3750	9.53	5.375	136.53	6.750	171.45	C15014
13/32	.4062	10.32	5.625	142.88	7.000	177.80	C15028
27/64	.4219	10.72	5.688	144.46	7.250	184.15	C15031
7/16	.4375	11.11	5.688	144.46	7.250	184.15	C15034
29/64	.4531	11.51	5.750	146.05	7.500	190.50	C15037
15/32	.4688	11.91	5.750	146.05	7.500	190.50	C15039
31/64	.4844	12.30	5.750	146.05	7.750	196.85	C15042
1/2	.5000	12.70	5.750	146.05	7.750	196.85	C15044

Taper Length

Styles 2540 • HSS Heavy-Duty Taper Length

DRILLING

FEATURES

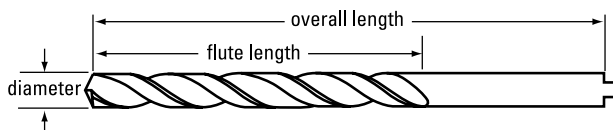
- ANSI SIZES**
- HSS SUBSTRATE**
- HEAVY DUTY**
- STEAM OXIDE**
- SHANK**
- 118° KNOTCH**
- 30°**

APPLICATIONS

- ALLOY-TOOL STEEL**
- STAINLESS STEEL**
- CAST IRON**



Style 2540 Black Oxide



HOLE FINISHING

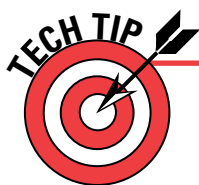
Operating parameters on page 32.
Tang specifications on page 85.

THREADING

Drill Diameter	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number
			in	mm	in	mm	
1/8	.1250	3.18	3.375	85.73	5.125	130.18	C09443
5/32	.1562	3.97	3.750	95.25	5.375	136.53	C09455
3/16	.1875	4.76	4.125	104.78	5.750	146.05	C09467
7/32	.2188	5.56	4.375	111.13	6.000	152.40	C09478
1/4	.2500	6.35	4.813	122.24	6.125	155.58	C09490
9/32	.2812	7.14	5.000	127.00	6.250	158.75	C09504
5/16	.3125	7.94	5.125	130.18	6.375	161.93	C09513
11/32	.3438	8.73	5.250	133.35	6.500	165.10	C09524
3/8	.3750	9.53	5.375	136.53	6.750	171.45	C09536
13/32	.4062	10.32	5.625	142.88	7.000	177.80	C09545
7/16	.4375	11.11	5.688	144.46	7.250	184.15	C09550
29/64	.4531	11.51	5.750	146.05	7.500	190.50	C09553
15/32	.4688	11.91	5.750	146.05	7.500	190.50	C09555
1/2	.5000	12.70	5.750	146.05	7.750	196.85	C09560
33/64	.5156	13.10	6.000	152.40	8.000	203.20	C09563
17/32	.5312	13.49	6.000	152.40	8.000	203.20	C09565
9/16	.5625	14.29	6.250	158.75	8.250	209.55	C09571
19/32	.5938	15.08	6.500	165.10	8.750	222.25	C09576
5/8	.6250	15.88	6.500	165.10	8.750	222.25	C09581

MILLING

OTHER TOOLS



Heavy-Duty Automotive Tang Taper Length Drills

These drills feature a 20% longer flute length than regular taper length drills for increased regrinds and reach.



Style 2745 • Carbide-Tipped Heavy-Duty Taper Length

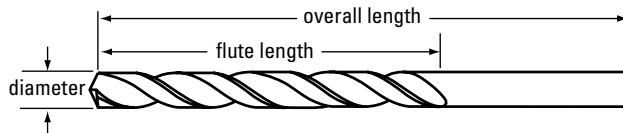
FEATURES

ANSI SIZES
HEAVY DUTY
SHANK

CARBIDE-TIPPED HSS
STRAW OXIDE
118°
30°

APPLICATIONS

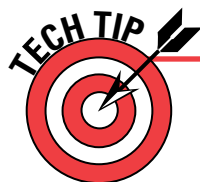
ALLOY STEEL
LOW CARBON STEEL
CAST IRON
NON-FERROUS MATERIALS



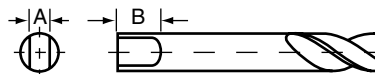
- Run at carbide speeds.
- HSS shank and body for extra strength.

Operating parameters on page 33.

Drill Diameter	Decimal Equiv.	Metric Equiv.	Flute Length in	Flute Length mm	Overall Length in	Overall Length mm	Order Number
1/8	.1250	3.18	2.750	69.85	5.125	130.18	C49017
5/32	.1562	3.97	3.000	76.20	5.375	136.53	C49029
3/16	.1875	4.76	3.375	85.73	5.750	146.05	C49041
7/32	.2188	5.56	3.625	92.08	6.000	152.40	C49052
1/4	.2500	6.35	3.750	95.25	6.125	155.58	C49064
9/32	.2812	7.14	3.875	98.43	6.250	158.75	C49078
5/16	.3125	7.94	4.000	101.60	6.375	161.93	C49087
11/32	.3438	8.73	4.125	104.78	6.500	165.10	C49098
3/8	.3750	9.53	4.250	107.95	6.750	171.45	C49110
13/32	.4062	10.32	4.375	111.13	7.000	177.80	C49119
27/64	.4219	10.72	4.625	117.48	7.250	184.15	C49121
7/16	.4375	11.11	4.625	117.48	7.250	184.15	C49124
15/32	.4688	11.91	4.750	120.65	7.500	190.50	C49129
1/2	.5000	12.70	4.750	120.65	7.750	196.85	C49134
17/32	.5312	13.49	4.750	120.65	8.000	203.20	C49139
9/16	.5625	14.29	4.875	123.83	8.250	209.55	C49145
5/8	.6250	15.88	4.875	123.83	8.750	222.25	C49155



Tang Specifications



shank diameter (inches)		tang dimensions (inches)	
from	to	width A	width B
1/8	3/16	.092	.281
over 3/16	1/4	.120	.312
over 1/4	5/16	.160	.344
over 5/16	3/8	.201	.375
over 3/8	15/32	.241	.438
over 15/32	9/16	.300	.500
over 9/16	21/32	.370	.563
over 21/32	3/4	.440	.625
over 3/4	7/8	.511	.688
over 7/8	1	.605	.750
over 1	1-3/16	.696	.813
over 1-3/16	1-3/8	.813	.875

Extra Length

Style 950E • General Purpose Extra Length

DRILLING

FEATURES

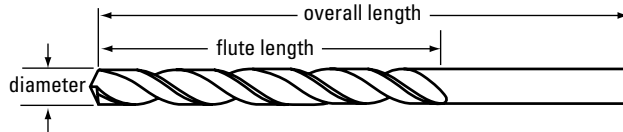
ANSI SIZES HSS SUBSTRATE
 GENERAL PURPOSE STEAM OXIDE
 SHANK 118° KNOTCH 30°

APPLICATIONS

ALLOY-TOOL STEEL
 CARBON STEEL
 CAST IRON



Style 950E Steam Oxide



Operating parameters on page 32.

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

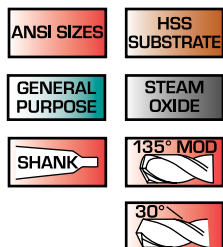
Drill Diameter	Dec. Equiv.	Metric Equiv.	Flute Length in	Flute Length mm	Overall Length in	Overall Length mm	Order Number
3/32	.0938	2.38	5.500	139.70	8.000	203.20	C09655
7/64	.1094	2.78	5.500	139.70	8.000	203.20	C09656
1/8	.1250	3.18	5.500	139.70	8.000	203.20	C09657
1/8	.1250	3.18	7.500	190.50	10.000	254.00	C09707
1/8	.1250	3.18	9.000	228.60	12.000	304.80	C09736
9/64	.1406	3.57	5.500	139.70	8.000	203.20	C09658
5/32	.1562	3.97	5.500	139.70	8.000	203.20	C09659
5/32	.1562	3.97	7.500	190.50	10.000	254.00	C09709
5/32	.1562	3.97	9.000	228.60	12.000	304.80	C09738
11/64	.1719	4.37	5.500	139.70	8.000	203.20	C09660
3/16	.1875	4.76	5.500	139.70	8.000	203.20	C09661
3/16	.1875	4.76	7.500	190.50	10.000	254.00	C09711
3/16	.1875	4.76	9.000	228.60	12.000	304.80	C09740
13/64	.2031	5.16	5.500	139.70	8.000	203.20	C09662
7/32	.2188	5.56	5.500	139.70	8.000	203.20	C09663
7/32	.2188	5.56	7.500	190.50	10.000	254.00	C09713
7/32	.2188	5.56	9.000	228.60	12.000	304.80	C09742
15/64	.2344	5.95	5.500	139.70	8.000	203.20	C09664
15/64	.2344	5.95	7.500	190.50	10.000	254.00	C09714
1/4	.2500	6.35	5.500	139.70	8.000	203.20	C09665
1/4	.2500	6.35	7.500	190.50	10.000	254.00	C09715
1/4	.2500	6.35	9.000	228.60	12.000	304.80	C09744
1/4	.2500	6.35	14.000	355.60	18.000	457.20	C09831
17/64	.2656	6.75	5.500	139.70	8.000	203.20	C09666
9/32	.2812	7.14	5.500	139.70	8.000	203.20	C09667
9/32	.2812	7.14	7.500	190.50	10.000	254.00	C09717
9/32	.2812	7.14	9.000	228.60	12.000	304.80	C09746
9/32	.2812	7.14	14.000	355.60	18.000	457.20	C09833
19/64	.2969	7.54	5.500	139.70	8.000	203.20	C09668
5/16	.3125	7.94	5.500	139.70	8.000	203.20	C09669
5/16	.3125	7.94	7.500	190.50	10.000	254.00	C09719
5/16	.3125	7.94	9.000	228.60	12.000	304.80	C09748
5/16	.3125	7.94	14.000	355.60	18.000	457.20	C09835
21/64	.3281	8.33	5.500	139.70	8.000	203.20	C09670
11/32	.3438	8.73	5.500	139.70	8.000	203.20	C09671
11/32	.3438	8.73	7.500	190.50	10.000	254.00	C09721

Drill Diameter	Dec. Equiv.	Metric Equiv.	Flute Length in	Flute Length mm	Overall Length in	Overall Length mm	Order Number
11/32	.3438	8.73	9.000	228.60	12.000	304.80	C09750
11/32	.3438	8.73	14.000	355.60	18.000	457.20	C09837
23/64	.3594	9.13	5.500	139.70	8.000	203.20	C09672
3/8	.3750	9.53	5.500	139.70	8.000	203.20	C09673
3/8	.3750	9.53	7.500	190.50	10.000	254.00	C09723
3/8	.3750	9.53	9.000	228.60	12.000	304.80	C09752
3/8	.3750	9.53	14.000	355.60	18.000	457.20	C09839
25/64	.3906	9.92	5.500	139.70	8.000	203.20	C09674
13/32	.4062	10.32	5.500	139.70	8.000	203.20	C09675
13/32	.4062	10.32	7.500	190.50	10.000	254.00	C09725
13/32	.4062	10.32	9.000	228.60	12.000	304.80	C09754
13/32	.4062	10.32	14.000	355.60	18.000	457.20	C09841
27/64	.4219	10.72	5.500	139.70	8.000	203.20	C09676
7/16	.4375	11.11	5.500	139.70	8.000	203.20	C09677
7/16	.4375	11.11	7.500	190.50	10.000	254.00	C09727
7/16	.4375	11.11	9.000	228.60	12.000	304.80	C09756
7/16	.4375	11.11	14.000	355.60	18.000	457.20	C09843
29/64	.4531	11.51	5.500	139.70	8.000	203.20	C09678
15/32	.4688	11.91	5.500	139.70	8.000	203.20	C09679
15/32	.4688	11.91	7.500	190.50	10.000	254.00	C09729
15/32	.4688	11.91	9.000	228.60	12.000	304.80	C09758
15/32	.4688	11.91	14.000	355.60	18.000	457.20	C09845
31/64	.4844	12.30	5.500	139.70	8.000	203.20	C09680
1/2	.5000	12.70	5.500	139.70	8.000	203.20	C09681
1/2	.5000	12.70	7.500	190.50	10.000	254.00	C09731
1/2	.5000	12.70	9.000	228.60	12.000	304.80	C09760
1/2	.5000	12.70	14.000	355.60	18.000	457.20	C09847
17/32	.5312	13.49	7.500	190.50	10.000	254.00	C09733
17/32	.5312	13.49	9.000	228.60	12.000	304.80	C09762
9/16	.5625	14.29	7.500	190.50	10.000	254.00	C09735
9/16	.5625	14.29	9.000	228.60	12.000	304.80	C09764
19/32	.5938	15.08	9.000	228.60	12.000	304.80	C09766
5/8	.6250	15.88	9.000	228.60	12.000	304.80	C09768
21/32	.6562	16.67	9.000	228.60	12.000	304.80	C09770
11/16	.6875	17.46	9.000	228.60	12.000	304.80	C09772
23/32	.7188	18.26	9.000	228.60	12.000	304.80	C09774
3/4	.7500	19.05	9.000	228.60	12.000	304.80	C09776

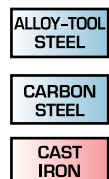


Styles 2410, 2411, 2412 • Standard Taper Shank, Undersized Shank, and Oversized Shank

FEATURES



APPLICATIONS



Style 2410 Standard Shank



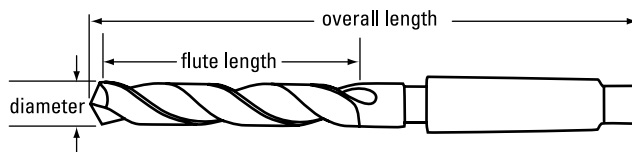
Style 2411 Undersized Shank



Style 2412 Oversized Shank

Operating parameters on page 32.
Morse taper shank specifications on page 90.

Undersize and oversize shank drills available from stock in popular sizes. See table below.



Drill Diameter Fract	Decimal Letter	Metric Equiv.	Metric Equiv.	Flute Length		Overall Length		Morse Taper	Order Number		
				in	mm	in	mm		Style 2410 Standard Shank	Style 2411 Undersize Shank	Style 2412 Oversize Shank
1/8		.1250	3.18	1.875	47.63	5.125	130.18	1	C12040	–	–
5/32		.1562	3.97	2.125	53.98	5.375	136.53	1	C12052	–	–
11/64		.1719	4.37	2.500	63.50	5.750	146.05	1	C12058	–	–
3/16		.1875	4.76	2.500	63.50	5.750	146.05	1	C12064	–	–
13/64		.2031	5.16	2.750	69.85	6.000	152.40	1	C12069	–	–
7/32		.2188	5.56	2.750	69.85	6.000	152.40	1	C12075	–	–
15/64		.2344	5.95	2.875	73.03	6.125	155.58	1	C12082	–	–
1/4	E	.2500	6.35	2.875	73.03	6.125	155.58	1	C12091	–	–
	F	.2570	6.53	3.000	76.20	6.250	158.75	1	C12095	–	–
17/64		.2656	6.75	3.000	76.20	6.250	158.75	1	C12099	–	–
9/32		.2812	7.14	3.000	76.20	6.250	158.75	1	C12113	–	–
19/64		.2969	7.54	3.125	79.38	6.375	161.93	1	C12117	–	–
5/16		.3125	7.94	3.125	79.38	6.375	161.93	1	C12124	–	–
	O	.3160	8.03	3.250	82.55	6.500	165.10	1	C12126	–	–
	P	.3230	8.20	3.250	82.55	6.500	165.10	1	C12129	–	–
21/64		.3281	8.33	3.250	82.55	6.500	165.10	1	C12132	–	–
	Q	.3320	8.43	3.250	82.55	6.500	165.10	1	C12134	–	–
	R	.3390	8.61	3.250	82.55	6.500	165.10	1	C12137	–	–
11/32		.3438	8.73	3.250	82.55	6.500	165.10	1	C12139	–	–
23/64		.3594	9.13	3.500	88.90	6.750	171.45	1	C12147	–	–
	U	.3680	9.35	3.500	88.90	6.750	171.45	1	C12151	–	–
3/8		.3750	9.53	3.500	88.90	6.750	171.45	1	C12154	–	–
3/8		.3750	9.53	3.500	88.90	7.375	187.33	2	–	–	C12641
	V	.3770	9.58	3.625	92.08	7.000	177.80	1	C12155	–	–
25/64		.3906	9.92	3.625	92.08	7.000	177.80	1	C12162	–	–
13/32		.4062	10.32	3.625	92.08	7.000	177.80	1	C12167	–	–
13/32		.4062	10.32	3.625	92.08	7.500	190.50	2	–	–	C12650

continued on next page

Taper Shank

Styles 2410, 2411, 2412 • Standard Taper Shank, Undersized Shank, and Oversized Shank (continued)

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Drill Diameter Fract	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Morse Taper	Order Number		
			in	mm	in	mm		Style 2410 Standard Shank	Style 2411 Undersize Shank	Style 2412 Oversize Shank
27/64	.4219	10.72	3.875	98.43	7.250	184.15	1	C12170	—	—
27/64	.4219	10.72	3.875	98.43	7.750	196.85	2	—	—	C12652
7/16	.4375	11.11	3.875	98.43	7.250	184.15	1	C12173	—	—
7/16	.4375	11.11	3.875	98.43	7.750	196.85	2	—	—	C12655
29/64	.4531	11.51	4.125	104.78	7.500	190.50	1	C12176	—	—
29/64	.4531	11.51	4.125	104.78	8.000	203.20	2	—	—	C12658
15/32	.4688	11.91	4.125	104.78	7.500	190.50	1	C12178	—	—
15/32	.4688	11.91	4.125	104.78	8.000	203.20	2	—	—	C12660
31/64	.4844	12.30	4.375	111.13	8.250	209.55	2	C12181	—	—
1/2	.5000	12.70	4.375	111.13	8.250	209.55	2	C12183	—	—
1/2	.5000	12.70	4.375	111.13	7.750	196.85	1	—	C12483	—
33/64	.5156	13.10	4.625	117.48	8.500	215.90	2	C12186	—	—
33/64	.5156	13.10	4.625	117.48	8.000	203.20	1	—	C12486	—
17/32	.5312	13.49	4.625	117.48	8.500	215.90	2	C12188	—	—
17/32	.5312	13.49	4.625	117.48	8.000	203.20	1	—	C12488	—
35/64	.5469	13.89	4.875	123.83	8.750	222.25	2	C12191	—	—
9/16	.5625	14.29	4.875	123.83	8.750	222.25	2	C12194	—	—
9/16	.5625	14.29	4.875	123.83	8.250	209.55	1	—	C12494	—
37/64	.5781	14.68	4.875	123.83	8.750	222.25	2	C12196	—	—
19/32	.5938	15.08	4.875	123.83	8.750	222.25	2	C12199	—	—
39/64	.6094	15.48	4.875	123.83	8.750	222.25	2	C12201	—	—
5/8	.6250	15.88	4.875	123.83	8.750	222.25	2	C12204	—	—
41/64	.6406	16.27	5.125	130.18	9.000	228.60	2	C12207	—	—
41/64	.6406	16.27	5.125	130.18	9.750	247.65	3	—	—	C12663
21/32	.6562	16.67	5.125	130.18	9.000	228.60	2	C12209	—	—
21/32	.6562	16.67	5.125	130.18	9.750	247.65	3	—	—	C12665
43/64	.6719	17.07	5.375	136.53	9.250	234.95	2	C12212	—	—
11/16	.6875	17.46	5.375	136.53	9.250	234.95	2	C12214	—	—
11/16	.6875	17.46	5.375	136.53	10.000	254.00	3	—	—	C12670
45/64	.7031	17.86	5.625	142.88	9.500	241.30	2	C12216	—	—
23/32	.7188	18.26	5.625	142.88	9.500	241.30	2	C12218	—	—
23/32	.7188	18.26	5.625	142.88	10.250	260.35	3	—	—	C12674
47/64	.7344	18.65	5.875	149.23	9.750	247.65	2	C12220	—	—
3/4	.7500	19.05	5.875	149.23	9.750	247.65	2	C12222	—	—
3/4	.7500	19.05	5.875	149.23	10.500	266.70	3	—	—	C12678
49/64	.7656	19.45	6.000	152.40	9.875	250.83	2	C12223	—	—
49/64	.7656	19.45	6.000	152.40	10.625	269.88	3	—	—	C12679
25/32	.7812	19.84	6.000	152.40	9.875	250.83	2	C12225	—	—
25/32	.7812	19.84	6.000	152.40	10.625	269.88	3	—	—	C12681
51/64	.7969	20.24	6.125	155.58	10.750	273.05	3	C12227	—	—
13/16	.8125	20.64	6.125	155.58	10.750	273.05	3	C12229	—	—
13/16	.8125	20.64	6.125	155.58	10.000	254.00	2	—	C12498	—
53/64	.8281	21.03	6.125	155.58	10.750	273.05	3	C12231	—	—
27/32	.8438	21.43	6.125	155.58	10.750	273.05	3	C12232	—	—
27/32	.8438	21.43	6.125	155.58	10.000	254.00	2	—	C12501	—
55/64	.8594	21.83	6.125	155.58	10.750	273.05	3	C12234	—	—
7/8	.8750	22.23	6.125	155.58	10.750	273.05	3	C12236	—	—
7/8	.8750	22.23	6.125	155.58	10.000	254.00	2	—	C12505	—
57/64	.8906	22.62	6.125	155.58	10.750	273.05	3	C12238	—	—
29/32	.9062	23.02	6.125	155.58	10.750	273.05	3	C12240	—	—
29/32	.9062	23.02	6.125	155.58	10.000	254.00	2	—	C12509	—

continued on next page



General Application Drills

Taper Shank

Styles 2410, 2411, 2412 • Standard Taper Shank, Undersized Shank, and Oversized Shank (continued)

Drill Diameter Fract	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Morse Taper	Order Number		
			in	mm	in	mm		Style 2410 Standard Shank	Style 2411 Undersize Shank	Style 2412 Oversize Shank
59/64	.9219	23.42	6.125	155.58	10.750	273.05	3	C12241	–	–
15/16	.9375	23.81	6.125	155.58	10.750	273.05	3	C12243	–	–
61/64	.9531	24.21	6.375	161.93	11.000	279.40	3	C12245	–	–
31/32	.9688	24.61	6.375	161.93	11.000	279.40	3	C12247	–	–
63/64	.9844	25.00	6.375	161.93	11.000	279.40	3	C12249	–	–
1	1.0000	25.40	6.375	161.93	11.000	279.40	3	C12250	–	–
1	1.0000	25.40	6.375	161.93	12.000	304.80	4	–	–	C12684
1-1/64	1.0156	25.80	6.500	165.10	11.125	282.58	3	C12252	–	–
1-1/32	1.0312	26.19	6.500	165.10	11.125	282.58	3	C12254	–	–
1-3/64	1.0469	26.59	6.625	168.28	11.250	285.75	3	C12256	–	–
1-1/16	1.0625	26.99	6.625	168.28	11.250	285.75	3	C12257	–	–
1-1/16	1.0625	26.99	6.625	168.28	12.250	311.15	4	–	–	C12691
1-5/64	1.0781	27.38	6.875	174.63	12.500	317.50	4	C12259	–	–
1-3/32	1.0938	27.78	6.875	174.63	12.500	317.50	4	C12261	–	–
1-7/64	1.1094	28.18	7.125	180.98	12.750	323.85	4	C12263	–	–
1-7/64	1.1094	28.18	7.125	180.98	11.750	298.45	3	–	C12516	–
1-1/8	1.1250	28.58	7.125	180.98	12.750	323.85	4	C12265	–	–
1-1/8	1.1250	28.58	7.125	180.98	11.750	298.45	3	–	C12518	–
1-9/64	1.1406	28.97	7.250	184.15	12.875	327.03	4	C12266	–	–
1-5/32	1.1562	29.37	7.250	184.15	12.875	327.03	4	C12268	–	–
1-11/64	1.1719	29.77	7.375	187.33	13.000	330.20	4	C12270	–	–
1-3/16	1.1875	30.16	7.375	187.33	13.000	330.20	4	C12272	–	–
1-3/16	1.1875	30.16	7.375	187.33	12.000	304.80	3	–	C12525	–
1-13/64	1.2031	30.56	7.500	190.50	13.125	333.38	4	C12274	–	–
1-7/32	1.2188	30.96	7.500	190.50	13.125	333.38	4	C12275	–	–
1-7/32	1.2188	30.96	7.500	190.50	12.125	307.98	3	–	C12528	–
1-15/64	1.2344	31.35	7.875	200.03	13.500	342.90	4	C12277	–	–
1-1/4	1.2500	31.75	7.875	200.03	13.500	342.90	4	C12279	–	–
1-1/4	1.2500	31.75	7.875	200.03	12.500	317.50	3	–	C12532	–
1-17/64	1.2656	32.15	8.500	215.90	14.125	358.78	4	C12281	–	–
1-9/32	1.2812	32.54	8.500	215.90	14.125	358.78	4	C12283	–	–
1-19/64	1.2969	32.94	8.625	219.08	14.250	361.95	4	C12284	–	–
1-5/16	1.3125	33.34	8.625	219.08	14.250	361.95	4	C12286	–	–
1-21/64	1.3281	33.73	8.750	222.25	14.375	365.13	4	C12288	–	–
1-11/32	1.3438	34.13	8.750	222.25	14.375	365.13	4	C12290	–	–
1-23/64	1.3594	34.53	8.875	225.43	14.500	368.30	4	C12292	–	–
1-3/8	1.3750	34.93	8.875	225.43	14.500	368.30	4	C12293	–	–
1-25/64	1.3906	35.32	9.000	228.60	14.625	371.48	4	C12295	–	–
1-13/32	1.4062	35.72	9.000	228.60	14.625	371.48	4	C12297	–	–
1-27/64	1.4219	36.12	9.125	231.78	14.750	374.65	4	C12299	–	–
1-7/16	1.4375	36.51	9.125	231.78	14.750	374.65	4	C12301	–	–
1-29/64	1.4531	36.91	9.250	234.95	14.875	377.83	4	C12302	–	–
1-15/32	1.4688	37.31	9.250	234.95	14.875	377.83	4	C12304	–	–
1-1/2	1.5000	38.10	9.375	238.13	15.000	381.00	4	C12308	–	–
1-33/64	1.5156	38.50	9.375	238.13	15.000	381.00	4	–	C12539	–
1-17/32	1.5312	38.89	9.375	238.13	15.000	381.00	5	C12311	–	–
1-17/32	1.5312	38.89	9.375	238.13	15.000	381.00	4	–	C12541	–
1-9/16	1.5625	39.69	9.625	244.48	16.625	422.28	5	C12315	–	–
1-9/16	1.5625	39.69	9.625	244.48	15.250	387.35	4	–	C12545	–
1-5/8	1.6250	41.28	10.000	254.00	17.000	431.80	5	C12322	–	–
1-5/8	1.6250	41.28	10.000	254.00	15.625	396.88	4	–	C12552	–

continued on next page



DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Taper Shank

Styles 2410, 2411, 2412 • Standard Taper Shank, Undersized Shank, and Oversized Shank (continued)

DRILLING

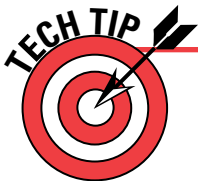
HOLE FINISHING

THREADING

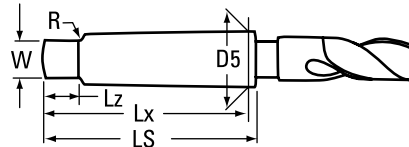
MILLING

OTHER TOOLS

Drill Diameter Fract	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Morse Taper	Order Number		
			in	mm	in	mm		Style 2410 Standard Shank	Style 2411 Undersize Shank	Style 2412 Oversize Shank
1-11/16	1.6875	42.86	10.125	257.18	17.125	434.98	5	C12329	–	–
1-23/32	1.7188	43.66	10.125	257.18	17.125	434.98	5	C12333	–	–
1-3/4	1.7500	44.45	10.125	257.18	17.125	434.98	5	C12336	–	–
1-3/4	1.7500	44.45	10.375	263.53	16.250	412.75	4	–	C12566	–
1-25/32	1.7812	45.24	10.125	257.18	17.125	434.98	5	C12340	–	–
1-13/16	1.8125	46.04	10.125	257.18	17.125	434.98	5	C12344	–	–
1-7/8	1.8750	47.63	10.375	263.53	17.375	441.33	5	C12351	–	–
1-7/8	1.8750	47.63	10.500	266.70	16.500	419.10	4	–	C12581	–
1-15/16	1.9375	49.21	10.375	263.53	17.375	441.33	5	C12358	–	–
2	2.0000	50.80	10.375	263.53	17.375	441.33	5	C12365	–	–
2	2.0000	50.80	10.625	269.88	16.625	422.28	4	–	C12595	–
2-1/8	2.1250	53.98	10.250	260.35	17.375	441.33	5	C12376	–	–
2-1/4	2.2500	57.15	10.125	257.18	17.375	441.33	5	C12388	–	–
2-5/16	2.3125	58.74	10.125	257.18	17.375	441.33	5	C12393	–	–
2-3/8	2.3750	60.33	10.125	257.18	17.375	441.33	5	C12399	–	–
2-1/2	2.5000	63.50	11.250	285.75	18.750	476.25	5	C12410	–	–



Morse Taper Shank Specifications



Morse Taper Shank Number	Taper per Foot	Taper per Inch	D5 Maximum Shank Diameter	LS Length of Shank	Lx Length of Shank to Gage Line	Lz Length of Tang	W Thickness of Tang	R Radius
1	.5985	.0498	.475	2.56	2.44	.37	.20	.19
2	.5994	.0499	.700	3.12	2.94	.44	.25	.25
3	.6023	.0501	.938	3.87	3.69	.56	.31	.28
4	.6232	.0519	1.231	4.87	4.62	.62	.47	.31
5	.6315	.0526	1.749	6.12	5.87	.75	.62	.37
6	.6256	.0521	2.494	8.56	8.25	1.12	.75	.50

Style 2440 • Cobalt Heavy-Duty Taper Shank

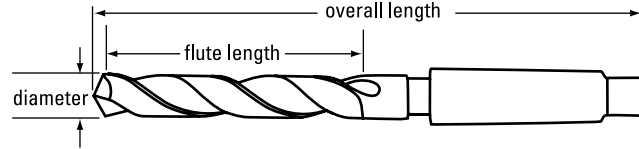
FEATURES



APPLICATIONS



Style 2440 Cobalt Taper Shank Straw Oxide



Operating parameters on page 32.
Morse taper shank specifications on page 90.

High red hardness for extended wear life in high heat conditions.

Diameter Fract	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Morse Taper	Order Number
			in	mm	in	mm		
1/4	.2500	6.35	2.875	73.03	6.125	155.58	1	C12705
5/16	.3125	7.94	3.125	79.38	6.375	161.93	1	C12728
11/32	.3438	8.73	3.250	82.55	6.500	165.10	1	C12739
3/8	.3750	9.53	3.500	88.90	6.750	171.45	1	C12751
13/32	.4062	10.32	3.625	92.08	7.000	177.80	1	C12760
7/16	.4375	11.11	3.875	98.43	7.250	184.15	1	C12765
15/32	.4688	11.91	4.125	104.78	7.500	190.50	1	C12770
1/2	.5000	12.70	4.375	111.13	8.250	209.55	2	C12775
17/32	.5312	13.49	4.625	117.48	8.500	215.90	2	C12780
9/16	.5625	14.29	4.875	123.83	8.750	222.25	2	C12786
19/32	.5938	15.08	4.875	123.83	8.750	222.25	2	C12791
5/8	.6250	15.88	4.875	123.83	8.750	222.25	2	C12796
21/32	.6562	16.67	5.125	130.18	9.000	228.60	3	C12801
11/16	.6875	17.46	5.375	136.53	9.250	234.95	3	C12806
23/32	.7188	18.26	5.625	142.88	9.500	241.30	3	C12810
3/4	.7500	19.05	5.875	149.23	9.750	247.65	3	C12814
25/32	.7812	19.84	6.000	152.40	9.875	250.83	3	C12817
13/16	.8125	20.64	6.125	155.58	10.750	273.05	3	C12821
7/8	.8750	22.23	6.125	155.58	10.750	273.05	3	C12828
15/16	.9375	23.81	6.125	155.58	10.750	273.05	3	C12835
1	1.0000	25.40	6.375	161.93	11.000	279.40	3	C12842

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Taper Shank

Style 2740 • Carbide-Tipped Heavy-Duty Taper Shank

DRILLING

FEATURES

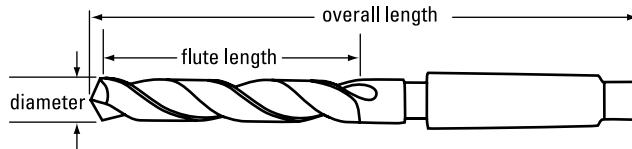
- ANSI SIZES**
- CARBIDE-TIPPED HSS**
- HEAVY DUTY**
- BRIGHT**
- SHANK**
- 118°**
- 30°**

APPLICATIONS

- ALLOY-TOOL STEEL**
- STAINLESS STEEL**
- CAST IRON**



Style 2740 Carbide-Tipped Taper Shank



Operating parameters on page 32.
Morse taper shank specifications on page 90.

- Run at carbide speeds.
- HSS shank and body for extra strength.

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

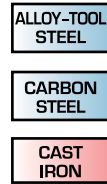
Diameter Fract	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Morse Taper	Order Number
			in	mm	in	mm		
9/16	.5625	14.29	4.875	123.83	8.750	222.25	2	C49413
19/32	.5938	15.08	4.875	123.83	8.750	222.25	2	C49417
5/8	.6250	15.88	4.875	123.83	8.750	222.25	2	C49421
21/32	.6562	16.67	5.125	130.18	9.000	228.60	2	C49425
11/16	.6875	17.46	5.375	136.53	9.250	234.95	2	C49429
23/32	.7188	18.26	5.625	142.88	9.500	241.30	2	C49432
3/4	.7500	19.05	5.875	149.23	9.750	247.65	2	C49435
13/16	.8125	20.64	6.125	155.58	10.750	273.05	3	C49440
27/32	.8438	21.43	6.125	155.58	10.750	273.05	3	C49442
7/8	.8750	22.23	6.125	155.58	10.750	273.05	3	C49445
15/16	.9375	23.81	6.125	155.58	10.750	273.05	3	C49450
31/32	.9688	24.61	6.375	161.93	11.000	279.40	3	C49453
1	1.0000	25.40	6.375	161.93	11.000	279.40	3	C49455

Style 940E • Extra Length Taper Shank

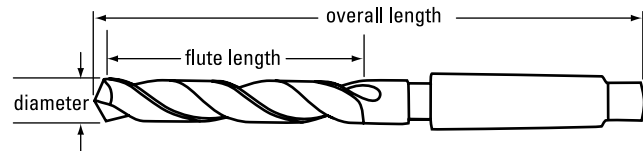
FEATURES



APPLICATIONS



Style 940E Steam Oxide



Operating parameters on page 32.
Morse taper shank specifications on page 90.

Drill Diameter	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Morse Shank	Order Number
			in	mm	in	mm		
1/4	.2500	6.35	6.000	152.40	9.250	234.95	1	C13795
1/4	.2500	6.35	10.000	254.00	13.250	336.55	1	C13873
1/4	.2500	6.35	12.000	304.80	15.250	387.35	1	C13926
5/16	.3125	7.94	6.000	152.40	9.250	234.95	1	C13799
5/16	.3125	7.94	10.000	254.00	13.250	336.55	1	C13877
5/16	.3125	7.94	12.000	304.80	15.250	387.35	1	C13930
11/32	.3438	8.73	6.000	152.40	9.250	234.95	1	C13801
11/32	.3438	8.73	12.000	304.80	15.250	387.35	1	C13932
23/64	.3594	9.13	6.000	152.40	9.250	234.95	1	C13802
3/8	.3750	9.53	6.000	152.40	9.250	234.95	1	C13803
3/8	.3750	9.53	10.000	254.00	13.250	336.55	1	C13881
3/8	.3750	9.53	12.000	304.80	15.250	387.35	1	C13934
13/32	.4062	10.32	6.000	152.40	9.375	238.13	1	C13805
13/32	.4062	10.32	12.000	304.80	15.250	387.35	1	C13936
27/64	.4219	10.72	6.000	152.40	9.375	238.13	1	C13806
7/16	.4375	11.11	6.000	152.40	9.375	238.13	1	C13807
7/16	.4375	11.11	10.000	254.00	13.375	339.73	1	C13885
7/16	.4375	11.11	12.000	304.80	15.250	387.35	1	C13938
15/32	.4688	11.91	6.000	152.40	9.375	238.13	1	C13809
31/64	.4844	12.30	8.000	203.20	11.875	301.63	2	C13830
1/2	.5000	12.70	8.000	203.20	11.875	301.63	2	C13831
1/2	.5000	12.70	10.000	254.00	13.875	352.43	2	C13889
1/2	.5000	12.70	12.000	304.80	15.875	403.23	2	C13942
33/64	.5156	13.10	8.000	203.20	11.875	301.63	2	C13832
17/32	.5312	13.49	8.000	203.20	11.875	301.63	2	C13833
17/32	.5312	13.49	12.000	304.80	15.875	403.23	2	C13944
35/64	.5469	13.89	8.000	203.20	11.875	301.63	2	C13834
9/16	.5625	14.29	8.000	203.20	11.875	301.63	2	C13835
9/16	.5625	14.29	10.000	254.00	13.875	352.43	2	C13893
9/16	.5625	14.29	12.000	304.80	15.875	403.23	2	C13946
37/64	.5781	14.68	8.000	203.20	11.875	301.63	2	C13836
19/32	.5938	15.08	8.000	203.20	11.875	301.63	2	C13837
19/32	.5938	15.08	12.000	304.80	15.875	403.23	2	C13948
5/8	.6250	15.88	8.000	203.20	11.875	301.63	2	C13839
5/8	.6250	15.88	10.000	254.00	13.875	352.43	2	C13897
5/8	.6250	15.88	12.000	304.80	15.875	403.23	2	C13950

continued on next page.

Taper Shank

Style 940E • Extra Length Taper Shank (continued)

Drill Diameter	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Morse Shank	Order Number
			in	mm	in	mm		
41/64	.6406	16.27	8.000	203.20	11.875	301.63	2	C13840
21/32	.6562	16.67	8.000	203.20	11.875	301.63	2	C13841
21/32	.6562	16.67	10.000	254.00	13.875	352.43	2	C13899
21/32	.6562	16.67	12.000	304.80	15.875	403.23	2	C13952
43/64	.6719	17.07	8.000	203.20	11.875	301.63	2	C13842
11/16	.6875	17.46	8.000	203.20	11.875	301.63	2	C13843
11/16	.6875	17.46	10.000	254.00	13.875	352.43	2	C13901
11/16	.6875	17.46	12.000	304.80	15.875	403.23	2	C13954
45/64	.7031	17.86	8.000	203.20	11.875	301.63	2	C13844
23/32	.7188	18.26	8.000	203.20	11.875	301.63	2	C13845
23/32	.7188	18.26	10.000	254.00	13.875	352.43	2	C13903
3/4	.7500	19.05	8.000	203.20	11.875	301.63	2	C13847
3/4	.7500	19.05	10.000	254.00	13.875	352.43	2	C13905
3/4	.7500	19.05	12.000	304.80	15.875	403.23	2	C13958
49/64	.7656	19.45	8.000	203.20	11.875	301.63	2	C13848
25/32	.7812	19.84	8.000	203.20	11.875	301.63	2	C13849
25/32	.7812	19.84	10.000	254.00	13.875	352.43	2	C13907
13/16	.8125	20.64	10.000	254.00	14.500	368.30	3	C13909
13/16	.8125	20.64	12.000	304.80	16.500	419.10	3	C13962
7/8	.8750	22.23	10.000	254.00	14.500	368.30	3	C13913
7/8	.8750	22.23	12.000	304.80	16.500	419.10	3	C13966
15/16	.9375	23.81	10.000	254.00	14.500	368.30	3	C13917
15/16	.9375	23.81	12.000	304.80	16.500	419.10	3	C13970
1	1.0000	25.40	10.000	254.00	14.500	368.30	3	C13921
1	1.0000	25.40	12.000	304.80	16.500	419.10	3	C13974
1-1/32	1.0312	26.19	10.000	254.00	14.500	368.30	3	C13923
1-1/16	1.0625	26.99	10.000	254.00	14.500	368.30	3	C13925
1-1/8	1.1250	28.58	12.000	304.80	17.500	444.50	4	C13982
1-5/32	1.1562	29.37	12.000	304.80	17.500	444.50	4	C13984
1-3/16	1.1875	30.16	12.000	304.80	17.500	444.50	4	C13986
1-1/4	1.2500	31.75	12.000	304.80	17.500	444.50	4	C13990

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

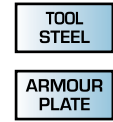


Styles 3745 • Cobalt Armour-Piercing Taper Shank

FEATURES



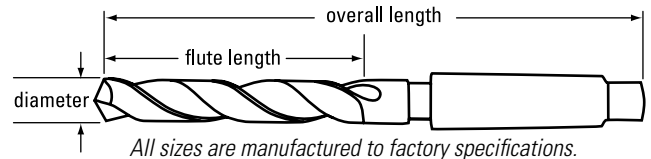
APPLICATIONS



Operating parameters on page 32.
Morse taper shank specifications on page 90.



Style 3745 Straw



All sizes are manufactured to factory specifications.

Drill Diameter fraction	Drill Diameter mm	Decimal Equiv.	Metric Equiv.	Flute Length in	Flute Length mm	Overall Length in	Overall Length mm	Morse Taper Number	Order Number
1/4		.2400	6.10	2.008	51.0	5.315	135.0	1	CL70374500104
9/32		.2812	7.14	2.008	51.0	5.315	135.0	1	C16464
5/16		.3125	7.94	2.008	51.0	5.315	135.0	1	CL70374500516
11/32		.3438	8.73	2.126	54.0	5.433	138.0	1	CL70374501132
3/8		.3750	9.53	2.205	56.0	5.512	140.0	1	CL70374500308
	10.0	.3937	10.00	2.205	56.0	5.512	140.0	1	CL70374801000
	10.5	.4134	10.50	2.205	56.0	5.512	140.0	1	CL70374801050
	11.0	.4331	11.00	2.992	76.0	6.890	175.0	2	CL70374801100
7/16		.4375	11.11	2.992	76.0	6.890	175.0	2	CL70374500716
	12.0	.4724	12.00	3.189	81.0	7.047	179.0	2	CL70374801200
1/2		.5000	12.70	3.189	81.0	7.047	179.0	2	CL70374500102
	13.0	.5118	13.00	3.189	81.0	7.047	179.0	2	CL70374801300
	14.0	.5512	14.00	3.386	86.0	7.244	184.0	2	CL70374801400
9/16		.5625	14.29	3.386	86.0	7.244	184.0	2	CL70374500916
	14.5	.5709	14.50	3.386	86.0	7.244	184.0	2	CL70374801450
	15.0	.5906	15.00	3.504	89.0	7.362	187.0	2	CL70374801500
5/8		.6250	15.88	3.504	89.0	7.362	187.0	2	C16471
	16.0	.6299	16.00	3.504	89.0	7.362	187.0	2	CL70374801600
	16.5	.6496	16.50	3.504	89.0	7.362	187.0	2	CL70374801650
	17.0	.6693	17.00	3.622	92.0	7.480	190.0	2	CL70374801700
11/16		.6875	17.46	3.622	92.0	7.480	190.0	2	CL70374501116
	17.5	.6890	17.50	3.622	92.0	7.480	190.0	2	CL70374801750
	18.0	.7087	18.00	3.622	92.0	7.480	190.0	2	CL70374801800
	19.0	.7480	19.00	3.740	95.0	8.386	213.0	3	CL70374801900
3/4		.7500	19.05	3.740	95.0	8.386	213.0	3	CL70374500304
	20.0	.7874	20.00	3.740	95.0	8.386	213.0	3	CL70374802000
13/16		.8125	20.64	4.016	102.0	8.622	219.0	3	CL70374501316
	21.0	.8268	21.00	4.134	105.0	8.740	222.0	3	CL70374802100
	22.0	.8661	22.00	4.134	105.0	8.740	222.0	3	CL70374802200
7/8		.8750	22.23	4.134	105.0	8.740	222.0	3	CL70374500708
15/16		.9375	23.81	4.134	105.0	8.740	222.0	3	CL70374501516
	24.0	.9449	24.00	4.134	105.0	8.740	222.0	3	CL70374802400
	25.0	.9843	25.00	4.252	108.0	8.858	225.0	3	CL70374802500
1		1.0000	25.40	4.252	108.0	8.858	225.0	3	CL70374510000
	26.0	1.0236	26.00	4.252	108.0	8.858	225.0	3	CL70374802600
	27.0	1.0630	27.00	4.882	124.0	10.630	270.0	4	CL70374802700
	28.0	1.1024	28.00	4.882	124.0	10.630	270.0	4	CL70374802800
1-1/8		1.1250	28.58	4.882	124.0	10.630	270.0	4	CL70374510108
	30.0	1.1811	30.00	4.882	124.0	10.630	270.0	4	CL70374803000
1-1/4		1.2500	31.75	5.236	133.0	10.984	279.0	4	CL70374510104
	32.0	1.2598	32.00	5.236	133.0	10.984	279.0	4	CL70374803200
1-3/8		1.3750	34.93	5.748	146.0	11.496	292.0	4	CL70374510308
1-1/2		1.5000	38.10	5.984	152.0	11.732	298.0	4	C16481

Core Drills

Style 2560, 2570 • Three-Flute and Four-Flute Straight Shank Taper Length Core Drills

DRILLING

FEATURES

ANSI SIZES	HSS SUBSTRATE
EXTRA HEAVY DUTY	STEAM OXIDE
SHANK	118°
	HI-HELIX

APPLICATIONS

CARBON STEEL
ALLOY STEEL
CAST IRON



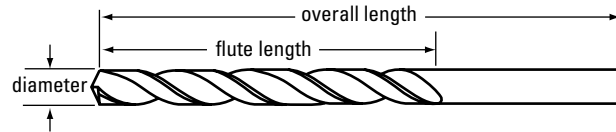
Style 2560 3-Flutes



Style 2570 4-Flutes

HOLE FINISHING

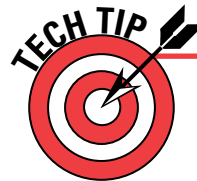
Modify operating parameters on page 32 as follows:
run at 2/3 the speed and double the feed of a standard HSS drill.



THREADING

Style 2560 • Three-Flute

Drill Diameter	Decimal Equiv.	Metric Equiv.	Flute Length in	Flute Length mm	Overall Length in	Overall Length mm	Order Number
1/4	.2500	6.35	3.750	95.25	6.125	155.58	C10189
9/32	.2812	7.14	3.875	98.43	6.250	158.75	C10203
5/16	.3125	7.94	4.000	101.60	6.375	161.93	C10212
11/32	.3438	8.73	4.125	104.78	6.500	165.10	C10223
3/8	.3750	9.53	4.250	107.95	6.750	171.45	C10235
13/32	.4062	10.32	4.375	111.13	7.000	177.80	C10244
7/16	.4375	11.11	4.625	117.48	7.250	184.15	C10249
15/32	.4688	11.91	4.750	120.65	7.500	190.50	C10254
1/2	.5000	12.70	4.750	120.65	7.750	196.85	C10259



Core Drills

- Cleveland core drills have an extremely heavy web for a strong tool that will enlarge holes up to 60% of tool diameter.
- The steam oxide finish increases wear resistance and improves lubricity, reducing chip welding and galling.
- The four-flute core drills deliver a better surface finish than the three-flute style.

MILLING

Style 2570 • Four-Flute

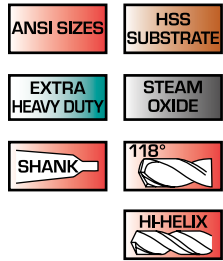
Drill Diameter	Decimal Equiv.	Metric Equiv.	Flute Length in	Flute Length mm	Overall Length in	Overall Length mm	Order Number
1/2	.5000	12.70	4.750	120.65	7.750	196.85	C10476
17/32	.5312	13.49	4.750	120.65	8.000	203.20	C10481
9/16	.5625	14.29	4.875	123.83	8.250	209.55	C10487
19/32	.5938	15.08	4.875	123.83	8.750	222.25	C10492
5/8	.6250	15.88	4.875	130.18	8.750	222.25	C10497
21/32	.6562	16.67	5.125	136.53	9.000	228.60	C10502
11/16	.6875	17.46	5.375	149.23	9.250	234.95	C10507
3/4	.7500	19.05	5.875	155.58	9.750	247.65	C10515
13/16	.8125	20.64	6.125	155.58	10.000	254.00	C10522
7/8	.8750	22.23	6.125	155.58	10.000	254.00	C10529
15/16	.9375	23.81	6.125	155.58	10.750	273.05	C10536
31/32	.9688	24.61	6.375	161.93	11.000	279.40	C10540
1	1.0000	25.40	6.375	161.93	11.000	279.40	C10543

OTHER TOOLS

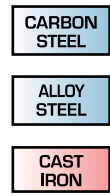


Style 2470 • Four-Flute Taper Shank Core Drill

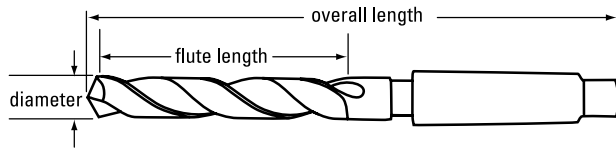
FEATURES



APPLICATIONS



Style 2470 4-Flutes



Modify operating parameters on page 32 as follows:
 run at 2/3 the speed and double the feed of a standard HSS drill.
 Morse taper shank specifications on page 90.

Drill Diameter	Decimal Equiv.	Metric Equiv.	Flute Length in	Flute Length mm	Overall Length in	Overall Length mm	Morse Taper	Order Number
1/2	.5000	12.70	4.375	111.13	8.250	209.55	2	C15680
17/32	.5312	13.49	4.625	117.48	8.500	215.90	2	C15685
9/16	.5625	14.29	4.875	123.83	8.750	222.25	2	C15691
19/32	.5938	15.08	4.875	123.83	8.750	222.25	2	C15696
5/8	.6250	15.88	4.875	123.83	8.750	222.25	2	C15701
21/32	.6562	16.67	5.125	130.18	9.000	228.60	2	C15706
11/16	.6875	17.46	5.375	136.53	9.250	234.95	2	C15711
23/32	.7188	18.26	5.625	142.88	9.500	241.30	2	C15715
3/4	.7500	19.05	5.875	149.23	9.750	247.65	2	C15719
25/32	.7812	19.84	6.000	152.40	9.875	250.83	2	C15722
13/16	.8125	20.64	6.125	155.58	10.750	273.05	3	C15726
27/32	.8438	21.43	6.125	155.58	10.750	273.05	3	C15729
7/8	.8750	22.23	6.125	155.58	10.750	273.05	3	C15733
29/32	.9062	23.02	6.125	155.58	10.750	273.05	3	C15737
15/16	.9375	23.81	6.125	155.58	10.750	273.05	3	C15740
31/32	.8688	22.07	6.375	161.93	11.000	279.40	3	C15744
1	1.0000	25.40	6.375	161.93	11.000	279.40	3	C15747
1-1/32	1.0312	26.19	6.500	165.10	11.125	282.58	3	C15751
1-1/16	1.0625	26.99	6.625	168.28	11.250	285.75	3	C15754
1-1/8	1.1250	28.58	7.125	180.98	12.750	323.85	4	C15762
1-5/32	1.1562	29.37	7.250	184.15	12.875	327.03	4	C15765
1-3/16	1.1875	30.16	7.375	187.33	13.000	330.20	4	C15769
1-1/4	1.2500	31.75	7.875	200.03	13.500	342.90	4	C15776
1-5/16	1.3125	33.34	8.625	219.08	14.250	361.95	4	C15783
1-3/8	1.3750	34.93	8.875	225.43	14.500	368.30	4	C15790
1-13/32	1.4062	35.72	9.000	228.60	14.625	371.48	4	C15794
1-7/16	1.4375	36.51	9.125	231.78	14.750	374.65	4	C15798
1-1/2	1.5000	38.10	9.375	238.13	15.000	381.00	4	C15805



Coolant Feed

Style 2580 • Coolant Feed Heavy-Duty Low Helix Regular Length

DRILLING

FEATURES

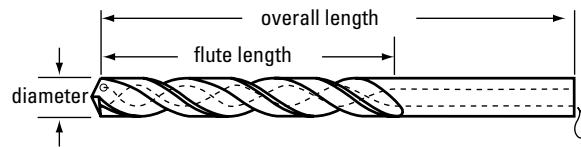
ANSI SIZES	HSS SUBSTRATE
HEAVY DUTY	STEAM OXIDE
COOLANT FEED	118°
SHANK	15°

APPLICATIONS

ALLOY-HARD STEEL	STAINLESS STEEL
CARBON STEEL	CAST IRON
TITANIUM ALLOYS	



Style 2580 Steam Oxide



HOLE FINISHING

Operating parameters on page 32 can be increased as follows: speeds can be increased by 10%, and feeds can be increased 25%



Low helix designed for use in harder materials and horizontal applications.

THREADING

Drill Diameter	Decimal Equiv.	Metric Equiv.	Flute Length in	Flute Length mm	Overall Length in	Overall Length mm	Order Number
3/8	.3750	9.53	4.250	107.95	6.750	171.450	C10696
25/64	.3906	9.92	4.375	111.13	7.000	177.800	C10702
13/32	.4062	10.32	4.375	111.13	7.000	177.800	C10705
27/64	.4219	10.72	4.625	117.48	7.250	184.150	C10707
7/16	.4375	11.11	4.625	117.48	7.250	184.150	C10710
29/64	.4531	11.51	4.875	123.83	7.500	190.500	C10713
15/32	.4688	11.91	4.875	123.83	7.500	190.500	C10715
31/64	.4844	12.30	5.000	127.00	7.750	196.850	C10718
1/2	.5000	12.70	5.000	127.00	7.750	196.850	C10720
33/64	.5156	13.10	5.250	133.35	8.000	203.200	C10723
17/32	.5312	13.49	5.250	133.35	8.000	203.200	C10725
35/64	.5469	13.89	5.375	136.53	8.250	209.550	C10728
9/16	.5625	14.29	5.375	136.53	8.250	209.550	C10731
37/64	.5781	14.68	5.625	142.88	8.500	215.900	C10733
19/32	.5938	15.08	5.625	142.88	8.500	215.900	C10736
39/64	.6094	15.48	5.750	146.05	8.750	222.250	C10738
5/8	.6250	15.88	5.750	146.05	8.750	222.250	C10741
41/64	.6406	16.27	5.875	149.23	9.000	228.600	C10744
21/32	.6562	16.67	5.875	149.23	9.000	228.600	C10746
43/64	.6719	17.07	6.000	152.40	9.250	234.950	C10749

Drill Diameter	Decimal Equiv.	Metric Equiv.	Flute Length in	Flute Length mm	Overall Length in	Overall Length mm	Order Number
11/16	.6875	17.46	6.000	152.40	9.250	234.950	C10751
45/64	.7031	17.86	6.188	157.16	9.500	241.300	C10753
23/32	.7188	18.26	6.188	157.16	9.500	241.300	C10755
47/64	.7344	18.65	6.375	161.93	9.750	247.650	C10757
3/4	.7500	19.05	6.375	161.93	9.750	247.650	C10759
49/64	.7656	19.45	6.500	165.10	9.875	250.825	C10760
25/32	.7812	19.84	6.500	165.10	9.875	250.825	C10762
51/64	.7969	20.24	6.625	168.28	10.000	254.000	C10764
13/16	.8125	20.64	6.625	168.28	10.000	254.000	C10766
27/32	.8438	21.43	6.750	171.45	10.250	260.350	C10769
55/64	.8594	21.83	7.000	177.80	10.500	266.700	C10771
7/8	.8750	22.23	7.000	177.80	10.500	266.700	C10773
57/64	.8906	22.62	7.000	177.80	10.625	269.875	C10775
29/32	.9062	23.02	7.000	177.80	10.625	269.875	C10777
15/16	.9375	23.81	7.000	177.80	10.750	273.050	C10780
31/32	.9688	24.61	7.125	180.98	10.875	276.225	C10784
1	1.0000	25.40	7.188	182.56	11.000	279.400	C10787
1-1/16	1.0625	26.99	7.375	187.33	11.250	285.750	C10794
1-3/16	1.1875	30.16	8.125	206.38	12.000	304.800	C10809
1-3/8	1.3750	34.93	9.500	241.30	14.500	368.300	C10830

MILLING

OTHER TOOLS

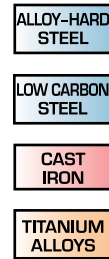


Style 2590 • Coolant Feed Heavy-Duty High-Helix Regular Length

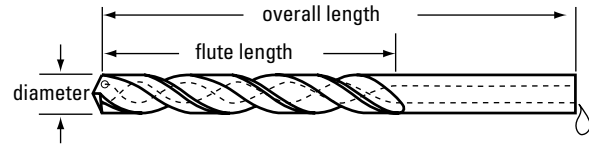
FEATURES



APPLICATIONS



Style 2590 Steam Oxide



Operating parameters on page 32 can be increased as follows:
speeds can be increased by 10%, and feeds can be increased 25%



Efficient chip removal
in deep holes.

Drill Diameter	Decimal Equiv.	Metric Equiv.	Flute Length in	Flute Length mm	Overall Length in	Overall Length mm	Order Number
3/8	.3750	9.53	4.250	107.95	6.750	171.45	C10878
25/64	.3906	9.92	4.375	111.13	7.000	177.80	C10884
13/32	.4062	10.32	4.375	111.13	7.000	177.80	C10887
27/64	.4219	10.72	4.625	117.48	7.250	184.15	C10889
7/16	.4375	11.11	4.625	117.48	7.250	184.15	C10892
29/64	.4531	11.51	4.875	123.83	7.500	190.50	C10895
15/32	.4688	11.91	4.875	123.83	7.500	190.50	C10897
31/64	.4844	12.30	5.000	127.00	7.750	196.85	C10900
1/2	.5000	12.70	5.000	127.00	7.750	196.85	C10902
33/64	.5156	13.10	5.250	133.35	8.000	203.20	C10905
17/32	.5312	13.49	5.250	133.35	8.000	203.20	C10907
35/64	.5469	13.89	5.375	136.53	8.250	209.55	C10910
9/16	.5625	14.29	5.375	136.53	8.250	209.55	C10913
37/64	.5781	14.68	5.625	142.88	8.500	215.90	C10915
19/32	.5938	15.08	5.625	142.88	8.500	215.90	C10918
39/64	.6094	15.48	5.750	146.05	8.750	222.25	C10920
5/8	.6250	15.88	5.750	146.05	8.750	222.25	C10923
41/64	.6406	16.27	5.875	149.23	9.000	228.60	C10926
21/32	.6562	16.67	5.875	149.23	9.000	228.60	C10928
43/64	.6719	17.07	6.000	152.40	9.250	234.95	C10931
11/16	.6875	17.46	6.000	152.40	9.250	234.95	C10933
45/64	.7031	17.86	6.188	157.16	9.500	241.30	C10935

Drill Diameter	Decimal Equiv.	Metric Equiv.	Flute Length in	Flute Length mm	Overall Length in	Overall Length mm	Order Number
23/32	.7188	18.26	6.188	157.16	9.500	241.30	C10937
47/64	.7344	18.65	6.375	161.93	9.750	247.65	C10939
3/4	.7500	19.05	6.375	161.93	9.750	247.65	C10941
49/64	.7656	19.45	6.500	165.10	9.875	250.83	C10942
25/32	.7812	19.84	6.500	165.10	9.875	250.83	C10944
13/16	.8125	20.64	6.625	168.28	10.000	254.00	C10948
27/32	.8438	21.43	6.750	171.45	10.250	260.35	C10951
7/8	.8750	22.23	7.000	177.80	10.500	266.70	C10955
57/64	.8906	22.62	7.000	177.80	10.625	269.88	C10957
29/32	.9062	23.02	7.000	177.80	10.625	269.88	C10959
59/64	.9219	23.42	7.000	177.80	10.750	273.05	C10960
15/16	.9375	23.81	7.000	177.80	10.750	273.05	C10962
31/32	.9688	24.61	7.125	180.98	10.875	276.23	C10966
63/64	.9844	25.00	7.188	182.56	11.000	279.40	C10968
1	1.0000	25.40	7.188	182.56	11.000	279.40	C10969
1-1/32	1.0312	26.19	7.313	185.74	11.125	282.58	C10973
1-1/16	1.0625	26.99	7.375	187.33	11.250	285.75	C10976
1-1/8	1.1250	28.58	7.875	200.03	11.750	298.45	C10984
1-5/32	1.1562	29.37	8.000	203.20	11.875	301.63	C10987
1-3/16	1.1875	30.16	8.125	206.38	12.000	304.80	C10991
1-7/32	1.2188	30.96	8.125	206.38	12.125	307.98	C10994
1-1/2	1.5000	38.10	9.875	250.83	15.000	381.00	C11027

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Coolant Feed

Style 2480, 2490 • Heavy-Duty Coolant Feed High-Helix Taper Shank

DRILLING

FEATURES

- ANSI SIZES
- HSS SUBSTRATE
- HEAVY DUTY
- STEAM OXIDE
- COOLANT FEED
- 118° RANOTCH
- SHANK
- 38°

APPLICATIONS

- ALLOY-TOOL STEEL
- CARBON STEEL
- STAINLESS STEEL
- CAST IRON

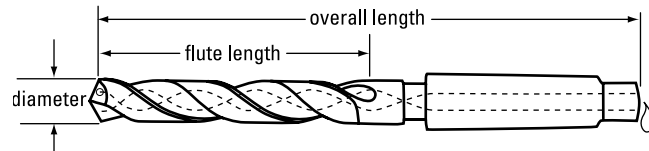


Style 2480 Plain



Style 2490 with Retaining Rings

Operating parameters on page 32 can be increased as follows:
speeds can be increased by 10%, and feeds can be increased 25%



HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Drill Diameter	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Morse Shank	Order Number	
			in	mm	in	mm		plain	with retaining rings*
31/64	.4844	12.30	4.375	111.13	9.000	228.60	3	C13593	C13420
1/2	.5000	12.70	4.375	111.13	9.000	228.60	3	C13595	—
33/64	.5156	13.10	4.625	117.48	9.250	234.95	3	C13598	—
17/32	.5312	13.49	4.625	117.48	9.250	234.95	3	C13600	—
9/16	.5625	14.29	4.875	123.83	9.500	241.30	3	C13606	C13433
19/32	.5938	15.08	4.875	123.83	9.500	241.30	3	C13611	—
39/64	.6094	15.48	4.875	123.83	9.500	241.30	3	C13613	—
5/8	.6250	15.88	4.875	123.83	9.500	241.30	3	C13616	C13443
41/64	.6406	16.27	5.125	130.18	9.750	247.65	3	C13619	—
21/32	.6562	16.67	5.125	130.18	9.750	247.65	3	C13621	C13448
11/16	.6875	17.46	5.375	136.53	10.000	254.00	3	C13626	C13453
23/32	.7188	18.26	5.625	142.88	10.250	260.35	3	C13630	—
47/64	.7344	18.65	5.875	149.23	10.500	266.70	3	C13632	C13459
3/4	.7500	19.05	5.875	149.23	10.500	266.70	3	C13634	C13461
49/64	.7656	19.45	6.000	152.40	10.625	269.88	3	C13635	—
25/32	.7812	19.84	6.000	152.40	10.625	269.88	3	C13637	—
13/16	.8125	20.64	6.125	155.58	10.750	273.05	3	C13641	C13468
27/32	.8438	21.43	6.125	155.58	10.750	273.05	3	C13644	—
55/64	.8594	21.83	6.125	155.58	10.750	273.05	3	C13646	—
7/8	.8750	22.23	6.125	155.58	10.750	273.05	3	C13648	C13475
57/64	.8906	22.62	6.125	155.58	10.750	273.05	3	C13650	—
29/32	.9062	23.02	6.125	155.58	10.750	273.05	3	C13652	—
59/64	.9219	23.42	6.125	155.58	10.750	273.05	3	C13653	—
15/16	.9375	23.81	6.125	155.58	10.750	273.05	3	C13655	—
31/32	.9688	24.61	6.375	161.93	11.000	279.40	3	C13659	—
63/64	.9844	25.00	6.375	161.93	11.000	279.40	3	C13661	—
1	1.0000	25.40	6.375	161.93	11.000	279.40	3	C13662	—
1-1/32	1.0312	26.19	6.500	165.10	11.125	282.58	4	C13666	—
1-1/16	1.0625	26.99	6.625	168.28	11.250	285.75	4	C13669	—
1-1/8	1.1250	28.58	7.125	180.98	12.750	323.85	4	C13677	—
1-3/16	1.1875	30.16	7.375	187.33	13.000	330.20	4	C13684	—
1-1/4	1.2500	31.75	7.875	200.03	13.500	342.90	4	C13691	—

* Style 2490 is used with 932 coolant inducer only. See next page.

continued on next page.



Style 2480 • Heavy-Duty Coolant Feed High-Helix Taper Shank (continued)

Drill Diameter	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Morse Shank	Order Number	
			in	mm	in	mm		plain	with retaining rings
1-5/16	1.3125	33.34	8.625	219.08	14.250	361.95	4	C13698	—
1-3/8	1.3750	34.93	9.000	228.60	14.500	368.30	4	C13705	—
1-7/16	1.4375	36.51	9.125	231.78	14.750	374.65	4	C13713	—
1-1/2	1.5000	38.10	9.375	238.13	15.000	381.00	4	C13720	—
1-9/16	1.5625	39.69	9.625	244.48	15.250	387.35	5	C13726	—
1-5/8	1.6250	41.28	10.000	254.00	15.625	396.88	5	C13731	—
1 3/4	1.7500	44.45	10.125	257.18	16.000	406.40	5	C13741	—
1 7/8	1.8750	47.63	10.375	263.53	17.375	441.33	5	C13752	—

Accessories for 2480 and 2490 Taper Shank Coolant Feed Drills

Style 0474 Taper Shank Coolant Inducer Socket

No.	Description	Overall Length	Order No.
4	#3 hole & #3 shank	8-1/2	C53700
5	#4 hole & #4 shank	10-7/16	C53701
6	#5 hole & #5 shank	13-1/16	C53702

Style 0475 Taper Shank Coolant Socket

Taper No.	Description	Overall Length	Order No.
4	#3 hole & #3 shank	8-1/2	C53703
5	#4 hole & #3 shank	10-7/16	C53704

Style 0476 Washer for Coolant Socket

Taper No.	Description	Order No.
4	#3 hole & #3 shank	C53706
5	#4 hole & #3 shank	C53707
6	#5 hole & #5 shank	C53708

Style 0932 Coolant Inducer for Style 2490

Inducer No.	Inducer O.D.	Inducer I.D.	Taper Pipe Tap Hole	Torque Arm Tap Hole	Order No.
3	1.625	.940	1/4-18	5/16-18	C53711

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

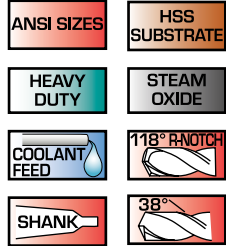


Coolant Feed

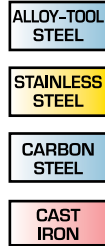
Style 927E • Extra Length Coolant Feed Taper Shank

DRILLING

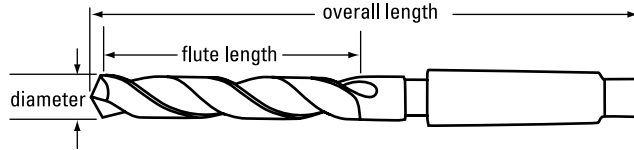
FEATURES



APPLICATIONS



Style 927E Steam Oxide



Operating parameters on page 32 can be increased as follows:
speeds can be increased by 10%, and feeds can be increased 25%

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Drill Diameter	Decimal Equiv.	Metric Equiv.	Flute Length in	Flute Length mm	Overall Length in	Overall Length mm	Morse Shank	Order Number
9/16	.5625	14.288	7.000	177.80	11.625	295.28	3	C09300
9/16	.5625	14.288	9.000	228.60	13.625	346.08	3	C09333
9/16	.5625	14.288	10.000	254.00	14.625	371.48	3	C09357
19/32	.5938	15.083	9.000	228.60	13.625	346.08	3	C09334
19/32	.5938	15.083	10.000	254.00	14.625	371.48	3	C09358
39/64	.6094	15.479	9.000	228.60	13.625	346.08	3	C09335
5/8	.6250	15.875	7.000	177.80	11.625	295.28	3	C09303
5/8	.6250	15.875	9.000	228.60	13.625	346.08	3	C09336
41/64	.6406	16.271	9.000	228.60	13.625	346.08	3	C09337
21/32	.6562	16.667	7.000	177.80	11.625	295.28	3	C09305
21/32	.6562	16.667	9.000	228.60	13.625	346.08	3	C09338
21/32	.6562	16.667	10.000	254.00	14.625	371.48	3	C09362
11/16	.6875	17.463	7.000	177.80	11.625	295.28	3	C09306
11/16	.6875	17.463	9.000	228.60	13.625	346.08	3	C09339
11/16	.6875	17.463	10.000	254.00	14.625	371.48	3	C09363
23/32	.7188	18.258	9.000	228.60	13.625	346.08	3	C09340
23/32	.7188	18.258	10.000	254.00	14.625	371.48	3	C09364
47/64	.7344	18.654	9.000	228.60	13.625	346.08	3	C09341
47/64	.7344	18.654	10.000	254.00	14.625	371.48	3	C09365
3/4	.7500	19.050	7.000	177.80	11.625	295.28	3	C09309
3/4	.7500	19.050	8.000	203.20	12.625	320.68	3	C09319
3/4	.7500	19.050	9.000	228.60	13.625	346.08	3	C09342
3/4	.7500	19.050	10.000	254.00	14.625	371.48	3	C09366
49/64	.7656	19.446	9.000	228.60	13.625	346.08	3	C09344
49/64	.7656	19.446	10.000	254.00	14.625	371.48	3	C09367
25/32	.7812	19.842	8.000	203.20	12.625	320.68	3	C09321
25/32	.7812	19.842	9.000	228.60	13.625	346.08	3	C09345
25/32	.7812	19.842	10.000	254.00	14.625	371.48	3	C09368
13/16	.8125	20.638	8.000	203.20	12.625	320.68	3	C09322
13/16	.8125	20.638	9.000	228.60	13.625	346.08	3	C09346
13/16	.8125	20.638	10.000	254.00	14.625	371.48	3	C09369
27/32	.8438	21.433	9.000	228.60	13.625	346.08	3	C09347
27/32	.8438	21.433	10.000	254.00	14.625	371.48	3	C09370

Style 927E uses 0475 taper shank coolant socket listed on page 101.

continued on next page



Style 927E • Extra Length Coolant Feed Taper Shank (continued)

Drill Diameter	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Morse Shank	Order Number
			in	mm	in	mm		
7/8	.8750	22.225	8.000	203.20	12.625	320.68	3	C09324
7/8	.8750	22.225	9.000	228.60	13.625	346.08	3	C09348
7/8	.8750	22.225	10.000	254.00	14.625	371.48	3	C09371
29/32	.9062	23.017	9.000	228.60	13.625	346.08	3	C09349
29/32	.9062	23.017	10.000	254.00	14.625	371.48	3	C09372
15/16	.9375	23.813	9.000	228.60	13.625	346.08	3	C09350
15/16	.9375	23.813	10.000	254.00	14.625	371.48	3	C09373
31/32	.9688	24.608	9.000	228.60	13.625	346.08	3	C09351
31/32	.9688	24.608	10.000	254.00	14.625	371.48	3	C09374
63/64	.9844	25.004	9.000	228.60	13.625	346.08	3	C09352
63/64	.9844	25.004	10.000	254.00	14.625	371.48	3	C09375
1	1.0000	25.400	9.000	228.60	13.625	346.08	3	C09353
1	1.0000	25.400	10.000	254.00	14.625	371.48	3	C09376
1 1/64	1.0156	25.796	9.000	228.60	13.625	346.08	3	C09354
1 1/32	1.0312	26.192	9.000	228.60	13.625	346.08	3	C09355
1-1/32	1.0312	26.192	10.000	254.00	14.625	371.48	4	C09378
1-1/16	1.0625	26.988	9.000	228.60	13.625	346.08	3	C09356
1-1/16	1.0625	26.988	10.000	254.00	14.625	371.48	4	C09379

Style 927E uses 0475 taper shank coolant socket listed on page 101.

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Spotting and Centering Drills

Styles 995 • Spotting and Centering

DRILLING

FEATURES

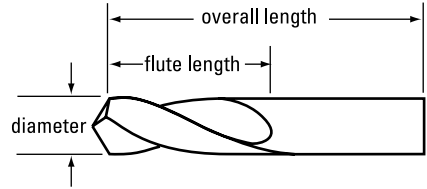
ANSI SIZES
HSS SUBSTRATE
GENERAL PURPOSE
BRIGHT
118°
SHANK

APPLICATIONS

CARBON STEEL
TOOL STEEL
ALLOY STEEL
CAST IRON



Style 995 Bright



Operating parameters shown on page 32.

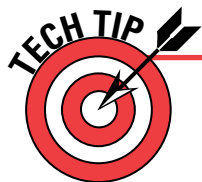
Drill Diameter	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number
			in	mm	in	mm	
3/8	.3750	9.53	1.000	25.40	2.000	50.80	C11739
1/2	.5000	12.70	1.000	25.40	2.000	50.80	C11757
5/8	.6250	15.88	1.125	28.58	2.250	57.15	C11771
3/4	.7500	19.05	1.125	28.58	2.250	57.15	C11782
1	1.0000	25.40	1.250	31.75	2.500	63.50	C11796

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS



Using Spotting and Centering Drills

- Use these drills to get true and accurate centers.
- There is no body clearance on these drills to allow chucking close to the point. This features helps to maintain drill accuracy for centering.

Spotting and Centering Drills

Styles 2636, 2646 • Cobalt NC Spotting Drills, Short and Long Lengths

FEATURES

ANSI SIZES	M42 COBALT SUBSTRATE
HEAVY DUTY	STRAW OXIDE
SHANK	90°
	120°

APPLICATIONS

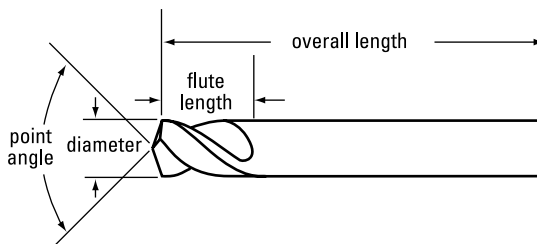
FREE-MACH STAINLESS
CARBON STEEL
ALLOY-TOOL STEEL
ALUMINUM



Style 2636 Short Length



Style 2646 Long Length



Operating parameters shown on page 32.

NC - Short Length

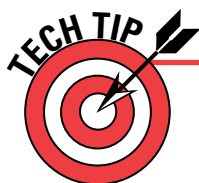
Drill Diameter	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number	
			in	mm	in	mm	Point Angle 90°	Point Angle 120°
1/4	.2500	6.35	1.000	25.40	2.500	63.50	C26167	C26174
3/8	.3750	9.53	1.125	28.58	3.125	79.38	C26168	C26175
1/2	.5000	12.70	1.500	38.10	3.750	95.25	C26169	C26176
5/8	.6250	15.88	1.625	41.28	4.250	107.95	C26170	C26177
3/4	.7500	19.05	1.750	44.45	5.000	127.00	C26171	C26178
1	1.0000	25.40	1.750	44.45	5.000	127.00	C26172	C26179

NC - Long Length

Drill Diameter	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number	
			in	mm	in	mm	Point Angle 90°	Point Angle 120°
1/4	.2500	6.35	1.000	25.40	4.000	101.60	C26181	C26188
3/8	.3750	9.53	1.125	28.58	5.000	127.00	C26182	C26189
1/2	.5000	12.70	1.500	38.10	6.000	152.40	C26183	C26190
5/8	.6250	15.88	1.625	41.28	7.125	180.98	C26184	C26191
3/4	.7500	19.05	1.750	44.45	8.000	203.20	C26185	C26192
1	1.0000	25.40	1.750	44.45	8.000	203.20	C26186	C26193

Sets

No of Pieces	Drill Style	Point Angle	Size Range	Set Order Number
6	2636	90°	1/4" through 1"	C26173
6	2636	120°	1/4" through 1"	C26180
6	2646	90°	1/4" through 1"	C26187
6	2646	120°	1/4" through 1"	C26194



90° Point Angle versus 120° Point Angle

- Use the 90° point spotting drill for a 118° point following drill.
- Use the 120° point spotting drill for a 135° following drill.

Spotting and Centering Drills

Styles 2635, 2645 • HSS NC Spotting Drills, Short and Long Lengths

DRILLING

FEATURES

ANSI SIZES
HEAVY DUTY
SHANK

HSS SUBSTRATE
BRIGHT
90°
120°

APPLICATIONS

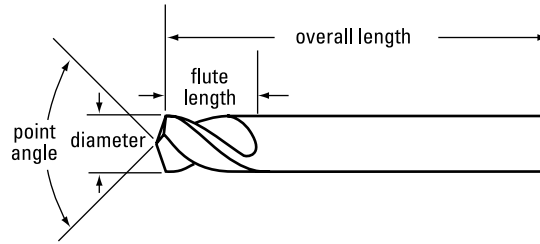
FREE-MACH STAINLESS
CARBON STEEL
ALLOY-TOOL STEEL
ALUMINUM



Style 2635 Short Length



Style 2645 Long Length



Operating parameters shown on page 32.

HOLE FINISHING

NC - Short Length

Drill Diameter	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number	
			in	mm	in	mm	Point Angle 90°	Point Angle 120°
1/4	.2500	6.35	1.000	25.40	2.500	63.50	C24167	C24174
3/8	.3750	9.53	1.125	28.58	3.125	79.38	C24168	C24175
1/2	.5000	12.70	1.500	38.10	3.750	95.25	C24169	C24176
5/8	.6250	15.88	1.625	41.28	4.250	107.95	C24170	C24177
3/4	.7500	19.05	1.750	44.45	5.000	127.00	C24171	C24178
1	1.0000	25.40	1.750	44.45	5.000	127.00	C24172	C24179

THREADING

NC - Long Length

Drill Diameter	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Order Number	
			in	mm	in	mm	Point Angle 90°	Point Angle 120°
1/4	.2500	6.35	1.000	25.40	4.000	101.60	C24181	C24188
3/8	.3750	9.53	1.125	28.58	5.000	127.00	C24182	C24189
1/2	.5000	12.70	1.500	38.10	6.000	152.40	C24183	C24190
5/8	.6250	15.88	1.625	41.28	7.125	180.98	C24184	C24191
3/4	.7500	19.05	1.750	44.45	8.000	203.20	C24185	C24192
1	1.0000	25.40	1.750	44.45	8.000	203.20	C24186	C24193

MILLING

Sets

No of Pieces	Drill Style	Point Angle	Size Range	Set Order Number
6	2635	90°	1/4" through 1"	C24173
6	2635	120°	1/4" through 1"	C24180
6	2645	90°	1/4" through 1"	C24187
6	2645	120°	1/4" through 1"	C24194

OTHER TOOLS



Style 610 • Four-Flute Center Reamer / Countersink

FEATURES

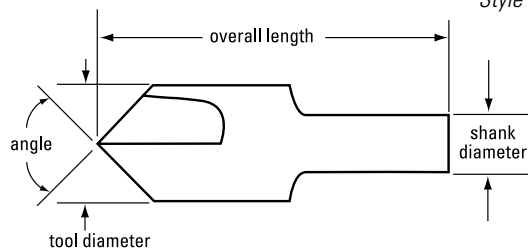
ANSI SIZES	HSS SUBSTRATE
GENERAL PURPOSE	STEAM OXIDE
	SHANK

APPLICATIONS

Used to countersink flat head screws and rivets.



Style 610 Steam Oxide



Operating parameters on page 32.

See page 110 for sets.

Fraction	Tool Diameter		Shank Diameter in	Shank Diameter mm	Overall Length		Order Number			
	Decimal	Metric.			in	mm	60° Angle	82° Angle	90° Angle	100° Angle
1/4	.2500	6.35	.188	4.76	1.438	36.51	C46198	C46199	C46200	C46201
3/8	.3750	9.53	.250	6.35	1.656	42.07	C46204	C46205	C46206	C46207
1/2	.5000	12.70	.375	9.53	1.844	46.83	C46210	C46211	C46212	C46213
5/8	.6250	15.88	.375	9.53	2.094	53.18	C46216	C46217	C46218	C46219
3/4	.7500	19.05	.500	12.70	2.406	61.12	C46222	C46223	C46224	C46225

Style 991 • Four-Flute Machine Countersink

FEATURES

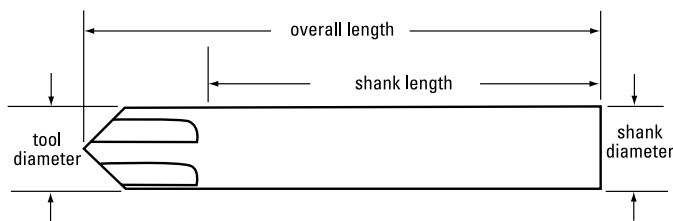
ANSI SIZES	HSS SUBSTRATE
GENERAL PURPOSE	STEAM OXIDE
	SHANK

APPLICATIONS

Ideal for screw machine work.



Style 991 Bright



Operating parameters on page 32.

Fraction	Tool Diameter		Shank Diameter in	Shank Diameter mm	Shank Length		Overall Length		Order Number	
	Decimal	Metric			in	mm	in	mm	60° Angle	82° Angle
1/2	.5000	12.70	.500	12.70	2.25	57.15	3.750	95.25	C46243	C46244
5/8	.6250	15.88	.500	12.70	2.25	57.15	4.000	101.60	C46245	C46246
3/4	.7500	19.05	.500	12.70	2.25	57.15	4.125	104.78	C46247	C46248
7/8	.8750	22.23	.500	12.70	2.25	57.15	4.250	107.95	C46249	C46250
1"	1.0000	25.40	.500	12.70	2.25	57.15	4.375	111.13	C46251	C46252

Countersinks

Style 1001, 1003 • Single-Flute and Three-Flute Countersink

DRILLING

FEATURES

ANSI SIZES
HSS SUBSTRATE
GENERAL PURPOSE
STEAM OXIDE
SHANK

APPLICATIONS

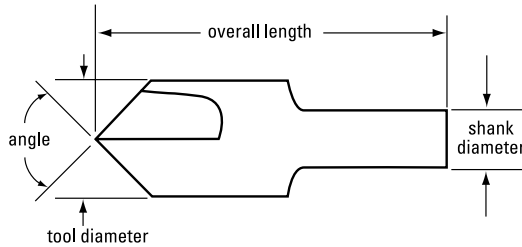
CARBON STEEL
CAST IRON



Style 1001 Single-Flute



Style 1003 Three-Flute



Operating parameters on page 32.

See page 110 for sets.

HOLE FINISHING

Style 1001 • Single-Flute

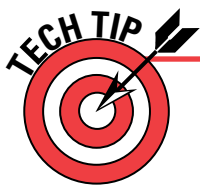
Fraction	Tool Diameter		Shank Diameter	Overall Length	Order Number						
	Decimal	Metric			in	mm	in	mm	60° Angle	82° Angle	90° Angle
1/4	.2500	6.35	.188	4.76	1.500	38.10	C46101	C46102	C46103	C46104	C46106
3/8	.3750	9.53	.250	6.35	1.750	44.45	C46107	C46108	C46109	C46110	C46112
1/2	.5000	12.70	.250	6.35	2.000	50.80	C46113	C46114	C46115	C46116	C46118
5/8	.6250	15.88	.375	9.53	2.250	57.15	C46119	C46120	C46121	C46122	C46123
3/4	.7500	19.05	.375	9.53	2.625	66.68	C46124	C46125	C46126	C46127	C46129
1	1.0000	25.40	.500	12.70	3.125	79.38	C46130	C46131	C46132	C46133	C46135
1-1/4	1.2500	31.75	.500	12.70	3.969	100.81	C46136	C46137	C46138	-	-
1-1/2	1.5000	38.10	.500	12.70	4.313	109.54	C46141	C46139	C46140	-	-
2	2.0000	50.80	.500	12.70	5.000	127.00	C46142	-	C46143	-	-

THREADING

Style 1003 • Three-Flute

Fraction	Tool Diameter		Shank Diameter	Overall Length	Order Number						
	Decimal	Metric			in	mm	in	mm	60° Angle	82° Angle	90° Angle
1/4	.2500	6.35	.188	4.76	1.500	38.10	C46150	C46151	C46152	C46153	C46155
3/8	.3750	9.53	.250	6.35	1.750	44.45	C46156	C46157	C46158	C46159	C46161
1/2	.5000	12.70	.250	6.35	2.000	50.80	C46162	C46163	C46164	C46165	C46167
5/8	.6250	15.88	.375	9.53	2.250	57.15	C46168	C46169	C46170	C46171	C46173
3/4	.7500	19.05	.375	9.53	2.625	66.68	C46174	C46175	C46176	C46177	C46179
1	1.0000	25.40	.500	12.70	3.125	79.38	C46180	C46181	C46182	C46183	C46185
1-1/4	1.2500	31.75	.500	12.70	3.969	100.81	C46186	C46187	C46188	-	-
1-1/2	1.5000	38.10	.500	12.70	4.313	109.54	C46189	C46190	C46191	-	-
2	2.0000	50.80	.500	12.70	5.000	127.00	C46192	-	-	-	-

MILLING



Using Countersinks

- The pre-drilled hole for countersinking should not be less than 10% of the countersink diameter.
- Use single-flute countersinks for smaller holes; multi-flute tools countersink much larger holes.
- Run countersinks at 50% to 66% of recommended drill speeds.

OTHER TOOLS



Combined Drill and Countersink

Styles 996, 998 • Bell-Type and Plain Drill and Countersink

FEATURES

ANSI SIZES **HSS SUBSTRATE**

GENERAL PURPOSE **BRIGHT**

118°

APPLICATIONS

ALLOY-TOOL STEEL

CARBON STEEL

CAST IRON

ALUMINUM

Bell-type tool forms protected centers.

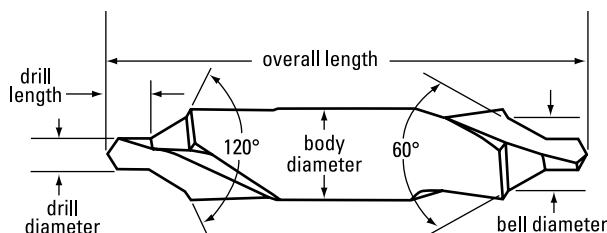


Style 996 Bell-Type



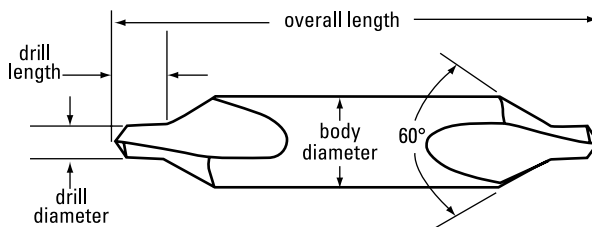
Style 998 Plain-Type

See page 110 for sets.



Style 996 Bell-Type

Size Number	Drill Diameter		Body Diameter		Drill Length		Overall Length		Bell Diameter		Order Number	
	in	decimal mm	in	mm	in	mm	in	mm	in	mm		
#11	3/64	.0469	1.19	.125	3.18	.047	1.19	1.250	31.75	.100	2.54	C46272
#12	1/16	.0625	1.59	.188	4.76	.063	1.59	1.875	47.63	.150	3.81	C46273
#13	3/32	.0938	2.38	.250	6.35	.094	2.38	2.000	50.80	.200	5.08	C46274
#14	7/64	.1094	2.78	.313	7.94	.109	2.78	2.125	53.98	.250	6.35	C46275
#15	5/32	.1562	3.97	.438	11.11	.156	3.97	2.750	69.85	.350	8.89	C46276
#16	3/16	.1875	4.76	.500	12.70	.188	4.76	3.000	76.20	.400	10.16	C46277
#17	7/32	.2188	5.56	.625	15.88	.219	5.56	3.250	82.55	.500	12.70	C46278
#18	1/4	.2500	6.35	.750	19.05	.250	6.35	3.500	88.90	.600	15.24	C46279



Style 998 Plain

Size Number	Drill Diameter		Body Diameter		Drill Length		Overall Length		Order Number	
	in	decimal mm	in	mm	in	mm	in	mm		
#00	.025	.0250	0.64	.125	3.18	.030	0.76	1.125	28.58	C46261
#0	1/32	.0312	0.79	.125	3.18	.038	0.97	1.125	28.58	C46262
#1	3/64	.0469	1.19	.125	3.18	.047	1.19	1.250	31.75	C46263
#2	5/64	.0781	1.98	.188	4.76	.078	1.98	1.875	47.63	C46264
#3	7/64	.1094	2.78	.250	6.35	.109	2.78	2.000	50.80	C46265
#4	1/8	.1250	3.18	.313	7.94	.125	3.18	2.125	53.98	C46266
#5	3/16	.1875	4.76	.438	11.11	.188	4.76	2.750	69.85	C46267
#6	7/32	.2188	5.56	.500	12.70	.219	5.56	3.000	76.20	C46268
#7	1/4	.2500	6.35	.625	15.88	.250	6.35	3.250	82.55	C46269
#8	5/16	.3125	7.94	.750	19.05	.313	7.94	3.500	88.90	C46270



DRILLING
 HOLE FINISHING
 THREADING
 MILLING
 OTHER TOOLS

Combined Drill and Countersinks

Style 1798 • Solid Carbide Combined Drill and Countersink

DRILLING

FEATURES

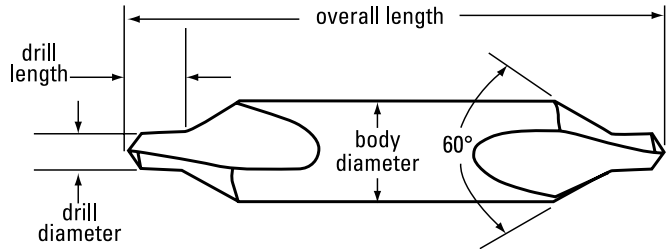
- ANSI SIZES
- CARBIDE SUBSTRATE
- GENERAL PURPOSE
- BRIGHT

APPLICATIONS

- ALLOY STEEL
- CARBON STEEL
- CAST IRON
- ALUMINUM



Style 1798 Solid Carbide



HOLE FINISHING

Size Number	Drill Diameter		Body Diameter		Drill Length		Overall Length		Order Number	
	in	decimal mm	in	mm	in	mm	in	mm		
#1	3/64	.0469	1.19	.125	3.18	.0469	1.19	1.250	31.75	C52772
#2	5/64	.0781	1.98	.188	4.76	.0781	1.98	1.875	47.63	C52773
#3	7/64	.1094	2.78	.250	6.35	.1094	2.78	2.000	50.80	C52774
#4	1/8	.1250	3.18	.313	7.94	.1250	3.18	2.125	53.98	C52775
#5	3/16	.1875	4.76	.438	11.11	.1875	4.76	2.750	69.85	C52776
#6	7/32	.2188	5.56	.500	12.70	.2188	5.56	3.000	76.20	C52777

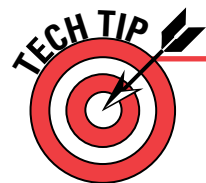
THREADING

Countersink and Drill/Countersink Sets

(individual tools on pages 108 through 110)

No. of Pieces	Style	Angle	Size Range	Set Order Number
5	610	82°	1/4" through 3/4" x 1/8"	C00969
5	1001	60°	1/4" through 3/4" x 1/8"	C00970
5	1001	82°	1/4" through 3/4" x 1/8"	C00971
5	1003	60°	1/4" through 3/4" x 1/8"	C00972
5	1003	82°	1/4" through 3/4" x 1/8"	C00973
5	998	—	#1 through #5	C00944

MILLING



Solid Carbide Drill and Countersink

- Use the 60° tool for centers and the 82° tool for countersinking.
- Run this tool at 3 times the speed of HSS tools.

OTHER TOOLS



Style 100 • Rough Sockets for Taper Shank Tools

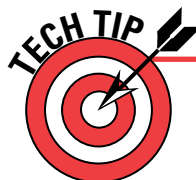
FEATURES

ANSI SIZES HSS SUBSTRATE
 GENERAL PURPOSE BRIGHT

APPLICATIONS



Size Number	Shank Diameter		Overall Length		Order Number
	decimal	mm	in	mm	
#1	1.125	28.58	7.50	190.50	C53001
#2	1.250	31.75	8.00	203.20	C53002
#3	1.500	38.10	10.00	254.00	C53003



Rough Sockets

- Unfinished shanks allow the user to customize fit.
- Furnished with a centered plug to aid in turning and grinding to size.

DRILLING

HOLE FINISHING

Style 102 • Fitted Sockets for Taper Shank Tools

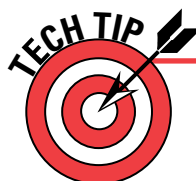
FEATURES

ANSI SIZES HSS SUBSTRATE
 GENERAL PURPOSE BRIGHT

APPLICATIONS



Morse Taper Hole Size	Morse Taper Shank Size	Overall Length		Order Number
		in	mm	
1	2	6.188	157.16	C53007
1	3	6.938	176.21	C53008
2	2	6.813	173.04	C53012
2	3	7.563	192.09	C53013
2	4	8.563	217.49	C53014
3	2	7.750	196.85	C53016
3	3	8.500	215.90	C53017
3	4	9.500	241.30	C53018
3	5	10.750	273.05	C53019
4	3	9.438	239.71	C53020
4	4	10.438	265.11	C53021
4	5	11.688	296.86	C53022
5	4	11.813	300.04	C53024



Fitted Sockets

- Adapt taper shank tools to machine spindle nose taper hole.
- Also use as extension socket.

THREADING

MILLING

OTHER TOOLS

Drill Sleeves

Style 104 • Reducing Sleeve for Taper Shank Tools

DRILLING

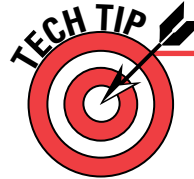
FEATURES

ANSI SIZES | HSS SUBSTRATE
 GENERAL PURPOSE | BRIGHT

APPLICATIONS



Morse Taper Hole Size	Morse Taper Shank Size	Overall Length in	Overall Length mm	Order Number
1	2	3.563	90.50	C53047
1	3	3.969	100.81	C53048
1	4	4.875	123.82	C53049
2	3	4.438	112.72	C53051
2	4	4.875	123.82	C53052
2	5	6.125	155.57	C53053
3	4	5.375	136.52	C53054
3	5	6.125	155.57	C53055
4	5	6.625	168.27	C53056
5	6	8.625	219.07	C53058



Using Reducing Sleeves

- Reduces the hole size of a machine spindle where the drill shank is smaller than the spindle hole.

HOLE FINISHING

THREADING

Style 105 • Drill Drifts

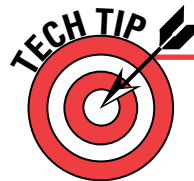
FEATURES

ANSI SIZES | HSS SUBSTRATE
 GENERAL PURPOSE | BRIGHT

APPLICATIONS



Fits Morse Taper Socket or Sleeve	Order Number
#1	C53665
#2	C53666
#3	C53667
#4	C53668



Using Drill Drifts

- Used to remove taper shank drills and tapered sockets from the spindle or from holders.

MILLING

OTHER TOOLS

Drill Nomenclature

Axis

The imaginary straight line which forms the longitudinal centerline of the drill.

Back Taper

A slight decrease in diameter, from front to back in the body of the drill.

Body

The portion of the drill extending from the shank or neck to the outer corners of the cutting lips.

Body Diameter Clearance

That portion of the land that has been cut away so it will not rub against the walls of the hole.

Chisel Edge

The edge at the end of the web that connects the cutting lips.

Drill Diameter

The diameter over the margins of the drill measured at the point.

Flutes

Helical or straight grooves cut or formed in the body of the drill to provide cutting lips, to permit removal of chips, and to allow cutting fluid to reach the cutting lips.

Flute Length

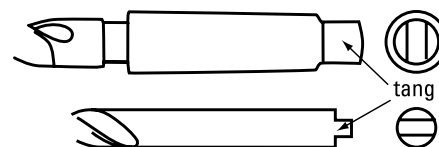
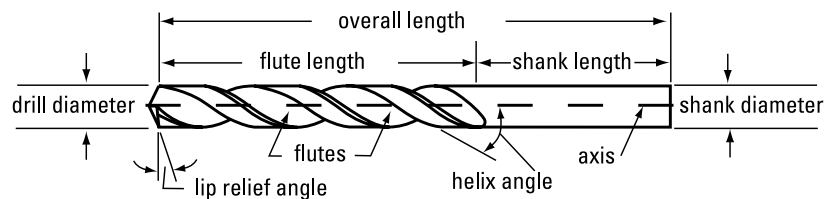
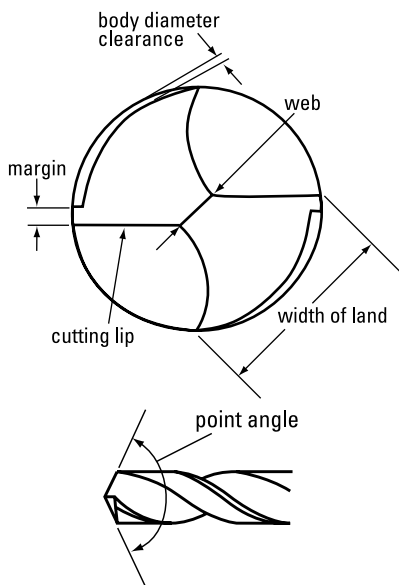
The length from the outer corners of the cutting lips to the extreme back end of the flutes. However, metric drills are measured from the extreme end of the shank to the end of the flute at the point.

Land

The peripheral portion of the body between adjacent flutes.

Land Width

The distance between the leading edge and the heel of the land measured at a right angle to the leading edge.

**Lip Relief**

The axial relief on the drill point.

Margin

The cylindrical portion of the land which is not cut away to provide clearance.

Neck

The section of reduced diameter between the body and the shank of a drill.

Overall Length

The length from the extreme end of the shank to the outer corners of the cutting lips. However, metric drills are measured from the extreme end of the shank to the end of the flute at the point.

Point

The cutting end of a drill, made up of the ends of the lands and the web. In form it resembles a cone, but departs from a true cone to furnish clearance behind the cutting lips.

Point Angle

The angle included between the cutting lips projected upon a plane parallel to the drill axis and parallel to the two cutting lips.

Shank

The part of the drill by which it is held and driven.

Tang

The flattened end of a taper shank, intended to fit into a driving slot in a socket.

Web

The central portion of the body that joins the lands. The extreme end of the web forms the chisel edge on a two-flute drill.

Technical Information

Drill Cutting Speeds – Fractional Sizes

Feet Per Minute

Drill Size Fraction / Dec	10'	20'	30'	40'	50'	60'	70'	80'	90'	100'	110'	120'	130'	140'	150'	
	Revolutions Per Minute															
1/16	.0625	611	1222	1833	2445	3056	3667	4278	4889	5500	6111	6722	7334	7945	8556	9167
1/8	.1250	306	611	917	1222	1528	1833	2139	2445	2750	3056	3361	3667	3973	4278	4584
3/16	.1875	204	407	611	815	1019	1222	1426	1630	1833	2037	2241	2445	2648	2852	3056
1/4	.2500	153	306	458	611	764	917	1070	1222	1375	1528	1681	1833	1986	2139	2292
5/16	.3125	122	244	367	489	611	733	856	978	1100	1222	1345	1467	1589	1711	1833
3/8	.3750	102	204	306	407	509	611	713	815	917	1019	1120	1222	1324	1426	1528
7/16	.4375	87	175	262	349	437	524	611	698	786	873	960	1048	1135	1222	1310
1/2	.5000	76	153	229	306	382	458	535	611	688	764	840	917	993	1070	1146
5/8	.6250	61	122	183	244	306	367	428	489	550	611	672	733	794	856	917
3/4	.7500	51	102	153	203	255	306	357	407	458	509	560	611	662	713	764
7/8	.8750	44	87	131	175	218	262	306	349	393	436	480	524	568	611	655
1	1.0000	38	76	115	153	191	229	267	306	344	382	420	458	497	535	573
1-1/8	1.1250	34	68	102	136	170	204	238	272	306	340	373	407	441	475	509
1-1/4	1.2500	31	61	92	122	153	183	214	244	275	306	336	367	397	428	458
1-3/8	1.3750	28	56	83	111	139	167	194	222	250	278	306	333	361	389	417
1-1/2	1.5000	26	51	76	102	127	153	178	204	229	255	280	306	331	357	382
1-5/8	1.6250	24	47	70	94	117	141	165	188	212	235	259	282	306	329	353
1-3/4	1.7500	22	44	65	87	109	131	153	175	196	218	240	262	284	306	327
1-7/8	1.8750	20	41	61	81	102	122	143	163	183	204	224	244	265	285	306
2	2.0000	19	38	57	76	95	115	134	153	172	191	210	229	248	267	287
2-1/4	2.2500	17	34	51	68	85	102	119	136	153	170	187	204	221	238	255
2-1/2	2.5000	15	31	46	61	76	92	107	122	137	153	168	183	199	214	229
2-3/4	2.7500	14	28	42	56	69	83	97	111	125	139	153	167	181	194	208
3	3.0000	13	25	38	51	64	76	89	102	115	127	140	153	166	178	191

Drill Cutting Speeds – Letter Sizes

Feet Per Minute

Drill Size Letter / Dec	10'	20'	30'	40'	50'	60'	70'	80'	90'	100'	110'	120'	130'	140'	150'	
	Revolutions Per Minute															
A	.2340	163	326	491	654	818	982	1145	1309	1472	1636	1796	1959	2122	2285	2448
B	.2380	161	321	482	642	803	963	1124	1284	1445	1605	1765	1926	2086	2247	2407
C	.2420	158	316	473	631	789	947	1105	1262	1420	1578	1736	1894	2052	2210	2368
D	.2460	155	311	467	622	778	934	1089	1245	1400	1556	1708	1863	2018	2174	2329
E	.2500	153	306	458	611	764	917	1070	1222	1375	1528	1681	1834	1986	2139	2292
F	.2570	149	297	446	594	743	892	1040	1189	1337	1486	1635	1784	1932	2081	2229
G	.2610	146	293	440	585	732	878	1024	1170	1317	1463	1610	1756	1903	2049	2195
H	.2660	144	287	430	574	718	862	1005	1149	1292	1436	1580	1723	1867	2010	2154
I	.2720	140	281	421	562	702	842	983	1123	1264	1404	1545	1685	1826	1966	2106
J	.2770	138	276	414	552	690	827	965	1103	1241	1379	1517	1655	1793	1930	2068
K	.2810	136	272	408	544	680	815	951	1087	1223	1359	1495	1631	1767	1903	2039
L	.2900	132	263	395	527	659	790	922	1054	1185	1317	1449	1581	1712	1844	1976
M	.2950	129	259	389	518	648	777	907	1036	1166	1295	1424	1554	1683	1813	1942
N	.3020	126	253	380	506	633	759	886	1012	1139	1265	1391	1518	1644	1771	1897
O	.3160	121	242	363	484	605	725	846	967	1088	1209	1330	1450	1571	1692	1813
P	.3230	118	237	355	473	592	710	828	946	1065	1183	1301	1419	1537	1657	1774
Q	.3320	115	230	345	460	575	690	805	920	1035	1150	1266	1384	1496	1611	1726
R	.3390	113	225	338	451	564	676	789	902	1014	1127	1239	1355	1465	1577	1690
S	.3480	110	220	329	439	549	659	769	878	988	1098	1207	1317	1427	1537	1646
T	.3580	107	213	320	426	533	640	746	853	959	1066	1173	1280	1387	1494	1600
U	.3680	104	208	311	415	519	623	727	830	934	1038	1142	1246	1349	1453	1557
V	.3770	101	203	304	405	507	608	709	810	912	1013	1114	1219	1317	1418	1520
W	.3860	99	198	297	396	495	594	693	792	891	989	1088	1188	1286	1385	1484
X	.3970	96	192	289	385	481	576	672	769	865	962	1058	1155	1251	1347	1443
Y	.4040	95	189	284	378	473	567	662	756	851	945	1040	1135	1229	1324	1418
Z	.4130	92	185	277	370	462	555	647	740	832	925	1017	1110	1202	1295	1387

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS



Technical Information

Drill Feeds

<i>Diameter Range (inches)</i>	<i>Normal Feeds (IPR)</i>	<i>Heavy Feed (IPR)</i>
from 1/16 thru 1/8	.001-.002	.002-.004
over 1/8 thru 1/4	.002-.004	.004-.008
over 1/4 thru 1/2	.004-.008	.008-.016
over 1/2 thru 1	.008-.016	.016-.024
over 1	.016-.024	.024-.032

Drill Cutting Speeds – Wire Gage Sizes

Drill Size Wire / Dec	<i>Feet Per Minute</i>															
	10'	20'	30'	40'	50'	60'	70'	80'	90'	100'	110'	120'	130'	140'	150'	
1	.2280	168	335	503	670	838	1005	1173	1340	1508	1675	1843	2010	2179	2346	2513
2	.2210	173	345	518	691	864	1037	1210	1382	1555	1728	1901	2074	2247	2420	2593
3	.213	179	359	538	717	897	1076	1255	1434	1614	1793	1974	2152	2331	2511	2690
4	.2090	183	365	548	731	914	1097	1280	1462	1645	1828	2010	2193	2376	2560	2741
5	.2055	186	372	558	744	930	1115	1301	1487	1673	1859	2045	2230	2416	2602	2788
6	.2040	187	374	562	749	936	1123	1310	1498	1685	1872	2060	2247	2434	2621	2809
7	.2010	190	380	570	760	950	1140	1330	1520	1710	1900	2090	2281	2470	2660	2850
8	.1990	192	384	576	768	960	1151	1343	1535	1727	1919	2111	2303	2495	2687	2879
9	.1960	195	390	585	780	975	1169	1364	1559	1754	1949	2144	2339	2534	2728	2923
10	.1935	197	395	592	790	987	1184	1382	1579	1777	1974	2171	2369	2566	2764	2961
11	.1910	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600	2800	3001
12	.1890	202	404	606	808	1010	1213	1415	1617	1819	2021	2223	2425	2627	2829	3032
13	.1850	206	413	620	826	1032	1239	1450	1652	1859	2065	2271	2479	2684	2891	3097
14	.1820	210	420	630	840	1050	1259	1469	1679	1889	2099	2309	2518	2728	2938	3148
15	.1800	213	425	638	851	1064	1276	1489	1702	1914	2127	2334	2546	2759	2971	3183
16	.1770	216	432	647	863	1079	1295	1511	1726	1942	2158	2374	2590	2806	3021	3237
17	.1730	221	442	662	883	1104	1325	1546	1766	1987	2208	2429	2650	2870	3091	3313
18	.1695	226	452	678	904	1130	1356	1582	1808	2034	2260	2479	2704	2930	3155	3380
19	.1660	230	460	690	920	1151	1381	1611	1841	2071	2301	2531	2761	2991	3222	3453
20	.1610	237	475	712	949	1186	1423	1660	1898	2135	2372	2610	2847	3084	3322	3559
21	.1590	240	480	721	961	1201	1441	1681	1922	2162	2402	2644	2883	3123	3363	3604
22	.1570	243	487	730	973	1217	1460	1703	1946	2190	2433	2676	2920	3164	3406	3649
23	.1540	248	496	744	992	1240	1488	1736	1984	2232	2480	2728	2976	3224	3472	3720
24	.1520	251	503	754	1005	1257	1508	1759	2010	2262	2513	2764	3016	3267	3518	3769
25	.1495	256	511	767	1022	1276	1533	1789	2044	2300	2555	2810	3066	3322	3577	3832
26	.1470	260	520	779	1039	1299	1559	1819	2078	2338	2598	2858	3118	3378	3638	3898
27	.1440	265	531	796	1061	1327	1592	1857	2122	2388	2653	2919	3183	3448	3714	3979
28	.1405	272	544	816	1088	1360	1631	1903	2175	2447	2719	2990	3262	3534	3806	4078
29	.1360	281	562	843	1124	1405	1685	1966	2247	2528	2809	3090	33701	3651	3932	4213
30	.1285	297	595	892	1189	1487	1784	2081	2378	2676	2973	3270	3567	3864	4162	4459
31	.1200	318	637	955	1273	1592	1910	2228	2546	2865	3183	3501	3821	4138	4456	4775
32	.1160	329	659	988	1317	1647	1976	2305	2634	2964	3293	3622	3951	4281	4610	4939
33	.1130	338	676	1014	1352	1690	2028	2366	2704	3042	3380	3718	4056	4394	4732	5070
34	.1110	344	688	1032	1376	1721	2065	2409	2753	3097	3442	3785	4129	4474	4818	5162
35	.1100	347	694	1042	1389	1736	2083	2430	2778	3125	3472	3821	4167	4514	4861	5209
36	.1065	359	717	1076	1435	1794	2152	2511	2870	3228	3587	3945	4304	4663	5021	5380
37	.1040	367	735	1102	1469	1837	2204	2571	2938	3306	3673	4040	4407	4775	5142	5509
38	.1015	376	753	1129	1505	1882	2258	2634	3010	3387	3763	4140	4516	4892	5269	5645
39	.0995	384	768	1152	1536	1920	2303	2687	3071	3455	3839	4222	4607	4991	5374	5758
40	.0980	390	780	1169	1559	1949	2339	2729	3118	3508	3898	4287	4677	5067	5457	5846

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DRILLING

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OTHER TOOLS

Technical Information

Drill Cutting Speeds – Wire Gage Sizes (continued) *Feet Per Minute*

Drill Size Letter / Dec	10'	20'	30'	40'	50'	60'	70'	80'	90'	100'	110'	120'	130'	140'	150'	
	<i>Revolutions Per Minute</i>															
41	.0960	398	796	1194	1592	1990	2387	2785	3183	3581	3979	4377	4775	5172	5570	5968
42	.0935	408	817	1226	1634	2043	2451	2860	3268	3677	4085	4494	4902	5311	5719	6128
43	.0890	429	858	1288	1717	2146	2575	3004	3434	3863	4292	4721	5150	5579	6008	6438
44	.0860	444	888	1333	1777	2221	2665	3109	3554	3999	4442	4886	5330	5774	6218	6662
45	.0820	466	932	1397	1863	2329	2795	3261	3726	4192	4658	5124	5590	6056	6522	6987
46	.0810	472	943	1415	1886	2358	2830	3301	3773	4244	4716	5187	5659	6130	6602	7074
47	.0785	487	973	1460	1946	2433	2920	3406	3893	4379	4866	5352	5839	6326	6812	7299
48	.0760	503	1005	1508	2010	2513	3016	3518	4021	4523	5026	5528	6031	6534	7036	7539
49	.0730	523	1047	1570	2093	2617	3140	3663	4186	4710	5233	5756	6279	6808	7326	7849
50	.0700	546	1091	1637	2183	2729	3274	3820	4366	4911	5457	6002	6548	7094	7640	8185
51	.0670	570	1140	1710	2280	2851	3421	3991	4561	5131	5701	6271	6841	7413	798	8552
52	.0635	602	1203	1805	2406	3008	3609	4211	4812	5414	6015	6619	7218	7820	8421	9023
53	.0595	641	1283	1924	2566	3207	3848	4490	5131	5773	6414	7062	7704	8346	8988	9630
54	.0550	694	1389	2084	2778	3473	4167	4862	5556	6251	6945	7639	8334	9028	9723	10417
55	.0520	735	1469	2204	2938	3673	4408	5142	5877	6611	7346	8080	8815	9549	10284	11028
56	.0465	821	1643	2465	3286	4108	4929	5751	6572	7394	8215	9036	9857	10678	11500	12322
57	.0430	888	1777	2671	3561	4452	5342	6232	7122	8013	8903	9793	10683	11573	12463	13353
58	.0420	910	1819	2729	3637	4547	5456	6367	7275	8186	9095	10004	10913	11823	12732	13642
59	.0410	932	1863	2795	3726	4658	5590	6521	7453	8388	9316	10248	11180	12111	13043	13975
60	.0400	955	1910	2865	3820	4775	5729	6684	7639	8594	9549	10504	11459	12414	13369	14324
61	.0390	979	1959	2938	3918	4897	5876	6856	7835	8815	9794	10774	11753	12732	13712	14691
62	.0380	1005	2010	3015	4020	5025	6030	7035	8040	9045	10050	11057	12060	13068	14073	15078
63	.0370	1032	2064	3096	4128	5160	6192	7224	8256	9288	10320	11366	12398	13421	14453	15485
64	.0360	1061	2122	3183	4244	5305	6366	7427	8488	9549	10610	11671	12732	13793	14854	15915
65	.0350	1091	2182	3273	4364	5455	6546	7637	8728	9819	10910	12005	13096	14187	15279	16370
66	.0330	1158	2316	3474	4632	5790	6948	8106	9264	10422	11580	12732	13890	15047	16205	17362
67	.0320	1194	2388	3582	4776	5970	7164	8358	9552	10746	11940	13130	14324	15517	16712	17905
68	.0310	1232	2465	3696	4928	6160	7392	8624	9856	11088	12320	13554	14786	16018	17250	18482
69	.0292	1308	2616	3918	5224	6530	7836	9142	10448	11754	13060	14389	15697	17006	18314	19622
70	.0280	1364	2729	4091	5456	6820	8184	9548	10912	12276	13640	15006	16370	17734	19099	20463
71	.0260	1469	2938	4419	5892	7365	8838	10311	11784	13257	14730	16160	17629	19099	20568	22037
72	.0250	1528	3056	4584	6112	7640	9168	10696	12224	13752	15280	16807	18335	19863	21390	22918
73	.0240	1592	3183	4776	6368	7960	9552	11144	12736	14328	15920	17507	19099	20690	22282	23873
74	.0225	1698	3396	5106	6808	8510	10212	11914	13616	15318	17020	18674	20372	22069	23767	25465
75	.0210	1819	3638	5457	7276	9095	10914	12733	14552	16371	18190	20008	21827	23646	25465	27284
76	.0200	1910	3820	5730	7640	9550	11460	13370	15280	17190	19100	21008	22918	24828	26738	28648
77	.0180	2122	4244	6366	8488	10610	12732	14854	16976	19098	21220	23343	25465	27587	29709	31831
78	.0160	2388	4775	7161	9548	11935	14322	16709	19096	21483	23870	26260	28648	31035	33422	35810
79	.0145	2634	5269	7902	10536	13170	15804	18438	21072	23706	26340	28988	31611	34246	36880	39514
80	.0135	2830	5659	8490	11320	14150	16980	19810	22640	25470	28300	31123	33953	36782	39612	42441

DRILLING

HOLE FINISHING

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OTHER TOOLS



Technical Information

Dimensions for Inch Size Drills (inches)

Conversion formulae • Inch = mm x .03937 • Metric = inch x 25.4

Drill Size	Decimal Equivalent	Screw Machine Length				Jobbers Length				Taper Length			
		Flute Length		Overall Length		Flute Length		Overall Length		Flute Length		Overall Length	
		fraction	decimal	fraction	decimal	fraction	decimal	fraction	decimal	fraction	decimal	fraction	decimal
1/64	.0156	—	—	—	—	3/16	.1875	3/4	.7500	5/16	.3125	1-1/2	1.5000
80	.0135	—	—	—	—	1/8	.1250	3/4	.7500	5/16	.3125	1-1/2	1.5000
79	.0145	—	—	—	—	1/8	.1250	3/4	.7500	5/16	.3125	1-1/2	1.5000
78	.0160	—	—	—	—	3/16	.1875	7/8	.8750	5/16	.3125	1-1/2	1.5000
77	.0180	—	—	—	—	3/16	.1875	7/8	.8750	5/16	.3125	1-1/2	1.5000
76	.0200	—	—	—	—	3/16	.1875	7/8	.8750	5/16	.3125	1-1/2	1.5000
75	.0210	—	—	—	—	1/4	.2500	1	1.0000	5/16	.3125	1-1/2	1.5000
74	.0225	—	—	—	—	1/4	.2500	1	1.0000	5/16	.3125	1-1/2	1.5000
73	.0240	—	—	—	—	5/16	.3125	1-1/8	1.1250	5/16	.3125	1-1/2	1.5000
72	.0250	—	—	—	—	5/16	.3125	1-1/8	1.1250	5/16	.3125	1-1/2	1.5000
71	.0260	—	—	—	—	3/8	.3750	1-1/4	1.2500	3/4	.7500	2	2.0000
70	.0280	—	—	—	—	3/8	.3750	1-1/4	1.2500	3/4	.7500	2	2.0000
69	.0292	—	—	—	—	1/2	.5000	1-3/8	1.3750	3/4	.7500	2	2.0000
68	.0310	—	—	—	—	1/2	.5000	1-3/8	1.3750	3/4	.7500	2	2.0000
1/32	.0312	1/2	.5000	1-3/8	1.3750	1/2	.5000	1-3/8	1.3750	3/4	.7500	2	2.0000
67	.0320	—	—	—	—	1/2	.5000	1-3/8	1.3750	3/4	.7500	2	2.0000
66	.0330	—	—	—	—	1/2	.5000	1-3/8	1.3750	3/4	.7500	2	2.0000
65	.0350	—	—	—	—	5/8	.6250	1-1/2	1.5000	3/4	.7500	2	2.0000
64	.0360	—	—	—	—	5/8	.6250	1-1/2	1.5000	3/4	.7500	2	2.0000
63	.0370	—	—	—	—	5/8	.6250	1-1/2	1.5000	3/4	.7500	2	2.0000
62	.0380	—	—	—	—	5/8	.6250	1-1/2	1.5000	3/4	.7500	2	2.0000
61	.0390	—	—	—	—	11/16	.6875	1-5/8	1.6250	1-1/8	1.1250	2-1/4	2.2500
60	.0400	1/2	.5000	1-3/8	1.3750	11/16	.6875	1-5/8	1.6250	1-1/8	1.1250	2-1/4	2.2500
59	.0410	1/2	.5000	1-3/8	1.3750	11/16	.6875	1-5/8	1.6250	1-1/8	1.1250	2-1/4	2.2500
58	.0420	1/2	.5000	1-3/8	1.3750	11/16	.6875	1-5/8	1.6250	1-1/8	1.1250	2-1/4	2.2500
57	.0430	1/2	.5000	1-3/8	1.3750	3/4	.7500	1-3/4	1.7500	1-1/8	1.1250	2-1/4	2.2500
56	.0465	1/2	.5000	1-3/8	1.3750	3/4	.7500	1-3/4	1.7500	1-1/8	1.1250	2-1/4	2.2500
3/64	.0469	1/2	.5000	1-3/8	1.3750	3/4	.7500	1-3/4	1.7500	1-1/8	1.1250	2-1/4	2.2500
55	.0520	5/8	.6250	1-5/8	1.6250	7/8	.8750	1-7/8	1.8750	1-3/4	1.7500	3	3.0000
54	.0550	5/8	.6250	1-5/8	1.6250	7/8	.8750	1-7/8	1.8750	1-3/4	1.7500	3	3.0000
53	.0595	5/8	.6250	1-5/8	1.6250	7/8	.8750	1-7/8	1.8750	1-3/4	1.7500	3	3.0000
1/16	.0625	5/8	.6250	1-5/8	1.6250	7/8	.8750	1-7/8	1.8750	1-3/4	1.7500	3	3.0000
52	.0635	11/16	.6875	1-11/16	1.6875	7/8	.8750	1-7/8	1.8750	2	2.0000	3-3/4	3.7500
51	.0670	11/16	.6875	1-11/16	1.6875	1	1.0000	2	2.0000	2	2.0000	3-3/4	3.7500
50	.0700	11/16	.6875	1-11/16	1.6875	1	1.0000	2	2.0000	2	2.0000	3-3/4	3.7500
49	.0730	11/16	.6875	1-11/16	1.6875	1	1.0000	2	2.0000	2	2.0000	3-3/4	3.7500
48	.0760	11/16	.6875	1-11/16	1.6875	1	1.0000	2	2.0000	2	2.0000	3-3/4	3.7500
5/64	.0781	11/16	.6875	1-11/16	1.6875	1	1.0000	2	2.0000	2	2.0000	3-3/4	3.7500
47	.0785	3/4	.7500	1-3/4	1.7500	1	1.0000	2	2.0000	2-1/4	2.2500	4-1/4	4.2500
46	.0810	3/4	.7500	1-3/4	1.7500	1-1/8	1.1250	2-1/8	2.1250	2-1/4	2.2500	4-1/4	4.2500
45	.0820	3/4	.7500	1-3/4	1.7500	1-1/8	1.1250	2-1/8	2.1250	2-1/4	2.2500	4-1/4	4.2500
44	.0860	3/4	.7500	1-3/4	1.7500	1-1/8	1.1250	2-1/8	2.1250	2-1/4	2.2500	4-1/4	4.2500
43	.0890	3/4	.7500	1-3/4	1.7500	1-1/4	1.2500	2-1/4	2.2500	2-1/4	2.2500	4-1/4	4.2500
42	.0935	3/4	.7500	1-3/4	1.7500	1-1/4	1.2500	2-1/4	2.2500	2-1/4	2.2500	4-1/4	4.2500
3/32	.0938	3/4	.7500	1-3/4	1.7500	1-1/4	1.2500	2-1/4	2.2500	2-1/4	2.2500	4-1/4	4.2500
41	.0960	13/16	.8125	1-13/16	1.8125	1-3/8	1.3750	2-3/8	2.3750	2-1/2	2.5000	4-5/8	4.6250
40	.0980	13/16	.8125	1-13/16	1.8125	1-3/8	1.3750	2-3/8	2.3750	2-1/2	2.5000	4-5/8	4.6250
39	.0995	13/16	.8125	1-13/16	1.8125	1-3/8	1.3750	2-3/8	2.3750	2-1/2	2.5000	4-5/8	4.6250
38	.1015	13/16	.8125	1-13/16	1.8125	1-7/16	1.4375	2-1/2	2.5000	2-1/2	2.5000	4-5/8	4.6250
37	.1040	13/16	.8125	1-13/16	1.8125	1-7/16	1.4375	2-1/2	2.5000	2-1/2	2.5000	4-5/8	4.6250
36	.1065	13/16	.8125	1-13/16	1.8125	1-7/16	1.4375	2-1/2	2.5000	2-1/2	2.5000	4-5/8	4.6250
7/64	.1094	13/16	.8125	1-13/16	1.8125	1-1/2	1.5000	2-5/8	2.6250	2-1/2	2.5000	4-5/8	4.6250
35	.1100	7/8	.8750	1-7/8	1.8750	1-1/2	1.5000	2-5/8	2.6250	2-3/4	2.7500	5-1/8	5.1250
34	.1110	7/8	.8750	1-7/8	1.8750	1-1/2	1.5000	2-5/8	2.6250	2-3/4	2.7500	5-1/8	5.1250
33	.1130	7/8	.8750	1-7/8	1.8750	1-1/2	1.5000	2-5/8	2.6250	2-3/4	2.7500	5-1/8	5.1250
32	.1160	7/8	.8750	1-7/8	1.8750	1-5/8	1.6250	2-3/4	2.7500	2-3/4	2.7500	5-1/8	5.1250

DRILLING

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Drills

Technical Information

Dimensions for Inch Size Drills (inches) cont'd.

Conversion formulae • Inch = mm x .03937 • Metric = inch x 25.4

Drill Size	Decimal Equivalent	Screw Machine Length				Jobbers Length				Taper Length			
		Flute Length		Overall Length		Flute Length		Overall Length		Flute Length		Overall Length	
		fraction	decimal	fraction	decimal	fraction	decimal	fraction	decimal	fraction	decimal	fraction	decimal
31	.1200	7/8	.8750	1-7/8	1.8750	1-5/8	1.6250	2-3/4	2.7500	2-3/4	2.7500	5-1/8	5.1250
1/8	.1250	7/8	.8750	1-7/8	1.8750	1-5/8	1.6250	2-3/4	2.7500	2-3/4	2.7500	5-1/8	5.1250
30	.1285	15/16	.9375	1-15/16	1.9375	1-5/8	1.6250	2-3/4	2.7500	3	3.0000	5-3/8	5.3750
29	.1360	15/16	.9375	1-15/16	1.9375	1-3/4	1.7500	2-7/8	2.8750	3	3.0000	5-3/8	5.3750
28	.1405	15/16	.9375	1-15/16	1.9375	1-3/4	1.7500	2-7/8	2.8750	3	3.0000	5-3/8	5.3750
9/64	.1406	15/16	.9375	1-15/16	1.9375	1-3/4	1.7500	2-7/8	2.8750	3	3.0000	5-3/8	5.3750
27	.1440	1	1.0000	2-1/16	2.0625	1-7/8	1.8750	3	3.0000	3	3.0000	5-3/8	5.3750
26	.1470	1	1.0000	2-1/16	2.0625	1-7/8	1.8750	3	3.0000	3	3.0000	5-3/8	5.3750
25	.1495	1	1.0000	2-1/16	2.0625	1-7/8	1.8750	3	3.0000	3	3.0000	5-3/8	5.3750
24	.1520	1	1.0000	2-1/16	2.0625	2	2.0000	3-1/8	3.1250	3	3.0000	5-3/8	5.3750
23	.1540	1	1.0000	2-1/16	2.0625	2	2.0000	3-1/8	3.1250	3	3.0000	5-3/8	5.3750
5/32	.1562	1	1.0000	2-1/16	2.0625	2	2.0000	3-1/8	3.1250	3	3.0000	5-3/8	5.3750
22	.1570	1-1/16	1.0625	2-1/8	2.1250	2	2.0000	3-1/8	3.1250	3-3/8	3.3750	5-3/4	5.7500
21	.1590	1-1/16	1.0625	2-1/8	2.1250	2-1/8	2.1250	3-1/4	3.2500	3-3/8	3.3750	5-3/4	5.7500
20	.1610	1-1/16	1.0625	2-1/8	2.1250	2-1/8	2.1250	3-1/4	3.2500	3-3/8	3.3750	5-3/4	5.7500
19	.1660	1-1/16	1.0625	2-1/8	2.1250	2-1/8	2.1250	3-1/4	3.2500	3-3/8	3.3750	5-3/4	5.7500
18	.1695	1-1/16	1.0625	2-1/8	2.1250	2-1/8	2.1250	3-1/4	3.2500	3-3/8	3.3750	5-3/4	5.7500
11/64	.1719	1-1/16	1.0625	2-1/8	2.1250	2-1/8	2.1250	3-1/4	3.2500	3-3/8	3.3750	5-3/4	5.7500
17	.1730	1-1/8	1.2500	2-3/16	2.1875	2-3/16	2.1875	3-3/8	3.3750	3-3/8	3.3750	5-3/4	5.7500
16	.1770	1-1/8	1.2500	2-3/16	2.1875	2-3/16	2.1875	3-3/8	3.3750	3-3/8	3.3750	5-3/4	5.7500
15	.1800	1-1/8	1.2500	2-3/16	2.1875	2-3/16	2.1875	3-3/8	3.3750	3-3/8	3.3750	5-3/4	5.7500
14	.1820	1-1/8	1.2500	2-3/16	2.1875	2-3/16	2.1875	3-3/8	3.3750	3-3/8	3.3750	5-3/4	5.7500
13	.1850	1-1/8	1.2500	2-3/16	2.1875	2-5/16	2.3125	3-1/2	3.5000	3-3/8	3.3750	5-3/4	5.7500
3/16	.1875	1-1/8	1.2500	2-3/16	2.1875	2-5/16	2.3125	3-1/2	3.5000	3-3/8	3.3750	5-3/4	5.7500
12	.1890	1-3/16	1.1875	2-1/4	2.2500	2-5/16	2.3125	3-1/2	3.5000	3-5/8	3.6250	6	6.0000
11	.1910	1-3/16	1.1875	2-1/4	2.2500	2-5/16	2.3125	3-1/2	3.5000	3-5/8	3.6250	6	6.0000
10	.1935	1-3/16	1.1875	2-1/4	2.2500	2-7/16	2.4375	3-5/8	3.6250	3-5/8	3.6250	6	6.0000
9	.1960	1-3/16	1.1875	2-1/4	2.2500	2-7/16	2.4375	3-5/8	3.6250	3-5/8	3.6250	6	6.0000
8	.1990	1-3/16	1.1875	2-1/4	2.2500	2-7/16	2.4375	3-5/8	3.6250	3-5/8	3.6250	6	6.0000
7	.2010	1-3/16	1.1875	2-1/4	2.2500	2-7/16	2.4375	3-5/8	3.6250	3-5/8	3.6250	6	6.0000
13/64	.2031	1-3/16	1.1875	2-1/4	2.2500	2-7/16	2.4375	3-5/8	3.6250	3-5/8	3.6250	6	6.0000
6	.2040	1-1/4	1.2500	2-3/8	2.3750	2-1/2	2.5000	3-3/4	3.7500	3-5/8	3.6250	6	6.0000
5	.2055	1-1/4	1.2500	2-3/8	2.3750	2-1/2	2.5000	3-3/4	3.7500	3-5/8	3.6250	6	6.0000
4	.2090	1-1/4	1.2500	2-3/8	2.3750	2-1/2	2.5000	3-3/4	3.7500	3-5/8	3.6250	6	6.0000
3	.2130	1-1/4	1.2500	2-3/8	2.3750	2-1/2	2.5000	3-3/4	3.7500	3-5/8	3.6250	6	6.0000
7/32	.2188	1-1/4	1.2500	2-3/8	2.3750	2-1/2	2.5000	3-3/4	3.7500	3-5/8	3.6250	6	6.0000
2	.2210	1-5/16	1.3125	2-7/16	2.4375	2-5/8	2.6250	3-7/8	3.8750	3-3/4	3.7500	6-1/8	6.1250
1	.2280	1-5/16	1.3125	2-7/16	2.4375	2-5/8	2.6250	3-7/8	3.8750	3-3/4	3.7500	6-1/8	6.1250
A	.2340	1-5/16	1.3125	2-7/16	2.4375	2-5/8	2.6250	3-7/8	3.8750	3-3/4	3.7500	6-1/8	6.1250
15/64	.2344	1-5/16	1.3125	2-7/16	2.4375	2-5/8	2.6250	3-7/8	3.8750	3-3/4	3.7500	6-1/8	6.1250
B	.2380	1-3/8	1.3750	2-1/2	2.5000	2-3/4	2.7500	4	4.0000	3-3/4	3.7500	6-1/8	6.1250
C	.2420	1-3/8	1.3750	2-1/2	2.5000	2-3/4	2.7500	4	4.0000	3-3/4	3.7500	6-1/8	6.1250
D	.2460	1-3/8	1.3750	2-1/2	2.5000	2-3/4	2.7500	4	4.0000	3-3/4	3.7500	6-1/8	6.1250
1/4-E	.2500	1-3/8	1.3750	2-1/2	2.5000	2-3/4	2.7500	4	4.0000	3-3/4	3.7500	6-1/8	6.1250
F	.2570	1-7/16	1.4375	2-5/8	2.6250	2-7/8	2.8750	4-1/8	4.1250	3-3/4	3.7500	6-1/8	6.1250
G	.2610	1-7/16	1.4375	2-5/8	2.6250	2-7/8	2.8750	4-1/8	4.1250	3-3/4	3.7500	6-1/8	6.1250
17/64	.2656	1-7/16	1.4375	2-5/8	2.6250	2-7/8	2.8750	4-1/8	4.1250	3-7/8	3.8750	6-1/4	6.2500
H	.2660	1-1/2	1.5000	2-11/16	2.6875	2-7/8	2.8750	4-1/8	4.1250	3-7/8	3.8750	6-1/4	6.2500
I	.2720	1-1/2	1.5000	2-11/16	2.6875	2-7/8	2.8750	4-1/8	4.1250	3-7/8	3.8750	6-1/4	6.2500
J	.2770	1-1/2	1.5000	2-11/16	2.6875	2-7/8	2.8750	4-1/8	4.1250	3-7/8	3.8750	6-1/4	6.2500
9/32	.2812	1-1/2	1.5000	2-11/16	2.6875	2-15/16	2.9375	4-1/4	4.2500	3-7/8	3.8750	6-1/4	6.2500
K	.2812	1-1/2	1.5000	2-11/16	2.6875	2-15/16	2.9375	4-1/4	4.2500	3-7/8	3.8750	6-1/4	6.2500
L	.2900	1-9/16	1.5625	2-3/4	2.7500	2-15/16	2.9375	4-1/4	4.2500	3-7/8	3.8750	6-1/4	6.2500
M	.2950	1-9/16	1.5625	2-3/4	2.7500	3-1/16	3.0625	4-3/8	4.3750	4	4.0000	6-3/8	6.3750
19/64	.2969	1-9/16	1.5625	2-3/4	2.7500	3-1/16	3.0625	4-3/8	4.3750	4	4.0000	6-3/8	6.3750
N	.3020	1-5/8	1.6250	2-13/16	2.8125	3-1/16	3.0625	4-3/8	4.3750	4	4.0000	6-3/8	6.3750

continued on next page



Technical Information

Dimensions for Inch Size Drills (inches) cont'd.

Conversion formulae • Inch = mm x .03937 • Metric = inch x 25.4

Drill Size	Decimal Equivalent	<i>Screw Machine Length</i>				<i>Jobbers Length</i>				<i>Taper Length</i>			
		Flute Length		Overall Length		Flute Length		Overall Length		Flute Length		Overall Length	
		fraction	decimal	fraction	decimal	fraction	decimal	fraction	decimal	fraction	decimal	fraction	decimal
5/16	.3125	1-5/8	1.6250	2-13/16	2.8125	3-3/16	3.1875	4-1/2	4.5000	4	4.0000	6-3/8	6.3750
O	.3160	1-11/16	1.6875	2-15/16	2.9375	3-3/16	3.1875	4-1/2	4.5000	4	4.0000	6-3/8	6.3750
P	.3230	1-11/16	1.6875	2-15/16	2.9375	3-5/16	3.1875	4-5/8	4.6250	4	4.0000	6-3/8	6.3750
21/64	.3281	1-11/16	1.6875	2-15/16	2.9375	3-5/16	3.1875	4-5/8	4.6250	4-1/8	4.1250	6-1/2	6.5000
Q	.3320	1-11/16	1.6875	3	3.0000	3-7/16	3.4375	4-3/4	4.7500	4-1/8	4.1250	6-1/2	6.5000
R	.3390	1-11/16	1.6875	3	3.0000	3-7/16	3.4375	4-3/4	4.7500	4-1/8	4.1250	6-1/2	6.5000
11/32	.3438	1-11/16	1.6875	3	3.0000	3-7/16	3.4375	4-3/4	4.7500	4-1/8	4.1250	6-1/2	6.5000
S	.3480	1-3/4	1.7500	3-1/16	3.0625	3-1/2	3.5000	4-7/8	4.8750	4-1/4	4.2500	6-3/4	6.7500
T	.3580	1-3/4	1.7500	3-1/16	3.0625	3-1/2	3.5000	4-7/8	4.8750	4-1/4	4.2500	6-3/4	6.7500
23/64	.3594	1-3/4	1.7500	3-1/16	3.0625	3-1/2	3.5000	4-7/8	4.8750	4-1/4	4.2500	6-3/4	6.7500
U	.3680	1-13/16	1.8125	3-1/8	3.1250	3-5/8	3.6250	5	5.0000	4-1/4	4.2500	6-3/4	6.7500
3/8	.3750	1-13/16	1.8125	3-1/8	3.1250	3-5/8	3.6250	5	5.0000	4-1/4	4.2500	6-3/4	6.7500
V	.3770	1-7/8	1.8750	3-1/4	3.2500	3-5/8	3.6250	5	5.0000	4-1/4	4.2500	6-3/4	6.7500
W	.3860	1-7/8	1.8750	3-1/4	3.2500	3-3/4	3.7500	5-1/8	5.1250	4-1/4	4.2500	6-3/4	6.7500
25/64	.3906	1-7/8	1.8750	3-1/4	3.2500	3-3/4	3.7500	5-1/8	5.1250	4-3/8	4.3750	7	7.0000
X	.3970	1-15/16	1.9375	3-5/16	3.3125	3-3/4	3.7500	5-1/8	5.1250	4-3/8	4.3750	7	7.0000
Y	.4040	1-15/16	1.9375	3-5/16	3.3125	3-7/8	3.8750	5-1/4	5.2500	4-3/8	4.3750	7	7.0000
13/32	.4062	1-15/16	1.9375	3-5/16	3.3125	3-7/8	3.8750	5-1/4	5.2500	4-3/8	4.3750	7	7.0000
Z	.4130	2	2.0000	3-3/8	3.3750	3-7/8	3.8750	5-1/4	5.2500	4-5/8	4.6250	7-1/4	7.2500
27/64	.4219	2	2.0000	3-3/8	3.3750	3-15/16	3.9375	5-3/8	5.3750	4-5/8	4.6250	7-1/4	7.2500
7/16	.4375	2-1/16	2.0625	3-7/16	3.4375	4-1/16	4.0625	5-1/2	5.5000	4-5/8	4.6250	7-1/4	7.2500
29/64	.4531	2-1/8	2.1250	3-9/16	3.5625	4-3/16	4.1875	5-5/8	5.6250	4-3/4	4.7500	7-1/2	7.5000
15/32	.4688	2-1/8	2.1250	3-5/8	3.6250	4-5/16	4.3125	5-3/4	5.7500	4-3/4	4.7500	7-1/2	7.5000
31/64	.4844	2-3/16	2.1875	3-11/16	3.6875	4-3/8	4.3750	5-7/8	5.8750	4-3/4	4.7500	7-3/4	7.7500
1/2	.5000	2-1/4	2.2500	3-3/4	3.7500	4-1/2	4.5000	6	6.0000	4-3/4	4.7500	7-3/4	7.7500
33/64	.5156	2-3/8	2.3750	3-7/8	3.8750	4-13/16	4.8125	6-5/8	6.6250	4-3/4	4.7500	8	8.0000
17/32	.5312	2-3/8	2.3750	3-7/8	3.8750	4-13/16	4.8125	6-5/8	6.6250	4-3/4	4.7500	8	8.0000
35/64	.5469	2-1/2	2.5000	4	4.0000	4-13/16	4.8125	6-5/8	6.6250	4-7/8	4.8750	8-1/4	8.2500
9/16	.5625	2-1/2	2.5000	4	4.0000	4-13/16	4.8125	6-5/8	6.6250	4-7/8	4.8750	8-1/4	8.2500
37/64	.5781	2-5/8	2.6250	4-1/8	4.1250	4-13/16	4.8125	6-5/8	6.6250	4-7/8	4.8750	8-3/4	8.7500
19/32	.5938	2-5/8	2.6250	4-1/8	4.1250	5-3/16	5.1875	7-1/8	7.1250	4-7/8	4.8750	8-3/4	8.7500
39/64	.6094	2-3/4	2.7500	4-1/4	4.2500	5-3/16	5.1875	7-1/8	7.1250	4-7/8	4.8750	8-3/4	8.7500
5/8	.6250	2-3/4	2.7500	4-1/4	4.2500	5-3/16	5.1875	7-1/8	7.1250	4-7/8	4.8750	8-3/4	8.7500
41/64	.6406	2-7/8	2.8750	4-1/2	4.5000	5-3/16	5.1875	7-1/8	7.1250	5-1/8	5.1250	9	9.0000
21/32	.6562	2-7/8	2.8750	4-1/2	4.5000	5-3/16	5.1875	7-1/8	7.1250	5-1/8	5.1250	9	9.0000
43/64	.6719	2-7/8	2.8750	4-5/8	4.6250	5-5/8	5.6250	7-5/8	7.6250	5-3/8	5.3750	9-1/4	9.2500
11/16	.6875	2-7/8	2.8750	4-5/8	4.6250	5-5/8	5.6250	7-5/8	7.6250	5-3/8	5.3750	9-1/4	9.2500
45/64	.7031	3	3.0000	4-3/4	4.7500	—	—	—	—	5-5/8	5.6250	9-1/2	9.5000
23/32	.7188	3	3.0000	4-3/4	4.7500	—	—	—	—	5-5/8	5.6250	9-1/2	9.5000
47/64	.7344	3-1/8	3.1250	5	5.0000	—	—	—	—	5-7/8	5.8750	9-3/4	9.7500
3/4	.7500	3-1/8	3.1250	5	5.0000	—	—	—	—	5-7/8	5.8750	9-3/4	9.7500
49/64	.7656	3-1/4	3.2500	5-1/8	5.1250	—	—	—	—	6	6.0000	9-7/8	9.8750
25/32	.7812	3-1/4	3.2500	5-1/8	5.1250	—	—	—	—	6	6.0000	9-7/8	9.8750
51/64	.7969	3-3/8	3.3750	5-1/4	5.2500	—	—	—	—	6-1/8	6.1250	10	10.0000
13/16	.8125	3-3/8	3.3750	5-1/4	5.2500	—	—	—	—	6-1/8	6.1250	10	10.0000
53/64	.8281	3-1/2	3.5000	5-3/8	5.3750	—	—	—	—	6-1/8	6.1250	10	10.0000
27/32	.8438	3-1/2	3.5000	5-3/8	5.3750	—	—	—	—	6-1/8	6.1250	10	10.0000
55/64	.8594	3-1/2	3.5000	5-1/2	5.5000	—	—	—	—	6-1/8	6.1250	10	10.0000
7/8	.8750	3-1/2	3.5000	5-1/2	5.5000	—	—	—	—	6-1/8	6.1250	10	10.0000
57/64	.8906	3-5/8	3.6250	5-5/8	5.6250	—	—	—	—	6-1/8	6.1250	10	10.0000
29/32	.9062	3-5/8	3.6250	5-5/8	5.6250	—	—	—	—	6-1/8	6.1250	10	10.0000
59/64	.9219	3-3/4	3.7500	5-3/4	5.7500	—	—	—	—	6-1/8	6.1250	10-3/4	10.7500
15/16	.9375	3-3/4	3.7500	5-3/4	5.7500	—	—	—	—	6-1/8	6.1250	10-3/4	10.7500
61/64	.9531	3-7/8	3.8750	5-7/8	5.8750	—	—	—	—	6-3/8	6.3750	11	11.0000
31/32	.9688	3-7/8	3.8750	5-7/8	5.8750	—	—	—	—	6-3/8	6.3750	11	11.0000
63/64	.9844	4	4.0000	6	6.0000	—	—	—	—	6-3/8	6.3750	11	11.0000
1	1.0000	4	4.0000	6	6.0000	—	—	—	—	6-3/8	6.3750	11	11.0000

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS



Technical Information

Dimensions for Metric Size Drills

Conversion formulae • Inch = mm x .03937 • Metric = inch x 25.4

Drill Size (mm)	Decimal Equivalent (in)	<i>Screw Machine Length DIN 1897</i>		<i>Jobbers Length DIN 338</i>		<i>Taper Length DIN 340</i>	
		Flute Length mm	Overall Length mm	Flute Length mm	Overall Length mm	Flute Length mm	Overall Length mm
0.2	.0079	1.5	19	2.5	19	—	—
0.22	.0087	1.5	19	2.5	19	—	—
0.25	.0098	1.5	19	3	19	—	—
0.28	.0110	1.5	19	3	19	—	—
0.3	.0118	1.5	19	3	19	—	—
0.32	.0126	2	19	4	19	—	—
0.35	.0138	2	19	4	19	—	—
0.38	.0150	2	19	4	19	—	—
0.4	.0157	2.5	19	5	20	—	—
0.42	.0165	2.5	19	5	20	—	—
0.45	.0177	2.5	19	5	20	—	—
0.48	.0189	2.5	19	5	20	—	—
0.5	.0197	3	20	6	22	—	—
0.52	.0205	3	20	6	22	—	—
0.55	.0217	3.5	21	7	24	—	—
0.58	.0228	3.5	21	7	24	—	—
0.6	.0236	3.5	21	7	24	—	—
0.62	.0244	4	22	8	26	—	—
0.65	.0256	4	22	8	26	—	—
0.68	.0268	4.5	23	9	28	—	—
0.7	.0276	4.5	23	9	28	—	—
0.72	.0283	4.5	23	9	28	—	—
0.75	.0295	4.5	23	9	28	—	—
0.78	.0307	5	24	10	30	—	—
0.8	.0315	5	24	10	30	—	—
0.82	.0322	5	24	10	30	—	—
0.85	.0335	5	24	10	30	—	—
0.88	.0346	5.5	25	11	32	—	—
0.9	.0354	5.5	25	11	32	—	—
0.92	.0362	5.5	25	11	32	—	—
0.95	.0374	5.5	25	11	32	—	—
0.98	.0385	6	26	12	34	—	—
1.0	.0394	6	26	12	34	33	56
1.05	.0413	6	26	12	34	—	—
1.1	.0433	7	28	14	36	37	60
1.15	.0453	7	28	14	36	—	—
1.2	.0472	8	30	16	38	41	65
1.25	.0492	8	30	16	38	—	—
1.3	.0512	8	30	16	38	41	65
1.35	.0531	9	32	18	40	—	—
1.4	.0551	9	32	18	40	45	70
1.45	.0571	9	32	18	40	—	—
1.5	.0591	9	32	18	40	45	70
1.55	.0610	10	34	20	43	—	—
1.6	.0630	10	34	20	43	50	76
1.65	.0650	10	34	20	43	—	—
1.7	.0669	10	34	20	43	50	76
1.75	.0689	11	36	22	46	—	—
1.8	.0709	11	36	22	46	53	80
1.85	.0728	11	36	22	46	—	—
1.9	.0748	11	36	22	46	53	80
1.95	.0767	12	38	24	49	—	—
2.0	.0787	12	38	24	49	56	85
2.05	.0807	12	38	24	49	—	—
2.1	.0827	12	38	24	49	56	85
2.15	.0846	13	40	27	53	—	—

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Technical Information

Dimensions for Metric Size Drills (continued)

Conversion formulae • Inch = mm x .03937 • Metric = inch x 25.4

Drill Size (mm)	Decimal Equivalent (in)	<i>Screw Machine Length DIN 1897</i>		<i>Jobbers Length DIN 338</i>		<i>Taper Length DIN 340</i>	
		Flute Length mm	Overall Length mm	Flute Length mm	Overall Length mm	Flute Length mm	Overall Length mm
2.2	.0866	13	40	27	53	59	90
2.25	.0886	13	40	27	53	—	—
2.3	.0906	13	40	27	53	59	90
2.35	.0925	13	40	27	53	—	—
2.4	.0945	14	43	30	57	62	95
2.45	.0964	14	43	30	57	—	—
2.5	.0984	14	43	30	57	62	95
2.55	.1003	14	43	30	57	—	—
2.6	.1024	14	43	30	57	62	95
2.65	.1043	14	43	30	57	—	—
2.7	.1062	16	46	33	61	66	100
2.75	.1082	16	46	33	61	—	—
2.8	.1102	16	46	33	61	66	100
2.85	.1122	16	46	33	61	—	—
2.9	.1142	16	46	33	61	66	100
2.95	.1161	16	46	33	61	—	—
3.0	.1181	16	46	33	61	66	100
3.1	.1220	18	49	36	65	69	106
3.2	.1260	18	49	36	65	69	106
3.3	.1299	18	49	36	65	69	106
3.4	.1339	20	52	39	70	73	112
3.5	.1378	20	52	39	70	73	112
3.6	.1417	20	52	39	70	73	112
3.7	.1457	20	52	39	70	73	112
3.8	.1496	22	55	43	75	78	119
3.9	.1535	22	55	43	75	78	119
4.0	.1575	22	55	43	75	78	119
4.1	.1614	22	55	43	75	78	119
4.2	.1654	22	55	43	75	78	119
4.3	.1692	24	58	47	80	82	126
4.4	.1732	24	58	47	80	82	126
4.5	.1772	24	58	47	80	82	126
4.6	.1811	24	58	47	80	82	126
4.7	.1850	24	58	47	80	82	126
4.8	.1890	26	62	52	86	87	132
5.0	.1969	26	62	52	86	87	132
5.1	.2008	26	62	52	86	87	132
5.2	.2047	26	62	52	86	87	132
5.3	.2086	26	62	52	86	87	132
5.4	.2125	28	66	57	93	91	139
5.5	.2165	28	66	57	93	91	139
5.6	.2205	28	66	57	93	91	139
5.7	.2244	28	66	57	93	91	139
5.8	.2283	28	66	57	93	91	139
5.9	.2322	28	66	57	93	91	139
6.0	.2362	28	66	57	93	91	139
6.1	.2401	31	70	63	101	97	148
6.2	.2440	31	70	63	101	97	148
6.3	.2480	31	70	63	101	97	148
6.4	.2520	31	70	63	101	97	148
6.5	.2559	31	70	63	101	97	148
6.6	.2598	31	70	63	101	97	148
6.7	.2638	31	70	63	101	97	148
6.8	.2677	34	74	69	109	102	156
6.9	.2717	34	74	69	109	102	156
7.0	.2756	34	74	69	109	102	156

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Technical Information

Dimensions for Metric Size Drills (continued)

Conversion formulae • Inch = mm x .03937 • Metric = inch x 25.4

Drill Size (mm)	Decimal Equivalent (in)	<i>Screw Machine Length DIN 1897</i>		<i>Jobbers Length DIN 338</i>		<i>Taper Length DIN 340</i>	
		Flute Length mm	Overall Length mm	Flute Length mm	Overall Length mm	Flute Length mm	Overall Length mm
7.1	.2795	34	74	69	109	102	156
7.2	.2835	34	74	69	109	102	156
7.3	.2874	34	74	69	109	102	156
7.4	.2913	34	74	69	109	102	156
7.5	.2953	34	74	69	109	102	156
7.6	.2992	37	79	75	117	109	165
7.7	.3031	37	79	75	117	109	165
7.8	.3070	37	79	75	117	109	165
7.9	.3110	37	79	75	117	109	165
8.0	.3150	37	79	75	117	109	165
8.1	.3189	37	79	75	117	109	165
8.2	.3228	37	79	75	117	109	165
8.3	.3267	37	79	75	117	109	165
8.4	.3307	37	79	75	117	109	165
8.5	.3346	37	79	75	117	109	165
8.6	.3386	40	84	81	125	115	175
8.7	.3425	40	84	81	125	115	175
8.8	.3464	40	84	81	125	115	175
8.9	.3503	40	84	81	125	115	175
9.0	.3543	40	84	81	125	115	175
9.1	.3582	40	84	81	125	115	175
9.2	.3622	40	84	81	125	115	175
9.3	.3661	40	84	81	125	115	175
9.4	.3700	40	84	81	125	115	175
9.5	.3740	40	84	81	125	115	175
9.6	.3779	43	89	87	133	121	184
9.7	.3817	43	89	87	133	121	184
9.8	.3858	43	89	87	133	121	184
9.9	.3897	43	89	87	133	121	184
10.0	.3937	43	89	87	133	121	184
10.1	.3976	43	89	87	133	121	184
10.2	.4016	43	89	87	133	121	184
10.3	.4055	43	89	87	133	121	184
10.4	.4094	43	89	87	133	121	184
10.5	.4134	43	89	87	133	121	184
10.6	.4173	43	89	87	133	121	184
10.7	.4212	47	95	94	142	128	195
10.8	.4252	47	95	94	142	128	195
10.9	.4291	47	95	94	142	128	195
11.0	.4331	47	95	94	142	128	195
11.1	.4370	47	95	94	142	128	195
11.2	.4409	47	95	94	142	128	195
11.3	.4448	47	95	94	142	128	195
11.4	.4488	47	95	94	142	128	195
11.5	.4527	47	95	94	142	128	195
11.6	.4566	47	95	94	142	128	195
11.7	.4606	47	95	94	142	128	195
11.8	.4645	47	95	94	142	128	195
11.9	.4685	51	102	101	151	134	205
12.0	.4724	51	102	101	151	134	205
12.1	.4763	51	102	101	151	134	205
12.2	.4823	51	102	101	151	134	205
12.3	.4842	51	102	101	151	134	205
12.4	.4881	51	102	101	151	134	205
12.5	.4921	51	102	101	151	134	205
12.6	.4960	51	102	101	151	134	205

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Technical Information

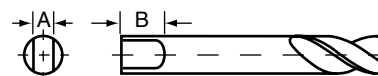
Dimensions for Metric Size Drills (continued)

Conversion formulae • Inch = mm x .03937 • Metric = inch x 25.4

Drill Size (mm)	Decimal Equivalent (in)	<i>Screw Machine Length DIN 1897</i>		<i>Jobbers Length DIN 338</i>		<i>Taper Length DIN 340</i>	
		Flute Length mm	Overall Length mm	Flute Length mm	Overall Length mm	Flute Length mm	Overall Length mm
12.7	.5000	51	102	101	151	134	205
12.8	.5039	51	102	101	151	134	205
12.9	.5078	51	102	101	151	134	205
13.0	.5118	51	102	101	151	134	205
13.1	.5157	51	102	101	151	134	205
13.2	.5197	51	102	101	151	134	205
13.3	.5236	54	107	108	160	140	214
13.4	.5118	54	107	108	160	140	214
13.5	.5315	54	107	108	160	140	214
13.6	.5354	54	107	108	160	140	214
13.7	.5394	54	107	108	160	140	214
13.8	.5433	54	107	108	160	140	214
13.9	.5472	54	107	108	160	140	214
14.0	.5512	54	107	108	160	140	214
14.25	.5610	56	111	114	169	144	220
14.5	.5709	56	111	114	169	144	220
14.75	.5807	56	111	114	169	144	220
15.0	.5906	56	111	114	169	144	220
15.25	.6004	58	115	120	178	149	227
15.5	.6102	58	115	120	178	149	227
15.75	.6201	58	115	120	178	149	227
16.0	.6299	58	115	120	178	149	227

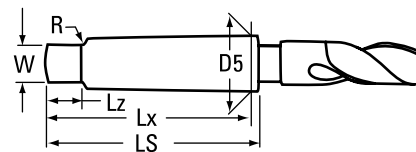
Tang Specifications

Shank Diameter (inches)		Tang Dimensions (inches)	
From	To	Width A	Length B
1/8	3/16	.092	9/32
over 3/16	1/4	.120	5/16
over 1/4	5/16	.160	11/32
over 5/16	3/8	.201	3/8
over 3/8	15/32	.241	7/16
over 15/32	9/16	.300	1/2
over 9/16	21/32	.370	9/16
over 21/32	3/4	.440	5/8
over 3/4	7/8	.511	11/16
over 7/8	1	.605	3/4
over 1-3/16	1-3/8	.813	7/8



Morse Taper Shank Specifications

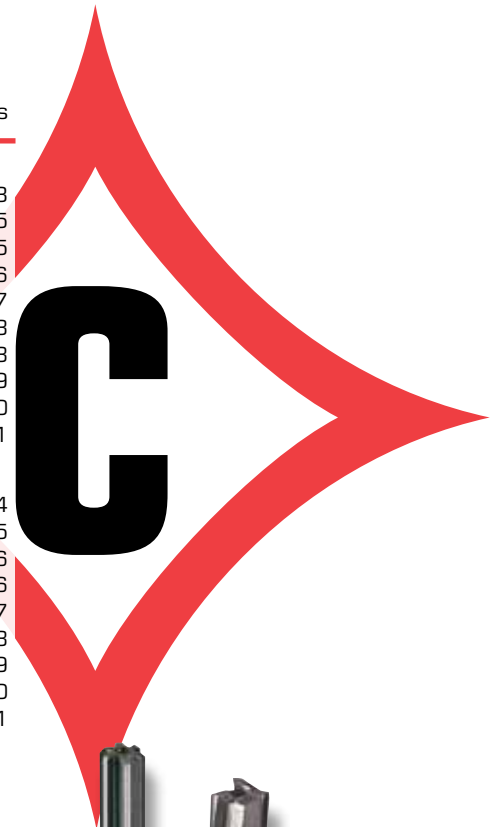
Morse Taper Shank Number	Taper per Foot	Taper per Inch	D5 Maximum Shank Diameter	LS Length of Shank	Lx Length of Shank to Gage Line	Lz Length of Tang	W Thickness of Tang	R Radius
1	.5985	.0498	.475	2.56	2.44	.37	.20	.19
2	.5994	.0499	.700	3.12	2.94	.44	.25	.25
3	.6023	.0501	.938	3.87	3.69	.56	.31	.28
4	.6232	.0519	1.231	4.87	4.62	.62	.47	.31
5	.6315	.0526	1.749	6.12	5.87	.75	.62	.37
6	.6256	.0521	2.494	8.56	8.25	1.12	.75	.50





Reamers and Counterbores

Style Number	Description	Pages
Reamers		
4001	Straight Shank, Straight Flute Chucking Reamers	130-133
4030	Straight Shank, Spiral Flute Chucking Reamers	134-135
4005	Taper Shank, Straight Flute Chucking Reamers	135
1730	Solid Carbide, Straight Shank, Straight Flute Chucking Reamers	136
4703	Carbide-tipped, Straight Shank, Straight Flute Chucking Reamers	137
616	Taper Shank Bridge Reamers	138
618	Taper Shank Car Reamers	138
642	Taper Pipe Reamers	139
650	Spirex Taper Pin Reamers	140
657, 659	Taper Pin Reamers, Straight Shank	141
Counterbores		
879	Counterbores w/Interchangeable Pilot, Straight Shank	144
878	Counterbores w/Interchangeable Pilot, Taper Shank	145
883	HSS Long Type Straight Shank Counterbores	146
884	Short, Aircraft-Type Counterbores	146
879P	Interchangeable Pilots for Counterbores	147
779	Carbide-tipped, Straight Shank Counterbores	148
655	3-Flute Clearance or Taper Router	149
183	3-Flute, Straight Shank Continuous Pilot Counterbores	150
184	3-Flute, Taper Shank Continuous Pilot Counterbores	151
Technical Information		
	Reaming speeds and feeds	126
	Morse taper dimensions	126
	Reamer stock removal	126
	Reamer tolerances	127
	Regrinding reamers	127
	Reamer operating parameters	128-129
	How to select the correct reamer style	136
	Custom reamer dimensions	142-143



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DRILLING

Reaming Speeds

Speeds for machine reaming may vary considerably depending in part on the material to be reamed, type of machine, and required finish and accuracy. In general most machine reaming is done at about 2/3 the speed used for drilling the same material. Speeds for reaming are shown on pages 128-129.

Reaming Feeds

Feeds for reaming are usually much higher than those used for drilling, often running 200% to 300% of drill feeds. Too low a feed may result in excessive reamer wear. At all times it is necessary that the feed be high enough to permit the reamer to cut rather than to rub or burnish. Too high a feed may tend to reduce the accuracy of the hole and may also lower the quality of the finish. The basic idea is to use as high a feed as possible and still produce the required finish and accuracy.

Stock to be Removed

For the same reason, insufficient stock for reaming may result in a burnishing rather than a cutting action. It is difficult to generalize on this phase as it is tied in closely with type of material, feed, finish required, depth of hole, and chip capacity of the reamer. For machine reaming, 0.010" on a 1/4" hole, 0.015" on a 1/2" hole, up to 0.025" on a 1-1/2" hole, seems a good starting point. For hand reaming, stock allowances are much smaller, partly because of the difficulty in forcing the reamer through greater stock. A common allowance is 0.001" to 0.003".

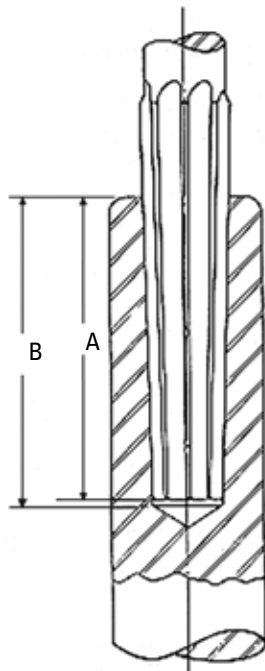
HOLE FINISHING

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American National Standard Reamer Taper (Morse Taper)

American National Standard Taper Number	A Depth of Drilled Hole	B Depth of Reamed Hole
0*	2-1/16	2-1/32
1	2-3/16	2-5/32
2	3-1/8	2-15/16
3	3-7/8	3-11/16
4	4-7/8	4-5/8
4-1/2	5-1/8	4-5/8
5	6-1/8	5-7/8
6	8-9/16	8-1/4
7	11-5/8	11-1/4

*Size 0 taper shank not listed in American National Standards.



Alignment

In the ideal reaming job, the spindle, reamer, bushing, and hole to be machined are all in perfect alignment. Any variation from this tends to increase reamer wear and detracts from the accuracy of the hole. Tapered, oversize, or bell-mouthed holes should call for a check of alignment. Sometimes the bad effects of misalignment can be reduced through the use of floating or adjustable holders. Quite often if the user will grind a slight back taper on the reamer it will also be of help in overcoming the effects of misalignment.

Chatter

The presence of chatter while reaming has a very bad effect on reamer life and on the finish in the hole. Chatter may be the result of one of several causes, some of which are listed:

- Excessive speed.
- Too much clearance on reamer.
- Lack of rigidity in jig or machine.
- Insecure holding of work.
- Excessive overhang of reamer or spindle.
- Excessive looseness in floating holder.
- Too light a feed.

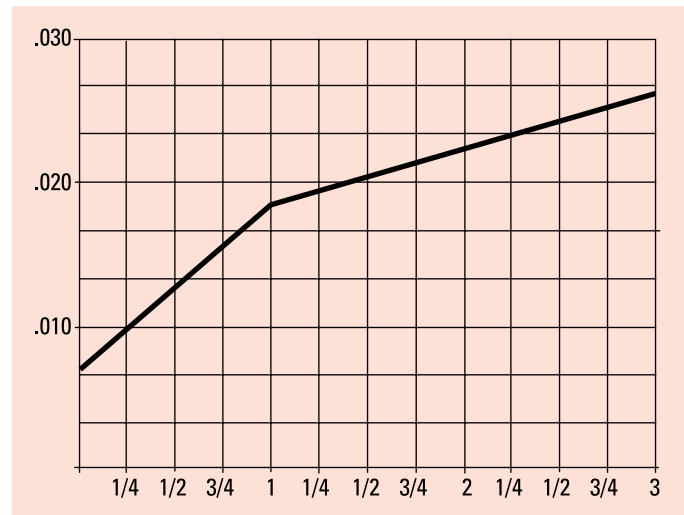
Correcting the cause can materially increase both reamer life and the quality of the reamed holes.

Coolant

In reaming, the emphasis is usually on finish, and a coolant is normally chosen for this purpose rather than for cooling. Quite often this means a change from that recommended for drilling as shown on page 2, but in general this list will be found satisfactory.

Reamer Stock Removal

Stock removal is dependent on material, feed, and finish required. The stock removal chart below illustrates starting points for various diameters when using machine and chucking reamers.



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Reamer Diameter Tolerances

Reamer Diameter inches	+	+
through 1/2	.0001	.0004
over 1/2 through 1	.0001	.0005
over 1	.0002	.0006
	+	-
dowel pin sizes	.0000	(.0002)

Reamer Overall Length and Flute Length Tolerances

Reamer Diameter inches	+	-
3/64 through 1	.0625	.0625
over 1 through 2	.0938	.0938
over 2 through 3	.1250	.1250

Reamer Lip Height Tolerances

Reamer Diameter inches	Total Indicator Variation inches
through 1/8	.0010
1/8 through 1/4	.0012
over 1/4 through 1/2	.0015
over 1/2 through 1	.0020
over 1 through 3-1/2	.0025

Reamer Straight Shank Diameter Tolerances

Reamer Diameter inches	+	-
Tool Style 4001, 4030		
.0390 to .4335	.0000	.0010
.4396 to 1.2495	.0000	.0015
Tool Style 657, 659		
.0781 to .6250	.0010	.0050
Tool Style 650		
.0781 to .6250	.0005	.0020

Reamer Regrinding

In obtaining maximum economy from reamers the same principles apply as in the case of most other cutting tools. One of these principles is not to allow a tool to become too dull. It is best to regrind the chamfer on a reamer long before it exhibits excessive wear or refuses to cut. This sharpening is usually restricted to the entering taper or chamfer. It can be done on almost any tool and cutter grinder. Care must be taken so that each flute is ground exactly even or the tool is apt to cut oversize.

Sharpening the chamfer on a reamer by hand is not recommended as it is practically impossible to keep the cutting edges even.

The following figures show three common types of grinds used on reamers:

In grinding down a reamer to special size it is usually necessary to relieve or clear the lands. No hard or fast rule may be given as to the amount of this clearance but the following table may be of help:

Size of Reamer	Circular Land Width	Primary Clearance
1/4"	.007	14°
1/2"	.009	11°
1"	.013	9°
1-1/2"	.016	7°
2"	.023	7°

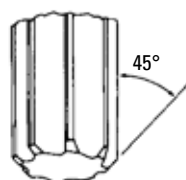


Figure A
Ordinary reamer grind for most jobs.

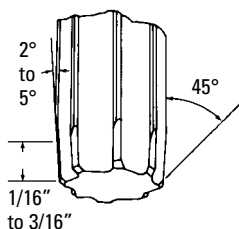


Figure B
Hand reamer grind also used on some machine reamer applications to obtain required finish or tolerance.

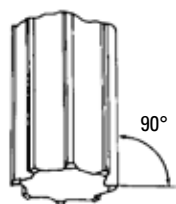


Figure C
Semi-finish reamer grind to straighten out bent or mis-aligned holes. Corners must be kept sharp.

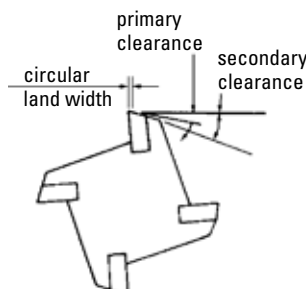


Figure D
A secondary clearance is often ground on reamers as shown in Fig. D. This clearance is only to insure the back of the land being well away from the wall of the reamed hole in order to prevent rubbing.

Technical Information

Reamer Cutting Speeds – Fractional Sizes

Feet Per Minute

Drill Size Fraction / Dec	10'	20'	30'	40'	50'	60'	70'	80'	90'	100'	110'	120'	130'	140'	150'	
	Revolutions Per Minute															
1/16	.0625	403	807	1210	1614	2017	2420	2823	3227	3663	4033	4437	4840	5244	5647	6050
1/8	.1250	202	403	605	807	1008	1210	1412	1614	1815	2017	2218	2420	2622	2823	3025
3/16	.1875	135	269	403	538	673	807	941	1076	1210	1344	1479	1614	1748	1882	2017
1/4	.2500	101	202	302	403	504	605	706	807	908	1008	1109	1210	1311	1412	1513
5/16	.3125	81	161	242	323	403	484	565	645	726	807	888	968	1049	1129	1210
3/8	.3750	67	135	202	269	336	403	471	538	605	673	739	807	874	941	1008
7/16	.4375	57	116	173	230	288	346	403	461	519	576	634	692	749	807	865
1/2	.5000	50	101	151	202	252	302	353	403	454	504	554	605	655	706	756
5/8	.6250	40	81	121	161	202	242	282	323	363	403	444	484	524	565	605
3/4	.7500	34	67	101	134	168	202	236	269	302	336	370	403	437	471	504
7/8	.8750	29	57	86	116	144	173	202	230	259	288	317	346	375	403	432
1	1.0000	25	50	76	101	126	151	176	202	227	252	277	302	328	353	378
1-1/8	1.1250	22	45	67	90	112	135	157	180	202	224	246	269	291	314	336
1-1/4	1.2500	20	40	61	81	101	121	141	161	182	202	222	242	262	282	302
1-3/8	1.3750	18	37	55	73	92	110	128	147	165	183	202	220	238	257	275
1-1/2	1.5000	17	34	50	67	84	101	117	135	151	168	185	202	218	236	252
1-5/8	1.6250	16	31	46	62	77	93	109	124	140	155	171	186	202	217	233
1-3/4	1.7500	15	29	43	57	72	86	101	116	129	144	158	173	187	202	216
1-7/8	1.8750	13	27	40	53	67	81	94	108	121	135	148	161	175	188	202
2	2.0000	13	25	38	50	63	76	88	101	114	126	139	151	164	176	189
2-1/4	2.2500	11	22	34	45	56	67	79	90	101	112	123	135	146	157	168
2-1/2	2.5000	10	20	30	40	50	61	71	81	90	101	111	121	131	141	151
2-3/4	2.7500	9	18	28	37	46	55	64	73	83	92	101	110	119	128	137
3	3.0000	9	17	25	34	42	50	59	67	76	84	92	101	110	117	126

Reamer Cutting Speeds – Letter Sizes

Feet Per Minute

Drill Size Letter / Dec	10'	20'	30'	40'	50'	60'	70'	80'	90'	100'	110'	120'	130'	140'	150'	
	Revolutions Per Minute															
A	.2340	108	215	324	432	540	648	756	864	972	1080	1185	1293	1401	1508	1616
B	.2380	106	212	318	424	530	636	742	847	954	1059	1165	1271	1377	1483	1589
C	.2420	104	209	312	416	521	625	729	833	937	1041	1146	1250	1354	1459	1563
D	.2460	102	205	308	411	513	616	719	822	924	1027	1127	1230	1332	1435	1537
E	.2500	101	202	302	403	504	605	706	807	908	1008	1109	1210	1299	1412	1513
F	.2570	98	196	294	392	490	589	686	785	882	981	1079	1177	1275	1373	1471
G	.2610	96	193	290	386	483	579	676	772	869	966	1063	1159	1256	1352	1449
H	.2660	95	189	284	379	474	569	663	758	853	948	1043	1137	1232	1327	1422
I	.2720	92	185	278	371	463	556	649	741	834	927	1020	1112	1205	1298	1390
J	.2770	91	182	273	364	455	546	637	728	819	910	1001	1092	1183	1274	1365
K	.2810	90	180	269	359	449	538	628	717	807	897	987	1076	1166	1256	1346
L	.2900	87	174	261	348	435	521	609	696	782	869	956	1043	1130	1217	1304
M	.2950	85	171	257	342	428	513	599	684	770	855	940	1026	1111	1197	1282
N	.3020	83	167	251	334	418	501	585	668	752	835	918	1002	1085	1169	1252
O	.3160	80	160	240	319	399	479	558	638	718	798	878	957	1037	1117	1197
P	.3230	78	156	234	312	391	469	546	624	703	781	859	937	1014	1094	1171
Q	.3320	76	152	228	304	380	455	531	607	683	759	836	913	987	1063	1139
R	.3390	75	149	223	298	372	446	521	595	669	744	818	894	967	1041	1115
S	.3480	73	145	217	290	362	435	508	579	652	725	797	869	942	1014	1086
T	.3580	71	141	211	281	352	422	492	563	633	704	774	845	915	986	1056
U	.3680	69	137	205	274	343	411	480	548	616	685	754	822	890	959	1028
V	.3770	67	134	201	267	335	401	468	535	602	669	735	805	869	936	1003
W	.3860	65	131	196	261	327	392	457	523	588	653	718	784	849	914	979
X	.3970	63	127	191	254	317	380	444	508	571	635	698	762	826	889	952
Y	.4040	63	125	187	249	312	374	437	499	562	624	686	749	811	874	936
Z	.4130	61	122	183	244	305	366	427	488	549	611	671	733	793	855	915

DRILLING

HOLE FINISHING

THREADING

MILLING

TECHNICAL



Technical Information

Reamer Cutting Speeds – Wire Gage Sizes

Feet Per Minute

Drill Size Wire / Dec	Revolutions Per Minute															
	10'	20'	30'	40'	50'	60'	70'	80'	90'	100'	110'	120'	130'	140'	150'	
1	.2280	111	221	332	442	553	663	774	884	995	1106	1216	1327	1438	1548	1659
2	.2210	114	228	342	456	570	684	799	912	1026	1140	1255	1369	1483	1597	1711
3	.2130	118	237	355	473	592	710	828	946	1065	1183	1303	1420	1538	1657	1775
4	.2090	121	241	362	482	603	724	845	965	1086	1206	1327	1447	1568	1690	1809
5	.2055	123	246	368	491	614	736	859	981	1104	1227	1350	1472	1595	1717	1840
6	.2040	123	247	371	494	618	741	865	989	1112	1236	1360	1483	1606	1730	1854
7	.2010	125	251	376	502	627	752	878	1003	1129	1254	1379	1505	1630	1756	1881
8	.1990	127	253	380	507	634	760	886	1013	1140	1267	1393	1520	1647	1773	1900
9	.1960	129	257	386	515	644	772	900	1029	1158	1286	1415	1544	1672	1800	1929
10	.1935	130	261	391	521	651	781	912	1042	1173	1303	1433	1564	1694	1824	1954
11	.1910	132	264	396	528	660	792	924	1056	1188	1320	1452	1584	1716	1848	1981
12	.1890	133	267	400	533	667	801	934	1067	1201	1334	1467	1601	1734	1867	2001
13	.1850	136	273	409	545	681	818	957	1090	1227	1363	1499	1636	1771	1908	2044
14	.1820	139	277	416	554	693	831	970	1108	1247	1385	1524	1662	1800	1939	2078
15	.1800	141	281	421	562	702	842	983	1123	1263	1404	1540	1680	1821	1961	2101
16	.1770	143	285	427	570	712	855	997	1139	1282	1424	1567	1709	1852	1994	2136
17	.1730	146	292	437	583	729	875	1020	1166	1311	1457	1603	1749	1894	2040	2187
18	.1695	149	298	447	597	746	895	1044	1193	1342	1492	1636	1785	1934	2082	2231
19	.1660	152	304	455	607	760	911	1063	1215	1367	1519	1670	1822	1974	2127	2279
20	.1610	156	314	470	626	783	939	1096	1253	1409	1566	1723	1879	2035	2193	2349
21	.1590	158	317	476	634	793	951	1109	1269	1427	1585	1745	1903	2061	2220	2379
22	.1570	160	321	482	642	803	964	1124	1284	1445	1606	1766	1927	2088	2248	2408
23	.1540	164	327	491	655	818	982	1146	1309	1473	1637	1800	1964	2128	2292	2455
24	.1520	166	332	498	663	830	995	1161	1327	1493	1659	1824	1991	2156	2322	2488
25	.1495	169	337	506	675	842	1012	1181	1349	1518	1686	1855	2024	2193	2361	2529
26	.1470	172	343	514	686	857	1029	1201	1371	1543	1715	1886	2058	2229	2401	2573
27	.1440	175	350	525	700	876	1051	1226	1401	1576	1751	1927	2101	2276	2451	2626
28	.1405	180	359	539	718	898	1076	1256	1436	1615	1795	1973	2153	2332	2512	2691
29	.1360	185	371	556	742	927	1112	1298	1483	1668	1854	2039	22243	2410	2595	2781
30	.1285	196	393	589	785	981	1177	1373	1569	1766	1962	2158	2354	2550	2747	2943
31	.1200	210	420	630	840	1051	1261	1470	1680	1891	2101	2311	2522	2731	2941	3152
32	.1160	217	435	652	869	1087	1304	1521	1738	1956	2173	2391	2608	2825	3043	3260
33	.1130	223	446	669	892	1115	1338	1562	1785	2008	2231	2454	2677	2900	3123	3346
34	.1110	227	454	681	908	1136	1363	1590	1817	2044	2272	2498	2725	2953	3180	3407
35	.1100	229	458	688	917	1146	1375	1604	1833	2063	2292	2522	2750	2979	3208	3438
36	.1065	237	473	710	947	1184	1420	1657	1894	2130	2367	2604	2841	3078	3314	3551
37	.1040	242	485	727	970	1212	1455	1697	1939	2182	2424	2666	2909	3152	3394	3636
38	.1015	248	497	745	993	1242	1490	1738	1987	2235	2484	2732	2981	3229	3478	3726
39	.0995	253	507	760	1014	1267	1520	1773	2027	2280	2534	2787	3041	3294	3547	3800
40	.0980	257	515	772	1029	1286	1544	1801	2058	2315	2573	2829	3087	3344	3602	3858
41	.0960	263	525	788	1051	1313	1575	1838	2101	2363	2626	2889	3152	3414	3676	3939
42	.0935	269	539	809	1078	1348	1618	1888	2157	2427	2696	2966	3235	3505	3775	4044
43	.0890	283	566	850	1133	1416	1700	1983	2266	2550	2833	3116	3399	3682	3965	4249
44	.0860	293	586	880	1173	1466	1759	2052	2346	2639	2932	3225	3518	3811	4104	4397
45	.0820	308	615	922	1230	1537	1845	2152	2459	2767	3074	3382	3689	3997	4305	4611
46	.0810	312	622	934	1245	1556	1868	2179	2490	2801	3113	3423	3735	4046	4357	4669
47	.0785	321	642	964	1284	1606	1927	2248	2569	2890	3212	3532	3854	4175	4496	4817
48	.0760	332	663	995	1327	1659	1991	2322	2654	2985	3317	3648	3980	4312	4644	4976
49	.0730	345	691	1036	1381	1727	2072	2418	2763	3109	3454	3799	4144	4493	4835	5180
50	.0700	360	720	1080	1441	1801	2161	2521	2882	3241	3602	3961	4322	4682	5042	5402
51	.0670	376	752	1129	1505	1882	2258	2634	3010	3386	3763	4139	4515	4893	527	5644
52	.0635	397	794	1191	1588	1985	2382	2779	3176	3573	3970	4369	4764	5161	5558	5955
53	.0595	423	847	1270	1694	2117	2540	2963	3386	3810	4233	4661	5085	5508	5932	6356
54	.0550	458	917	1375	1833	2292	2750	3209	3667	4126	4584	5042	5500	5958	6417	6875
55	.0520	485	970	1455	1939	2424	2909	3394	3879	4363	4848	5333	5818	6302	6787	7278
56	.0465	542	1084	1627	2169	2711	3253	3796	4338	4880	5422	5964	6506	7047	7590	8133
57	.0430	586	1173	1763	2350	2938	3526	4113	4701	5289	5876	6449	7036	7622	8208	8795
58	.0420	601	1201	1801	2400	3001	3601	4202	4802	5403	6003	6603	7203	7803	8403	9004
59	.0410	615	1230	1845	2459	3074	3689	4304	4919	5536	6149	6764	7379	7993	8608	9224
60	.0400	630	1261	1891	2521	3152	3781	4411	5042	5672	6302	6933	7563	8193	8824	9454

DRILLING

HOLE FINISHING

THREADING

MILLING

TECHNICAL

Reamers Chucking

Styles 4001 • Straight Shank Straight Flute

DRILLING

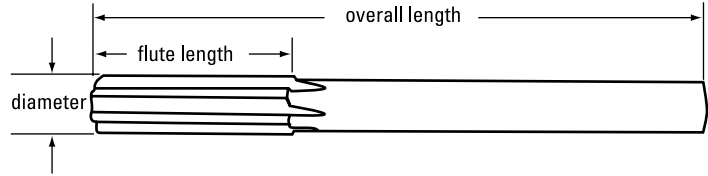
FEATURES



APPLICATIONS



Style 4001 Bright



HOLE FINISHING

Operating parameters shown on pages 128-129.
Custom reamer dimensions shown on page 142.

THREADING

MILLING

TECHNICAL

	Reamer Diameter		Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Number of Flutes	Order Number
	In	Wire Metric			in	mm	in	mm		
	60		.0400	1.02	.500	12.70	2.500	63.50	4	C25003
	59		.0410	1.04	.500	12.70	2.500	63.50	4	C25005
	58		.0420	1.07	.500	12.70	2.500	63.50	4	C25008
	57		.0430	1.09	.500	12.70	2.500	63.50	4	C25010
	56		.0465	1.18	.500	12.70	2.500	63.50	4	C25019
3/64			.0469	1.19	.500	12.70	2.500	63.50	4	C25020
	55		.0520	1.32	.500	12.70	2.500	63.50	4	C25034
	54		.0550	1.40	.500	12.70	2.500	63.50	4	C25041
		1.5	.0591	1.50	.500	12.70	2.500	63.50	4	C25059
			.0595	1.51	.500	12.70	2.500	63.50	4	C25053
1/16			.0625	1.59	.500	12.70	2.500	63.50	4	C25060
			.0635	1.61	.500	12.70	2.500	63.50	4	C25063
			.0670	1.70	.750	19.05	3.000	76.20	4	C25072
			.0700	1.78	.750	19.05	3.000	76.20	4	C25079
			.0730	1.85	.750	19.05	3.000	76.20	4	C25087
			.0760	1.93	.750	19.05	3.000	76.20	4	C25094
5/64			.0781	1.98	.750	19.05	3.000	76.20	4	C25100
			.0785	1.99	.750	19.05	3.000	76.20	4	C25101
		2.0	.0787	2.00	.750	19.05	3.000	76.20	4	C25095
			.0810	2.06	.750	19.05	3.000	76.20	4	C25108
			.0820	2.08	.750	19.05	3.000	76.20	4	C25110
			.0860	2.18	.750	19.05	3.000	76.20	4	C25120
			.0890	2.26	.750	19.05	3.000	76.20	4	C25128
			.0935	2.37	.750	19.05	3.000	76.20	4	C25139
3/32			.0938	2.38	.750	19.05	3.000	76.20	4	C25140
			.0960	2.44	.875	22.23	3.500	88.90	4	C25146
			.0980	2.49	.875	22.23	3.500	88.90	4	C25151
			.0995	2.53	.875	22.23	3.500	88.90	4	C25155
			.1015	2.58	.875	22.23	3.500	88.90	4	C25159
			.1040	2.64	.875	22.23	3.500	88.90	4	C25165
			.1065	2.71	.875	22.23	3.500	88.90	4	C25171
7/64			.1094	2.78	.875	22.23	3.500	88.90	4	C25178
			.1100	2.79	.875	22.23	3.500	88.90	4	C25180
			.1110	2.82	.875	22.23	3.500	88.90	4	C25183
			.1130	2.87	.875	22.23	3.500	88.90	4	C25187
			.1160	2.95	.875	22.23	3.500	88.90	4	C25194

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Styles 4001 • Straight Shank Straight Flute (continued)

Reamer Diameter			Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Number of Flutes	Order Number
In	Wire/Let	Metric			in	mm	in	mm		
		3.0	.1181	3.00	.875	22.23	3.500	88.90	4	C25185
	31		.1200	3.05	.875	22.23	3.500	88.90	6	C25203
.1230*			.1230	3.12	.875	22.23	3.500	88.90	6	*C25210
.1240			.1240	3.15	.875	22.23	3.500	88.90	6	C25212
.1247*			.1247	3.17	.875	22.23	3.500	88.90	6	*C25215
1/8			.1250	3.18	.875	22.23	3.500	88.90	6	C25216
.1260			.1260	3.20	.875	22.23	3.500	88.90	6	C25220
	30		.1285	3.26	.875	22.23	3.500	88.90	6	C25226
	29		.1360	3.45	1.000	25.40	4.000	101.60	6	C25243
	28		.1405	3.57	1.000	25.40	4.000	101.60	6	C25253
9/64			.1406	3.57	1.000	25.40	4.000	101.60	6	C25254
	27		.1440	3.66	1.000	25.40	4.000	101.60	6	C25262
	26		.1470	3.73	1.000	25.40	4.000	101.60	6	C25269
	25		.1495	3.80	1.000	25.40	4.000	101.60	6	C25275
	24		.1520	3.86	1.000	25.40	4.000	101.60	6	C25281
	23		.1540	3.91	1.000	25.40	4.000	101.60	6	C25285
5/32			.1562	3.97	1.000	25.40	4.000	101.60	6	C25290
	22		.1570	3.99	1.000	25.40	4.000	101.60	6	C25292
		4.0	.1575	4.00	1.000	25.40	4.000	101.60	6	C25291
	21		.1590	4.04	1.125	28.58	4.500	114.30	6	C25297
	20		.1610	4.09	1.125	28.58	4.500	114.30	6	C25301
	19		.1660	4.22	1.125	28.58	4.500	114.30	6	C25313
	18		.1695	4.31	1.125	28.58	4.500	114.30	6	C25322
11/64			.1719	4.37	1.125	28.58	4.500	114.30	6	C25327
	17		.1730	4.39	1.125	28.58	4.500	114.30	6	C25330
	16		.1770	4.50	1.125	28.58	4.500	114.30	6	C25339
	15		.1800	4.57	1.125	28.58	4.500	114.30	6	C25346
	14		.1820	4.62	1.125	28.58	4.500	114.30	6	C25351
	13		.1850	4.70	1.125	28.58	4.500	114.30	6	C25357
.1855*			.1855	4.71	1.125	28.58	4.500	114.30	6	*C25360
.1865			.1865	4.74	1.125	28.58	4.500	114.30	6	C25362
.1870*			.1870	4.75	1.125	28.58	4.500	114.30	6	*C25365
3/16			.1875	4.76	1.125	28.58	4.500	114.30	6	C25366
.1885			.1885	4.79	1.125	28.58	4.500	114.30	6	C25368
	12		.1890	4.80	1.125	28.58	4.500	114.30	6	C25369
	11		.1910	4.85	1.250	31.75	5.000	127.00	6	C25374
	10		.1935	4.91	1.250	31.75	5.000	127.00	6	C25380
	9		.1960	4.98	1.250	31.75	5.000	127.00	6	C25385
		5.0	.1969	5.00	1.250	31.75	5.000	127.00	6	C25314
	8		.1990	5.05	1.250	31.75	5.000	127.00	6	C25392
	7		.2010	5.11	1.250	31.75	5.000	127.00	6	C25397
13/64			.2031	5.16	1.250	31.75	5.000	127.00	6	C25402
	6		.2040	5.18	1.250	31.75	5.000	127.00	6	C25404
	5		.2055	5.22	1.250	31.75	5.000	127.00	6	C25408
	4		.2090	5.31	1.250	31.75	5.000	127.00	6	C25417
	3		.2130	5.41	1.250	31.75	5.000	127.00	6	C25426
7/32			.2188	5.56	1.250	31.75	5.000	127.00	6	C25438
	2		.2210	5.61	1.500	38.10	6.000	152.40	6	C25443
	1		.2280	5.79	1.500	38.10	6.000	152.40	6	C25459
	A		.2340	5.94	1.500	38.10	6.000	152.40	6	C25473
15/64			.2344	5.95	1.500	38.10	6.000	152.40	6	C25474
		6.0	.2362	6.00	1.500	38.10	6.000	152.40	6	C25475

*dowel pin reamer tolerance $+.000 / -.002$

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DRILLING
HOLE FINISHING
THREADING
MILLING
TECHNICAL

Reamers Chucking

Styles 4001 • Straight Shank Straight Flute (continued)

	Reamer Diameter		Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Number of Flutes	Order Number	
	In	Letter Metric			in	mm	in	mm			
DRILLING		B	.2380	6.05	1.500	38.10	6.000	152.40	6	C25483	
		C	.2420	6.15	1.500	38.10	6.000	152.40	6	C25492	
		D	.2460	6.25	1.500	38.10	6.000	152.40	6	C25501	
	.2480*		.2480	6.30	1.500	38.10	6.000	152.40	6	*C25508	
	.2490		.2490	6.32	1.500	38.10	6.000	152.40	6	C25510	
	.2495*		.2495	6.33	1.500	38.10	6.000	152.40	6	*C25512	
	1/4	E	.2500	6.35	1.500	38.10	6.000	152.40	6	C25513	
	.2510		.2510	6.38	1.500	38.10	6.000	152.40	6	C25516	
		F	.2570	6.53	1.500	38.10	6.000	152.40	6	C25530	
		G	.2610	6.63	1.500	38.10	6.000	152.40	6	C25539	
HOLE FINISHING	17/64		.2656	6.75	1.500	38.10	6.000	152.40	6	C25550	
		H	.2660	6.76	1.500	38.10	6.000	152.40	6	C25552	
		I	.2720	6.91	1.500	38.10	6.000	152.40	6	C25566	
			7.0	.2756	7.00	1.500	38.10	6.000	152.40	6	C25567
		J	.2770	7.04	1.500	38.10	6.000	152.40	6	C25577	
		K	.2810	7.14	1.500	38.10	6.000	152.40	6	C25585	
	9/32		.2812	7.14	1.500	38.10	6.000	152.40	6	C25608	
		L	.2900	7.37	1.500	38.10	6.000	152.40	6	C25605	
		M	.2950	7.49	1.500	38.10	6.000	152.40	6	C25617	
	19/64		.2969	7.54	1.500	38.10	6.000	152.40	6	C25622	
THREADING		N	.3020	7.67	1.500	38.10	6.000	152.40	6	C25634	
	.3105*		.3105	7.89	1.500	38.10	6.000	152.40	6	*C25655	
	.3115		.3115	7.91	1.500	38.10	6.000	152.40	6	*C25658	
	.3120*		.3120	7.92	1.500	38.10	6.000	152.40	6	C25660	
	5/16		.3125	7.94	1.500	38.10	6.000	152.40	6	C25661	
	.3135		.3135	7.96	1.500	38.10	6.000	152.40	6	C25663	
			8.0	.3150	8.00	1.500	38.10	6.000	152.40	6	C25668
		O	.3160	8.03	1.500	38.10	6.000	152.40	6	C25669	
		P	.3230	8.20	1.500	38.10	6.000	152.40	6	C25685	
	21/64		.3281	8.33	1.500	38.10	6.000	152.40	6	C25698	
MILLING		Q	.3320	8.43	1.500	38.10	6.000	152.40	6	C25707	
		R	.3390	8.61	1.500	38.10	6.000	152.40	6	C25723	
	11/32		.3438	8.73	1.500	38.10	6.000	152.40	6	C25733	
		S	.3480	8.84	1.750	44.45	7.000	177.80	6	C25742	
			9.0	.3543	9.00	1.750	44.45	7.000	177.80	6	C25743
		T	.3580	9.09	1.750	44.45	7.000	177.80	6	C25764	
	23/64		.3594	9.13	1.750	44.45	7.000	177.80	6	C25768	
		U	.3680	9.35	1.750	44.45	7.000	177.80	6	C25789	
	.3730*		.3730	9.47	1.750	44.45	7.000	177.80	6	C25801	
	.3740		.3740	9.50	1.750	44.45	7.000	177.80	6	C25804	
TECHNICAL	.3745*		.3745	9.51	1.750	44.45	7.000	177.80	6	C25806	
	3/8		.3750	9.53	1.750	44.45	7.000	177.80	6	C25807	
	.3760		.3760	9.55	1.750	44.45	7.000	177.80	6	C25809	
		V	.3770	9.58	1.750	44.45	7.000	177.80	6	C25811	
		W	.3860	9.80	1.750	44.45	7.000	177.80	6	C25833	
	25/64		.3906	9.92	1.750	44.45	7.000	177.80	6	C25844	
			10.0	.3937	10.00	1.750	44.45	7.000	177.80	6	C25845
		X	.3970	10.08	1.750	44.45	7.000	177.80	6	C25858	
		Y	.4040	10.26	1.750	44.45	7.000	177.80	6	C25873	
	13/32		.4062	10.32	1.750	44.45	7.000	177.80	6	C25878	
	Z	.4130	10.49	1.750	44.45	7.000	177.80	6	C25892		

*dowel pin reamer tolerance +.000 / -.002

continued on next page

Styles 4001 • Straight Shank Straight Flute (continued)

Reamer Diameter Fract	Decimal Metric	Decimal Equiv.	Metric Equiv.	Flute Length in	mm	Overall Length in	mm	Number of Flutes	Order Number
27/64	11.0	.4219	10.72	1.750	44.45	7.000	177.80	6	C25911
		.4331	11.00	1.750	44.45	7.000	177.80	6	C25912
.4355*		.4355	11.06	1.750	44.45	7.000	177.80	6	*C25942
.4365		.4365	11.09	1.750	44.45	7.000	177.80	6	C25944
.4370*		.4370	11.10	1.750	44.45	7.000	177.80	6	*C25946
7/16		.4375	11.11	1.750	44.45	7.000	177.80	6	C25947
.4385		.4385	11.14	1.750	44.45	7.000	177.80	6	C25949
29/64		.4531	11.51	1.750	44.45	7.000	177.80	6	C25981
15/32	12.0	.4688	11.91	1.750	44.45	7.000	177.80	6	C26014
		.4724	12.00	1.750	44.45	7.000	177.80	6	C26015
31/64		.4844	12.30	2.000	50.80	8.000	203.20	6	C26048
.4990		.4990	12.67	2.000	50.80	8.000	203.20	6	C26080
1/2		.5000	12.70	2.000	50.80	8.000	203.20	6	C26083
.5010		.5010	12.73	2.000	50.80	8.000	203.20	8	C26085
	13.0	.5118	13.00	2.000	50.80	8.000	203.20	8	C26086
17/32		.5312	13.49	2.000	50.80	8.000	203.20	8	C26150
	14.0	.5512	14.00	2.000	50.80	8.000	203.20	8	C26151
9/16		.5625	14.29	2.000	50.80	8.000	203.20	8	C26217
	15.0	.5906	15.00	2.000	50.80	8.000	203.20	8	C26218
19/32		.5938	15.08	2.000	50.80	8.000	203.20	8	C26284
5/8		.6250	15.88	2.250	57.15	9.000	228.60	8	C26351
	16.0	.6299	16.00	2.250	57.15	9.000	228.60	8	C26352
21/32		.6562	16.67	2.250	57.15	9.000	228.60	8	C26418
11/16		.6875	17.46	2.250	57.15	9.000	228.60	8	C26485
23/32		.7188	18.26	2.250	57.15	9.000	228.60	8	C26550
3/4		.7500	19.05	2.500	63.50	9.500	241.30	8	C26615
25/32		.7812	19.84	2.500	63.50	9.500	241.30	8	C26680
13/16		.8125	20.64	2.500	63.50	9.500	241.30	8	C26746
27/32		.8438	21.43	2.500	63.50	9.500	241.30	8	C26811
7/8		.8750	22.23	2.625	66.68	10.000	254.00	8	C26876
29/32		.9062	23.02	2.625	66.68	10.000	254.00	8	C26941
15/16		.9375	23.81	2.625	66.68	10.000	254.00	8	C27006
31/32		.9688	24.61	2.625	66.68	10.000	254.00	8	C27072
1		1.0000	25.40	2.750	69.85	10.500	266.70	8	C27137
1-1/16		1.0625	26.99	2.750	69.85	10.500	266.70	10	C27144
1-1/8		1.1250	28.58	2.875	73.03	11.000	279.40	10	C27152
1-3/16		1.1875	30.16	2.875	73.03	11.000	279.40	10	C27159
1-1/4		1.2500	31.75	3.000	76.20	11.500	292.10	10	C27166
1-3/8		1.3750	34.93	3.250	82.55	12.000	304.80	10	C27180
1-1/2		1.5000	38.10	3.500	88.90	12.500	317.50	12	C27195

Set

No. of Pieces	Reamer Style	Finish	Size Range	Set Order Number
29	4001	bright	1/16" through 1/2" x 1/64"	C00964

*dowel pin reamer tolerance +.000 / -.002



DRILLING
HOLE FINISHING
THREADING
MILLING
TECHNICAL

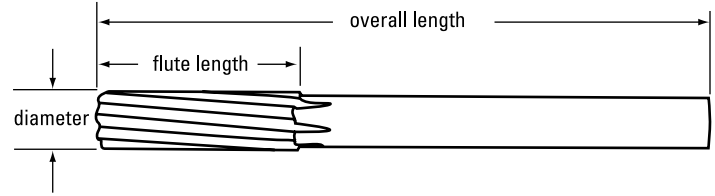
Reamers

Chucking

Style 4030 • Straight Shank Spiral Flute



Style 4030 Bright



FEATURES

- ANSI SIZES
- HSS SUBSTRATE
- GENERAL PURPOSE
- BRIGHT
- BLIND HOLES
- SHANK
- RH Spiral Flute

APPLICATIONS

- ALLOY-TOOL STEEL
- FREE-MACH STAINLESS
- CAST IRON
- PLASTIC
- ALUMINUM

Operating parameters shown on pages 128-129.
Custom reamer dimensions shown on page 142.

Reamer Diameter	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Number of Flutes	Order Number
			in	mm	in	mm		
1/16	.0625	1.59	.500	12.70	2.500	63.50	4	C29273
5/64	.0781	1.98	.750	19.05	3.000	76.20	4	C29311
3/32	.0938	2.38	.750	19.05	3.000	76.20	4	C29350
7/64	.1094	2.78	.875	22.23	3.500	88.90	4	C29386
1/8	.1250	3.18	.875	22.23	3.500	88.90	6	C29421
9/64	.1406	3.57	1.000	25.40	4.000	101.60	6	C29457
5/32	.1562	3.97	1.000	25.40	4.000	101.60	6	C29493
3/16	.1875	4.76	1.125	28.58	4.500	114.30	6	C29565
13/64	.2031	5.16	1.250	31.75	5.000	127.00	6	C29601
7/32	.2188	5.56	1.250	31.75	5.000	127.00	6	C29637
1/4	.2500	6.35	1.500	38.10	6.000	152.40	6	C29709
17/64	.2656	6.75	1.500	38.10	6.000	152.40	6	C29745
9/32	.2812	7.14	1.500	38.10	6.000	152.40	6	C29803
5/16	.3125	7.94	1.500	38.10	6.000	152.40	6	C29853
21/64	.3281	8.33	1.500	38.10	6.000	152.40	6	C29890
11/32	.3438	8.73	1.500	38.10	6.000	152.40	6	C29925
23/64	.3594	9.13	1.750	44.45	7.000	177.80	6	C29960
3/8	.3750	9.53	1.750	44.45	7.000	177.80	6	C29997
25/64	.3906	9.92	1.750	44.45	7.000	177.80	6	C30033
13/32	.4062	10.32	1.750	44.45	7.000	177.80	6	C30067
7/16	.4375	11.11	1.750	44.45	7.000	177.80	6	C30134
29/64	.4531	11.51	1.750	44.45	7.000	177.80	6	C30168
15/32	.4688	11.91	1.750	44.45	7.000	177.80	6	C30201
31/64	.4844	12.30	2.000	50.80	8.000	203.20	6	C30235
1/2	.5000	12.70	2.000	50.80	8.000	203.20	6	C30268
17/32	.5312	13.49	2.000	50.80	8.000	203.20	8	C30335
9/16	.5625	14.29	2.000	50.80	8.000	203.20	8	C30402
19/32	.5938	15.08	2.000	50.80	8.000	203.20	8	C30469
5/8	.6250	15.88	2.250	57.15	9.000	228.60	8	C30536
21/32	.6562	16.67	2.250	57.15	9.000	228.60	8	C30603
11/16	.6875	17.46	2.250	57.15	9.000	228.60	8	C30670
23/32	.7188	18.26	2.250	57.15	9.000	228.60	8	C30735
3/4	.7500	19.05	2.500	63.50	9.500	241.30	8	C30800
25/32	.7812	19.84	2.500	63.50	9.500	241.30	8	C30865
13/16	.8125	20.64	2.500	63.50	9.500	241.30	8	C30931
7/8	.8750	22.23	2.625	66.68	10.000	254.00	8	C31061
15/16	.9375	23.81	2.625	66.68	10.000	254.00	8	C31191
1	1.0000	25.40	2.750	69.85	10.500	266.70	8	C31322

continued on next page

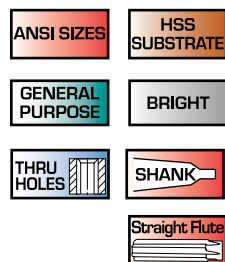


Style 4030 • Straight Shank Spiral Flute (continued)

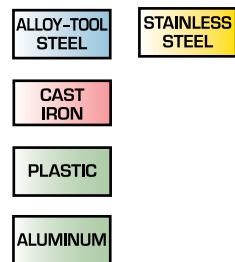
Reamer Diameter	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Number of Flutes	Order Number
			in	mm	in	mm		
1-1/8	1.1250	28.58	2.875	73.03	11.000	279.40	10	C31337
1-1/4	1.2500	31.75	3.000	76.20	11.500	292.10	10	C31351
1-3/8	1.3750	34.93	3.250	82.55	12.000	304.80	10	C31365
1-1/2	1.5000	38.10	3.500	88.90	12.500	317.50	12	C31380

Style 4005 • Taper Shank Straight Flute

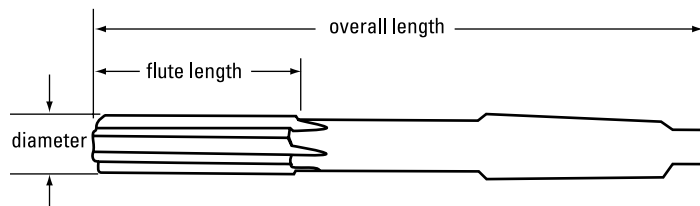
FEATURES



APPLICATIONS



Style 4005 Bright



Operating parameters shown on pages 128-129.
Custom reamer dimensions shown on page 143.

Reamer Diameter	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Morse Taper	Number of Flutes	Order Number
			in	mm	in	mm			
1/4	.2500	6.35	1.500	38.10	6.000	152.40	1	6	C33842
5/16	.3125	7.94	1.500	38.10	6.000	152.40	1	6	C33986
3/8	.3750	9.53	1.750	44.45	7.000	177.80	1	6	C34129
7/16	.4375	11.11	1.750	44.45	7.000	177.80	1	6	C34266
1/2	.5000	12.70	2.000	50.80	8.000	203.20	1	6	C34400
17/32	.5312	13.49	2.000	50.80	8.000	203.20	1	6	C34467
9/16	.5625	14.29	2.000	50.80	8.000	203.20	1	8	C34534
19/32	.5938	15.08	2.000	50.80	8.000	203.20	1	8	C34601
5/8	.6250	15.88	2.250	57.15	9.000	228.60	2	8	C34668
21/32	.6562	16.67	2.250	57.15	9.000	228.60	2	8	C34735
11/16	.6875	17.46	2.250	57.15	9.000	228.60	2	8	C34802
23/32	.7188	18.26	2.250	57.15	9.000	228.60	2	8	C34867
3/4	.7500	19.05	2.500	63.50	9.500	241.30	2	8	C34932
25/32	.7812	19.84	2.500	63.50	9.500	241.30	2	8	C34997
13/16	.8125	20.64	2.500	63.50	9.500	241.30	2	8	C35063
27/32	.8438	21.43	2.500	63.50	9.500	241.30	2	8	C35128
7/8	.8750	22.23	2.625	66.68	10.000	254.00	2	8	C35193
29/32	.9062	23.02	2.625	66.68	10.000	254.00	2	8	C35258
15/16	.9375	23.81	2.625	66.68	10.000	254.00	3	8	C35323
31/32	.9688	24.61	2.625	66.68	10.000	254.00	3	8	C35389
1 1/16	1.0000	25.40	2.750	69.85	10.500	266.70	3	8	C35454
1-1/16	1.0625	26.99	2.750	69.85	10.500	266.70	3	10	C35461
1-1/8	1.1250	28.58	2.875	73.03	11.000	279.40	3	10	C35469
1-3/16	1.1875	30.16	2.875	73.03	11.000	279.40	3	10	C35476
1-1/4	1.2500	31.75	3.000	76.20	11.500	292.10	4	10	C35483
1-5/16	1.3125	33.34	3.000	76.20	11.500	292.10	4	10	C35490
1-3/8	1.3750	34.93	3.250	82.55	12.000	304.80	4	10	C35497
1-7/16	1.4375	36.51	3.250	82.55	12.000	304.80	4	10	C35505
1-1/2	1.5000	38.10	3.500	88.90	12.500	317.50	4	12	C35512

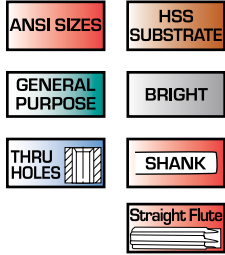
DRILLING
HOLE FINISHING
THREADING
MILLING
TECHNICAL

Reamers Chucking

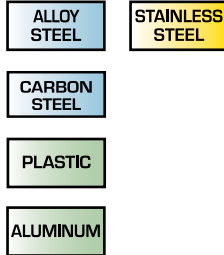
Style 1730 • Solid Carbide Straight Shank Straight Flute

DRILLING

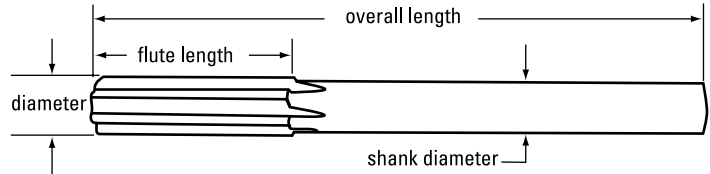
FEATURES



APPLICATIONS



Style 1730 Bright



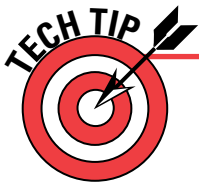
HOLE FINISHING

Operating parameters shown on pages 128-129.

High red hardness for extended wear life in high heat conditions.

Reamer Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Flute Length		Overall Length		Number of Flutes	Order Number
			in	mm	in	mm	in	mm		
1/16	.0625	1.59	.058	1.47	.375	9.53	1.500	38.10	4	C50103
3/32	.0938	2.38	.088	2.24	.500	12.70	2.000	50.80	4	C50121
1/8	.1250	3.18	.120	3.05	.625	15.88	2.250	57.15	4	C50133
5/32	.1562	3.97	.151	3.84	.750	19.05	2.500	63.50	4	C50145
3/16	.1875	4.76	.182	4.62	.875	22.23	2.750	69.85	4	C50157
7/32	.2188	5.56	.213	5.41	1.000	25.40	3.000	76.20	4	C50168
1/4	.2500	6.35	.244	6.20	1.000	25.40	3.000	76.20	4	C50180
9/32	.2812	7.14	.270	6.86	1.125	28.58	3.250	82.55	6	C50194
5/16	.3125	7.94	.301	7.65	1.125	28.58	3.250	82.55	6	C50203
11/32	.3438	8.73	.332	8.43	1.250	31.75	3.500	88.90	6	C50214
3/8	.3750	9.53	.363	9.22	1.250	31.75	3.500	88.90	6	C50226

THREADING



How to Choose the Correct Reamer Style

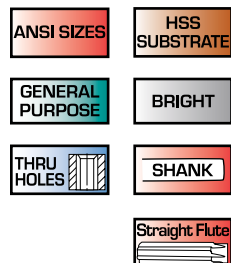
- Straight flute reamers, styles 4001, 4005, 1730, and 4703, are for use in through hole applications.
- Spiral flute reamers, style 4030, are for use in blind holes. They produce a smoother finish than straight flute reamers.
- Use reamer style 616, bridge reamer and style 618, car reamer, for aligning mis-aligned holes.
- Style 642 taper pipe reamers are used to ream a tapered hole before tapping only in soft, stringy materials.
- High spiral Taper Pin Reamers, style 650 are used to produce taper pin holes; the high spiral prevents chip packing.
- Taper pin reamers styles 657 and 659 are used to produce taper pin holes primarily by hand reaming; drill the starting hole a few thousandths of an inch smaller than the desired small diameter of the finished hole.

MILLING

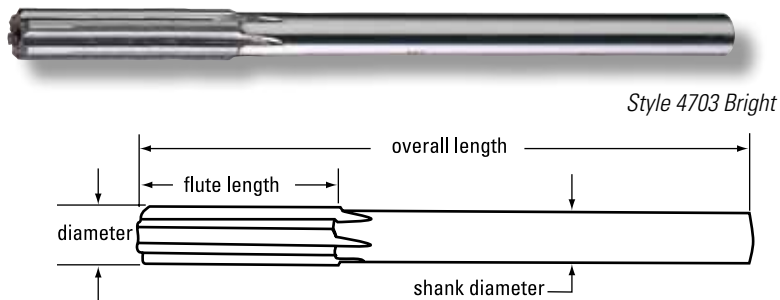
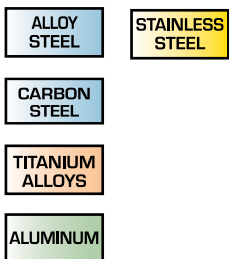
TECHNICAL

Style 4703 • Carbide-tipped Straight Shank Straight Flute

FEATURES



APPLICATIONS



Operating parameters shown on pages 128-129.

- Run at carbide speeds.
- HSS shank and body for extra strength.

Reamer Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Flute Length		Overall Length		Number of Flutes	Order Number
			in	mm	in	mm	in	mm		
1/4	.2500	6.35	.2405	6.11	1.500	38.10	6.000	152.40	4	C50368
9/32	.2812	7.14	.2485	6.31	1.500	38.10	6.000	152.40	4	C50382
5/16	.3125	7.94	.2792	7.09	1.500	38.10	6.000	152.40	4	C50391
11/32	.3438	8.73	.2792	7.09	1.500	38.10	6.000	152.40	4	C50402
3/8	.3750	9.53	.3105	7.89	1.750	44.45	7.000	177.80	4	C50414
13/32	.4062	10.32	.3105	7.89	1.750	44.45	7.000	177.80	4	C50423
7/16	.4375	11.11	.3730	9.47	1.750	44.45	7.000	177.80	6	C50428
15/32	.4688	11.91	.3730	9.47	1.750	44.45	7.000	177.80	6	C50433
1/2	.5000	12.70	.4355	11.06	2.000	50.80	8.000	203.20	6	C50438
17/32	.5312	13.49	.4355	11.06	2.000	50.80	8.000	203.20	6	C50443
9/16	.5625	14.29	.4355	11.06	2.000	50.80	8.000	203.20	6	C50449
5/8	.6250	15.88	.5620	14.27	2.250	57.15	9.000	228.60	6	C50459

DRILLING

HOLE FINISHING

THREADING

MILLING

TECHNICAL

Taper Shank

DRILLING

HOLE FINISHING

THREADING

MILLING

TECHNICAL

Style 616 • Taper Shank Bridge Reamer

FEATURES

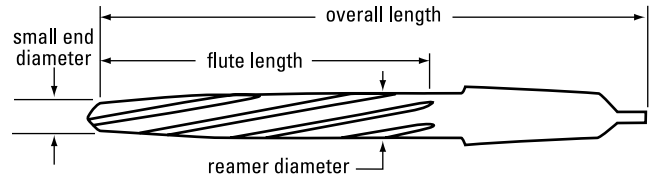
ANSI SIZES	HSS SUBSTRATE
GENERAL PURPOSE	STEAM OXIDE
SHANK	LHH/RHC

APPLICATIONS

CARBON STEEL
CAST IRON



Style 616 Steam Oxide



Operating parameters on pages 128-129.

Reamer Diameter	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Small End Diameter		Morse Taper	Number of Flutes	Order Number
			in	mm	in	mm	in	mm			
7/16	.4375	11.11	4.375	111.13	8.250	209.55	.266	6.75	2	4	C23812
1/2	.5000	12.70	5.125	130.18	9.000	228.60	.313	7.94	2	4	C23813
9/16	.5625	14.29	5.125	130.18	9.000	228.60	.375	9.53	2	4	C23814
5/8	.6250	15.88	6.125	155.58	10.000	254.00	.391	9.92	2	4	C23815
11/16	.6875	17.46	7.125	180.98	11.750	298.45	.406	10.32	3	4	C23816
3/4	.7500	19.05	7.375	187.33	12.000	304.80	.469	11.91	3	4	C23817
13/16	.8125	20.64	7.375	187.33	12.000	304.80	.547	13.89	3	4	C23818
7/8	.8750	22.23	7.375	187.33	12.000	304.80	.609	15.48	3	4	C23819
15/16	.9375	23.81	7.375	187.33	12.000	304.80	.672	17.07	3	4	C23820
1	1.0000	25.40	7.375	187.33	12.000	304.80	.734	18.65	3	4	C23821
1-1/16	1.0625	26.99	7.375	187.33	12.000	304.80	.813	20.64	3	4	C23822
1-1/8	1.1250	28.58	7.375	187.33	12.000	304.80	.859	21.83	3	4	C23823
1-3/16	1.1875	30.16	7.375	187.33	12.000	304.80	.922	23.42	3	4	C23824

Style 618 • Taper Shank Car Reamer

FEATURES

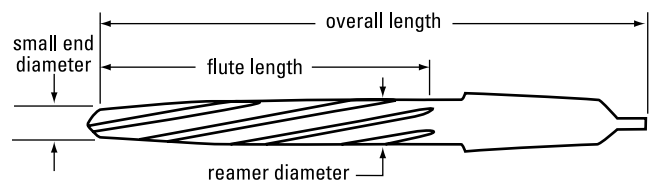
ANSI SIZES	HSS SUBSTRATE
GENERAL PURPOSE	STEAM OXIDE
SHANK	LHH/RHC

APPLICATIONS

CARBON STEEL
CAST IRON



Style 618 Steam Oxide



Operating parameters on pages 128-129.

Reamer Diameter	Decimal Equiv.	Metric Equiv.	Flute Length		Overall Length		Small End Diameter		Morse Taper	Number of Flutes	Order Number
			in	mm	in	mm	in	mm			
9/16	.5625	14.290	3.938	100.01	7.563	192.09	0.313	7.94	2	5	C23957
5/8	.6250	15.880	4.438	112.71	8.063	204.79	0.328	8.33	2	5	C23958
11/16	.6875	17.460	4.438	112.71	8.813	223.84	0.359	9.13	3	5	C23959
3/4	.7500	19.050	5.000	127.00	9.500	241.30	0.422	10.72	3	5	C23960
13/16	.8125	20.640	5.000	127.00	9.500	241.30	0.469	11.91	3	5	C23961
15/16	.9375	23.810	5.000	127.00	9.500	241.30	0.563	14.29	3	5	C23962

Style 642 • Taper Pipe Reamer

FEATURES

ANSI SIZES	HSS SUBSTRATE	ALLOY-TOOL STEEL
GENERAL PURPOSE	BRIGHT	CARBON STEEL
SHANK	LHH/RHC	PLASTIC

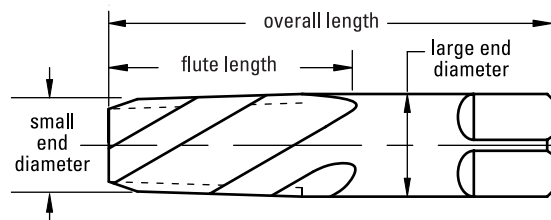
APPLICATIONS

ALLOY-TOOL STEEL
CARBON STEEL
PLASTIC



Style 642 Bright

Operating parameters on pages 128-129.



Nominal Pipe Diameter	Decimal Equiv.	Metric Equiv.	Small End Dia.		Large End Dia.		Flute Length		Overall Length		Number of Flutes	Order Number
			in	mm	in	mm	in	mm	in	mm		
1/8	.1250	3.18	.316	8.03	.362	9.19	.750	19.05	2.125	53.98	6	C24982
1/4	.2500	6.35	.406	10.31	.472	11.99	1.063	26.99	2.438	61.91	6	C24983
3/8	.3750	9.53	.540	13.72	.606	15.39	1.063	26.99	2.563	65.09	6	C24984
1/2	.5000	12.70	.665	16.89	.751	19.08	1.375	34.93	3.125	79.38	6	C24985
3/4	.7500	19.50	.876	22.25	.962	24.43	1.375	34.93	3.750	95.25	8	C24986
1	1.0000	25.40	1.103	28.02	1.212	30.78	1.750	44.45	3.750	95.25	8	C24987
1-1/4	1.2500	31.75	1.444	36.68	1.553	39.45	1.750	44.45	4.000	101.60	10	C24988
1-1/2	1.5000	38.10	1.684	42.77	1.793	45.54	1.750	44.45	4.250	107.95	10	C24989

DRILLING

HOLE FINISHING

THREADING

MILLING

TECHNICAL

Taper Pin

Style 650 • High Spiral Spirex Taper Pin

DRILLING

FEATURES

- ANSI SIZES**
- HSS SUBSTRATE**
- GENERAL PURPOSE**
- BRIGHT**
- 1/4" / 12"**
- LH Spiral Flute**
- SHANK**

APPLICATIONS

- ALLOY-TOOL STEEL**
- CARBON STEEL**
- ALUMINUM**



Style 650 Bright

HOLE FINISHING

Operating parameters on pages 128-129.

THREADING

Pin Size	Small End Diameter		Large End Diameter		Shank Diameter		Flute Length		Overall Length		Order Number
	in	mm	in	mm	in	mm	in	mm	in	mm	
#8/O	.0351	0.89	.0514	1.31	.0625	1.59	.781	19.84	1.625	41.28	C24228
#7/O	.0497	1.26	.0666	1.69	.0781	1.98	.813	20.64	1.813	46.04	C24229
#6/O	.0611	1.55	.0806	2.05	.0938	2.38	.938	23.81	1.938	49.21	C24230
#5/O	.0719	1.83	.0966	2.45	.1094	2.78	1.188	30.16	2.188	55.56	C24231
#4/O	.0869	2.21	.1142	2.90	.1250	3.18	1.313	33.34	2.313	58.74	C24232
#3/O	.1029	2.61	.1302	3.31	.1406	3.57	1.313	33.34	2.313	58.74	C24233
#2/O	.1137	2.89	.1462	3.71	.1562	3.97	1.563	39.69	2.563	65.09	C24234
#0	.1287	3.27	.1638	4.16	.1719	4.37	1.688	42.86	2.938	74.61	C24235
#1	.1447	3.68	.1798	4.57	.1875	4.76	1.688	42.86	2.938	74.61	C24236
#2	.1605	4.08	.2008	5.10	.2031	5.16	1.938	49.21	3.188	80.96	C24237
#3	.1813	4.61	.2294	5.83	.2344	5.95	2.313	58.74	3.688	93.66	C24238
#4	.2071	5.26	.2604	6.61	.2656	6.75	2.563	65.09	4.063	103.19	C24239
#5	.2409	6.12	.2994	7.60	.3125	7.94	2.813	71.44	4.313	109.54	C24240
#6	.2773	7.04	.3540	8.99	.3594	9.13	3.688	93.66	5.438	138.11	C24241
#7	.3297	8.37	.4220	10.72	.4062	10.32	4.438	112.71	6.313	160.34	C24242
#8	.3971	10.09	.5050	12.83	.4375	11.11	5.188	131.76	7.188	182.56	C24243
#9	.4805	12.20	.6066	15.41	.5625	14.29	6.063	153.99	8.313	211.14	C24244
#10	.5799	14.73	.7216	18.33	.6250	15.88	6.813	173.04	9.313	236.54	C24245

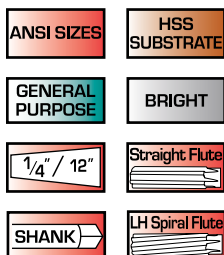
MILLING

TECHNICAL

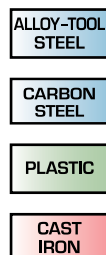


Styles 657, 659 • Straight Shank, Straight Flute and Helical Flue

FEATURES



APPLICATIONS



Style 657 Straight Flute



Style 659 Helical Flute

Operating parameters on pages 128-129.

Pin Size	Small End Diameter		Large End Diameter		Shank Diameter		Flute Length		Overall Length		Order Number	
	in	mm	in	mm	in	mm	in	mm	in	mm	Straight Flute	Helical Flute
#6/0	.0611	1.55	.0806	2.05	.0938	2.38	.938	23.81	1.938	49.21	C24250	C24271
#5/0	.0719	1.83	.0966	2.45	.1094	2.78	1.188	30.16	2.188	55.56	C24251	C24272
#4/0	.0869	2.21	.1142	2.90	.1250	3.18	1.313	33.34	2.313	58.74	C24252	C24273
#3/0	.1029	2.61	.1302	3.31	.1406	3.57	1.313	33.34	2.313	58.74	C24253	C24274
#2/0	.1137	2.89	.1462	3.71	.1562	3.97	1.563	39.69	2.563	65.09	C24254	C24275
#0	.1287	3.27	.1638	4.16	.1719	4.37	1.688	42.86	2.938	74.61	C24255	C24276
#1	.1447	3.68	.1798	4.57	.1875	4.76	1.688	42.86	2.938	74.61	C24256	C24277
#2	.1605	4.08	.2008	5.10	.2031	5.16	1.938	49.21	3.188	80.96	C24257	C24278
#3	.1813	4.61	.2294	5.83	.2344	5.95	2.313	58.74	3.688	93.66	C24258	C24279
#4	.2071	5.26	.2604	6.61	.2656	6.75	2.563	65.09	4.063	103.19	C24259	C24280
#5	.2409	6.12	.2994	7.60	.3125	7.94	2.813	71.44	4.313	109.54	C24260	C24281
#6	.2773	7.04	.3540	8.99	.3594	9.13	3.688	93.66	5.438	138.11	C24261	C24282
#7	.3297	8.37	.4220	10.72	.4062	10.32	4.438	112.71	6.313	160.34	C24262	C24283
#8	.3971	10.09	.5050	12.83	.4375	11.11	5.188	131.76	7.188	182.56	C24263	C24284
#9	.4805	12.20	.6066	15.41	.5625	14.29	6.063	153.99	8.313	211.14	C24264	C24285
#10	.5799	14.73	.7216	18.33	.6250	15.88	6.813	173.04	9.313	236.54	C24265	C24286

DRILLING

HOLE FINISHING

THREADING

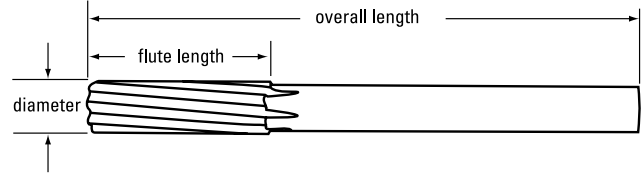
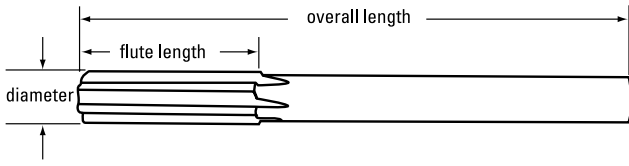
MILLING

TECHNICAL

Technical Information

Custom Reamer Dimensions - Straight Shank Chucking Reamers with Straight or Spiral Flutes

DRILLING



HOLE FINISHING

THREADING

MILLING

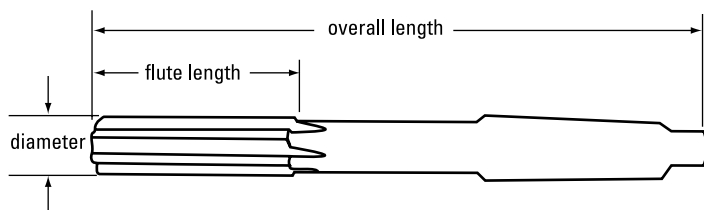
TECHNICAL

Decimal Size Range		Flute Length	Overall Length	Shank Diameter		No. of Flutes
min	max			max	min	
.0394	.0460	.500	2.500	.0390	.0380	4
.0461	.0515	.500	2.500	.0455	.0445	4
.0516	.0590	.500	2.500	.0510	.0500	4
.0591	.0635	.500	2.500	.0585	.0575	4
.0636	.0665	.750	3.000	.0585	.0575	4
.0666	.0755	.750	3.000	.0660	.0650	4
.0756	.0805	.750	3.000	.0720	.0710	4
.0806	.0855	.750	3.000	.0771	.0761	4
.0856	.0930	.750	3.000	.0810	.0800	4
.0931	.0938	.750	3.000	.0880	.0870	4
.0939	.0955	.875	3.500	.0880	.0870	4
.0956	.1005	.875	3.500	.0928	.0918	4
.1006	.1060	.875	3.500	.0950	.0940	4
.1061	.1105	.875	3.500	.1030	.1020	4
.1106	.1155	.875	3.500	.1055	.1045	4
.1156	.1160	.875	3.500	.1120	.1110	4
.1161	.1225	.875	3.500	.1120	.1110	6
.1226	.1285	.875	3.500	.1190	.1180	6
.1286	.1355	1.000	4.000	.1190	.1180	6
.1356	.1400	1.000	4.000	.1275	.1265	6
.1401	.1465	1.000	4.000	.1350	.1340	6
.1466	.1515	1.000	4.000	.1430	.1420	6
.1516	.1560	1.000	4.000	.1460	.1450	6
.1561	.1570	1.000	4.000	.1510	.1500	6
.1571	.1585	1.125	4.500	.1510	.1500	6
.1586	.1655	1.125	4.500	.1530	.1520	6
.1656	.1715	1.125	4.500	.1595	.1585	6
.1716	.1765	1.125	4.500	.1645	.1635	6
.1766	.1795	1.125	4.500	.1704	.1694	6
.1796	.1845	1.125	4.500	.1755	.1745	6

Decimal Size Range		Flute Length	Overall Length	Shank Diameter		No. of Flutes
min	max			max	min	
.1846	.1890	1.125	4.500	.1805	.1795	6
.1891	.1905	1.250	5.000	.1805	.1795	6
.1906	.1955	1.250	5.000	.1860	.1850	6
.1956	.2005	1.250	5.000	.1895	.1885	6
.2006	.2050	1.250	5.000	.1945	.1935	6
.2051	.2125	1.250	5.000	.2016	.2006	6
.2126	.2188	1.250	5.000	.2075	.2065	6
.2189	.2205	1.500	6.000	.2075	.2065	6
.2206	.2335	1.500	6.000	.2173	.2163	6
.2336	.2375	1.500	6.000	.2265	.2255	6
.2376	.2475	1.500	6.000	.2329	.2319	6
.2476	.2530	1.500	6.000	.2405	.2395	6
.2531	.2840	1.500	6.000	.2485	.2475	6
.2841	.3438	1.500	6.000	.2792	.2782	6
.3439	.4062	1.750	7.000	.3105	.3095	6
.4063	.4688	1.750	7.000	.3730	.3720	6
.4689	.5010	2.000	8.000	.4355	.4345	6
.5011	.6000	2.000	8.000	.4355	.4345	8
.6001	.7230	2.250	9.000	.5620	.5605	8
.7231	.8490	2.500	9.500	.6245	.6230	8
.8491	.9740	2.625	10.000	.7495	.7480	8
.9741	1.0000	2.750	10.500	.8745	.8730	8
1.0001	1.0625	2.750	10.500	.8745	.8730	10
1.0626	1.1250	2.875	11.000	.8745	.8730	10
1.1251	1.1875	2.875	11.000	.9995	.9980	10
1.1876	1.3125	3.000	11.500	.9995	.9980	10
1.3126	1.3750	3.250	12.000	.9995	.9980	10
1.3751	1.4375	3.250	12.000	1.2495	1.2480	10
1.4376	1.5000	3.500	12.500	1.2495	1.2480	12



Custom Reamer Dimensions – Taper Shank Chucking Reamers with Straight Flutes



Decimal Size Range min max	Flute Length	Overall Length	Morse Taper Shank Number	No. of Flutes
.1750 .1890	1.125	4.500	1	6
.1891 .2041	1.250	5.000	1	6
.2042 .2188	1.250	5.000	1	6
.2189 .2630	1.500	6.000	1	6
.2531 .2840	1.500	6.000	1	6
.2841 .3135	1.500	6.000	1	6
.3136 .3438	1.500	6.000	1	6
.3439 .3770	1.750	7.000	1	6
.3771 .4062	1.750	7.000	1	6
.4063 .4385	1.750	7.000	1	6
.4386 .4688	1.750	7.000	1	6
.4689 .5010	2.000	8.000	1	6
.5011 .5330	2.000	8.000	1	8
.5331 .5635	2.000	8.000	1	8
.5636 .5938	2.000	8.000	1	8
.5939 .6260	2.250	9.000	2	8
.6261 .6719	2.250	9.000	2	8
.6720 .7230	2.250	9.000	2	8
.7231 .7656	2.500	9.500	2	8
.7657 .8125	2.500	9.500	2	8
.8126 .8490	2.500	9.500	2	8
.8491 .9062	2.625	1.000	2	8
.9063 .9740	2.625	1.000	3	8
.9741 1.0000	2.750	1.500	3	8
1.0001 1.0625	2.750	1.500	3	10
1.0626 1.1250	2.875	11.000	3	10
1.1251 1.1875	2.875	11.000	3	10
1.1876 1.2500	3.000	11.500	4	10
1.2501 1.3125	3.000	11.500	4	10
1.3126 1.3750	3.250	12.000	4	10
1.3751 1.4375	3.250	12.000	4	10
1.4376 1.5000	3.500	12.500	4	12

DRILLING

HOLE FINISHING

THREADING

MILLING

TECHNICAL

Counterbores

With Interchangeable Pilot

Style 879 • Short Series Straight Shank Counterbore & Spot Facer



Style 879 Bright

FEATURES

ANSI SIZES
HSS SUBSTRATE
GENERAL PURPOSE
BRIGHT
SHANK
RH Spiral Flute

APPLICATIONS

ALLOY-TOOL STEEL
ALUMINUM
MED CARBON STEEL
CAST IRON
LOW CARBON STEEL

Pilots listed on page 146.

Counterbore Diameter			Pilot Shank Size			Shank Diameter		Overall Length		Shank Length		Pilot Size	No. of	Order
fract	in	mm	fract	in	mm	in	mm	in	mm	in	mm	Range	Flutes	Number
3/16	.1875	4.76	3/32	.0938	2.38	.234	5.95	3.000	76.20	2.125	53.98	1/8 - 3/16	3	C46421
7/32	.2188	5.56	3/32	.0938	2.38	.234	5.95	3.000	76.20	2.125	53.98	1/8 - 7/32	3	C46422
1/4	.2500	6.35	3/32	.0938	2.38	.234	5.95	3.813	96.84	3.063	77.79	1/8 - 3/16	3	C46423
9/32	.2812	7.14	3/32	.0938	2.38	.266	6.75	3.813	96.84	3.063	77.79	1/8 - 7/32	3	C46424
5/16	.3125	7.94	3/32	.0938	2.38	.297	7.54	3.813	96.84	3.063	77.79	1/8 - 1/4	3	C46425
11/32	.3438	8.73	3/32	.0938	2.38	.313	7.94	3.813	96.84	3.063	77.79	1/8 - 9/32	3	C46426
3/8	.3750	9.53	5/32	.1562	3.97	.313	7.94	4.063	103.19	3.063	77.79	3/16 - 5/16	3	C46427
13/32	.4062	10.32	5/32	.1562	3.97	.375	9.53	4.063	103.19	3.063	77.79	3/16 - 11/32	3	C46428
7/16	.4375	11.11	5/32	.1562	3.97	.375	9.53	4.063	103.19	3.063	77.79	3/16 - 3/8	3	C46429
15/32	.4688	11.91	3/16	.1875	4.76	.438	11.11	4.313	109.54	3.063	77.79	1/4 - 13/32	3	C46430
1/2	.5000	12.70	3/16	.1875	4.76	.438	11.11	4.313	109.54	3.063	77.79	1/4 - 7/16	3	C46431
17/32	.5312	13.49	3/16	.1875	4.76	.500	12.70	4.313	109.54	3.063	77.79	1/4 - 15/32	3	C46432
9/16	.5625	14.29	3/16	.1875	4.76	.500	12.70	4.313	109.54	3.063	77.79	1/4 - 1/2	3	C46433
19/32	.5938	15.08	3/16	.1875	4.76	.500	12.70	5.125	130.18	3.875	98.43	1/4 - 17/32	3	C46434
5/8	.6250	15.88	3/16	.1875	4.76	.500	12.70	5.125	130.18	3.875	98.43	1/4 - 9/16	3	C46435
21/32	.6562	16.67	3/16	.1875	4.76	.500	12.70	5.125	130.18	3.875	98.43	1/4 - 19/32	3	C46436
11/16	.6875	17.46	3/16	.1875	4.76	.500	12.70	5.125	130.18	3.875	98.43	1/4 - 5/8	3	C46437
23/32	.7188	18.26	1/4	.2500	6.35	.500	12.70	5.375	136.53	3.875	98.43	5/16 - 21/32	3	C46438
3/4	.7500	19.05	1/4	.2500	6.35	.500	12.70	5.375	136.53	3.875	98.43	5/16 - 11/16	3	C46439
25/32	.7812	19.84	1/4	.2500	6.35	.625	15.88	5.375	136.53	3.875	98.43	5/16 - 23/32	3	C46440
13/16	.8125	20.64	1/4	.2500	6.35	.625	15.88	5.375	136.53	3.875	98.43	5/16 - 3/4	3	C46441
27/32	.8438	21.43	1/4	.2500	6.35	.750	19.05	5.375	136.53	3.875	98.43	5/16 - 25/32	3	C46442
7/8	.8750	22.23	1/4	.2500	6.35	.750	19.05	5.375	136.53	3.875	98.43	5/16 - 13/16	3	C46443
29/32	.9062	23.02	1/4	.2500	6.35	.750	19.05	6.125	155.58	4.625	117.48	5/16 - 27/32	3	C46444
15/16	.9375	23.81	1/4	.2500	6.35	.750	19.05	6.125	155.58	4.625	117.48	5/16 - 7/8	3	C46445
31/32	.9688	24.61	5/16	.3125	7.94	.750	19.05	6.375	161.93	4.625	117.48	3/8 - 29/32	3	C46446
1	1.0000	25.40	5/16	.3125	7.94	.750	19.05	6.375	161.93	4.625	117.48	3/8 - 15/16	3	C46447
1-1/16	1.0625	26.99	5/16	.3125	7.94	.750	19.05	6.375	161.93	4.625	117.48	3/8/2001	3	C46448
1-1/8	1.1250	28.58	5/16	.3125	7.94	1.000	25.40	6.375	161.93	4.625	117.48	3/8 - 1-1/16	3	C46449
1-3/16	1.1875	30.16	5/16	.3125	7.94	1.000	25.40	6.375	161.93	4.625	117.48	3/8 - 1-1/8	3	C46450
1-1/4	1.2500	31.75	3/8	.3750	9.53	1.000	25.40	6.375	161.93	4.625	117.48	7/16 - 1-3/16	5	C46451
1-3/8	1.3750	34.93	3/8	.3750	9.53	1.000	25.40	6.625	168.28	4.625	117.48	7/16 - 1-5/16	5	C46452
1-1/2	1.5000	38.10	3/8	.3750	9.53	1.250	31.75	7.875	200.03	5.875	149.23	7/16 - 1-7/16	5	C46453
1-5/8	1.6250	41.28	7/16	.4375	11.11	1.250	31.75	8.125	206.38	5.875	149.23	1/2 - 1-9/16	5	C46454

SET

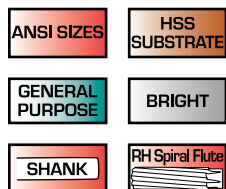
No. of Pieces	Counterbore Style	Finish	Size Range	Set Order Number
13 sizes	879	bright	1/4" through 1" x 1/16"	C00946



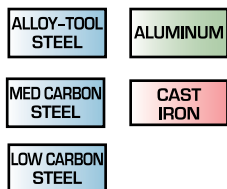
With Interchangeable Pilot

Styles 878 • Short Series Taper Shank Counterbore & Spot Facer

FEATURES



APPLICATIONS



Style 878 Bright

Pilots listed on page 146.

Counterbore Diameter			Pilot Shank Size			Overall Length		Morse Taper	Pilot Size Range	No. of Flutes	Order Number
fract	in	mm	fract	in	mm	in	mm				
7/16	.4375	11.11	5/32	.1562	3.97	4.063	103.19	1	3/16 - 3/8	3	C46479
1/2	.5000	12.70	3/16	.1875	4.76	4.313	109.54	1	1/4 - 7/16	3	C46481
9/16	.5625	14.29	3/16	.1875	4.76	4.313	109.54	1	1/4 - 1/2	3	C46483
5/8	.6250	15.88	3/16	.1875	4.76	5.125	130.18	2	1/4 - 9/16	3	C46485
11/16	.6875	17.46	3/16	.1875	4.76	5.125	130.18	2	1/4 - 5/8	3	C46487
3/4	.7500	19.05	1/4	.2500	6.35	5.375	136.53	2	5/16 - 11/16	3	C46489
13/16	.8125	20.64	1/4	.2500	6.35	5.375	136.53	2	5/16 - 3/4	3	C46491
7/8	.8750	22.23	1/4	.2500	6.35	5.375	136.53	2	5/16 - 13/16	3	C46492
15/16	.9375	23.81	1/4	.2500	6.35	6.125	155.58	3	5/16 - 7/8	3	C46493
1	1.0000	25.40	5/16	.3125	7.94	6.375	161.93	3	3/8 - 15/16	3	C46494
1-1/16	1.0625	26.99	5/16	.3125	7.94	6.375	161.93	3	3/8 - 1	3	C46495
1-1/8	1.1250	28.58	5/16	.3125	7.94	6.375	161.93	3	3/8 - 1-1/16	3	C46496
1-1/4	1.2500	31.75	3/8	.3750	9.53	6.625	161.93	3	7/16 - 1-3/16	5	C46498
1-3/8	1.3750	34.93	3/8	.3750	9.53	6.625	161.93	3	7/16 - 1-5/16	5	C46500
1-1/2	1.5000	38.10	3/8	.3750	9.53	7.875	200.03	4	7/16 - 1-7/16	5	C46501
1-5/8	1.6250	41.28	7/16	.4375	11.11	8.125	206.38	4	1/2 - 1-9/16	5	C46502
1-3/4	1.7500	44.45	7/16	.4375	11.11	8.125	206.38	4	1/2 - 1-11/16	5	C46503
1-7/8	1.8750	47.63	7/16	.4375	11.11	8.125	206.38	4	1/2 - 1-13/16	5	C46504
2	2.0000	50.80	1/2	.5000	12.70	8.375	206.38	4	9/16 - 1-15/16	5	C46505

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

With Interchangeable Pilots

Styles 883 • Long Type, High-Speed Steel

FEATURES

ANSI SIZES
GENERAL PURPOSE
SHANK

HSS SUBSTRATE
BRIGHT

APPLICATIONS

ALLOY STEEL
CARBON STEEL
CAST IRON

ALUMINUM
COPPER ALLOYS



Style 883 Bright

Counterbore Diameter			Pilot Shank Size			Shank Diameter		Overall Length		Pilot Size Range	No. of Flutes	Order Number
fract	in	mm	fract	in	mm	in	mm	in	mm			
3/4	.7500	19.05	3/16	.1875	4.76	.500	12.70	5.375	136.53	5/16 - 11/16	3	C46866
7/8	.8750	22.23	3/16	.1875	4.76	.500	12.70	5.375	136.53	5/16 - 13/16	3	C46870
15/16	.9375	23.81	3/16	.1875	4.76	.500	12.70	5.375	136.53	5/16 - 7/8	3	C46872
1	1.0000	25.40	3/16	.1875	4.76	.500	12.70	5.375	136.53	3/8 - 15/16	3	C46874
1-1/16	1.0625	26.99	3/16	.1875	4.76	.500	12.70	5.375	136.53	3/8 - 1	3	C46875
1-1/8	1.1250	28.58	3/16	.1875	4.76	.500	12.70	5.375	136.53	3/8 - 1-1/16	3	C46876
1-3/16	1.1875	30.16	3/16	.1875	4.76	.500	12.70	5.375	136.53	3/8 - 1-1/8	3	C46878
1-1/4	1.2500	31.75	3/16	.1875	4.76	.500	12.70	5.375	136.53	7/16 - 1-3/16	5	C46879

Styles 884 • Short Aircraft Type

FEATURES

ANSI SIZES
GENERAL PURPOSE
SHANK

HSS SUBSTRATE
BRIGHT

APPLICATIONS

ALLOY STEEL
CARBON STEEL
CAST IRON

ALUMINUM
COPPER ALLOYS



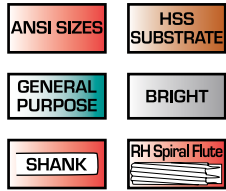
Style 884 Bright

Counterbore Diameter			Pilot Shank Size			Shank Diameter		Shank Length		Overall Length		Pilot Size Range	No. of Flutes	Order Number
fract	in	mm	fract	in	mm	in	mm	in	mm	in	mm			
1/4	.2500	6.35	3/32	.0938	2.38	.250	6.35	1.125	28.58	2.375	60.33	1/8 - 3/16	4	C46886
9/32	.2812	7.14	3/32	.0938	2.38	.250	6.35	.875	22.23	2.375	60.33	1/8 - 7/32	4	C46887
5/16	.3125	7.94	3/32	.0938	2.38	.250	6.35	.875	22.23	2.375	60.33	1/8 - 1/4	4	C46888
11/32	.3438	8.73	3/32	.0938	2.38	.250	6.35	.875	22.23	2.375	60.33	1/8 - 9/32	4	C46889
3/8	.3750	9.53	3/32	.0938	2.38	.250	6.35	.875	22.23	2.375	60.33	3/16 - 5/16	4	C46890
13/32	.4062	10.32	1/8	.1250	3.18	.250	6.35	.875	22.23	2.813	71.44	3/16 - 11/32	4	C46891
7/16	.4375	11.11	1/8	.1250	3.18	.250	6.35	.875	22.23	2.813	71.44	3/16 - 3/8	4	C46892
15/32	.4688	11.91	1/8	.1250	3.18	.250	6.35	.875	22.23	2.813	71.44	1/4 - 13/32	4	C46893
1/2	.5000	12.70	1/8	.1250	3.18	.250	6.35	.875	22.23	2.813	71.44	1/4 - 7/16	4	C46894
17/32	.5312	13.49	1/8	.1250	3.18	.250	6.35	.875	22.23	2.813	71.44	1/4 - 15/32	4	C46895
9/16	.5625	14.29	1/8	.1250	3.18	.250	6.35	.875	22.23	2.813	71.44	1/4 - 1/2	4	C46896
5/8	.6250	15.88	1/8	.1250	3.18	.250	6.35	.875	22.23	2.813	71.44	1/4 - 9/16	4	C46898
11/16	.6875	17.46	3/16	.1875	4.76	.250	6.35	.875	22.23	2.813	71.44	1/4 - 5/8	4	C46900
3/4	.7500	19.05	3/16	.1875	4.76	.250	6.35	.875	22.23	2.813	71.44	5/16 - 11/16	4	C46902
13/16	.8125	20.64	3/16	.1875	4.76	.250	6.35	.875	22.23	2.813	71.44	5/16 - 3/4	4	C46904
7/8	.8750	22.23	3/16	.1875	4.76	.250	6.35	.875	22.23	2.813	71.44	5/16 - 13/16	4	C46906
15/16	.9375	23.81	3/16	.1875	4.76	.250	6.35	.875	22.23	2.813	71.44	5/16 - 7/8	4	C46908
1	1.0000	25.40	3/16	.1875	4.76	.250	6.35	.875	22.23	2.813	71.44	3/8 - 15/16	4	C46910
1-1/8	1.1250	28.58	3/16	.1875	4.76	.250	6.35	.875	22.23	2.813	71.44	3/8 - 15/16	4	C46912
1-1/4	1.2500	31.75	3/16	.1875	4.76	.250	6.35	.875	22.23	2.813	71.44	3/8 - 15/16	4	C46914

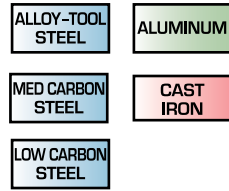
Counterbores Interchangeable Pilots

Styles 879P • Interchangeable Pilot for Counterbore & Spot Facer

FEATURES

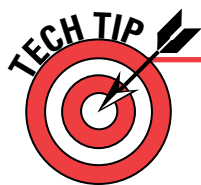


APPLICATIONS



Style 879P Bright

Pilot Diameter	Decimal Equiv.	Metric Equiv.	For pilot diameter, match pilot shank size dimension on pgs 144-146 to pilot shank size in these columns.							
			3/32"	1/8"	5/32"	3/16"	1/4"	5/16"	3/8"	7/16"
3/32	.0938	2.38	C46520	-	-	-	-	-	-	-
.127	.1250	3.18	C46525	-	-	-	-	-	-	-
1/8	.1250	3.18	C46523	C46522	-	-	-	-	-	-
5/32	.1562	3.97	C46528	C46527	C46529	-	-	-	-	-
.157	.1570	3.99	C46531	-	-	-	-	-	-	-
.159	.1590	4.04	C46533	-	-	-	-	-	-	-
3/16	.1875	4.76	C46538	C46537	C46539	C46540	-	-	-	-
.191	.1910	4.85	C46545	C46544	-	C46546	-	-	-	-
13/64	.2031	5.16	-	C46547	-	-	-	-	-	-
7/32	.2188	5.56	C46549	C46548	C46550	C46551	-	-	-	-
1/4	.2500	6.35	C46554	C46553	C46555	C46556	C46557	-	-	-
.255	.2550	6.48	C46559	C46558	-	C46560	-	-	-	-
5/16	.3125	7.94	C46570	C46569	C46571	C46572	C46573	-	-	-
11/32	.3438	8.73	-	C46576	C46578	C46579	C46580	-	-	-
3/8	.3750	9.53	C46314	C46583	C46584	C46585	C46586	C46587	-	-
13/32	.4062	10.32	-	-	-	C46592	C46593	C46594	-	-
7/16	.4375	11.11	-	-	C46597	C46598	C46599	C46600	-	-
15/32	.4688	11.91	-	-	-	C46605	-	-	-	-
1/2	.5000	12.70	-	-	-	C46612	C46613	C46614	-	-
17/32	.5312	13.49	-	-	-	C46620	C46621	C46622	-	-
9/16	.5625	14.29	-	-	-	C46628	C46629	C46630	-	-
19/32	.5938	15.08	-	-	-	-	C46637	-	C46639	-
9/32	.5938	15.08	-	-	C46565	C46566	-	-	-	-
5/8	.6250	15.88	-	-	-	-	C46645	-	C46647	-
11/16	.6875	17.46	-	-	-	-	C46657	C46658	C46659	-
3/4	.7500	19.05	-	-	-	C46316	-	-	C46669	C46670
25/32	.7812	19.84	-	-	-	-	-	C46673	C46674	-
13/16	.8125	20.64	-	-	-	-	-	C46678	C46679	C46680
7/8	.8750	22.23	-	-	-	-	C46687	-	-	-
1	1.0000	25.40	-	-	-	-	-	-	-	C46708
1-1/16	1.0625	26.99	-	-	-	-	-	-	-	C46716
1-1/8	1.1250	28.58	-	-	-	-	-	-	C46723	-



Aircraft Type Counterbores

- Designed for aircraft fabricating use with portable pneumatic and electric drills.
- Smaller pilot holes than standard counterbores.
- Corner radius of 1/32" is standard.

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Counterbores Straight Shank

Styles 779 • Carbide-Tipped Counterbore & Spot Facer

DRILLING

FEATURES

- ANSI SIZES
- HSS SUBSTRATE
- GENERAL PURPOSE
- BRIGHT
- SHANK

APPLICATIONS

- CARBON STEEL
- CAST IRON
- ALUMINUM



Style 779 Bright

HOLE FINISHING

Counterbore Diameter	Hole Diameter		Shank Diameter		Overall Length		Shank Length		Min Dead Center		No. of Flutes	Order Number		
	frac	in	mm	in	mm	in	mm	in	mm	in			mm	
7/16	.4375	11.11	.1562	3.97	.3750	9.53	4.063	103.19	3.063	77.79	.182	4.62	3	C52804
1/2	.5000	12.70	.1875	4.76	.4375	11.11	4.313	109.54	3.063	77.79	.218	5.54	3	C52805
9/16	.5625	14.29	.1875	4.76	.5000	12.70	4.313	109.54	3.063	77.79	.218	5.54	3	C52806
5/8	.6250	15.88	.1875	4.76	.5000	12.70	5.125	130.18	3.875	98.43	.218	5.54	3	C52807
7/8	.8750	22.23	.2500	6.35	.7500	19.05	5.375	136.53	3.875	98.43	.300	7.62	3	C52811
1	1.0000	25.40	.3125	7.94	.7500	19.05	6.375	161.93	3.875	98.43	.360	9.14	3	C52813

THREADING

MILLING

OTHER TOOLS

Styles 655 • Three-Flute Clearance or Taper Router

FEATURES

ANSI SIZES HSS SUBSTRATE
GENERAL PURPOSE BRIGHT
SHANK

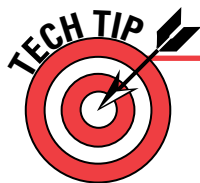
APPLICATIONS

ALLOY STEEL ALUMINUM
CARBON STEEL COPPER ALLOYS
CAST IRON



Style 655 Bright

Size Number	Shank Diameter		Small End Diameter		Large End Diameter		Flute Length		Overall Length		Order Number
	in	mm	in	mm	in	mm	in	mm	in	mm	
#1	.098	2.49	.081	2.06	.0980	2.49	.813	20.64	2.000	50.80	C24292
#2	.128	3.25	.110	2.79	.1280	3.25	.875	22.23	2.250	57.15	C24293
#3	.188	4.76	.165	4.19	.1875	4.19	1.063	26.99	2.500	63.50	C24294
#4	.250	6.35	.224	5.69	.2500	6.35	1.250	31.75	2.750	69.85	C24295



Three-Flute Clearance or Taper Router

- Use for cutting, trimming, routing, and elongating existing holes.

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Continuous Pilot

Style 183 • 3-Flute, Straight Shank



Style 183 Straight Shank

FEATURES

- ANSI SIZES
- HSS SUBSTRATE
- DIN 1897
- BRIGHT
- GENERAL PURPOSE
- SHANK

APPLICATIONS

- CARBON STEEL
- ALLOY-TOOL STEEL
- CAST IRON

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Counterbore Number	Cutter Diameter		Pilot Diameter		Shank Diameter		Overall Length		Cap Screw Size	Order Number
	in	mm	in	mm	in	mm	in	mm		
183-CSS-6	.230	5.84	.135	3.43	.219	5.56	3.000	76.20	No. 6	C91695
183-CSS-7	.242	6.15	.150	3.81	.219	5.56	3.000	76.20	No. 6	C91696
183-CSS-8	.274	6.96	.161	4.09	.250	6.35	3.000	76.20	No. 8	C91697
183-CSS-9	.286	7.26	.178	4.52	.250	6.35	3.000	76.20	No. 8	C91698
183-CSS-10	.316	8.03	.187	4.75	.313	7.94	3.500	88.90	No. 10	C91699
183-CSS-11	.328	8.33	.204	5.18	.313	7.94	3.500	88.90	No. 10	C91700
183-CSS-12	.348	8.84	.213	5.41	.344	8.73	3.500	88.90	No. 12	C91701
183-CSS-16	.375	9.53	.250	6.35	.375	9.53	3.500	88.90	No. 12	C91703
183-CSS-17	.391	9.92	.266	6.75	.375	9.53	5.750	146.05	1/4	C92704
183-CSS-18	.406	10.32	.281	7.14	.375	9.53	5.750	146.05	1/4	C92705
183-CSM-6	.433	11.00	.268	6.80	.438	11.11	6.000	152.40	6mm	C91830
183-CSS-20	.438	11.11	.313	7.94	.438	11.11	6.000	152.40	5/16	C92706
183-CSS-21	.453	11.51	.328	8.33	.438	11.11	6.000	152.40	5/16	C92708
183-CSS-20-60	.469	11.91	.313	7.94	.438	11.11	6.000	152.40	5/16	C92707
183-CSS-22	.469	11.91	.344	8.73	.438	11.11	6.000	152.40	5/16	C91710
183-CSS-21-60	.484	12.30	.328	8.33	.438	11.11	6.000	152.40	5/16	C91709
183-CSS-22-60	.500	12.70	.344	8.73	.438	11.11	6.000	152.40	5/16	C91711
183-CSS-24	.563	14.29	.375	9.53	.500	12.70	6.500	165.10	3/8	C91712
183-CSS-25	.578	14.68	.391	9.92	.500	12.70	6.500	165.10	3/8	C91713
183-CSS-26	.594	15.08	.406	10.32	.500	12.70	6.500	165.10	3/8	C91714
183-CSS-28	.625	15.88	.438	11.11	.500	12.70	7.000	177.80	7/16	C91715
183-CSS-29	.641	16.27	.453	11.51	.500	12.70	7.000	177.80	7/16	C91717
183-CSS-30	.656	16.67	.469	11.91	.500	12.70	7.000	177.80	7/16	C91719
183-CSS-30-60	.688	17.46	.469	11.91	.500	12.70	7.000	177.80	7/16	C91720
183-CSM-10	.709	18.00	.433	11.00	.500	12.70	7.000	177.80	10mm	C91832
183-CSS-32	.750	19.05	.500	12.70	.500	12.70	7.250	184.15	1/2	C91721
183-CSS-33	.766	19.45	.516	13.10	.500	12.70	7.250	184.15	1/2	C91722
183-CSS-34	.781	19.84	.531	13.49	.500	12.70	7.250	184.15	1/2	C91723
183-CSM-12	.787	20.00	.531	13.50	.500	12.70	7.000	177.80	12mm	C91833
183-CSS-36	.813	20.64	.563	14.29	.750	19.05	7.500	190.50	9/16	C91724
183-CSS-40	.875	22.23	.625	15.88	.750	19.05	7.500	190.50	5/8	C91726
183-CSS-42	.906	23.02	.656	16.67	.750	19.05	8.250	209.55	5/8	C91728
183-CSS-42-60	.969	24.61	.656	16.67	.750	19.05	8.250	209.55	5/8	C91729
183-CSM-16	1.024	26.00	.689	17.50	.750	19.05	8.250	209.55	16mm	C91834
183-CSS-50	1.031	26.19	.781	19.84	1.000	25.40	8.813	223.84	3/4	C91734
183-CSS-50-60	1.156	29.37	.781	19.84	1.000	25.40	8.813	223.84	3/4	C91735
183-CSS-52-60	1.188	30.16	.813	20.64	1.000	25.40	8.813	223.84	3/4	C91737
183-CSM-20	1.299	33.00	.866	22.00	1.000	25.40	8.813	223.84	20mm	C91835
183-CSS-68-60	1.563	39.69	1.063	26.99	1.000	25.40	8.813	223.84	1	C91749
183-CSM-24	1.575	40.00	1.024	26.00	1.000	25.40	8.813	223.84	24mm	C92836



Style 183 • 3-Flute, Taper Shank

FEATURES

ANSI SIZES	HSS SUBSTRATE	CARBON STEEL
DIN 1897	BRIGHT	ALLOY-TOOL STEEL
GENERAL PURPOSE	SHANK	CAST IRON

APPLICATIONS



Style 183 Taper Shank

Counterbore Number	Cutter Diameter		Pilot Diameter		Morse Taper Shank Size	Overall Length		Cap Screw Size	Order Number
	in	mm	in	mm		in	mm		
183-CTM-6	.430	11.00	.270	6.80	1	6.000	152.40	6mm	C91840
183-CTT-22	.469	11.91	.344	8.73	1	6.000	152.40	5/16	C91782
183-CTT-22-60	.500	12.70	.344	8.73	1	6.000	152.40	5/16	C91783
183-CTT-26	.594	15.08	.406	10.32	1	6.500	165.10	3/8	C91786
183-CTM-10	.710	18.00	.430	11.00	2	7.250	184.15	10mm	C91842
183-CTT-34	.781	19.84	.531	13.49	2	7.250	184.15	1/2	C92795
183-CTM-12	.790	20.00	.530	13.50	2	7.500	190.50	12mm	C91843
183-CTT-36	.813	20.64	.563	14.29	2	7.500	190.50	9/16	C92796
183-CTT-42-60	.969	24.61	.656	16.67	3	8.250	209.55	5/8	C91801
183-CTT-44-60	1.000	25.40	.688	17.46	3	8.250	209.55	5/8	C92803
183-CTT-52-60	1.000	25.40	.813	20.64	3	8.813	223.84	3/4	C91809
183-CTM-16	1.020	26.00	.690	17.50	3	8.813	223.84	16mm	C91844
183-CTM-20	1.300	33.00	.870	22.00	3	8.813	223.84	20mm	C91845
183-CTM-24	1.570	40.00	1.020	26.00	3	8.813	223.84	24mm	C91846

Continuous Pilot Counterbore Sets

Set No.	No of Pieces	Size Ranges	Straight or Taper Shank	Order Number
183-CSS-1	9	CSS-6, -8, -10, -12, -16, -20, -24, -28, -32	straight	C91750
183-CSS-3	8	CSS-18, -20-60, -21-60, -22-60, -22, -26, -30, -34	straight	C91770



Threading

Style Number	Description	Pages
High-Performance Taps		
T101	SD Spiral Point for Steel	156-157
B101	SD Spiral Flute for Steel	158-159
T202	SD Spiral Point for Hardened Materials	160-161
B202	SD Spiral Flute for Hardened Materials	162-163
CI1000	SD Straight Flute for Cast Iron and Harder Materials	164-165
	Made to Order Taps	166-167
General Application Taps		
1001, 1002, 1003, 1004	General Purpose Hand Tap	168-172
1011, 1011TN	General Purpose Spiral Point Tap	173-175
1053	Low Shear Spiral Point Tap	176-177
1012	Spiral Point Bottoming Tap	177
1093, 1094	General Purpose High-Spiral Tap	178
1091, 1092	General Purpose Forming Tap	179-180
Pipe Taps		
965B, 975	Medium Hook Taper Pipe Tap	181
964B, 966B	Interrupted Thread Medium Hook Taper Pipe Tap	182
963B, 967B	Medium Hook Straight Pipe Tap	183
Technical Information		
Tapping speeds		154-155
Tap nomenclature		185-186
Tap / drill recommendations		189
Hardness conversion table		190
Standard tap marking system		191
USCTI tables		
	Table 338 Taper Pipe Tap Thread Limits	181
	Table 311 Standard Pipe Tap Dimensions	183
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	Table 302 Standard Tap Dimensions	187-188
	Table 302A Optional Neck and Optional Shortened Thread Length	189
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	Table 329 Unified and American National Form - Machine Screw Sizes	193
	Table 341 Tap Limits - Metric Sizes	194
	Table 352 Basic Thread Dimensions - Machine Screw Sizes	195
	Table 352 Basic Thread Dimensions - Fractional Sizes	196-197



DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Tapping Speeds

DRILLING

Consider these factors when trying to determine the best tapping speeds.

- Material to be tapped
- Length of chamfer on tap
- Percentage of full thread to be cut
- Length of hole (depth of thread)
- Pitch of thread
- Cutting fluids
- Machine equipment
- Horizontal or vertical tapping

HOLE FINISHING

The best and most efficient operating speeds for taps cannot be calculated with the same certainty as for many other metalcutting tools. With other tools, the feed per revolution can be set at any desired point and can be varied as conditions demand. Taps, on the other hand, must always be advanced at a rate equal to one pitch for every revolution. The style of tap may vary the conditions. For example, with a bottoming tap, the first thread on each land cuts the full height of thread, while, with a taper or starting tap, a number of threads do their share of the cutting before the full height of thread is reached.

THREADING

The depth of thread also varies, depending on the pitch. The coarser the thread, the greater the advance of the tap per revolution and the greater the amount of material removed.

The method of feeding the tap, and the type of equipment for driving, also influence the permissible speeds. If taps are mechanically fed at the proper rate of advance, they can be operated at higher speeds than if they are required to feed themselves and pull some part of the machine along with them.

MILLING

Speeds may be modified to take into account any or all of the factors listed above. Speeds must be lowered as the length of thread increases, because, in deep thread holes, the accumulated chips increase friction and interfere with lubrication.

Bottoming taps must be run slower than plug taps.

Tapping of full height of thread calls for slower speed than if the commercial 75% height only is required.

Coarse-thread taps in the larger diameters should be run more slowly than fine-thread taps of the same diameters.

OTHER TOOLS

The quantity and quality of cutting fluid may affect the permissible speeds as much as 100%.

Taper threaded taps, such as pipe taps, should be operated from 1/2 to 3/4 the speed of a straight thread tap of comparable major diameter.

Tapping Definitions

SFM = Surface Feet per Minute

RPM = Revolutions Per Minute

IPM = Inches Per Minute

TPI = Threads Per Inch

S m/m = Surface Meters per Minute

π = 3.1416

mm/m = Millimeters per Minute

P = Pitch (1/ No of Threads Per Inch)

Tapping Formulae

INCH SIZES

$$\text{SFM} = \frac{(\text{RPM} \times \text{tool diameter})}{3.82}$$

or $0.26 \times \text{RPM} \times \text{tool diameter}$

$$\text{RPM} = \frac{(3.82 \times \text{SFM})}{\text{tool diameter}}$$

$$\text{IPM} = \frac{\text{RPM}}{\text{TPI}^*}$$

or $*P \times \text{RPM}$

METRIC SIZES

$$\text{S m/m} = \frac{(\pi \times \text{tool diameter} \times \text{RPM})}{1000}$$

$$\text{RPM} = \frac{(\text{m/m} \times 1000)}{\pi \times \text{tool diameter}}$$

$$\text{mm/m} = \text{mm P} \times \text{RPM}$$



Technical Information

Tapping Speeds

UNC/UNF and NPT/NPTF Sizes

UNC UNF	NPT NPTF	Tap Size	Taper Pipe	Surface Feet per Minute (SFM)																	
				5'	10'	15'	20'	25'	30'	40'	50'	60'	70'	80'	90'	100'	110'	120'	130'	140'	150'
0				318	637	955	1273	1592	1910	2546	3183	3820	4456	5093	5729	6366	7003	7639	8276	8913	9549
1				273	546	819	1046	1308	1570	2093	2617	3140	3663	4186	4710	5233	5756	6279	6805	7326	7849
2				212	424	637	888	1110	1333	1777	2221	2665	3109	3554	3999	4442	4886	5330	5774	6218	6662
3				191	382	573	772	964	1157	1543	1929	2315	2701	3086	3472	3858	4244	4629	5015	5401	5787
4				174	347	521	682	853	1023	1364	1705	2046	2387	2728	3069	3411	3751	4092	4434	4775	5115
5				147	294	441	611	764	917	1222	1528	1833	2139	2445	2750	3056	3361	3667	3973	4278	4584
6				136	273	409	553	691	829	1106	1382	1859	1935	2212	2488	2766	3042	3318	3595	3871	4148
8				119	239	358	466	583	699	932	1165	1398	1631	1864	2097	2330	2563	2796	3029	3262	3495
10				101	201	302	402	502	603	804	1005	1205	1406	1607	1808	2009	2210	2411	2612	2813	3014
12				87	174	260	354	442	531	707	884	1061	1238	1415	1592	1769	1945	2122	2300	2476	2653
1/4				76	153	229	306	382	458	611	764	917	1070	1222	1375	1528	1681	1833	1986	2139	2292
5/16				62	123	185	245	306	367	489	611	733	856	978	1100	1222	1345	1467	1589	1711	1833
3/8				50	101	151	204	255	305	407	509	611	713	815	917	1019	1120	1222	1324	1426	1528
7/16	1/8			43	87	130	175	219	262	349	437	524	611	698	786	873	960	1048	1135	1222	1310
1/2	—			38	76	115	153	191	229	305	382	458	535	611	688	764	840	917	993	1070	1146
9/16	1/4			34	68	102	137	172	206	274	342	410	478	547	616	683	752	820	888	952	1020
5/8	—			32	64	96	122	153	183	244	306	367	428	489	550	611	672	733	794	856	917
11/16	3/8			28	55	83	111	138	167	222	278	333	389	444	500	556	611	667	722	778	833
3/4	—			25	51	76	102	128	153	203	255	305	357	407	458	509	560	611	662	713	764
7/8	1/2			22	43	65	87	109	131	175	218	262	306	350	392	437	480	524	568	611	655
1	—			19	38	57	76	96	115	153	191	230	268	305	344	382	420	458	497	535	573
1-1/8	3/4			17	34	51	68	84	102	136	170	204	238	272	306	340	373	407	441	475	509
1-1/4	—			15	31	46	61	76	92	122	153	183	214	244	275	305	336	367	397	428	458
1-3/8	1			14	28	42	56	69	83	111	139	167	194	222	250	278	306	333	361	389	417
1-1/2	—			13	25	38	51	63	76	102	127	153	178	204	229	255	280	305	331	356	382
1-5/8	1			12	23	35	47	59	71	94	118	141	165	188	212	235	259	282	306	329	353
1-3/4	—			11	22	33	44	55	65	87	109	131	153	175	196	218	240	262	284	306	327
1-7/8	1			10	20	30	41	51	61	81	102	122	143	163	183	204	224	244	265	285	306
2	—			9	19	29	38	48	57	76	96	115	134	153	172	191	210	229	248	267	287

Metric Sizes

Tap Size	Surface Feet per Minute (SFM)																	
	5'	10'	15'	20'	25'	30'	40'	50'	60'	70'	80'	90'	100'	110'	120'	130'	140'	150'
M1	490	979	1469	1959	2449	2938	3918	4897	5877	6856	7836	8815	9795	10774	11754	12733	13713	14692
M2	242	484	725	967	1209	1451	1934	2418	2901	3385	3868	4352	4835	5319	5803	6286	6770	7253
M3	162	324	486	647	809	971	1295	1619	1942	2266	2590	2914	3237	3561	3885	4208	4532	4856
M3.5	138	277	415	554	692	830	1107	1384	1661	1938	2214	2491	2768	3045	3322	3599	3875	4152
M4	122	243	365	487	608	730	973	1217	1460	1703	1946	2190	2433	2676	2920	3163	3406	3650
M5	97	194	291	388	485	582	776	970	1163	1357	1551	1745	1939	2133	2327	2521	2715	2905
M6	81	162	243	324	405	486	647	809	971	1133	1295	1457	1619	1781	1942	2104	2266	2428
M7	69	138	208	277	346	415	554	692	830	969	1107	1246	1384	1522	1661	1799	1938	2076
M8	61	121	182	243	303	364	485	606	728	849	970	1091	1213	1334	1455	1577	1698	1819
M10	48	97	145	194	242	291	388	485	582	679	776	873	970	1067	1163	1260	1357	1454
M12	40	81	121	162	202	243	324	405	486	567	647	728	809	890	971	1052	1133	1214
M14	35	69	104	139	173	208	277	347	416	485	555	624	693	763	832	901	971	1040
M16	30	61	91	121	152	182	243	303	364	424	485	546	606	667	728	788	849	910
M18	27	54	81	108	135	162	216	269	323	377	431	485	539	593	647	700	754	808
M20	24	49	73	97	121	146	194	243	291	340	388	437	485	534	582	631	680	728
M22	22	44	66	88	110	132	176	221	265	309	353	397	441	485	529	573	618	662
M24	20	40	61	81	101	121	162	202	243	283	323	364	404	445	485	526	566	606
M27	18	36	54	72	90	108	144	180	216	252	287	323	359	395	431	467	503	539
M30	16	32	49	65	81	97	129	162	194	226	259	291	323	356	388	420	453	485



DRILLING
HOLE FINISHING
THREADING
MILLING
OTHER TOOLS

Style T-101 • Spiral Point for Steels and Stainless Steels

DRILLING

FEATURES

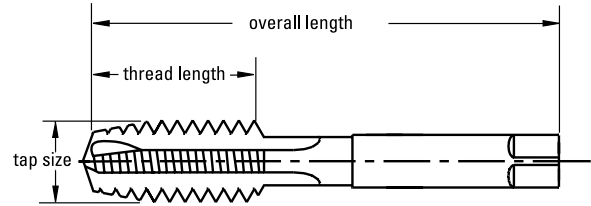
USCTI 302A CPM-M4 V SUBSTRATE
 HIGH PERFORMANCE STEAM OXIDE
 THRU HOLES PLUG 3-5
 GROUND THREAD NECKED

APPLICATIONS

ALLOY-TOOL STEEL
 CARBON STEEL
 STAINLESS STEEL



Style T-101 Steam Oxide



HOLE FINISHING

Tapping speeds are listed on page 155.

THREADING

Tap Size and Pitch	Thread Form	Decimal Equiv.	Metric Equiv.	Number of Flutes	H-Limit	Overall Length		Thread Length		Order Number
						in	mm	in	mm	
4-40	UNC	.1120	2.84	2	H2	1.875	47.63	.563	14.29	C27689
6-32	UNC	.1380	3.51	2	H2	2.000	50.80	.688	17.46	C27690
6-32	UNC	.1380	3.51	2	H3	2.000	50.80	.688	17.46	C27696
6-32	UNC	.1380	3.51	2	H5	2.000	50.80	.688	17.46	C27719
8-32	UNC	.1640	4.17	3	H2	2.125	53.98	.750	19.05	C27691
8-32	UNC	.1640	4.17	3	H3	2.125	53.98	.750	19.05	C27697
8-32	UNC	.1640	4.17	3	H5	2.125	53.98	.750	19.05	C27720
10-24	UNC	.1900	4.83	3	H2	2.375	60.33	.875	22.23	C27692
10-24	UNC	.1900	4.83	3	H3	2.375	60.33	.875	22.23	C27698
10-24	UNC	.1900	4.83	3	H5	2.375	60.33	.875	22.23	C27721
10-32	UNF	.1900	4.83	3	H2	2.375	60.33	.875	22.23	C27693
10-32	UNF	.1900	4.83	3	H3	2.375	60.33	.875	22.23	C27699
10-32	UNF	.1900	4.83	3	H5	2.375	60.33	.875	22.23	C27722
1/4-20	UNC	.2500	6.35	3	H2	2.500	63.50	1.000	25.40	C27694
1/4-20	UNC	.2500	6.35	3	H3	2.500	63.50	1.000	25.40	C27700
1/4-20	UNC	.2500	6.35	3	H5	2.500	63.50	1.000	25.40	C27723
1/4-28	UNF	.2500	6.35	3	H2	2.500	63.50	1.000	25.40	C27695
1/4-28	UNF	.2500	6.35	3	H3	2.500	63.50	1.000	25.40	C27701
1/4-28	UNF	.2500	6.35	3	H4	2.500	63.50	1.000	25.40	C27716
5/16-18	UNC	.3125	7.94	3	H3	2.719	69.06	1.125	28.58	C27702
5/16-18	UNC	.3125	7.94	3	H5	2.719	69.06	1.125	28.58	C27724
5/16-24	UNF	.3125	7.94	3	H3	2.719	69.06	1.125	28.58	C27703
5/16-24	UNF	.3125	7.94	3	H4	2.719	69.06	1.125	28.58	C27717
3/8-16	UNC	.3750	9.53	3	H3	2.938	74.61	1.250	31.75	C27704
3/8-16	UNC	.3750	9.53	3	H5	2.938	74.61	1.250	31.75	C27725
3/8-24	UNF	.3750	9.53	3	H3	2.938	74.61	1.250	31.75	C27705
3/8-24	UNF	.3750	9.53	3	H4	2.938	74.61	1.250	31.75	C27718
7/16-14	UNC	.4375	11.11	3	H3	3.156	80.17	1.438	36.51	C27706
7/16-14	UNC	.4375	11.11	3	H5	3.156	80.17	1.438	36.51	C27726
7/16-20	UNF	.4375	11.11	3	H3	3.156	80.17	1.438	36.51	C27707
7/16-20	UNF	.4375	11.11	3	H5	3.156	80.17	1.438	36.51	C27727
1/2-13	UNC	.5000	12.70	3	H3	3.375	85.73	1.656	42.07	C27708
1/2-13	UNC	.5000	12.70	3	H5	3.375	85.73	1.656	42.07	C27728
1/2-20	UNF	.5000	12.70	3	H3	3.375	85.73	1.656	42.07	C27709
1/2-20	UNF	.5000	12.70	3	H5	3.375	85.73	1.656	42.07	C27729

MILLING

OTHER TOOLS

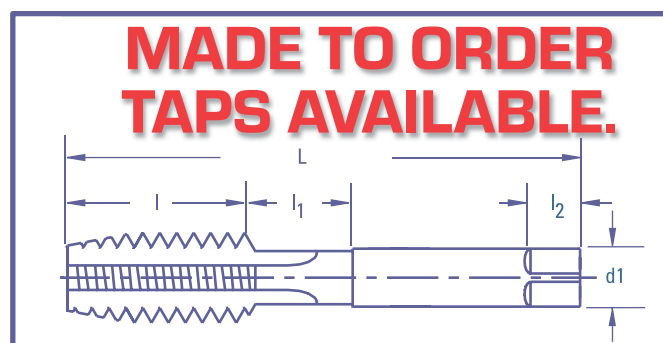
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Style T-101 • Spiral Point for Steels and Stainless Steels (continued)

Tap Size and Pitch	Thread Form	Decimal Equiv.	Metric Equiv.	Number of Flutes	H-Limit	Overall Length in	Overall Length mm	Thread Length in	Thread Length mm	Order Number
9/16-12	UNC	.5625	14.29	3	H3	3.594	91.28	1.656	42.07	C27710
9/16-18	UNF	.5625	14.29	3	H3	3.594	91.28	1.656	42.07	C27711
5/8-11	UNC	.6250	15.88	3	H3	3.813	96.84	1.813	46.04	C27712
5/8-11	UNC	.6250	15.88	3	H5	3.813	96.84	1.813	46.04	C27730
5/8-18	UNF	.6250	15.88	3	H3	3.813	96.84	1.813	46.04	C27713
3/4-10	UNC	.7500	19.05	3	H3	4.250	107.95	2.000	50.80	C27714
3/4-16	UNF	.7500	19.05	3	H3	4.250	107.95	2.000	50.80	C27715

Tap Size and Pitch	Decimal Equiv.	Metric Equiv.	Number of Flutes	D-Limit	Overall Length in	Overall Length mm	Thread Length in	Thread Length mm	Order Number
M3 x 0.5	.1181	3.00	2	D3	1.938	49.21	.625	15.88	C27731
M4 x 0.7	.1575	4.00	3	D4	2.125	53.98	.750	19.05	C27732
M5 x 0.8	.1968	5.00	3	D4	2.375	60.33	.875	22.23	C27733
M6 x 1	.2362	6.00	3	D5	2.500	63.50	1.000	25.40	C27734
M8 x 1.25	.3150	8.00	3	D5	2.719	69.06	1.125	28.58	C27735
M10 x 1.5	.3937	10.00	3	D6	2.938	74.61	1.250	31.75	C27736
M12 x 1.75	.4724	12.00	3	D6	3.375	85.73	1.656	42.07	C27737
M14 x 1.5	.5512	14.00	3	D6	3.594	91.28	1.656	42.07	C27738
M18 x 1.5	.7087	18.00	3	D6	4.031	102.39	1.813	46.04	C27739



Made to Order sizes are available upon request. Please see pages 166-167 for quick ship information.

Style B-101 • Spiral Flute for Steels and Stainless Steels

DRILLING

FEATURES

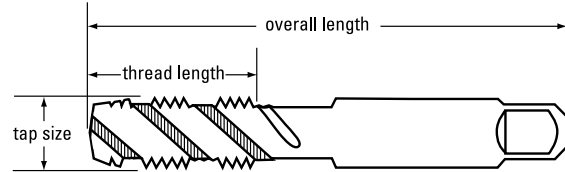
USCT1 302A	CPM-M4 V SUBSTRATE
HIGH PERFORMANCE	STEAM OXIDE
BLIND HOLES	MOD BOTT 2 1/2
GROUND THREAD	NECKED

APPLICATIONS

ALLOY-TOOL STEEL
CARBON STEEL
STAINLESS STEEL



Style B-101 Steam Oxide



HOLE FINISHING

Tapping speeds are listed on page 155.

THREADING

Tap Size and Pitch	Thread Form	Decimal Equiv.	Metric Equiv.	Number of Flutes	H-Limit	Overall Length		Thread Length		Order Number
						in	mm	in	mm	
4-40	UNC	.1120	2.84	2	H2	1.875	47.63	.563	14.29	C27887
6-32	UNC	.1380	3.51	3	H2	2.000	50.80	.688	17.46	C27888
6-32	UNC	.1380	3.51	3	H3	2.000	50.80	.688	17.46	C27894
6-32	UNC	.1380	3.51	3	H5	2.000	50.80	.688	17.46	C27917
8-32	UNC	.1640	4.17	3	H2	2.125	53.98	.750	19.05	C27889
8-32	UNC	.1640	4.17	3	H3	2.125	53.98	.750	19.05	C27895
8-32	UNC	.1640	4.17	3	H5	2.125	53.98	.750	19.05	C27918
10-24	UNC	.1900	4.83	3	H2	2.375	60.33	.875	22.23	C27890
10-24	UNC	.1900	4.83	3	H3	2.375	60.33	.875	22.23	C27896
10-24	UNC	.1900	4.83	3	H5	2.375	60.33	.875	22.23	C27919
10-32	UNF	.1900	4.83	3	H2	2.375	60.33	.875	22.23	C27891
10-32	UNF	.1900	4.83	3	H3	2.375	60.33	.875	22.23	C27897
10-32	UNF	.1900	4.83	3	H5	2.375	60.33	.875	22.23	C27920
1/4-20	UNC	.2500	6.35	3	H2	2.500	63.50	1.000	25.40	C27892
1/4-20	UNC	.2500	6.35	3	H3	2.500	63.50	1.000	25.40	C27898
1/4-20	UNC	.2500	6.35	3	H5	2.500	63.50	1.000	25.40	C27921
1/4-28	UNF	.2500	6.35	3	H2	2.500	63.50	1.000	25.40	C27893
1/4-28	UNF	.2500	6.35	3	H3	2.500	63.50	1.000	25.40	C27899
1/4-28	UNF	.2500	6.35	3	H4	2.500	63.50	1.000	25.40	C27914
5/16-18	UNC	.3125	7.94	3	H3	2.719	69.06	1.125	28.58	C27900
5/16-18	UNC	.3125	7.94	3	H5	2.719	69.06	1.125	28.58	C27922
5/16-24	UNF	.3125	7.94	3	H3	2.719	69.06	1.125	28.58	C27901
5/16-24	UNF	.3125	7.94	3	H4	2.719	69.06	1.125	28.58	C27915
3/8-16	UNC	.3750	9.53	3	H3	2.938	74.61	1.250	31.75	C27902
3/8-16	UNC	.3750	9.53	3	H5	2.938	74.61	1.250	31.75	C27923
3/8-24	UNF	.3750	9.53	3	H3	2.938	74.61	1.250	31.75	C27903
3/8-24	UNF	.3750	9.53	3	H4	2.938	74.61	1.250	31.75	C27916
7/16-14	UNC	.4375	11.11	3	H3	3.156	80.17	1.438	36.51	C27904
7/16-14	UNC	.4375	11.11	3	H5	3.156	80.17	1.438	36.51	C27924
7/16-20	UNF	.4375	11.11	3	H3	3.156	80.17	1.438	36.51	C27905
7/16-20	UNF	.4375	11.11	3	H5	3.156	80.17	1.438	36.51	C27925
1/2-13	UNC	.5000	12.70	3	H3	3.375	85.73	1.656	42.07	C27906
1/2-13	UNC	.5000	12.70	3	H5	3.375	85.73	1.656	42.07	C27926
1/2-20	UNF	.5000	12.70	3	H3	3.375	85.73	1.656	42.07	C27907
1/2-20	UNF	.5000	12.70	3	H5	3.375	85.73	1.656	42.07	C27927

MILLING

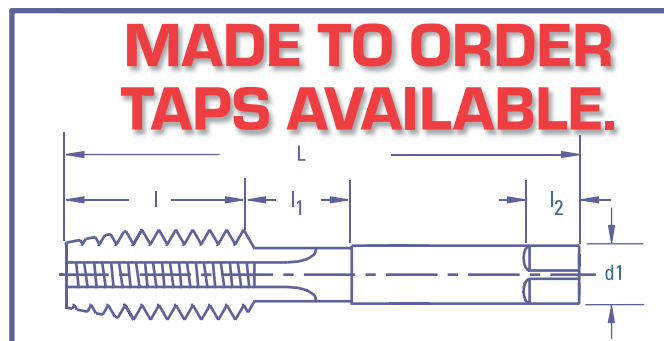
OTHER TOOLS

continued on next page

Style B-101 • Spiral Flute for Steels and Stainless Steels (continued)

Tap Size and Pitch	Thread Form	Decimal Equiv.	Metric Equiv.	Number of Flutes	H-Limit	Overall Length		Thread Length		Order Number
						in	mm	in	mm	
9/16-12	UNC	.5625	14.29	3	H3	3.594	91.28	1.656	42.07	C27908
9/16-18	UNF	.5625	14.29	3	H3	3.594	91.28	1.656	42.07	C27909
5/8-11	UNC	.6250	15.88	4	H3	3.813	96.84	1.813	46.04	C27910
5/8-11	UNC	.6250	15.88	4	H5	3.813	96.84	1.813	46.04	C27928
5/8-18	UNF	.6250	15.88	4	H3	3.813	96.84	1.813	46.04	C27911
3/4-10	UNC	.7500	19.05	4	H3	4.250	107.95	2.000	50.80	C27912
3/4-16	UNF	.7500	19.05	4	H3	4.250	107.95	2.000	50.80	C27913

Tap Size and Pitch	Decimal Equiv.	Metric Equiv.	Number of Flutes	D-Limit	Overall Length		Thread Length		Order Number
					in	mm	in	mm	
M4 x 0.7	.1575	4.00	3	D4	2.125	53.98	.750	19.05	C27930
M5 x 0.8	.1968	5.00	3	D4	2.375	60.33	.875	22.23	C27931
M6 x 1	.2362	6.00	3	D5	2.500	63.50	1.000	25.40	C27932
M8 x 1.25	.3150	8.00	3	D5	2.719	69.06	1.125	28.58	C27933
M10 x 1.5	.3937	10.00	3	D6	2.938	74.61	1.250	31.75	C27934
M12 x 1.75	.4724	12.00	3	D6	3.375	85.73	1.656	42.07	C27935
M14 x 1.5	.5512	14.00	3	D6	3.594	91.28	1.656	42.07	C27936



Made to Order sizes are available upon request. Please see pages 166-167 for quick ship information.

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Style T-202 • Spiral Point for Harder Materials

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

FEATURES

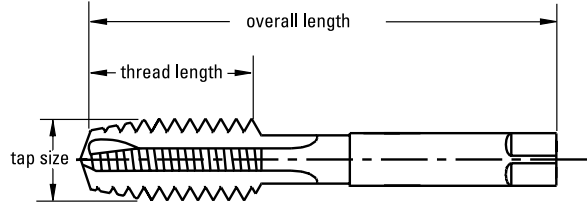
USCT1 302A CPM-M4 V SUBSTRATE
 HIGH PERFORMANCE STEAM OXIDE
 THRU HOLES PLUG 3-5
 GROUND THREAD NECKED

APPLICATIONS

HARDENED STEEL
 NICKEL ALLOYS



Style T-202 Steam Oxide



Tapping speeds are listed on page 155.

Tap Size and Pitch	Thread Form	Decimal Equiv.	Metric Equiv.	Number of Flutes	H-Limit	Overall Length		Thread Length		Order Number
						in	mm	in	mm	
4-40	UNC	.1120	2.84	2	H2	1.875	47.63	.563	14.29	C27755
6-32	UNC	.1380	3.51	2	H2	2.000	50.80	.688	17.46	C27756
6-32	UNC	.1380	3.51	2	H3	2.000	50.80	.688	17.46	C27762
6-32	UNC	.1380	3.51	2	H5	2.000	50.80	.688	17.46	C27785
8-32	UNC	.1640	4.17	3	H2	2.125	53.98	.750	19.05	C27757
8-32	UNC	.1640	4.17	3	H3	2.125	53.98	.750	19.05	C27763
8-32	UNC	.1640	4.17	3	H5	2.125	53.98	.750	19.05	C27786
10-24	UNC	.1900	4.83	3	H2	2.375	60.33	.875	22.23	C27758
10-24	UNC	.1900	4.83	3	H3	2.375	60.33	.875	22.23	C27764
10-24	UNC	.1900	4.83	3	H5	2.375	60.33	.875	22.23	C27787
10-32	UNF	.1900	4.83	3	H2	2.375	60.33	.875	22.23	C27759
10-32	UNF	.1900	4.83	3	H3	2.375	60.33	.875	22.23	C27765
10-32	UNF	.1900	4.83	3	H5	2.375	60.33	.875	22.23	C27788
1/4-20	UNC	.2500	6.35	3	H2	2.500	63.50	1.000	25.40	C27760
1/4-20	UNC	.2500	6.35	3	H3	2.500	63.50	1.000	25.40	C27766
1/4-20	UNC	.2500	6.35	3	H5	2.500	63.50	1.000	25.40	C27789
1/4-28	UNF	.2500	6.35	3	H2	2.500	63.50	1.000	25.40	C27761
1/4-28	UNF	.2500	6.35	3	H3	2.500	63.50	1.000	25.40	C27767
1/4-28	UNF	.2500	6.35	3	H4	2.500	63.50	1.000	25.40	C27782
5/16-18	UNC	.3125	7.94	3	H3	2.719	69.06	1.125	28.58	C27768
5/16-18	UNC	.3125	7.94	3	H5	2.719	69.06	1.125	28.58	C27790
5/16-24	UNF	.3125	7.94	3	H3	2.719	69.06	1.125	28.58	C27769
5/16-24	UNF	.3125	7.94	3	H4	2.719	69.06	1.125	28.58	C27783
3/8-16	UNC	.3750	9.53	3	H3	2.938	74.61	1.250	31.75	C27770
3/8-16	UNC	.3750	9.53	3	H5	2.938	74.61	1.250	31.75	C27791
3/8-24	UNF	.3750	9.53	3	H3	2.938	74.61	1.250	31.75	C27771
3/8-24	UNF	.3750	9.53	3	H4	2.938	74.61	1.250	31.75	C27784
7/16-14	UNC	.4375	11.11	4	H3	3.156	80.17	1.438	36.51	C27772
7/16-14	UNC	.4375	11.11	4	H5	3.156	80.17	1.438	36.51	C27792
7/16-20	UNF	.4375	11.11	4	H3	3.156	80.17	1.438	36.51	C27773
7/16-20	UNF	.4375	11.11	4	H5	3.156	80.17	1.438	36.51	C27793
1/2-13	UNC	.5000	12.70	4	H3	3.375	85.73	1.656	42.07	C27774
1/2-13	UNC	.5000	12.70	4	H5	3.375	85.73	1.656	42.07	C27794
1/2-20	UNF	.5000	12.70	4	H3	3.375	85.73	1.656	42.07	C27775
1/2-20	UNF	.5000	12.70	4	H5	3.375	85.73	1.656	42.07	C27795

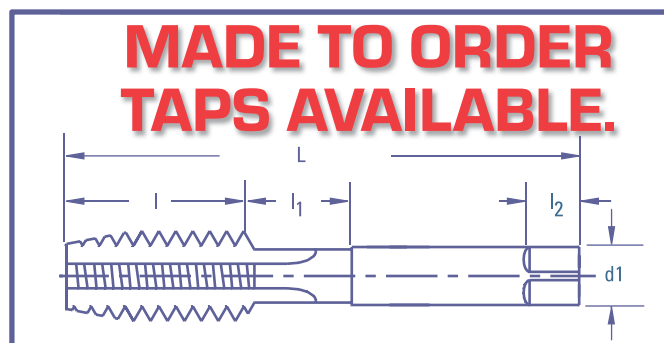
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Style T-202 • Spiral Point for Harder Materials (continued)

Tap Size and Pitch	Thread Form	Decimal Equiv.	Metric Equiv.	Number of Flutes	H-Limit	Overall Length		Thread Length		Order Number
						in	mm	in	mm	
9/16-12	UNC	.5625	14.29	4	H3	3.594	91.28	1.656	42.07	C27776
9/16-18	UNF	.5625	14.29	4	H3	3.594	91.28	1.656	42.07	C27777
5/8-11	UNC	.6250	15.88	4	H3	3.813	96.84	1.813	46.04	C27778
5/8-11	UNC	.6250	15.88	4	H5	3.813	96.84	1.813	46.04	C27796
5/8-18	UNF	.6250	15.88	4	H3	3.813	96.84	1.813	46.04	C27779
3/4-10	UNC	.7500	19.05	4	H3	4.250	107.95	2.000	50.80	C27780
3/4-16	UNF	.7500	19.05	4	H3	4.250	107.95	2.000	50.80	C27781

Tap Size and Pitch	Decimal Equiv.	Metric Equiv.	Number of Flutes	D-Limit	Overall Length		Thread Length		Order Number
					in	mm	in	mm	
M3 x 0.5	.1181	3.00	2	D3	1.938	49.21	.625	15.88	C27797
M4 x 0.7	.1575	4.00	3	D4	2.125	53.98	.750	19.05	C27798
M5 x 0.8	.1968	5.00	3	D4	2.375	60.33	.875	22.23	C27799
M6 x 1	.2362	6.00	3	D5	2.500	63.50	1.000	25.40	C27800
M8 x 1.25	.3150	8.00	3	D5	2.719	69.06	1.125	28.58	C27801
M10 x 1.5	.3937	10.00	3	D6	2.938	74.61	1.250	31.75	C27802
M12 x 1.75	.4724	12.00	4	D6	3.375	85.73	1.656	42.07	C27803
M14 x 1.5	.5512	14.00	4	D6	3.594	91.28	1.656	42.07	C27804
M18 x 1.5	.7087	18.00	4	D6	4.031	102.39	1.813	46.04	C27805



Made to Order sizes are available upon request. Please see pages 166-167 for quick ship information.

Style B-202 • Spiral Flute for Harder Materials

DRILLING

FEATURES

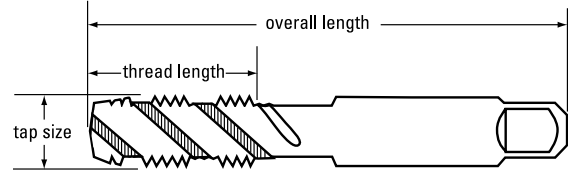
USCT1 302A	CPM-M4 V SUBSTRATE
HIGH PERFORMANCE	STEAM OXIDE
BLIND HOLES	MOD BOT 2 1/2
GROUND THREAD	NECKED

APPLICATIONS

HARDENED STEEL
NICKEL ALLOYS



Style B-202 Steam Oxide



HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Tapping speeds are listed on page 155.

Tap Size and Pitch	Thread Form	Decimal Equiv.	Metric Equiv.	Number of Flutes	H-Limit	Overall Length		Thread Length		Order Number
						in	mm	in	mm	
4-40	UNC	.1120	2.84	2	H2	1.875	47.63	.563	14.29	C27953
6-32	UNC	.1380	3.51	2	H2	2.000	50.80	.688	17.46	C27954
6-32	UNC	.1380	3.51	2	H3	2.000	50.80	.688	17.46	C27960
6-32	UNC	.1380	3.51	2	H5	2.000	50.80	.688	17.46	C27983
8-32	UNC	.1640	4.17	2	H2	2.125	53.98	.750	19.05	C27955
8-32	UNC	.1640	4.17	2	H3	2.125	53.98	.750	19.05	C27961
8-32	UNC	.1640	4.17	2	H5	2.125	53.98	.750	19.05	C27984
10-24	UNC	.1900	4.83	3	H2	2.375	60.33	.875	22.23	C27956
10-24	UNC	.1900	4.83	3	H3	2.375	60.33	.875	22.23	C27962
10-24	UNC	.1900	4.83	3	H5	2.375	60.33	.875	22.23	C27985
10-32	UNF	.1900	4.83	3	H2	2.375	60.33	.875	22.23	C27957
10-32	UNF	.1900	4.83	3	H3	2.375	60.33	.875	22.23	C27963
10-32	UNF	.1900	4.83	3	H5	2.375	60.33	.875	22.23	C27986
1/4-20	UNC	.2500	6.35	3	H2	2.500	63.50	1.000	25.40	C27958
1/4-20	UNC	.2500	6.35	3	H3	2.500	63.50	1.000	25.40	C27964
1/4-20	UNC	.2500	6.35	3	H5	2.500	63.50	1.000	25.40	C27987
1/4-28	UNF	.2500	6.35	3	H2	2.500	63.50	1.000	25.40	C27959
1/4-28	UNF	.2500	6.35	3	H3	2.500	63.50	1.000	25.40	C27965
1/4-28	UNF	.2500	6.35	3	H4	2.500	63.50	1.000	25.40	C27980
5/16-18	UNC	.3125	7.94	3	H3	2.719	69.06	1.125	28.58	C27966
5/16-18	UNC	.3125	7.94	3	H5	2.719	69.06	1.125	28.58	C27988
5/16-24	UNF	.3125	7.94	3	H3	2.719	69.06	1.125	28.58	C27967
5/16-24	UNF	.3125	7.94	3	H4	2.719	69.06	1.125	28.58	C27981
3/8-16	UNC	.3750	9.53	3	H3	2.938	74.61	1.250	31.75	C27968
3/8-16	UNC	.3750	9.53	3	H5	2.938	74.61	1.250	31.75	C27989
3/8-24	UNF	.3750	9.53	3	H3	2.938	74.61	1.250	31.75	C27969
3/8-24	UNF	.3750	9.53	3	H4	2.938	74.61	1.250	31.75	C27982
7/16-14	UNC	.4375	11.11	3	H3	3.156	80.17	1.438	36.51	C27970
7/16-14	UNC	.4375	11.11	3	H5	3.156	80.17	1.438	36.51	C27990
7/16-20	UNF	.4375	11.11	3	H3	3.156	80.17	1.438	36.51	C27971
7/16-20	UNF	.4375	11.11	3	H5	3.156	80.17	1.438	36.51	C27991
1/2-13	UNC	.5000	12.70	4	H3	3.375	85.73	1.656	42.07	C27972
1/2-13	UNC	.5000	12.70	4	H5	3.375	85.73	1.656	42.07	C27992
1/2-20	UNF	.5000	12.70	4	H3	3.375	85.73	1.656	42.07	C27973
1/2-20	UNF	.5000	12.70	4	H5	3.375	85.73	1.656	42.07	C27993

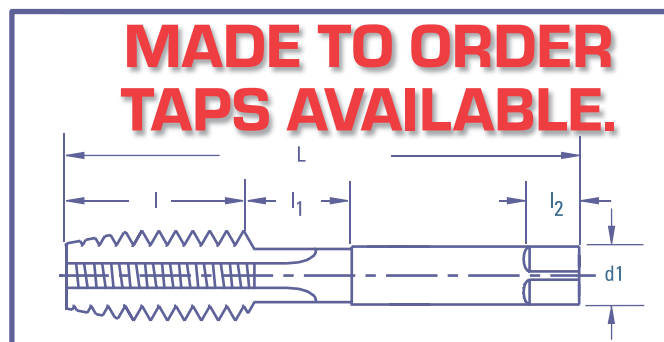
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Style B-202 • Spiral Flute for Harder Materials (continued)

Tap Size and Pitch	Thread Form	Decimal Equiv.	Metric Equiv.	Number of Flutes	H-Limit	Overall Length in	Overall Length mm	Thread Length in	Thread Length mm	Order Number
9/16-12	UNC	.5625	14.29	4	H3	3.594	91.28	1.656	42.07	C27974
9/16-18	UNF	.5625	14.29	4	H3	3.594	91.28	1.656	42.07	C27975
5/8-11	UNC	.6250	15.88	4	H3	3.813	96.84	1.813	46.04	C27976
5/8-11	UNC	.6250	15.88	4	H5	3.813	96.84	1.813	46.04	C27994
5/8-18	UNF	.6250	15.88	4	H3	3.813	96.84	1.813	46.04	C27977
3/4-10	UNC	.7500	19.05	4	H3	4.250	107.95	2.000	50.80	C27978
3/4-16	UNF	.7500	19.05	4	H3	4.250	107.95	2.000	50.80	C27979

Tap Size and Pitch	Decimal Equiv.	Metric Equiv.	Number of Flutes	D-Limit	Overall Length in	Overall Length mm	Thread Length in	Thread Length mm	Order Number
M3 x 0.5	.1181	3.00	2	D3	1.938	49.21	.625	15.88	C27995
M4 x 0.7	.1575	4.00	2	D4	2.125	53.98	.750	19.05	C27996
M5 x 0.8	.1968	5.00	3	D4	2.375	60.33	.875	22.23	C27997
M6 x 1	.2362	6.00	3	D5	2.500	63.50	1.000	25.40	C27998
M8 x 1.25	.3150	8.00	3	D5	2.719	69.06	1.125	28.58	C27999
M10 x 1.5	.3937	10.00	3	D6	2.938	74.61	1.250	31.75	C28000
M12 x 1.75	.4724	12.00	4	D6	3.375	85.73	1.656	42.07	C28001
M14 x 1.5	.5512	14.00	4	D6	3.594	91.28	1.656	42.07	C28002
M18 x 1.5	.7087	18.00	4	D6	4.031	102.39	1.813	46.04	C28003



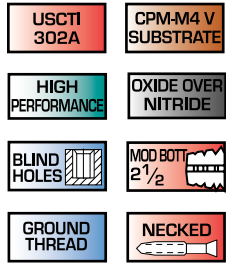
Made to Order sizes are available upon request. Please see pages 166-167 for quick ship information.

High-Performance Taps SD Powder Metal

Style CI-1000 • Straight Flute for Cast Iron and Harder Materials

DRILLING

FEATURES



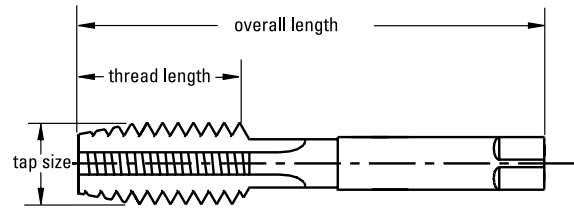
APPLICATIONS



Style CI-1000 Steam Oxide over Nitride



Style CI-1000 TiCN-Coated



Tapping speeds are listed on page 155.

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

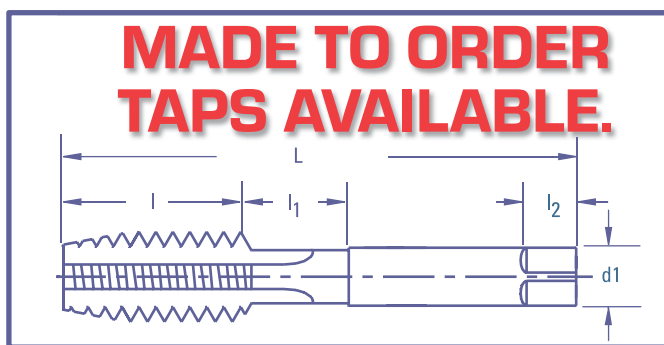
Tap Size and Pitch	Thread Form	Decimal Equiv.	Metric Equiv.	Number of Flutes	H-Limit	Overall Length		Thread Length		Order Number	
						in	mm	in	mm	Oxide	TiCN
10-24	UNC	.1900	4.83	4	H3	2.375	60.33	.875	22.23	C27636	C28020
10-24	UNC	.1900	4.83	4	H5	2.375	60.33	.875	22.23	C27654	C28038
10-32	UNF	.1900	4.83	4	H3	2.375	60.33	.875	22.23	C27637	C28021
1/4-20	UNC	.2500	6.35	4	H3	2.500	63.50	1.000	25.40	C27638	C28022
1/4-20	UNC	.2500	6.35	4	H5	2.500	63.50	1.000	25.40	C27655	C28039
1/4-28	UNF	.2500	6.35	4	H3	2.500	63.50	1.000	25.40	C27639	C28023
5/16-18	UNC	.3125	7.94	4	H3	2.719	69.06	1.125	28.58	C27640	C28024
5/16-18	UNC	.3125	7.94	4	H5	2.719	69.06	1.125	28.58	C27656	C28040
5/16-24	UNF	.3125	7.94	4	H3	2.719	69.06	1.125	28.58	C27641	C28025
3/8-16	UNC	.3750	9.53	4	H3	2.938	74.61	1.250	31.75	C27642	C28026
3/8-16	UNC	.3750	9.53	4	H5	2.938	74.61	1.250	31.75	C27657	C28041
3/8-24	UNF	.3750	9.53	4	H3	2.938	74.61	1.250	31.75	C27643	C28027
7/16-14	UNC	.4375	11.11	4	H3	3.156	80.17	1.438	36.51	C27644	C28028
7/16-14	UNC	.4375	11.11	4	H5	3.156	80.17	1.438	36.51	C27658	C28042
7/16-20	UNF	.4375	11.11	4	H3	3.156	80.17	1.438	36.51	C27645	C28029
7/16-20	UNF	.4375	11.11	4	H5	3.156	80.17	1.438	36.51	C27659	C28043
1/2-13	UNC	.5000	12.70	4	H3	3.375	85.73	1.656	42.07	C27646	C28030
1/2-13	UNC	.5000	12.70	4	H5	3.375	85.73	1.656	42.07	C27660	C28044
1/2-20	UNF	.5000	12.70	4	H3	3.375	85.73	1.656	42.07	C27647	C28031
1/2-20	UNF	.5000	12.70	4	H5	3.375	85.73	1.656	42.07	C27661	C28045
9/16-12	UNC	.5625	14.29	4	H3	3.594	91.28	1.656	42.07	C27648	C28032
9/16-12	UNC	.5625	14.29	4	H5	3.594	91.28	1.656	42.07	C27662	C28046
9/16-18	UNF	.5625	14.29	4	H3	3.594	91.28	1.656	42.07	C27649	C28033
9/16-18	UNF	.5625	14.29	4	H5	3.594	91.28	1.656	42.07	C27663	C28047
5/8-11	UNC	.6250	15.88	6	H3	3.813	96.84	1.813	46.04	C27650	C28034
5/8-11	UNC	.6250	15.88	6	H5	3.813	96.84	1.813	46.04	C27664	C28048
5/8-18	UNF	.6250	15.88	6	H3	3.813	96.84	1.813	46.04	C27651	C28035
5/8-18	UNF	.6250	15.88	6	H5	3.813	96.84	1.813	46.04	C27665	C28049
3/4-10	UNC	.7500	19.05	6	H3	4.250	107.95	2.000	50.80	C27652	C28036
3/4-10	UNC	.7500	19.05	6	H5	4.250	107.95	2.000	50.80	C27666	C28050
3/4-16	UNF	.7500	19.05	6	H3	4.250	107.95	2.000	50.80	C27653	C28037
3/4-16	UNF	.7500	19.05	6	H5	4.250	107.95	2.000	50.80	C27667	C28051

continued on next page

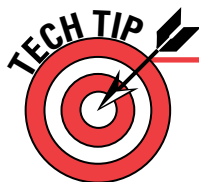


Style CI-1000 • Straight Flute for Cast Iron and Harder Materials (continued)

Tap Size and Pitch	Decimal Equiv.	Metric Equiv.	Number of Flutes	D-Limit	Overall Length		Thread Length		Order Number	
					in	mm	in	mm	Oxide	TiCN
M5 x 0.8	.1968	5.00	3	D4	2.375	60.33	.875	22.23	C27668	C28052
M6 x 1	.2362	6.00	3	D5	2.500	63.50	1.000	25.40	C27669	C28053
M8 x 1.25	.3150	8.00	3	D5	2.719	69.06	1.125	28.58	C27670	C28054
M10 x 1.5	.3937	10.00	4	D6	2.938	74.61	1.250	31.75	C27671	C28055
M12 x 1.25	.4724	12.00	4	D6	3.375	85.73	1.656	42.07	C27672	C28056
M12 x 1.75	.4724	12.00	4	D6	3.375	85.73	1.656	42.07	C27673	C28057
M14 x 1.25	.5512	14.00	4	D6	3.594	91.28	1.656	42.07	C27674	C28058
M14 x 1.5	.5512	14.00	4	D6	3.594	91.28	1.656	42.07	C27675	C28059
M18 x 1.5	.7087	18.00	4	D6	4.031	102.39	1.813	46.04	C27676	C28060



Made to Order sizes are available upon request. Please see pages 166-167 for quick ship information.



The Proper Use of Lubricants in Tapping

Applying the proper lubricants in tapping operations can result in longer tap life, increased production, better workpiece size control, smoother and more accurate threads, less resharping, and more efficient chip removal. Generally, for best tap performance, straight cutting oil should be used. For non-ferrous and non-metallic materials, a coolant or a cutting fluid (light oil or soluble oil) is recommended.

Often, machining centers are equipped with a coolant or a cutting fluid that contains enough water and oil to provide adequate cooling and lubrication for a variety of tools and workpieces. However, most soluble blends are not suitable for tapping applications. Tapping, especially with thread-forming taps, requires more lubrication than cooling. A coolant or cutting fluid might lack the lubrication necessary to obtain acceptable tool life and part finish. Get recommendations from a coolant specialist.

After you select the proper lubricant, choose the right method of application and pressure. For tapping, use multiple nozzles around the tap. Nozzles should be as close to the surface of the part as possible, positioned at an angle close to the axis of the tool, and should point directly into the hole to flush chips from the flutes. For horizontal tapping,

where the tap is stationary and the workpieces rotate, consider using two streams of lubricant, one on each side of the tap.

Whether you are tapping vertically, horizontally, or at an angle, make sure the lubricant reaches the cutting lands of the tap at all times, especially at the point or chamfered sections. Brushing or squirting oil or fluid onto the tap does not provide sufficient lubrication. In fact, heavy viscosity oil may cause the chips to stick or cling to a tap, increasing the chance of breakage. In addition, if the lubricant is automatically applied only on the forward motion of the tap, time the application of the lubricant so that it will reach the hole before the tap starts to cut, particularly with machines on which the cutting fluid is automatically shut off when the tap reverses. For maximum effectiveness, it is better to force the lubricant into the hole under pressure, which will vary depending on the tapping method, hole depth, and tapping speed.

Keep tapping lubricants as clean as possible using a filtering system or other equipment. Dust and other foreign particles can contaminate oil and decrease its effectiveness. Thoroughly clean machines and oil tanks when adding new lubricant and at regular intervals to ensure optimum results.

Made-to-Order Taps

Styles T-101, T-202, T-303, T-404 • Spiral Point SD Taps

DRILLING

HOLE FINISHING

Diameter Range (in)	Inch Taps		Metric Taps		Maximum Limit	T-101		T-202	
	Tap Size	Max TPI	Tap Size	Min Pitch		No. of Flutes	Order No.	No. of Flutes	Order No.
.104-.117	4	100	–	–	l1	2	C27740	–	–
.117-.130	5	100	M3, M3.15	.250mm	l1	2	C28070	–	–
.130-.145	6	100	M3.5	.250mm	l1	2		2	C27807
.145-.171	8	100	M4	.250mm	l1	3	C27742	3	C27808
.171-.197	10	100	M4.5	.250mm	l1	3	C27743	3	C27809
–	–	–	M5	.250mm	l1	3		3	C27810
.197-.223	12	100	M5.5	.250mm	l1	3	C28136	–	–
.223-.260	1/4	80	M6	.300mm	l1	3	C27745	3	C27811
.260-.323	5/16	80	M7, M8	.300mm	l1	3	C27746	3	C27812
.323-.395	3/8	80	–	–	l1	3	C27747	3	C27813
–	–	–	M10	.300mm	l1	3	C27748	–	–
.448-.510	1/2	80	M12, M12.5	.300mm	l5	3	C27750	–	–
.510-.573	9/16	64	M14	.400mm	l5	3	C27751	3	C27817
.573-.635	5/8	64	M16	.400mm	l5	3	C27752	3	C27818
.635-.709	11/16	64	M18	.400mm	l5	3	C27753	3	C27819
.709-.760	3/4	64	–	–	l5	3	C27754	3	–

THREADING

MILLING

OTHER TOOLS

Styles B-101, B-202 • Spiral Flute SD Taps

Diameter Range (in)	Inch Taps		Metric Taps		Maximum Limit	B-101		B-202	
	Tap Size	Max TPI	Tap Size	Min Pitch		No. of Flutes	Order No.	No. of Flutes	Order No.
.104-.117	4	100	–	–	l1	2	C27938	–	–
.117-.130	5	100	M3, M3.15	.250mm	l1	2	C28074	–	–
.130-.145	6	100	M3.5	.250mm	l1	3	C27939	–	–
.145-.171	8	100	M4	.250mm	l1	3	C27940	–	–
.171-.197	10	100	M4.5	.250mm	l1	3	C27941	3	C28007
–	–	–	M5	.250mm	l1	3	C27942	–	–
.197-.223	12	100	M5.5	.250mm	l1	3	C28140	–	–
.223-.260	1/4	80	M6	.300mm	l1	3	C27943	3	C28009
.260-.323	5/16	80	M7, M8	.300mm	l1	3	C27944	3	C28010
.323-.395	3/8	80	–	–	l1	3	C27945	3	C28011
–	–	–	M10	.300mm	l1	3	C27946	3	C28012
.395-.448	7/16	80	M11	.300mm	l1	3	C27947	3	C28013
.448-.510	1/2	80	M12, M12.5	.300mm	l5	3	C27948	4	C28014
.510-.573	9/16	64	M14	.400mm	l5	3	C27949	–	–
.573-.635	5/8	64	M16	.400mm	l5	4	C27950	4	C28016
.635-.709	11/16	64	M18	.400mm	l5	4	C27951	4	C28017
.709-.760	3/4	64	–	–	l5	4	C27952	4	C28018



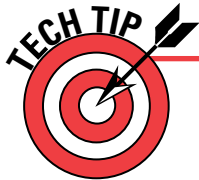
Style CI-1000 • Straight Flute SD Taps

Diameter Range (in)	Inch Taps		Metric Taps		Maximum Limit	CI-1000	
	Tap Size	Max TPI	Tap Size	Min Pitch		No. of Flutes	Order No.
.171-.197	10	100	M4.5	.250mm	l1	4	C27677
–	–	–	M5	.250mm	l1	4	C27678
.197-.223	12	100	M5.5	.250mm	l1	4	C28283
.223-.260	1/4	80	M6	.300mm	l1	4	C27679
.260-.323	5/16	80	M7, M8	.300mm	l1	4	C27680
.323-.395	3/8	80	–	–	l1	4	C27681
–	–	–	M10	.300mm	l1	4	C27682
.395-.448	7/16	80	M11	.300mm	l5	4	C27683
.448-.510	1/2	80	M12, M12.5	.300mm	l5	4	C27684
.510-.573	9/16	64	M14	.400mm	l5	4	C27685
.573-.635	5/8	64	M16	.400mm	l5	6	C27686
.635-.709	11/16	64	M18	.400mm	l5	6	C27687
.709-.760	3/4	64	–	–	l5	6	C27688

Special Right-Hand or Left-Hand Taper, Plug, or Bottoming General Purpose Hand Taps

Diameter Range (in)	Inch Taps		Metric Taps		Max H or D Limit	No. of Flutes	Order No.	Diameter Range (in)	Inch Taps		Metric Taps		Max H or D Limit	No. of Flutes	Order No.
	Tap Size	Max TPI	Metric Size	Min Pitch					Metric Size	Min Pitch	Tap Size	Max TPI			
1.010 - 1.073	1-1/16	13	M27	2.0mm	21	4	C64296	1.323 - 1.385	1-3/8	13	–	–	21	6	C64312
1.073 - 1.135	1-1/8	13	M28	2.0mm	21	4	C64298	1.448 - 1.510	1-1/2	13	M38	2.0mm	21	6	C64316
1.135 - 1.198	1-3/16	13	M30	2.0mm	21	4	C64300	1.635 - 1.760	1-3/4	9	–	–	21	6	C64319
1.198 - 1.260	1-1/4	13	–	–	21	4	C64301	1.885 - 2.010	2	9	M48	3.0mm	21	6	C64321
1.260 - 1.323	1-5/16	13	M33	2.0mm	21	4	C64302	2.135 - 2.260	2-1/4	9	M56	3.0mm	21	6	C64323
1.323 - 1.385	1-3/8	13	–	–	21	4	C64303	2.385 - 2.510	2-1/2	9	–	–	21	6	C64325
1.385 - 1.448	1-7/16	13	M36	2.0mm	21	4	C64304	2.635 - 2.760	2-3/4	9	–	–	21	6	C64327
1.135 - 1.198	1-3/16	13	M30	2.0mm	21	6	C64306	2.760 - 2.885	2-7/8	9	M72	3.0mm	21	6	C64328
1.198 - 1.260	1-1/4	13	–	–	21	6	C64308	2.885 - 3.010	3	9	–	–	21	6	C64329
1.260 - 1.323	1-5/16	13	M33	2.0mm	21	6	C64310	3.135 - 3.260	3-1/4	9	M80	3.0mm	21	6	C64330

L Series dimensions: see USCTI Table 302



How to request Made-to-Order taps:

INFORMATION REQUIRED FOR EVERY ORDER:

- quantity
- ordering number

INFORMATION REQUIRED FOR SOME ORDERS, DEPENDING ON TOOL STYLE

- | | |
|---------------------------------------|------------------------|
| exact tool size | class of fit |
| threads per inch | chamfer |
| pitch | number of |
| thread form | chamfered threads |
| right-hand or left-hand configuration | chamfer angle |
| limit | number of lube grooves |
| pitch diameter | short projections |

OTHER FEATURES AVAILABLE

- surface treatment
- special hook
- male centers removed
- special back taper
- recessed neck
- shank flats
- special shank diameter
- special rake
- thread relief
- interrupted threads
- controlled root
- ETTCO notch
- shank grooves

Hand Taps

Styles 1001, 1001TN, 1002, 1002TN, 1003, 1003TN, 1004 • Hand Taps

DRILLING

HOLE FINISHING

FEATURES

USCT1 302	HSS SUBSTRATE
GENERAL PURPOSE	BRIGHT
BLIND HOLES	TiN
THRU HOLES	TAPER 7-10
GROUND THREAD	PLUG 3-5
	BOTTOMING 1 1/2 - 2

APPLICATIONS

ALLOY STEEL
CARBON STEEL
FREE-MACH STAINLESS
ALUMINUM



Style 1001 Taper Chamfer Bright



Style 1001 Taper Chamfer TiN-Coated



Style 1002 Plug Chamfer Bright



Style 1002 Plug Chamfer TiN-Coated

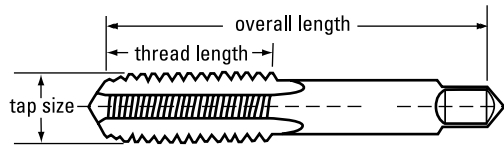


Style 1003 Bottoming Chamfer Bright



Style 1003 Bottoming Chamfer TiN-Coated

Tapping speeds are listed on page 155.



THREADING

MILLING

OTHER TOOLS

Tap Size and Pitch	Thread Form	Decimal Equiv.	Metric Equiv.	No of Flutes	H- Limit	Overall Length		Thread in	Length mm	Order Number		Bottoming 1003		1004/Set Bright		
						in	mm			Taper 1001 Bright	TiN	Plug 1002 Bright	TiN			
0-80	UNF	.0600	1.52	2	H1	1.625	41.28	.313	7.94	C54025	-	C54026	-	C54027	-	C54028
0-80	UNF	.0600	1.52	2	H2	1.625	41.28	.313	7.94	-	-	C54029	-	C54030	-	-
1-64	UNC	.0730	1.85	2	H1	1.688	42.86	.375	9.53	C54055	-	C54056	-	C54057	-	C54058
1-64	UNC	.0730	1.85	2	H2	1.688	42.86	.375	9.53	-	-	C54059	-	-	-	-
1-72	UNF	.0730	1.85	2	H1	1.688	42.88	.375	9.53	C54060	-	C54061	-	C54062	-	C54063
1-72	UNF	.0730	1.85	2	H2	1.688	42.88	.375	9.53	-	-	C54064	-	C54065	-	-
2-56	UNC	.0860	2.18	3	H1	1.750	44.45	.375	9.53	C54083	-	C54084	-	C54085	-	C54086
2-56	UNC	.0860	2.18	2	H2	1.750	44.45	.375	9.53	-	-	C54087	-	C54088	-	-
2-56	UNC	.0860	2.18	3	H2	1.750	44.45	.375	9.53	C54089	-	C54090	-	C54091	-	C54092
2-64	UNC	.0860	2.18	3	H2	1.750	44.45	.438	11.11	C54093	-	C54094	-	C54095	-	C54096
3-48	UNC	.0990	2.51	3	H1	1.813	46.04	.500	12.70	-	-	C54112	-	-	-	-
3-48	UNC	.0990	2.51	2	H2	1.813	46.04	.500	12.70	-	-	C54113	-	C54114	-	-
3-48	UNC	.0990	2.51	3	H2	1.813	46.04	.500	12.70	C54115	-	C54116	-	C54117	-	C54118
3-56	UNF	.0990	2.51	3	H2	1.813	46.04	.500	12.70	C54120	-	C54121	-	C54122	-	C54123
4-36	UNS	.1120	2.84	3	H2	1.875	47.63	.563	14.30	C54139	-	C54140	-	C54141	-	C54137
4-40	UNC	.1120	2.84	2	H1	1.875	47.63	.563	14.29	-	-	C54142	-	-	-	-
4-40	UNC	.1120	2.84	2	H2	1.875	47.63	.563	14.29	-	-	C54147	-	C54148	-	-
4-40	UNC	.1120	2.84	3	H2	1.875	47.63	.563	14.29	C54149	-	C54150	-	C54151	-	C54152
4-48	UNF	.1120	2.84	3	H2	1.875	47.63	.563	14.29	C54153	-	C54154	-	C54155	-	C54156
5-40	UNC	.1250	3.18	3	H1	1.938	49.21	.625	15.88	-	-	C54185	-	-	-	-
5-40	UNC	.1250	3.18	2	H2	1.938	49.21	.625	15.88	-	-	C54186	-	C54187	-	-
5-40	UNC	.1250	3.18	3	H2	1.938	49.21	.625	15.88	C54188	-	C54189	-	C54190	-	C54191
5-44	UNF	.1250	3.18	3	H2	1.938	49.21	.625	15.88	C54192	-	C54193	-	C54194	-	C54195
6-32	UNC	.1380	3.51	2	H1	2.000	50.80	.688	17.46	-	-	C54210	-	-	-	-
6-32	UNC	.1380	3.51	3	H1	2.000	50.80	.688	17.46	C54211	-	C54212	-	C54213	-	-
6-32	UNC	.1380	3.51	2	H2	2.000	50.80	.688	17.46	-	-	C54215	-	C54216	-	-
6-32	UNC	.1380	3.51	3	H2	2.000	50.80	.688	17.46	C54217	-	C54218	-	C54219	-	C54226
6-32	UNC	.1380	3.51	2	H3	2.000	50.80	.688	17.46	-	-	C54221	-	C54222	-	-
6-32	UNC	.1380	3.51	3	H3	2.000	50.80	.688	17.46	C54223	-	C54224	C55100	C54225	C55200	C54220
6-32	UNC	.1380	3.51	3	H7	2.000	50.80	.688	17.46	-	-	C54227	-	C54228	-	-
6-32	UNC	.1380	3.51	3	H11	2.000	50.80	.688	17.46	-	-	C60122	-	-	-	-



Hand Taps

Styles 1001, 1001TN, 1002, 1002TN, 1003, 1003TN, 1004 • Hand Taps (continued)

Tap Size and Pitch	Thread Form	Decimal Equiv.	Metric Equiv.	No of Flutes	H-Limit	Overall Length in	Length mm	Thread in	Length mm	Order Number						
										Taper 1001 Bright	TiN	Plug 1002 Bright	TiN	Bottoming 1003 Bright	TiN	1004/Set Bright
6-40	UNF	.1380	3.51	3	H1	2.000	50.80	.688	17.46	-	-	C54230	-	-	-	-
6-40	UNF	.1380	3.51	2	H2	2.000	50.80	.688	17.46	-	-	C54231	-	-	-	-
6-40	UNF	.1380	3.51	3	H2	2.000	50.80	.688	17.46	C54232	-	C54233	C55102	C54234	C55202	C54235
8-32	UNC	.1640	4.17	2	H1	2.125	53.98	.750	19.05	-	-	C54256	-	-	-	-
8-32	UNC	.1640	4.17	4	H1	2.125	53.98	.750	19.05	C54260	-	C54261	-	C54262	-	C54263
8-32	UNC	.1640	4.17	2	H2	2.125	53.98	.750	19.05	-	-	C54264	-	C54265	-	-
8-32	UNC	.1640	4.17	3	H2	2.125	53.98	.750	19.05	-	-	C54267	-	C54268	-	-
8-32	UNC	.1640	4.17	4	H2	2.125	53.98	.750	19.05	C54269	-	C54270	-	C54271	-	C54272
8-32	UNC	.1640	4.17	2	H3	2.125	53.98	.750	19.05	-	-	C54273	-	C54274	-	-
8-32	UNC	.1640	4.17	3	H3	2.125	53.98	.750	19.05	-	-	C54275	-	C54276	-	-
8-32	UNC	.1640	4.17	4	H3	2.125	53.98	.750	19.05	C54277	C54307	C54278	C55104	C54279	C55204	C54280
8-32	UNC	.1640	4.17	3	H7	2.125	53.98	.750	19.05	-	-	C54281	-	C54282	-	-
8-32	UNC	.1640	4.17	4	H7	2.125	53.98	.750	19.05	-	-	C54283	-	C54284	-	-
8-32	UNC	.1640	4.17	4	H11	2.125	53.98	.750	19.05	-	-	C60130	-	-	-	-
8-36	UNF	.1640	4.17	4	H2	2.125	53.98	.750	19.05	C54289	-	C54290	C55106	C54291	C55206	C54292
10-24	UNC	.1900	4.83	4	H1	2.375	60.33	.875	22.23	C54314	-	C54315	-	C54316	-	C54317
10-24	UNC	.1900	4.83	2	H2	2.375	60.33	.875	22.23	-	-	C54318	-	C54319	-	-
10-24	UNC	.1900	4.83	3	H2	2.375	60.33	.875	22.23	-	-	C54320	-	-	-	-
10-24	UNC	.1900	4.83	4	H2	2.375	60.33	.875	22.23	C54321	-	C54322	-	C54323	-	C54324
10-24	UNC	.1900	4.83	2	H3	2.375	60.33	.875	22.23	-	-	C54325	-	C54326	-	-
10-24	UNC	.1900	4.83	3	H3	2.375	60.33	.875	22.23	-	-	C54327	-	C54328	-	-
10-24	UNC	.1900	4.83	4	H3	2.375	60.33	.875	22.23	C54329	-	C54330	C55108	C54331	C55208	C54332
10-24	UNC	.1900	4.83	3	H7	2.375	60.33	.875	22.23	-	-	-	-	C54334	-	-
10-24	UNC	.1900	4.83	4	H7	2.375	60.33	.875	22.23	-	-	C54333	-	-	-	-
10-24	UNC	.1900	4.83	4	H11	2.375	60.33	.875	22.23	-	-	C60138	-	-	-	-
10-32	UNF	.1900	4.83	2	H1	2.375	60.33	.875	22.23	-	-	C54338	-	-	-	-
10-32	UNF	.1900	4.83	4	H1	2.375	60.33	.875	22.23	C54339	-	C54340	-	C54341	-	C54342
10-32	UNF	.1900	4.83	2	H2	2.375	60.33	.875	22.23	-	-	C54343	-	C54344	-	-
10-32	UNF	.1900	4.83	3	H2	2.375	60.33	.875	22.23	-	-	C54346	-	C54347	-	-
10-32	UNF	.1900	4.83	4	H2	2.375	60.33	.875	22.23	C54348	-	C54349	-	C54350	-	C54351
10-32	UNF	.1900	4.83	2	H3	2.375	60.33	.875	22.23	-	-	C54352	-	C54353	-	-
10-32	UNF	.1900	4.83	3	H3	2.375	60.33	.875	22.23	-	-	C54354	-	C54355	-	-
10-32	UNF	.1900	4.83	4	H3	2.375	60.33	.875	22.23	C54356	C54309	C54357	C55110	C54358	C55210	C54359
10-32	UNF	.1900	4.83	3	H7	2.375	60.33	.875	22.23	-	-	C54360	-	C54361	-	-
10-32	UNF	.1900	4.83	4	H7	2.375	60.33	.875	22.23	-	-	C54362	-	C54363	-	-
10-32	UNF	.1900	4.83	4	H11	2.375	60.33	.875	22.23	-	-	C60142	-	-	-	-
12-24	UNC	.2160	5.49	4	H3	2.375	60.33	.938	23.81	C54385	-	C54386	C55112	C54387	C55212	C54388
12-28	UNF	.2160	5.49	4	H3	2.375	60.33	.938	23.81	C54389	-	C54390	C55114	C54391	C55214	C54392
12-32	UNEF	.2160	5.49	4	H3	2.375	60.33	.938	23.81	-	-	C60146	-	-	-	-
1/4-20	UNC	.2500	6.35	3	H1	2.500	63.50	1.000	25.40	-	-	C54446	-	-	-	-
1/4-20	UNC	.2500	6.35	4	H1	2.500	63.50	1.000	25.40	C54443	-	C54444	-	C54445	-	C54447
1/4-20	UNC	.2500	6.35	3	H2	2.500	63.50	1.000	25.40	-	-	C54451	-	-	-	-
1/4-20	UNC	.2500	6.35	4	H2	2.500	63.50	1.000	25.40	C54448	-	C54449	-	C54450	-	C54452
1/4-20	UNC	.2500	6.35	2	H3	2.500	63.50	1.000	25.40	-	-	C54456	-	C54457	-	-
1/4-20	UNC	.2500	6.35	3	H3	2.500	63.50	1.000	25.40	-	-	C54458	-	C54459	-	-
1/4-20	UNC	.2500	6.35	4	H3	2.500	63.50	1.000	25.40	C54453	-	C54454	C55116	C54455	C55216	C54460
1/4-20	UNC	.2500	6.35	3	H5	2.500	63.50	1.000	25.40	-	-	C54463	-	-	-	-
1/4-20	UNC	.2500	6.35	4	H5	2.500	63.50	1.000	25.40	-	-	C54461	-	C54462	-	-
1/4-20	UNC	.2500	6.35	4	H11	2.500	63.50	1.000	25.40	-	-	C54464	-	-	-	-
1/4-28	UNF	.2500	6.35	4	H1	2.500	63.50	1.000	25.40	-	-	C54465	-	C54466	-	-
1/4-28	UNF	.2500	6.35	4	H2	2.500	63.50	1.000	25.40	-	-	C54467	-	C54468	-	-

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DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

General-Purpose Taps

Hand Taps

Styles 1001, 1001TN, 1002, 1002TN, 1003, 1003TN, 1004 • Hand Taps (continued)

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Tap Size and Pitch	Thread Form	Decimal Equiv.	Metric Equiv.	No of Flutes	H-Limit	Overall Length in	Length mm	Thread in	Length mm	Order Number						
										Taper 1001 Bright	TiN	Plug 1002 Bright	TiN	Bottoming 1003 Bright	TiN	1004/Set Bright
1/4-28	UNF	.2500	6.35	2	H3	2.500	63.50	1.000	25.40	-	-	C54472	-	C54473	-	-
1/4-28	UNF	.2500	6.35	3	H3	2.500	63.50	1.000	25.40	-	-	C54474	-	C54475	-	-
1/4-28	UNF	.2500	6.35	4	H3	2.500	63.50	1.000	25.40	C54469	-	C54470	C55118	C54471	C55218	C54476
1/4-28	UNF	.2500	6.35	4	H4	2.500	63.50	1.000	25.40	-	-	C54477	-	C54478	-	-
1/4-28	UNF	.2500	6.35	4	H11	2.500	63.50	1.000	25.40	-	-	C60162	-	-	-	-
1/4-32	UNEF	.2500	6.35	4	H11	2.500	63.50	1.000	25.40	C60165	-	C60166	-	C60167	-	-
5/16-18	UNC	.3125	7.94	4	H1	2.719	69.06	1.125	28.58	-	-	C54499	-	C54500	-	-
5/16-18	UNC	.3125	7.94	4	H2	2.719	69.06	1.125	28.58	-	-	C54502	-	C54503	-	-
5/16-18	UNC	.3125	7.94	2	H3	2.719	69.06	1.125	28.58	-	-	C54507	-	C54508	-	-
5/16-18	UNC	.3125	7.94	3	H3	2.719	69.06	1.125	28.58	-	-	C54509	-	C54510	-	-
5/16-18	UNC	.3125	7.94	4	H3	2.719	69.06	1.125	28.58	C54504	-	C54505	C55120	C54506	C55220	C54511
5/16-18	UNC	.3125	7.94	4	H5	2.719	69.06	1.125	28.58	-	-	C54512	-	C54513	-	-
5/16-18	UNC	.3125	7.94	4	H11	2.719	69.06	1.125	28.58	-	-	C54514	-	-	-	-
5/16-24	UNF	.3125	7.94	4	H1	2.719	69.06	1.125	28.58	-	-	C54515	-	C54516	-	-
5/16-24	UNF	.3125	7.94	4	H2	2.719	69.06	1.125	28.58	-	-	C54517	-	-	-	-
5/16-24	UNF	.3125	7.94	3	H3	2.719	69.06	1.125	28.58	-	-	C54521	-	C54522	-	-
5/16-24	UNF	.3125	7.94	4	H3	2.719	69.06	1.125	28.58	C54518	-	C54519	C55122	C54520	C55222	C54523
5/16-24	UNF	.3125	7.94	4	H4	2.719	69.06	1.125	28.58	-	-	C54524	-	C54525	-	-
5/16-24	UNF	.3125	7.94	4	H11	2.719	69.06	1.125	28.58	-	-	C60194	-	-	-	-
5/16-32	UNEF	.3125	7.94	4	H3	2.719	69.06	1.125	28.58	C60201	-	C60202	-	C60203	-	-
3/8-16	UNC	.3750	9.53	4	H1	2.938	74.61	1.250	31.75	-	-	C54577	-	C54578	-	-
3/8-16	UNC	.3750	9.53	4	H2	2.938	74.61	1.250	31.75	-	-	C54580	-	C54581	-	-
3/8-16	UNC	.3750	9.53	3	H3	2.938	74.61	1.250	31.75	-	-	C54585	-	C54586	-	-
3/8-16	UNC	.3750	9.53	4	H3	2.938	74.61	1.250	31.75	C54582	-	C54583	C55124	C54584	C55224	C54587
3/8-16	UNC	.3750	9.53	4	H5	2.938	74.61	1.250	31.75	-	-	C54588	-	C54589	-	-
3/8-16	UNC	.3750	9.53	4	H11	2.938	74.61	1.250	31.75	-	-	C54590	-	-	-	-
3/8-24	UNF	.3750	9.53	4	H1	2.938	74.61	1.250	31.75	-	-	C54591	-	C54592	-	-
3/8-24	UNF	.3750	9.53	4	H2	2.938	74.61	1.250	31.75	-	-	C54593	-	C54594	-	-
3/8-24	UNF	.3750	9.53	3	H3	2.938	74.61	1.250	31.75	-	-	C54598	-	C54599	-	-
3/8-24	UNF	.3750	9.53	4	H3	2.938	74.61	1.250	31.75	C54595	-	C54596	C55126	C54597	C55226	C54600
3/8-24	UNF	.3750	9.53	4	H4	2.938	74.61	1.250	31.75	-	-	C54601	-	C54602	-	-
3/8-24	UNF	.3750	9.53	4	H11	2.938	74.61	1.250	31.75	-	-	C60226	-	-	-	-
3/8-32	UNEF	.3750	9.53	4	H3	2.938	74.61	1.250	31.75	C60233	-	C60234	-	C60235	-	-
7/16-14	UNC	.4375	11.11	3	H3	3.156	80.17	1.438	36.51	-	-	C54655	-	-	-	-
7/16-14	UNC	.4375	11.11	4	H3	3.156	80.17	1.438	36.51	C54652	-	C54653	C55128	C54654	C55228	C54656
7/16-14	UNC	.4375	11.11	4	H5	3.156	80.17	1.438	36.51	-	-	C54658	-	C54659	-	-
7/16-14	UNC	.4375	11.11	4	H11	3.156	80.17	1.438	36.51	-	-	C54660	-	-	-	-
7/16-20	UNF	.4375	11.11	3	H3	3.156	80.17	1.438	36.51	-	-	C54664	-	-	-	-
7/16-20	UNF	.4375	11.11	4	H3	3.156	80.17	1.438	36.51	C54661	-	C54662	C55130	C54663	C55230	C54665
7/16-20	UNF	.4375	11.11	4	H5	3.156	80.17	1.438	36.51	-	-	C54666	-	C54667	-	-
7/16-20	UNF	.4375	11.11	4	H11	3.156	80.17	1.438	36.51	-	-	C60254	-	-	-	-
7/16-28	UNEF	.4375	11.11	4	H3	3.156	80.17	1.438	36.51	-	-	C60266	-	C60267	-	-
1/2-13	UNC	.5000	12.70	4	H1	3.375	85.73	1.656	42.06	-	-	C54724	-	-	-	-
1/2-13	UNC	.5000	12.70	3	H3	3.375	85.73	1.656	42.06	-	-	C54729	-	C54730	-	-
1/2-13	UNC	.5000	12.70	4	H3	3.375	85.73	1.656	42.06	C54726	-	C54727	C55132	C54728	C55232	C54731
1/2-13	UNC	.5000	12.70	4	H5	3.375	85.73	1.656	42.06	-	-	C54732	-	C54733	-	-
1/2-13	UNC	.5000	12.70	4	H11	3.375	85.73	1.656	42.06	-	-	C54734	-	-	-	-

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General-Purpose Taps Hand Taps

Styles 1001, 1001TN, 1002, 1002TN, 1003, 1003TN, 1004 • Hand Taps (continued)

Tap Size and Pitch	Thread Form	Decimal Equiv.	Metric Equiv.	No of Flutes	H- Limit	Overall Length		Thread Length		Order Number						
										Taper 1001		Plug 1002		Bottoming 1003		1004/Set
						in	mm	in	mm	Bright	TiN	Bright	TiN	Bright	TiN	Bright
1/2-20	UNF	.5000	12.70	4	H1	3.375	85.73	1.656	42.06	-	-	C54735	-	C54736	-	-
1/2-20	UNF	.5000	12.70	3	H3	3.375	85.73	1.656	42.06	-	-	C54740	-	-	-	-
1/2-20	UNF	.5000	12.70	4	H3	3.375	85.73	1.656	42.06	C54737	-	C54738	C55134	C54739	C55234	C54741
1/2-20	UNF	.5000	12.70	4	H5	3.375	85.73	1.656	42.06	-	-	C54742	-	-	-	-
1/2-20	UNF	.5000	12.70	4	H11	3.375	85.73	1.656	42.06	-	-	C60294	-	-	-	-
1/2-28	UNEF	.5000	12.70	4	H3	3.375	85.73	1.656	42.06	-	-	C60302	-	C60303	-	-
9/16-12	UNC	.5625	14.29	4	H3	3.594	91.28	1.656	42.07	C54759	-	C54760	C55136	C54761	C55236	C54762
9/16-12	UNC	.5625	14.29	4	H5	3.594	91.28	1.656	42.07	-	-	C54763	-	-	-	-
9/16-18	UNF	.5625	14.29	4	H2	3.594	91.28	1.656	42.07	-	-	C54764	-	-	-	-
9/16-18	UNF	.5625	14.29	4	H3	3.594	91.28	1.656	42.07	C54765	-	C54766	C55138	C54767	C55238	C54768
9/16-18	UNF	.5625	14.29	4	H5	3.594	91.28	1.656	42.07	-	-	C54769	-	-	-	-
9/16-24	UNEF	.5625	14.29	4	H3	3.594	91.28	1.656	42.07	-	-	C60326	-	C60327	-	-
5/8-11	UNC	.6250	15.88	4	H2	3.813	96.84	1.813	46.04	-	-	C54778	-	-	-	-
5/8-11	UNC	.6250	15.88	4	H3	3.813	96.84	1.813	46.04	C54779	-	C54780	C55140	C54781	C55240	C54782
5/8-11	UNC	.6250	15.88	4	H5	3.813	96.84	1.813	46.04	-	-	C54783	-	C54784	-	-
5/8-11	UNC	.6250	15.88	4	H11	3.813	96.84	1.813	46.04	-	-	C54785	-	-	-	-
5/8-18	UNF	.6250	15.88	4	H2	3.813	96.84	1.813	46.04	-	-	C54786	-	-	-	-
5/8-18	UNF	.6250	15.88	4	H3	3.813	96.84	1.813	46.04	C54787	-	C54788	C55142	C54789	C55242	C54790
5/8-18	UNF	.6250	15.88	4	H5	3.813	96.84	1.813	46.04	-	-	C54791	-	C54792	-	-
5/8-18	UNF	.6250	15.88	4	H11	3.813	96.84	1.813	46.04	-	-	C60354	-	-	-	-
5/8-24	UNEF	.6250	15.88	4	H3	3.813	96.84	1.813	46.04	-	-	C60362	-	C60363	-	-
11/16-11	UNC	.6875	17.46	4	H3	4.031	102.39	1.813	46.04	C54813	-	C54814	-	C54815	-	C54816
11/16-16	UNF	.6875	17.46	4	H3	4.031	102.39	1.813	46.04	C54817	-	C54818	-	C54819	-	C54820
3/4-10	UNC	.7500	19.05	4	H2	4.250	107.95	2.000	50.80	-	-	C54837	-	-	-	-
3/4-10	UNC	.7500	19.05	4	H3	4.250	107.95	2.000	50.80	C54838	-	C54839	C55144	C54840	C55244	C54841
3/4-10	UNC	.7500	19.05	4	H5	4.250	107.95	2.000	50.80	-	-	C54842	-	C54843	-	-
3/4-10	UNC	.7500	19.05	4	H11	4.250	107.95	2.000	50.80	-	-	C60398	-	-	-	-
3/4-16	UNF	.7500	19.05	4	H1	4.250	107.95	2.000	50.80	-	-	C54844	-	-	-	-
3/4-16	UNF	.7500	19.05	4	H2	4.250	107.95	2.000	50.80	-	-	C54845	-	-	-	-
3/4-16	UNF	.7500	19.05	4	H3	4.250	107.95	2.000	50.80	C54846	-	C54847	C55146	C54848	C55246	C54849
3/4-16	UNF	.7500	19.05	4	H5	4.250	107.95	2.000	50.80	-	-	C54850	-	C54851	-	-
3/4-16	UNF	.7500	19.05	4	H11	4.250	107.95	2.000	50.80	-	-	C60406	-	-	-	-
3/4-20	UNEF	.7500	19.05	4	H3	4.250	107.95	2.000	50.80	C60413	-	C60414	-	C60415	-	-
7/8-9	UNC	.8750	22.23	4	H4	4.688	119.06	2.219	56.36	C54884	-	C54885	C55148	C54886	C55248	C54887
7/8-9	UNC	.8750	22.23	4	H6	4.688	119.06	2.219	56.36	-	-	C54888	-	-	-	-
7/8-14	UNF	.8750	22.23	4	H2	4.688	119.06	2.219	56.36	-	-	C54889	-	-	-	-
7/8-14	UNF	.8750	22.23	4	H4	4.688	119.06	2.219	56.36	C54890	-	C54891	C55150	C54892	C55250	C54893
7/8-20	UNEF	.8750	22.23	4	H4	4.688	119.06	2.219	56.36	-	-	C60474	-	C60475	-	-
1-8	UNC	1.0000	25.40	4	H4	5.125	130.18	2.500	63.50	C54923	-	C54924	C55152	C54925	C55252	C54926
1-8	UNC	1.0000	25.40	4	H6	5.125	130.18	2.500	63.50	-	-	C54927	-	-	-	-
1-12	UNF	1.0000	25.40	4	H4	5.125	130.18	2.500	63.50	C54928	-	C54929	C55154	C54930	C55254	C54931
1-14	UNS	1.0000	25.40	4	H4	5.125	130.18	2.500	63.50	C54933	-	C54934	-	C54935	-	C54936
1-20	UNEF	1.0000	25.40	4	H3	5.125	130.18	2.500	63.50	-	-	C60522	-	C60523	-	-
1-1/8 - 7	UNC	1.1250	28.58	4	H4	5.438	138.11	2.563	65.09	C54965	-	C54966	-	C54967	-	-
1-1/8 - 12	UNC	1.1250	28.58	4	H4	5.438	138.11	2.563	65.09	C54971	-	C54972	-	C54973	-	-
1-1/4 - 7	UNC	1.2500	31.75	4	H4	5.750	146.05	2.563	65.09	C54994	-	C54995	-	C54996	-	-
1-1/4 - 12	UNF	1.2500	31.75	6	H4	5.750	146.05	2.563	65.09	C55000	-	C55001	-	C55002	-	-
1-3/8 - 6	UNC	1.3750	34.93	4	H4	5.750	146.05	2.563	65.09	C55027	-	C55028	-	C55029	-	-
1-3/8 - 12	UNF	1.3750	34.93	6	H4	5.750	146.05	2.563	65.09	C55030	-	C55031	-	C55032	-	-
1-1/2 - 6	UNC	1.5000	38.10	4	H4	6.375	161.93	3.000	76.20	C55057	-	C55058	-	C55059	-	-
1-1/2 - 12	UNF	1.5000	38.10	6	H4	6.375	161.93	3.000	76.20	C55063	-	C55064	-	C55065	-	-

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS



General-Purpose Taps

Hand Taps

Styles 1001, 1002, 1003 • Hand Taps (continued)

Metric Sizes

Tap Size and Pitch	Decimal Equivalent	Metric Equivalent	No of Flutes	D-Limit	Overall Length		Thread Length		Order Number		
					in	mm	in	mm	Taper 1001 Bright	Plug 1002 Bright	Bottoming 1003 Bright
M1.6 x 0.35	.0630	1.60	2	D3	1.625	41.28	.313	7.94	C54043	C54044	C54045
M1.8 x 0.35	.0709	1.80	2	D3	1.625	41.28	.313	7.94	C54051	C54052	C54053
M2 x 0.4	.0787	2.00	3	D3	1.750	44.45	.438	11.11	C54073	C54074	C54075
M2.2 x 0.45	.0866	2.20	3	D3	1.750	44.45	.438	11.11	C54105	C54106	C54107
M2.5 x 0.45	.0984	2.50	3	D3	1.813	46.04	.500	12.70	C54131	C54132	C54133
M3 x 0.5	.1181	3.00	3	D3	1.938	49.21	.625	15.88	C54164	C54165	C54166
M3.5 x 0.6	.1378	3.50	3	D4	2.000	50.80	.688	17.46	C54203	C54204	C54205
M4 x 0.7	.1575	4.00	3	D4	2.125	53.98	.750	19.05	C54246	C54247	C54248
M4.5 x 0.75	.1771	4.50	4	D4	2.375	60.33	.875	22.23	C54303	C54304	C54305
M5 x 0.8	.1968	5.00	4	D4	2.375	60.33	.875	22.23	C54374	C54375	C54376
M6 x 1	.2362	6.00	4	D5	2.500	63.50	1.000	25.40	C54413	C54414	C54415
M7 x 1	.2756	7.00	4	D5	2.719	69.06	1.125	28.58	C54489	C54490	C54491
M8 x 1	.3150	8.00	4	D5	2.719	69.06	1.125	28.58	C54536	C54537	C54538
M8 x 1.25	.3150	8.00	4	D5	2.719	69.06	1.125	28.58	C54546	C54547	C54548
M10 x 1.25	.3937	10.00	4	D5	2.938	74.61	1.250	31.75	C54617	C54618	C54619
M10 x 1.5	.3937	10.00	4	D6	2.938	74.61	1.250	31.75	C54624	C54625	C54626
M12 x 1.25	.4724	12.00	4	D5	3.375	85.73	1.656	42.07	C54675	C54676	C54677
M12 x 1.75	.4724	12.00	4	D6	3.375	85.73	1.656	42.07	C54689	C54690	C54691
M14 x 1.5	.5512	14.00	4	D6	3.594	91.28	1.656	42.07	C54751	C54752	C54753
M14 x 2	.5512	14.00	4	D7	3.594	91.28	1.656	42.07	C54755	C54756	C54757
M16 x 1.5	.6299	16.00	4	D6	3.813	96.84	1.813	46.04	C54797	C54798	C54799
M16 x 2	.6299	16.00	4	D7	3.813	96.84	1.813	46.04	C54801	C54802	C54803
M18 x 1.5	.7087	18.00	4	D6	4.031	102.39	1.813	46.04	C54825	C54826	C54827
M18 x 2.5	.7087	18.00	4	D7	4.031	102.39	1.813	46.04	C54833	C54834	C54835
M20 x 1.5	.7874	20.00	4	D6	4.469	113.51	2.000	50.80	C54856	C54857	C54858
M20 x 2.5	.7874	20.00	4	D7	4.469	113.51	2.000	50.80	C54864	C54865	C54866
M22 x 1.5	.8661	22.00	4	D6	4.688	119.06	2.219	56.36	C54872	C54873	C54874
M22 x 2.5	.8661	22.00	4	D7	4.688	119.06	2.219	56.36	C54880	C54881	C54882
M24 x 2	.9449	24.00	4	D7	4.906	124.62	2.219	56.36	C54903	C54904	C54905
M24 x 3	.9449	24.00	4	D8	4.906	124.62	2.219	56.36	C54907	C54908	C54909
M27 x 2	1.0630	27.00	4	D7	5.125	130.18	2.500	63.50	C54949	C54950	C54951
M27 x 3	1.0630	27.00	4	D8	5.125	130.18	2.500	63.50	C54953	C54954	C54955
M30 x 2	1.1811	30.00	4	D7	5.438	138.11	2.563	65.09	C54982	C54983	C54984
M30 x 3.5	1.1811	30.00	4	D9	5.438	138.11	2.563	65.09	C54990	C54991	C54992
M33 x 2	1.2992	33.00	4	D7	5.750	146.05	2.563	65.09	C55015	C55016	C55017
M33 x 3.5	1.2992	33.00	4	D9	5.750	146.05	2.563	65.09	C55023	C55024	C55025
M36 x 3	1.4173	36.00	4	D8	6.063	153.99	3.000	76.20	C55045	C55046	C55047
M36 x 4	1.4173	36.00	4	D9	6.063	153.99	3.000	76.20	C55049	C55050	C55051
M39 x 3	1.5354	39.00	4	D8	6.688	169.86	3.188	80.96	C55074	C55075	C55076
M39 x 4	1.5454	39.25	4	D9	6.688	169.86	3.188	80.96	C55078	C55079	C55080

DRILLING

HOLE FINISHING

THREADING

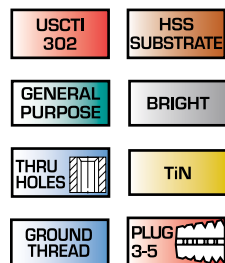
MILLING

OTHER TOOLS

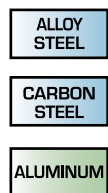


Styles 1011, 1011TN • Spiral Point Taps

FEATURES



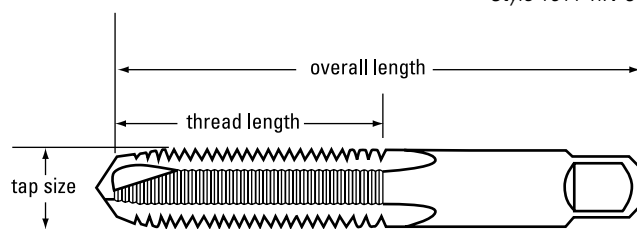
APPLICATIONS



Style 1011 Bright



Style 1011 TiN-Coated



Tapping speeds are listed on page 155.

Tap Size and Pitch	Thread Form	Decimal Equiv.	Metric Equiv.	Number of Flutes	H-Limit	Overall Length		Thread Length		Order Number	
						in	mm	in	mm	Bright	TiN
0-80	UNC	.0600	1.52	2	H1	1.688	42.86	.375	9.53	C57009	–
0-80	UNC	.0600	1.52	2	H2	1.688	42.86	.375	9.53	C57011	C55290
1-64	UNC	.0730	1.85	2	H1	1.688	42.86	.375	9.53	C57021	–
1-64	UNC	.0730	1.85	2	H2	1.688	42.86	.375	9.53	C57022	–
1-72	UNF	.0730	1.85	2	H1	1.688	42.86	.375	9.53	C57023	–
1-72	UNF	.0730	1.85	2	H2	1.688	42.86	.375	9.53	C57024	–
2-56	UNC	.0860	2.18	2	H1	1.750	44.45	.438	11.11	C57029	–
2-56	UNC	.0860	2.18	2	H2	1.750	44.45	.438	11.11	C57031	C55292
2-64	UNC	.0860	2.18	2	H2	1.750	44.45	.438	11.11	C57033	–
3-48	UNC	.0990	2.51	2	H2	1.813	46.04	.500	12.70	C57038	C55294
3-56	UNF	.0990	2.51	2	H1	1.813	46.04	.500	12.70	C57040	–
3-56	UNF	.0990	2.51	2	H2	1.813	46.04	.500	12.70	C57041	–
4-40	UNC	.1120	2.84	2	H1	1.875	47.63	.563	14.29	C57047	–
4-40	UNC	.1120	2.84	2	H2	1.875	47.63	.563	14.29	C57048	C55296
4-48	UNF	.1120	2.84	2	H2	1.875	47.63	.563	14.29	C57051	–
5-40	UNC	.1250	3.18	2	H1	1.938	49.21	.625	15.88	C57061	–
5-40	UNC	.1250	3.18	2	H2	1.938	49.21	.625	15.88	C57062	C55298
5-44	UNF	.1250	3.18	2	H2	1.938	49.21	.625	15.88	C57064	–
6-32	UNC	.1380	3.51	2	H1	2.000	50.80	.688	17.46	C57069	–
6-32	UNC	.1380	3.51	2	H2	2.000	50.80	.688	17.46	C57070	–
6-32	UNC	.1380	3.51	2	H3	2.000	50.80	.688	17.46	C57072	C55300
6-32	UNC	.1380	3.51	2	H7	2.000	50.80	.688	17.46	C57074	–
6-40	UNF	.1380	3.51	2	H2	2.000	50.80	.688	17.46	C57076	C55302
8-32	UNC	.1640	4.17	2	H1	2.125	53.98	.750	19.05	C57082	–
8-32	UNC	.1640	4.17	2	H2	2.125	53.98	.750	19.05	C57083	–
8-32	UNC	.1640	4.17	2	H3	2.125	53.98	.750	19.05	C57085	C55304
8-32	UNC	.1640	4.17	2	H7	2.125	53.98	.750	19.05	C57087	–
8-36	UNF	.1640	4.17	2	H2	2.125	53.98	.750	19.05	C57089	C55306
10-24	UNC	.1900	4.83	2	H1	2.375	60.33	.875	22.23	C57094	–
10-24	UNC	.1900	4.83	2	H2	2.375	60.33	.875	22.23	C57095	–
10-24	UNC	.1900	4.83	2	H3	2.375	60.33	.875	22.23	C57097	C55308
10-24	UNC	.1900	4.83	2	H7	2.375	60.33	.875	22.23	C57099	–

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DRILLING
HOLE FINISHING
THREADING
MILLING
OTHER TOOLS

General-Purpose Taps

Spiral Point

Styles 1011, 1011TN • Spiral Point (continued)

Tap Size and Pitch	Thread Form	Decimal Equiv.	Metric Equiv.	Number of Flutes	H-Limit	Overall Length		Thread Length		Order Number	
						in	mm	in	mm	Bright	TiN
10-32	UNF	.1900	4.83	2	H1	2.375	60.33	.875	22.23	C57100	–
10-32	UNF	.1900	4.83	2	H2	2.375	60.33	.875	22.23	C57102	–
10-32	UNF	.1900	4.83	2	H3	2.375	60.33	.875	22.23	C57104	C55310
10-32	UNF	.1900	4.83	2	H7	2.375	60.33	.875	22.23	C57106	–
12-24	UNC	.2160	5.49	2	H3	2.375	60.33	.938	23.81	C57112	C55312
12-28	UNF	.2160	5.49	2	H3	2.375	60.33	.938	23.81	C57114	–
1/4-20	UNC	.2500	6.35	2	H1	2.500	63.50	1.000	25.40	C57127	–
1/4-20	UNC	.2500	6.35	2	H2	2.500	63.50	1.000	25.40	C57128	C55315
1/4-20	UNC	.2500	6.35	2	H3	2.500	63.50	1.000	25.40	C57129	C55316
1/4-20	UNC	.2500	6.35	3	H3	2.500	63.50	1.000	25.40	C57130	–
1/4-20	UNC	.2500	6.35	2	H5	2.500	63.50	1.000	25.40	C57132	C55317
1/4-20	UNC	.2500	6.35	3	H5	2.500	63.50	1.000	25.40	C57133	–
1/4-20	UNC	.2500	6.35	2	H11	2.500	63.50	1.000	25.40	C57135	–
1/4-28	UNF	.2500	6.35	2	H1	2.500	63.50	1.000	25.40	C57136	–
1/4-28	UNF	.2500	6.35	2	H2	2.500	63.50	1.000	25.40	C57137	–
1/4-28	UNF	.2500	6.35	3	H2	2.500	63.50	1.000	25.40	C57138	–
1/4-28	UNF	.2500	6.35	2	H3	2.500	63.50	1.000	25.40	C57139	C55318
1/4-28	UNF	.2500	6.35	2	H4	2.500	63.50	1.000	25.40	C57141	–
1/4-28	UNF	.2500	6.35	3	H4	2.500	63.50	1.000	25.40	C57142	–
5/16-18	UNC	.3125	7.94	2	H1	2.719	69.06	1.125	28.58	C57149	–
5/16-18	UNC	.3125	7.94	2	H2	2.719	69.06	1.125	28.58	C57150	–
5/16-18	UNC	.3125	7.94	2	H3	2.719	69.06	1.125	28.58	C57151	C55320
5/16-18	UNC	.3125	7.94	3	H3	2.719	69.06	1.125	28.58	C57152	–
5/16-18	UNC	.3125	7.94	2	H5	2.719	69.06	1.125	28.58	C57154	–
5/16-18	UNC	.3125	7.94	3	H5	2.719	69.06	1.125	28.58	C57155	–
5/16-24	UNF	.3125	7.94	2	H1	2.719	69.06	1.125	28.58	C57157	–
5/16-24	UNF	.3125	7.94	2	H2	2.719	69.06	1.125	28.58	C57158	–
5/16-24	UNF	.3125	7.94	3	H3	2.719	69.06	1.125	28.58	C57159	–
5/16-24	UNF	.3125	7.94	2	H3	2.719	69.06	1.125	28.58	C57160	C55322
5/16-24	UNF	.3125	7.94	2	H4	2.719	69.06	1.125	28.58	C57163	–
5/16-24	UNF	.3125	7.94	2	H4	2.719	69.06	1.125	28.58	C57164	–
3/8-16	UNC	.3750	9.53	3	H1	2.938	74.61	1.250	31.75	C57174	–
3/8-16	UNC	.3750	9.53	3	H2	2.938	74.61	1.250	31.75	C57175	–
3/8-16	UNC	.3750	9.53	3	H3	2.938	74.61	1.250	31.75	C57176	C55324
3/8-16	UNC	.3750	9.53	3	H5	2.938	74.61	1.250	31.75	C57177	–
3/8-24	UNF	.3750	9.53	3	H1	2.938	74.61	1.250	31.75	C57179	–
3/8-24	UNF	.3750	9.53	3	H2	2.938	74.61	1.250	31.75	C57180	–
3/8-24	UNF	.3750	9.53	3	H3	2.938	74.61	1.250	31.75	C57181	C55326
3/8-24	UNF	.3750	9.53	3	H4	2.938	74.61	1.250	31.75	C57182	–
7/16-14	UNC	.4375	11.11	3	H2	3.156	80.17	1.438	36.51	C57191	–
7/16-14	UNC	.4375	11.11	3	H3	3.156	80.17	1.438	36.51	C57192	C55328
7/16-14	UNC	.4375	11.11	3	H5	3.156	80.17	1.438	36.51	C57193	–
7/16-20	UNF	.4375	11.11	3	H3	3.156	80.17	1.438	36.51	C57195	C55330
7/16-20	UNF	.4375	11.11	3	H5	3.156	80.17	1.438	36.51	C57196	–
1/2-13	UNC	.5000	12.70	3	H1	3.375	85.73	1.656	42.07	C57213	–
1/2-13	UNC	.5000	12.70	3	H2	3.375	85.73	1.656	42.07	C57214	–
1/2-13	UNC	.5000	12.70	3	H3	3.375	85.73	1.656	42.07	C57215	C55332
1/2-13	UNC	.5000	12.70	3	H5	3.375	85.73	1.656	42.07	C57216	–

continued on next page



Styles 1011, 1011TN • Spiral Point (continued)

Tap Size and Pitch	Thread Form	Decimal Equiv.	Metric Equiv.	Number of Flutes	H-Limit	Overall Length		Thread Length		Order Number	
						in	mm	in	mm	Bright	TiN
1/2-20	UNF	.5000	12.70	3	H1	3.375	85.73	1.656	42.07	C57218	–
1/2-20	UNF	.5000	12.70	3	H2	3.375	85.73	1.656	42.07	C57219	–
1/2-20	UNF	.5000	12.70	3	H3	3.375	85.73	1.656	42.07	C57220	C55334
1/2-20	UNF	.5000	12.70	3	H5	3.375	85.73	1.656	42.07	C57221	–
5/8-11	UNC	.6250	15.88	3	H3	3.813	96.84	1.813	46.04	C57230	C55336
5/8-11	UNC	.6250	15.88	3	H5	3.813	96.84	1.813	46.04	C57232	–
5/8-18	UNF	.6250	15.88	3	H3	3.813	96.84	1.813	46.04	C57555	–
3/4-10	UNC	.7500	19.05	3	H3	4.250	107.95	2.000	50.80	C57246	C55338
3/4-10	UNC	.7500	19.05	3	H5	4.250	107.95	2.000	50.80	C57247	–
3/4-16	UNF	.7500	19.05	3	H3	4.250	107.95	2.000	50.80	C60999	–

Metric Sizes

Tap Size and Pitch	Decimal Equiv.	Metric Equiv.	Number of Flutes	D-Limit	Overall Length		Thread Length		Order Number Bright
					in	mm	in	mm	
M1.6 x 0.35	.0630	1.60	2	D3	1.750	44.45	.438	11.11	C57015
M1.8 x 0.35	.0709	1.80	2	D3	1.750	44.45	.438	11.11	C57019
M2 x 0.4	.0787	2.00	2	D3	1.750	44.45	.438	11.11	C57027
M2.2 x 0.45	.0866	2.20	2	D3	1.750	44.45	.438	11.11	C57036
M2.5 x 0.45	.0984	2.50	2	D3	1.813	46.04	.500	12.70	C57044
M3 x 0.5	.1181	3.00	2	D3	1.938	49.21	.625	15.88	C57055
M3.5 x 0.6	.1378	3.50	2	D4	2.000	50.80	.688	17.46	C57067
M4 x 0.7	.1575	4.00	2	D4	2.125	53.98	.750	19.05	C57080
M4.5 x 0.75	.1771	4.50	2	D4	2.375	60.33	.875	22.23	C57092
M5 x 0.8	.1968	5.00	2	D4	2.375	60.33	.875	22.23	C57110
M6 x 1	.2362	6.00	2	D5	2.500	63.50	1.000	25.40	C57118
M7 x 1	.2756	7.00	2	D5	2.719	69.06	1.125	28.58	C57146
M8 x 1	.3150	8.00	2	D5	2.719	69.06	1.125	28.58	C57168
M8 x 1.25	.3150	8.00	2	D5	2.719	69.06	1.125	28.58	C57171
M10 x 1.25	.3937	10.00	3	D5	2.938	74.61	1.250	31.75	C57187
M10 x 1.5	.3937	10.00	3	D6	2.938	74.61	1.250	31.75	C57189
M12 x 1.25	.4724	12.00	3	D5	3.375	85.73	1.656	42.07	C57199
M12 x 1.75	.4724	12.00	3	D6	3.375	85.73	1.656	42.07	C57203
M14 x 1.5	.5512	14.00	3	D6	3.594	91.28	1.656	42.07	C57226
M14 x 2	.5512	14.00	3	D7	3.594	91.28	1.656	42.07	C57228
M16 x 1.5	.6299	16.00	3	D6	3.813	96.84	1.813	46.04	C57234
M16 x 2	.6299	16.00	3	D7	3.813	96.84	1.813	46.04	C57236
M18 x 2.5	.7087	18.00	3	D7	3.813	96.84	1.813	46.04	C57244
M20 x 2.5	.7874	20.00	3	D7	3.813	96.84	1.813	46.04	C57253

Spiral Point

Styles 1053 • Low Shear Spiral Point

DRILLING

FEATURES

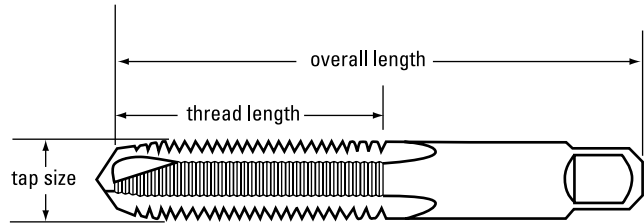
USCT1 302	HSS SUBSTRATE
GENERAL PURPOSE	BRIGHT
THRU HOLES	PLUG 3-5
GROUND THREAD	

APPLICATIONS

ALLOY STEEL
TOOL STEEL
HIGH CARBON STEEL
CAST IRON



Style 1053 Bright



Tapping speeds are listed on page 155.

HOLE FINISHING

THREADING

Tap Size and Pitch	Thread Form	Decimal Equiv.	Metric Equiv.	Number of Flutes	H-Limit	Overall Length		Thread Length		Order Number
						in	mm	in	mm	
0-80	UNF	.0600	1.52	2	H1	1.625	41.28	.313	7.94	C57285
1-72	UNF	.0730	1.85	2	H1	1.688	42.86	.375	9.53	C57299
2-56	UNC	.0860	2.18	2	H2	1.750	44.45	.438	11.11	C57307
2-64	UNF	.0860	2.18	2	H2	1.750	44.45	.438	11.11	C57309
3-48	UNC	.0990	2.51	2	H2	1.813	46.04	.500	12.70	C57314
3-56	UNF	.0990	2.51	2	H2	1.813	46.04	.500	12.70	C57317
4-36	UNS	.1120	2.84	2	H2	1.875	47.63	.563	14.29	C57322
4-40	UNC	.1120	2.84	2	H2	1.875	47.63	.563	14.29	C57324
4-48	UNF	.1120	2.84	2	H2	1.875	47.63	.563	14.29	C57327
5-40	UNC	.1250	3.18	2	H2	1.938	49.21	.625	15.88	C57338
5-44	UNF	.1250	3.18	2	H2	1.938	49.21	.625	15.88	C57340
6-32	UNC	.1380	3.51	2	H3	2.000	50.80	.688	17.46	C57348
6-40	UNF	.1380	3.51	2	H2	2.000	50.80	.688	17.46	C57352
8-32	UNC	.1640	4.17	2	H3	2.125	53.98	.750	19.05	C57361
8-36	UNF	.1640	4.17	2	H2	2.125	53.98	.750	19.05	C57365
10-24	UNF	.1900	4.83	2	H3	2.375	60.33	.875	22.23	C57373
10-32	UNC	.1900	4.83	2	H3	2.375	60.33	.875	22.23	C57380
12-24	UNC	.2160	5.49	2	H3	2.375	60.33	.938	23.81	C57388
12-28	UNF	.2160	5.49	2	H3	2.375	60.33	.938	23.81	C57390
1/4-20	UNC	.2500	6.35	2	H1	2.500	63.50	1.000	25.40	C57403
1/4-20	UNC	.2500	6.35	2	H2	2.500	63.50	1.000	25.40	C57404
1/4-20	UNC	.2500	6.35	2	H3	2.500	63.50	1.000	25.40	C57406
1/4-20	UNC	.2500	6.35	2	H5	2.500	63.50	1.000	25.40	C57409
1/4-20	UNC	.2500	6.35	2	H11	2.500	63.50	1.000	25.40	C57411
1/4-28	UNF	.2500	6.35	2	H2	2.500	63.50	1.000	25.40	C57414
1/4-28	UNF	.2500	6.35	2	H3	2.500	63.50	1.000	25.40	C57415
1/4-28	UNF	.2500	6.35	2	H4	2.500	63.50	1.000	25.40	C57418
5/16-18	UNC	.3125	7.94	2	H1	2.719	69.06	1.125	28.58	C57425
5/16-18	UNC	.3125	7.94	2	H2	2.719	69.06	1.125	28.58	C57426
5/16-18	UNC	.3125	7.94	2	H3	2.719	69.06	1.125	28.58	C57428
5/16-18	UNC	.3125	7.94	2	H5	2.719	69.06	1.125	28.58	C57431
5/16-18	UNC	.3125	7.94	2	H11	2.719	69.06	1.125	28.58	C57432
5/16-24	UNF	.3125	7.94	2	H1	2.719	69.06	1.125	28.58	C57433
5/16-24	UNF	.3125	7.94	2	H3	2.719	69.06	1.125	28.58	C57437
5/16-24	UNF	.3125	7.94	2	H4	2.719	69.06	1.125	28.58	C57440

MILLING

OTHER TOOLS

continued on next page



Styles 1053 • Low Shear Spiral Point (continued)

Tap Size and Pitch	Thread Form	Decimal Equiv.	Metric Equiv.	Number of Flutes	H-Limit	Overall Length in	Overall Length mm	Thread Length in	Thread Length mm	Order Number
3/8-16	UNC	.3750	9.53	3	H1	2.938	74.61	1.250	31.75	C57450
3/8-16	UNC	.3750	9.53	3	H2	2.938	74.61	1.250	31.75	C57451
3/8-16	UNC	.3750	9.53	3	H3	2.938	74.61	1.250	31.75	C57452
3/8-16	UNC	.3750	9.53	3	H5	2.938	74.61	1.250	31.75	C57454
3/8-16	UNC	.3750	9.53	3	H11	2.938	74.61	1.250	31.75	C57455
3/8-24	UNF	.3750	9.53	3	H1	2.938	74.61	1.250	31.75	C57456
3/8-24	UNF	.3750	9.53	3	H3	2.938	74.61	1.250	31.75	C57458
3/8-24	UNF	.3750	9.53	3	H4	2.938	74.61	1.250	31.75	C57459
7/16-14	UNC	.4375	11.11	3	H3	3.156	80.17	1.438	36.51	C57469
7/16-14	UNC	.4375	11.11	3	H5	3.156	80.17	1.438	36.51	C57470
7/16-20	UNF	.4375	11.11	3	H3	3.156	80.17	1.438	36.51	C57472
7/16-20	UNF	.4375	11.11	3	H5	3.156	80.17	1.438	36.51	C57473
1/2-13	UNC	.5000	12.70	3	H3	3.375	85.73	1.656	42.07	C57492
1/2-13	UNC	.5000	12.70	3	H5	3.375	85.73	1.656	42.07	C57493
1/2-13	UNC	.5000	12.70	3	H11	3.375	85.73	1.656	42.07	C57494
1/2-20	UNF	.5000	12.70	3	H3	3.375	85.73	1.656	42.07	C57497
1/2-20	UNF	.5000	12.70	3	H5	3.375	85.73	1.656	42.07	C57498
5/8-11	UNC	.6250	15.88	3	H3	3.813	96.84	1.813	46.04	C57507
3/4-10	UNC	.7500	19.05	3	H3	4.250	107.95	2.000	50.80	C57523
3/4-10	UNC	.7500	19.05	3	H5	4.250	107.95	2.000	50.80	C57524

Styles 1012 • Spiral Point Bottoming

FEATURES

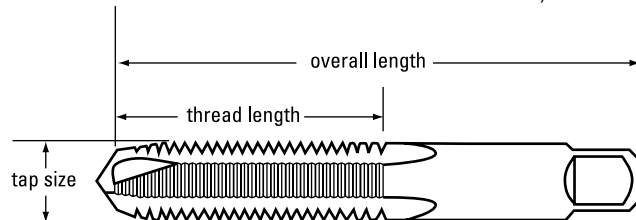
USCTI 302	HSS SUBSTRATE
GENERAL PURPOSE	BRIGHT
THRU HOLES	PLUG 3-5
GROUND THREAD	

APPLICATIONS

MAGNESIUM
COPPER ALLOYS
ALUMINUM
LOW CARBON STEEL



Style 1012 Bright



Tap Size and Pitch	Thread Form	Decimal Equiv.	Metric Equiv.	Number of Flutes	H-Limit	Overall Length in	Overall Length mm	Thread Length in	Thread Length mm	Order Number
0-80	UNF	.0600	1.52	2	H2	1.625	41.28	.313	7.94	C57012
2-56	UNC	.0860	2.18	2	H2	1.750	44.45	.438	11.11	C57032
3-48	UNC	.0990	2.51	2	H2	1.813	46.04	.500	12.70	C57039
4-40	UNC	.1120	2.84	2	H2	1.875	47.63	.563	14.29	C57049
4-48	UNF	.1120	2.84	2	H2	1.875	47.63	.563	14.29	C57052
5-40	UNC	.1250	3.18	2	H2	1.938	49.21	.625	15.88	C57063
6-32	UNC	.1380	3.51	2	H3	2.000	50.80	.688	17.46	C57073
6-40	UNF	.1380	3.51	2	H2	2.000	50.80	.688	17.46	C57077
8-32	UNC	.1640	4.17	2	H3	2.125	53.98	.750	19.05	C57086
10-24	UNC	.1900	4.83	2	H3	2.375	60.33	.875	22.23	C57098
10-32	UNF	.1900	4.83	2	H3	2.375	60.33	.875	22.23	C57105
1/4-20	UNC	.2500	6.35	2	H3	2.500	63.50	1.000	25.40	C57131
1/4-28	UNF	.2500	6.35	2	H3	2.500	63.50	1.000	25.40	C57140
5/16-18	UNC	.3125	7.94	3	H3	2.719	69.06	1.125	28.58	C57153
5/16-24	UNF	.3125	7.94	2	H3	2.719	69.06	1.125	28.58	C57162

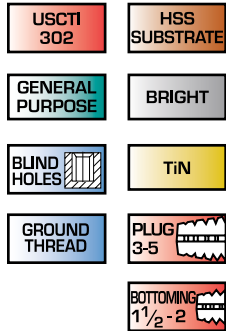
DRILLING
HOLE FINISHING
THREADING
MILLING
OTHER TOOLS

General-Purpose Taps Spiral Flute

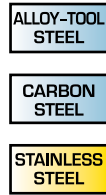
Styles 1093, 1093TN, 1094, 1094TN • High-Spiral

DRILLING

FEATURES



APPLICATIONS



Style 1093 Plug Chamfer Bright



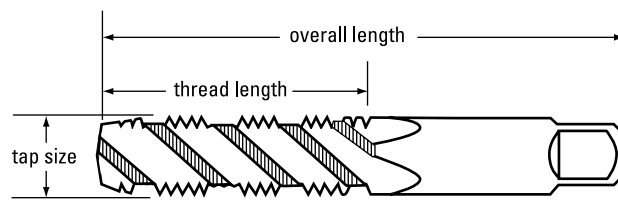
Style 1093TN Plug Chamfer TiN-Coated



Style 1094 Bottoming Chamfer Bright



Style 1094TN Bottoming Chamfer TiN-Coated



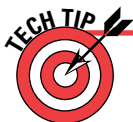
Tapping speeds are listed on page 155.

HOLE FINISHING

THREADING

Tap Size and Pitch	Thread Form	Decimal Equiv.	Metric Equiv.	No of Flutes	H-Limit	Overall Length in	Overall Length mm	Thread Length in	Thread Length mm	Order Number			
										Plug 1093 Bright	TiN	Bottoming 1094 Bright	TiN
4-40	UNC	.1120	2.84	2	H2	1.875	47.63	.463	11.75	C58515	—	C58516	—
6-32	UNC	.1380	3.51	2	H3	2.000	50.80	.688	17.46	C58532	—	C58533	—
8-32	UNC	.1640	4.17	3	H3	2.125	53.98	.750	19.05	C58538	—	C58539	—
10-24	UNC	.1900	4.83	3	H3	2.375	60.33	.875	22.23	C58544	—	C58545	—
10-32	UNF	.1900	4.83	3	H3	2.375	60.33	.875	22.23	C58546	—	C58547	—
12-24	UNC	.2160	5.49	3	H3	2.375	60.33	.938	23.81	C58552	—	C58553	—
1/4-20	UNC	.2500	6.35	3	H3	2.500	63.50	1.000	25.40	C58562	C55581	C58563	C55580
1/4-28	UNF	.2500	6.35	3	H3	2.500	63.50	1.000	25.40	C58564	C55583	C58565	C55582
5/16-18	UNC	.3125	7.94	3	H3	2.719	69.06	1.125	28.58	C58570	C55585	C58571	C55584
5/16-24	UNF	.3125	7.94	3	H3	2.719	69.06	1.125	28.58	C58572	C55587	C58573	C55586
3/8-16	UNC	.3750	9.53	3	H3	2.938	74.61	1.250	31.75	C58581	C55589	C58582	C55588
3/8-24	UNF	.3750	9.53	3	H3	2.938	74.61	1.250	31.75	C58583	C55591	C58584	C55590
7/16-14	UNC	.4375	11.11	3	H3	3.156	80.17	1.438	36.51	C58593	C55593	C58594	C55592
7/16-20	UNF	.4375	11.11	3	H3	3.156	80.17	1.438	36.51	C58595	C55595	C58596	C55594
1/2-13	UNC	.5000	12.70	3	H3	3.375	85.73	1.656	42.07	C58613	C55597	C58614	C55596
1/2-20	UNF	.5000	12.70	3	H3	3.375	85.73	1.656	42.07	C58615	C55599	C58616	C55598

MILLING



Ground Thread Tap Limits

All standard ground thread taps made to USCTI Tables 327 and 329 will be marked **G** to designate ground thread. **G** will be followed by **H** to designate above basic or **L** for below basic and a numeral to designate the pitch diameter limits. For example: **G H3** indicates a ground thread tap with pitch diameter limits .0010" to .0015" over basic. See table at right.

For taps over 1-1/2" diameter with H or L limit numbers, divide the the H or L limit number by 2 to get the amount (in thousandths of an inch) the maximum tap pitch diameter is over basic for the H series or under basic for the L series. In H series taps, the tolerance shown in USCTI Table 331, Column D, **subtracted** from the maximum pitch diameter

Pitch Diameter Limits for taps through 1" diameter

- L1 = basic to basic - .0005
- H1 = basic to basic + .0005
- H2 = basic + .0005 to basic + .0010
- H3 = basic + .0010 to basic + .0015
- H4 = basic + .0015 to basic + .0020
- H5 = basic + .0020 to basic + .0025
- H6 = basic + .0025 to basic + .0030

for taps over 1" diameter through 1-1/2" diameter

- H4 = basic + .0010 to basic + .0020

will give the minimum pitch diameter. In L series taps the tolerance shown in Table 331, Column D, **added** to the minimum pitch diameter will give the maximum pitch diameter. These taps will be marked with the appropriate H or L limit number.

OTHER TOOLS



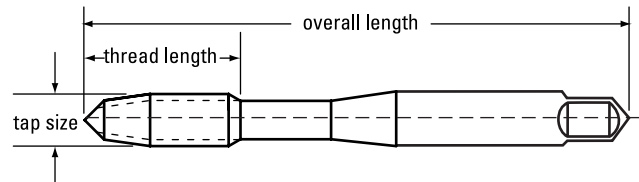
General-Purpose Taps Thread Forming

Styles 1091, 1092 • Thread Forming Taps

FEATURES

USCT1 302A	HSS SUBSTRATE	ALLOY STEEL
GENERAL PURPOSE	BRIGHT	CARBON STEEL
BLIND HOLES	PLUG 3-5	FREE-MACH STAINLESS
GROUND THREAD	BOTTOMING 1 1/2 - 2	ALUMINUM
NECKED	COPPER ALLOYS	

APPLICATIONS



Modify tapping speeds listed on page 155 as follows:
double the speeds versus thread cutting taps.

Tap Size and Pitch	Thread Form	Decimal Equiv.	Metric Equiv.	H-Limit	Overall Length		Thread Length		Neck Length		Order Number	
					in	mm	in	mm	in	mm	Plug 1091	Bottoming 1092
0-80	UNF	.0600	1.52	H2	1.625	41.28	.313	7.94	—	—	—	C59159
1-64	UNC	.0730	1.85	H2	1.688	42.86	.375	9.53	—	—	—	C59169
1-72	UNF	.0730	1.85	H2	1.688	42.86	.375	9.53	—	—	—	C59171
2-56	UNC	.0860	2.18	H2	1.750	44.45	.438	11.11	—	—	—	C59177
2-64	UNF	.0860	2.18	H2	1.750	44.45	.438	11.11	—	—	—	C59179
3-48	UNC	.0990	2.51	H3	1.813	46.04	.500	12.70	—	—	—	C59186
3-56	UNF	.0990	2.51	H3	1.813	46.04	.500	12.70	—	—	—	C59188
4-40	UNC	.1120	2.84	H3	1.875	47.63	.313	7.94	.250	6.35	C59193	C59194
4-40	UNC	.1120	2.84	H5	1.875	47.63	.313	7.94	.250	6.35	C59195	C59196
4-48	UNF	.1120	2.84	H3	1.875	47.63	.313	7.94	.250	6.35	C59197	—
4-48	UNF	.1120	2.84	H5	1.875	47.63	.313	7.94	.250	6.35	C59199	—
5-40	UNC	.1250	3.18	H3	1.938	49.21	.313	7.94	.313	7.94	C59209	C59210
5-40	UNC	.1250	3.18	H5	1.938	49.21	.313	7.94	.313	7.94	C59211	—
6-32	UNC	.1380	3.51	H3	2.000	50.80	.375	9.53	.310	7.87	C59221	C59222
6-32	UNC	.1380	3.51	H5	2.000	50.80	.375	9.53	.310	7.87	C59223	C59224
6-32	UNC	.1380	3.51	H10	2.000	50.80	.375	9.53	.310	7.87	C59225	C59226
6-40	UNF	.1380	3.51	H3	2.000	50.80	.375	9.53	.310	7.87	C59227	C59228
6-40	UNF	.1380	3.51	H5	2.000	50.80	.375	9.53	.310	7.87	C59229	—
8-32	UNC	.1640	4.17	H3	2.125	53.98	.375	9.53	.380	9.65	C59235	C59236
8-32	UNC	.1640	4.17	H5	2.125	53.98	.375	9.53	.380	9.65	C59237	C59238
8-32	UNC	.1640	4.17	H10	2.125	53.98	.375	9.53	.380	9.65	C59239	C59240
8-36	UNF	.1640	4.17	H3	2.125	53.98	.375	9.53	.380	9.65	—	C59242
8-36	UNF	.1640	4.17	H5	2.125	53.98	.375	9.53	.380	9.65	—	C59244
10-24	UNC	.1900	4.83	H4	2.375	60.33	.500	12.70	.380	9.65	C59249	C59250
10-24	UNC	.1900	4.83	H6	2.375	60.33	.500	12.70	.380	9.65	C59251	C59252
10-24	UNC	.1900	4.83	H10	2.375	60.33	.500	12.70	.380	9.65	C59254	—
10-32	UNF	.1900	4.83	H4	2.375	60.33	.500	12.70	.380	9.65	C59256	C59257
10-32	UNF	.1900	4.83	H6	2.375	60.33	.500	12.70	.380	9.65	C59258	C59259
10-32	UNF	.1900	4.83	H10	2.375	60.33	.500	12.70	.440	11.18	C59260	C59261
12-24	UNC	.2160	5.49	H4	2.375	60.33	.500	12.70	.440	11.18	C59266	—
12-24	UNC	.2160	5.49	H6	2.375	60.33	.500	12.70	.440	11.18	C59268	—
12-28	UNF	.2160	5.49	H4	2.375	60.33	.500	12.70	.440	11.18	C59270	—
12-28	UNF	.2160	5.49	H6	2.375	60.33	.500	12.70	.440	11.18	C59272	—

continued on next page

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

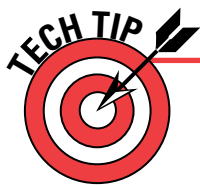
Thread Forming

Styles 1091, 1092 • Thread Forming Taps (continued)

Tap Size and Pitch	Thread Form	Decimal Equiv.	Metric Equiv.	H-Limit	Overall Length		Thread Length		Neck Length		Order Number	
					in	mm	in	mm	in	mm	Plug 1091	Bottoming 1092
1/4-20	UNC	.2500	6.35	H4	2.500	63.50	.625	15.88	.380	9.65	C59282	C59283
1/4-20	UNC	.2500	6.35	H4	2.500	63.50	.625	15.88	.380	9.65	—	—
1/4-20	UNC	.2500	6.35	H6	2.500	63.50	.625	15.88	.380	9.65	C59284	C59285
1/4-20	UNC	.2500	6.35	H6	2.500	63.50	.625	15.88	.380	9.65	—	—
1/4-28	UNF	.2500	6.35	H4	2.500	63.50	.625	15.88	.380	9.65	C59289	C59290
1/4-28	UNF	.2500	6.35	H6	2.500	63.50	.625	15.88	.380	9.65	C59291	C59292
5/16-18	UNC	.3125	7.94	H5	2.719	69.06	.688	17.48	.440	11.18	C59299	C59300
5/16-18	UNC	.3125	7.94	H5	2.719	69.06	.688	17.48	.440	11.18	—	—
5/16-18	UNC	.3125	7.94	H7	2.719	69.06	.688	17.48	.440	11.18	C59301	C59302
5/16-18	UNC	.3125	7.94	H7	2.719	69.06	.688	17.48	.440	11.18	—	—
5/16-24	UNF	.3125	7.94	H5	2.719	69.06	.688	17.48	.440	11.18	C59305	C59306
5/16-24	UNF	.3125	7.94	H7	2.719	69.06	.688	17.48	.440	11.18	C59307	C59308
3/8-16	UNC	.3750	9.53	H5	2.938	74.61	.750	19.05	.500	12.70	C59315	C59316
3/8-16	UNC	.3750	9.53	H5	2.938	74.61	.750	19.05	.500	12.70	—	—
3/8-16	UNC	.3750	9.53	H7	2.938	74.61	.750	19.05	.500	12.70	C59317	C59318
3/8-16	UNC	.3750	9.53	H7	2.938	74.61	.750	19.05	.500	12.70	—	—
3/8-24	UNF	.3750	9.53	H5	2.938	74.61	.750	19.05	.500	12.70	C59321	C59322
3/8-24	UNF	.3750	9.53	H7	2.938	74.61	.750	19.05	.500	12.70	C59323	C59324
7/16-14	UNC	.4375	11.11	H5	3.156	80.17	.875	22.23	—	—	C59335	C59336
7/16-14	UNC	.4375	11.11	H8	3.156	80.17	.875	22.23	—	—	C59337	C59338
7/16-20	UNF	.4375	11.11	H5	3.156	80.17	.875	22.23	—	—	C59339	C59340
7/16-20	UNF	.4375	11.11	H8	3.156	80.17	.875	22.23	—	—	C59341	C59342
1/2-13	UNC	.5000	12.70	H5	3.375	85.73	.938	23.81	—	—	C59359	C59360
1/2-13	UNC	.5000	12.70	H8	3.375	85.73	.938	23.81	—	—	C59361	C59362
1/2-20	UNF	.5000	12.70	H5	3.375	85.73	.938	23.81	—	—	C59363	C59364
1/2-20	UNF	.5000	12.70	H8	3.375	85.73	.938	23.81	—	—	C59365	—
9/16-12	UNC	.5625	14.29	H7	3.594	91.28	1.000	25.40	—	—	C59375	—
9/16-18	UNF	.5625	14.29	H7	3.594	91.28	1.000	25.40	—	—	C59379	—
5/8-11	UNC	.6250	15.88	H7	3.813	96.84	1.088	27.62	—	—	C59383	C59384
5/8-18	UNF	.6250	15.88	H7	3.813	96.84	1.088	27.62	—	—	C59388	C59389
3/4-10	UNC	.7500	19.05	H7	4.250	107.95	1.218	30.92	—	—	C59406	C59407
3/4-16	UNF	.7500	19.05	H7	4.250	107.95	1.218	30.92	—	—	C59410	—

Metric Sizes

Tap Size and Pitch	Decimal Equiv.	Metric Equiv.	H-Limit	Overall Length		Thread Length		Neck Length		Order Number	
				in	mm	in	mm	in	mm	Plug 1091	Bottoming 1092
M3 x 0.5	.1181	3.00	D5	1.938	49.21	.312	7.92	.312	7.92	C59420	C59421
M4 x 0.7	.1575	4.00	D6	2.125	53.98	.375	9.53	.375	9.53	C59424	C59425
M5 x 0.8	.1968	5.00	D7	2.375	60.33	.500	12.70	.438	11.11	C59428	C59429
M6 x 1	.2362	6.00	D8	2.500	63.50	.625	15.88	.375	9.53	C59432	C59433
M8 x 1.25	.3150	8.00	D9	2.719	69.06	.680	17.27	.438	11.11	C59436	C59437
M10 x 1.5	.3937	10.00	D10	2.938	74.61	.750	19.05	.500	12.70	C59440	C59441
M12 x 1.75	.4724	12.00	D11	3.375	85.73	.938	23.81	—	—	C59444	C59445



Using Thread Forming Taps

- Forming taps can run in ductile materials up to approximately 28 Rc.
- Run thread forming taps at double the speed of thread cutting taps.



DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Styles 965B, 975, 975TN • NPT/NPTF Medium Hook Taper Pipe Taps

FEATURES

USCTI 311	HSS SUBSTRATE
GENERAL PURPOSE	BRIGHT
NPT	TiN
NPTF DRYSEAL	3/4" / 12"
GROUND THREAD	PIPE 3-1/2

APPLICATIONS

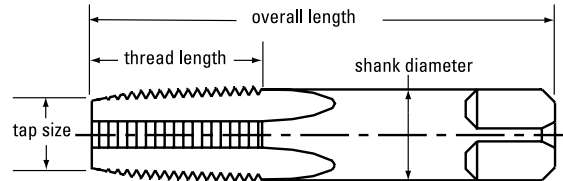
ALLOY STEEL
CARBON STEEL



Style 965B NPT Bright



Style 975 NPTF Bright

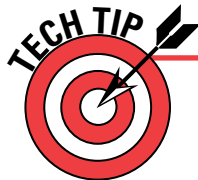


Style 975TN NPTF TiN-Coated

Tapping speeds are listed on page 155.

Tap Size and Pitch	Decimal Equiv.	Metric Equiv.	Number of Flutes	Shank Diameter		Overall Length		Thread Length in	Thread Length mm	Order Number		
				in	mm	in	mm			NPT 965B	NPTF 975	NPTF 975TN
1/16-27	.0625	1.59	4	.3125	7.94	2.125	53.98	.688	17.46	C64036	C64058	C55680
1/8-27*	.1250	3.18	4	.3125	7.94	2.125	53.98	.750	19.05	C64037	C64059	-
1/8-27	.1250	3.18	4	.4375	11.11	2.125	53.98	.750	19.05	C64038	C64060	C55682
1/4-18	.2500	6.35	4	.5625	14.29	2.438	61.91	1.063	26.99	C64039	C64061	C55683
3/8-18	.3750	9.53	4	.7000	17.78	2.563	65.09	1.063	26.99	C64040	C64062	C55684
1/2-14	.5000	12.70	4	.6875	17.46	3.125	79.38	1.375	34.93	C64041	C64063	C55685
3/4-14	.7500	19.05	5	.9063	23.02	3.250	82.55	1.375	34.93	C64042	C64064	C55686
1 - 11-1/2	1.0000	25.40	5	1.1250	28.58	3.750	95.25	1.750	44.45	C64043	C64065	C55687
1-1/4 - 11-1/2	1.2500	31.75	5	1.3125	33.34	4.000	101.60	1.750	44.45	C64044	C64066	-
1-1/2 - 11-1/2	1.5000	38.10	7	1.5000	38.10	4.250	107.95	1.750	44.45	C64045	C64067	-
2 - 11-1/2	2.0000	50.80	7	1.8750	47.63	4.500	114.30	1.750	44.45	C64046	C64068	-

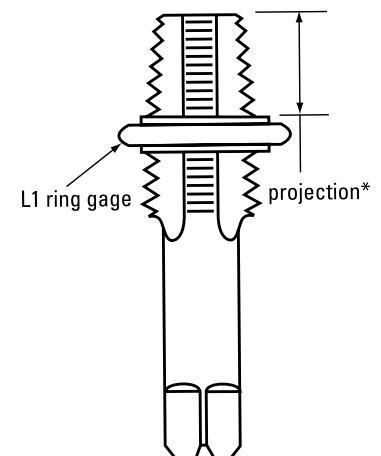
* small shank



USCTI Table 338 Taper Pipe Tap Thread Limits, Ground Thread

American National Standard Taper Pipe Thread Form (NPT)
Aeronautical National Taper Pipe Thread Form (ANPT),
Dryseal American National Standard Taper Pipe Thread Form (NPTF)

Nominal Size inch	Threads Per Inch	Projection* inch	Projection Tolerance +/- inch	Taper per Foot (inches)		L1 Thickness	Tap Drill Size NPT, ANPT, NPTF
				Min.	Max.		
1/16	27	.312	.063	.719	.781	.160	C
1/8	27	.312	.063	.719	.781	.1615	Q
1/4	18	.459	.063	.719	.781	.2278	7/16
3/8	18	.454	.063	.719	.781	.240	9/16
1/2	14	.579	.063	.719	.781	.320	45/64
3/4	14	.565	.063	.719	.781	.339	29/32
1	11-1/2	.678	.094	.719	.781	.400	1-9/64
1-1/4	11-1/2	.686	.094	.719	.781	.420	1-31/64
1-1/2	11-1/2	.699	.094	.719	.781	.420	1-23/32
2	11-1/2	.667	.094	.719	.781	.436	2-3/16
2-1/2	8	.925	.094	.734	.781	.682	2-39/64
3	8	.925	.094	.734	.781	.766	3-15/64
3-1/2	8	.938	.125	.734	.781	.821	-
4	8	.950	.125	.734	.781	.844	-



Taper Pipe Taps

Styles 964B, 966B • NPT/NPTF Interrupted Thread Taper Pipe Taps

DRILLING

FEATURES

USCTI 311	HSS SUBSTRATE
GENERAL PURPOSE	BRIGHT
NPT	3/4" / 12"
NPTF DRYSEAL	PIPE 3-1/2
GROUND THREAD	

APPLICATIONS

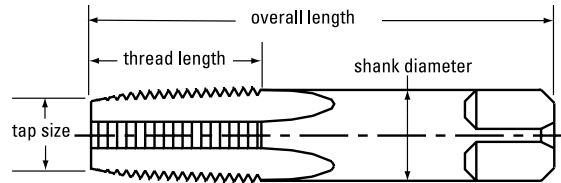
ALLOY-TOOL STEEL
CARBON STEEL



Style 964B NPT Bright



Style 966B NPTF Bright



HOLE FINISHING

Tapping speeds are listed on page 155.

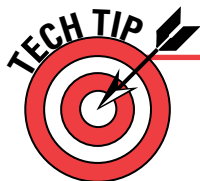
THREADING

Tap Size and Pitch	Decimal Equiv.	Metric Equiv.	Number of Flutes	Shank Diameter		Overall Length		Thread Length		Order Number	
				in	mm	in	mm	in	mm	NPT 964B	NPTF 966B
1/8-27*	.1250	3.18	5	.3125	7.94	2.125	53.98	.750	19.05	C64097	C64107
1/8-27	.1250	3.18	5	.4375	11.11	2.125	53.98	.750	19.05	C64098	C64108
1/4-18	.2500	6.35	5	.5625	14.29	2.438	61.91	1.063	26.99	C64099	C64109
3/8-18	.3750	9.53	5	.7000	17.78	2.563	65.09	1.063	26.99	C64100	C64110
1/2-14	.5000	12.70	5	.6875	17.46	3.125	79.38	1.375	34.93	C64101	C64111
3/4-14	.7500	19.05	5	.9063	23.02	3.250	82.55	1.375	34.93	C64102	C64112
1 - 11-1/2	1.0000	25.40	5	1.1250	28.58	3.750	95.25	1.750	44.45	C64103	C64113
1-1/4 - 11-1/2	1.2500	31.75	5	1.3125	33.34	4.000	101.60	1.750	44.45	C64104	C64114
1-1/2 - 11-1/2	1.5000	38.10	7	1.5000	38.10	4.250	107.95	1.750	44.45	C64105	-
2 - 11-1/2	2.0000	50.80	7	1.8750	47.63	4.500	114.30	1.750	44.45	C64106	-

* small shank

MILLING

OTHER TOOLS



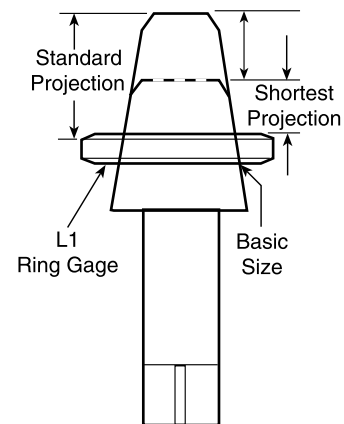
General purpose pipe taps are appropriate for threading a wide variety of materials, both ferrous and non-ferrous.

Ground thread pipe taps are standard in American Standard Pipe Form (NPT) and American Standard Dryseal Pipe Form (NPFT). NPT threads require the use of a sealer, like Teflon® tape or pipe compound. Dryseal taps are used to tap fittings which will give a pressure-tight joint without the use of a sealer.

The nominal size of a pipe tap is that of the pipe fitting to be tapped, not the actual size of the tap. The thread tapers 3/4" per foot.

All pipe taps are furnished with 2 1/2 to 3-1/2 thread chamfer.

Short projection pipe taps are made with a projection shorter than standard for taper pipe tapping where the depth of tapping is limited. Special short projection pipe taps and left hand pipe taps are available as specials.



General-Purpose Taps Straight Pipe Taps

Styles 963B, 967B • NPS/NPSF Straight Pipe Taps

FEATURES

USCTI 311	HSS SUBSTRATE
GENERAL PURPOSE	BRIGHT
NPS	MOD 3-5
NPSF DRYSEAL	
GROUND THREAD	

APPLICATIONS

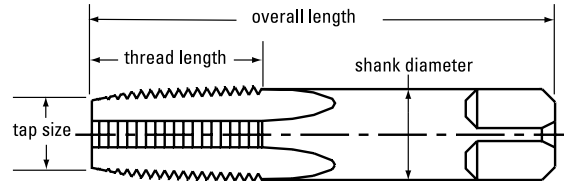
ALLOY-TOOL STEEL
CARBON STEEL



Style 963B NPS Bright



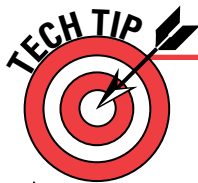
Style 967B NPSF Bright



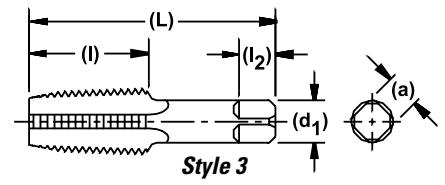
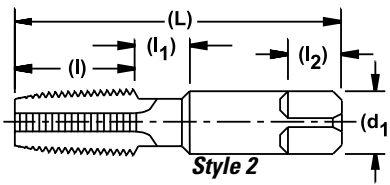
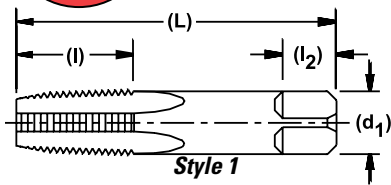
Tapping speeds are listed on page 155.

Tap Size and Pitch	Decimal Equiv.	Metric Equiv.	Number of Flutes	Shank Diameter		Overall Length		Thread Length		Order Number	
				in	mm	in	mm	in	mm	NPS 963B	NPSF 967B
1/8-27*	.1250	3.18	4	.3125	7.94	2.125	53.98	.750	19.05	C64115	C64129
1/8-27	.1250	3.18	4	.4375	11.11	2.125	53.98	.750	19.05	C64116	C64130
1/4-18	.2500	6.35	4	.5625	14.29	2.438	61.91	1.063	26.99	C64117	C64131
3/8-18	.3750	9.53	4	.7000	17.78	2.563	65.09	1.063	26.99	C64118	C64132
1/2-14	.5000	12.70	4	.6875	17.46	3.125	79.38	1.375	34.93	C64119	C64133
3/4-14	.7500	19.05	5	.9063	23.02	3.250	82.55	1.375	34.93	C64120	C64139
1 - 11-1/2	1.0000	25.40	5	1.1250	28.58	3.750	95.25	1.750	44.45	C64121	-

* small shank



USCTI Table 311 • Standard Pipe Tap Dimensions, Straight and Taper, Ground Thread



General Dimensions (all measurements in inches)

Nominal Size	Tap Style	Overall Length L	Thread Length l	Square Length l2	Shank Diameter d1	Square Size a	Optional Neck l1
1/16	1	2.13	.69	.38	.3125	.234	.375
1/8	1	2.13	.75	.38	.3125	.234	-
1/8	1	2.13	.75	.38	.4375	.328	.375
1/4	1	2.44	1.06	.44	.5625	.421	.375
3/8	1	2.56	1.06	.50	.7000	.531	.375
1/2	3	3.13	1.38	.63	.6875	.515	-
3/4	3	3.25	1.38	.69	.9063	.679	-
1	3	3.75	1.75	.81	1.1250	.843	-
1-1/4	3	4.00	1.75	.94	1.3125	.984	-
1-1/2	3	4.25	1.75	1.00	1.5000	1.125	-
2	3	4.25	1.75	1.13	1.8750	1.406	-
2-1/2	3	5.50	2.56	1.25	2.2500	1.687	-
3	3	6.00	2.63	1.38	2.6250	1.968	-
3-1/2	3	6.50	2.69	1.50	2.8125	2.108	-
4	3	6.75	2.75	1.56	3.0000	2.250	-

Tolerances (all measurements in inches)

Element	Range	Direction	Tolerance
Length Overall	1/16" to 3/4" inc.	+/-	.031
- L	1" to 4" inc.	+/-	.063
Length of Thread	1/16" to 3/4" inc.	+/-	.063
- l	1" to 1-1/4" inc.	+/-	.094
	1-1/2" to 4" inc.	+/-	.125
Length of Square	1/16" to 3/4" inc.	+/-	.031
- l2	1" to 4" inc.	+/-	.063
Diameter of Shank	1/16" to 1/8"	-	.0015
- d1	1/4" to 1" inc.	-	.0020
	1-1/4" to 4" inc.	-	.0030
Size of Square	1/16" to 1/8"	-	.004
- a	1/4" to 3/4" inc.	-	.006
	1" to 4" inc.	-	.008

Quick Shipment Program

Prices for special taps are available upon request. Special taps can be furnished in quantities to meet your specific requirements. All special metric taps will produce internal threads which conform to ISO, ISO modified, and the obsolete OMFS thread systems and are manufactured to USCTI standard blank dimensions to fit the tap holders and machine spindles now in use in the USA.

Call Customer Service at 800.348.2885 for your quote.

USCTI Table 331 • Special Taps, Ground Thread – Unified & American Form

General

The following tables and formulae are used in determining the limits and tolerances for ground thread taps having special diameter or special pitch or both and having a thread lead angle not in excess of 5%, unless otherwise specified. This table does not apply to the diameter and pitch combinations shown in Tables 327 and 329.

Note: When the tap major diameter must be determined from a specific tap pitch diameter, the maximum major diameter = the minimum specified pitch diameter – constant C, + constant A.

Lead Tolerance

A maximum lead error of + / – .0005" in 1" of thread is permitted.

Angle Tolerance

Threads Per Inch	Error in Half Angle
4 to 5-1/2 inclusive	20' + / –
6 to 9 inclusive	25' + / –
10 to 80 inclusive	30' + / –

Formulae

- Max. Major Diameter = Basic Major Diameter + A*
- Min. Major Diameter = Max. Major Diameter – B*
- Max. Pitch Diameter = Min. Pitch Diameter + D
- Min. Pitch Diameter = Basic Pitch Diameter + C

A = constant to add:

- 35% of the theoretical truncation for 4 to 5 threads per inch
- 40% for 5-1/2 to 12 threads per inch
- 45% for 13 to 80 threads per inch
- to nearest .005" for 8 or more threads per inch

B = Major diameter tolerance

C = Amount over basic for minimum pitch diameter

D = Pitch diameter tolerance

Values for A, B, C, and D

Threads per Inch	A	B	C			D			
			thru 5/8"	over 5/8" thru 2-1/2"	over 2-1/2"	thru 1"	over 1" thru 1-1/2"	over 1-1/2" thru 2-1/2"	over 2-1/2"
80	.0015	.0010	.0005	.0010	.0015	.0005	.0010	.0010	.0015
56	.0015	.0010	.0005	.0010	.0015	.0005	.0010	.0010	.0015
48	.0020	.0010	.0005	.0010	.0015	.0005	.0010	.0010	.0015
44	.0020	.0010	.0005	.0010	.0015	.0005	.0010	.0010	.0015
40	.0025	.0010	.0005	.0010	.0015	.0005	.0010	.0010	.0015
36	.0025	.0010	.0005	.0010	.0015	.0005	.0010	.0010	.0015
32	.0030	.0010	.0010	.0010	.0015	.0005	.0010	.0010	.0015
28	.0035	.0010	.0010	.0010	.0015	.0005	.0010	.0010	.0015
24	.0040	.0010	.0010	.0010	.0015	.0005	.0010	.0015	.0015
20	.0050	.0010	.0010	.0010	.0015	.0005	.0010	.0015	.0015
18	.0055	.0010	.0010	.0010	.0015	.0005	.0010	.0015	.0015
16	.0060	.0010	.0010	.0010	.0015	.0005	.0010	.0015	.0020
14	.0070	.0010	.0010	.0015	.0015	.0005	.0010	.0015	.0020
13	.0075	.0010	.0010	.0015	.0015	.0005	.0010	.0015	.0020
12	.0075	.0010	.0010	.0015	.0015	.0005	.0010	.0015	.0020
11	.0080	.0010	.0010	.0015	.0020	.0005	.0010	.0015	.0020
10	.0090	.0015	-	.0015	.0020	.0005	.0010	.0015	.0020
9	.0100	.0015	-	.0015	.0020	.0005	.0010	.0015	.0020
8	.0110	.0015	-	.0015	.0020	.0005	.0010	.0015	.0020
7	.0120	.0020	-	.0015	.0020	.0010	.0010	.0020	.0025
6	.0140	.0020	-	.0015	.0020	.0010	.0010	.0020	.0025
5-1/2	.0160	.0025	-	.0015	.0020	.0010	.0015	.0020	.0025
5	.0160	.0025	-	.0015	.0020	.0010	.0015	.0020	.0025
4-1/2	.0170	.0025	-	.0015	.0020	.0010	.0015	.0020	.0025
4	.0190	.0025	-	.0015	.0020	.0010	.0015	.0020	.0025

For intermediate pitches use value for next coarser pitch.

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS



Tap Nomenclature

Bottoming Tap

A tap having a chamfer length of 1-2 threads.

Chamfer

The tapering of the threads at the front end of each land of a chaser, tap or die by cutting away and relieving the crest of the first few teeth to distribute the cutting action over several teeth.

Chamfer Angle

The angle formed between the chamfer and the axis of the tap or die by cutting away and relieving the crest of the first few teeth to distribute the cutting action over several teeth.

Crest

The surface of the thread which joins the flanks of the thread and is farthest from the cylinder or cone from which the thread projects.

Flank

The part of a helical thread surface which connects the crest and the root and which is theoretically a straight line in an axial plane section.

Flute

The longitudinal channel formed in a tap to create cutting edges on the thread profile and to provide chip spaces and cutting fluid passage.

Hand of Threads

A thread, when viewed axially, winds in a clockwise and receding direction for LEFT-HAND THREADS and counter-clockwise and receding direction for RIGHT-HAND THREADS.

Hook, Chordal

A concave face having an angle of inclination specified between a chord passing through the root and crest of a thread form at the cutting face, and a radial line through the crest at the cutting edge.

Hook, Tangential

A concave face having an angle of inclination specified between a line tangent to the hook surface at the cutting edge and a radial line to the same point.

Hook Angle

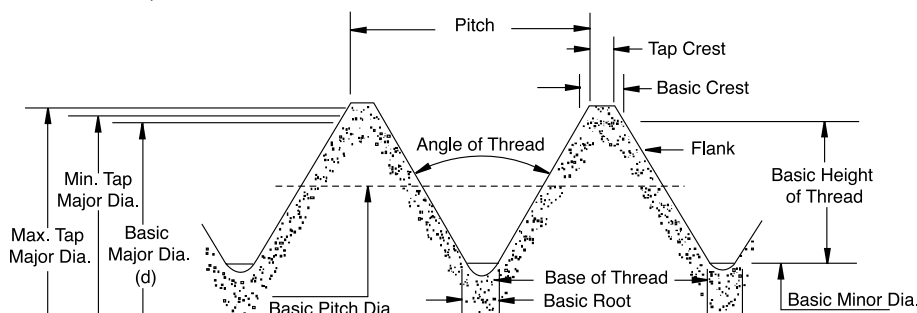
The angle of inclination of a concave face, usually specified either as CHORDAL HOOK or TANGENTIAL HOOK.

Interrupted Thread Tap

A tap having an odd number of lands with alternate teeth in the thread helix removed. In some cases alternate teeth are removed only for a portion of the thread length.

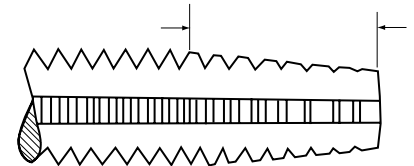
continued on next page

Illustration of Tap Terms



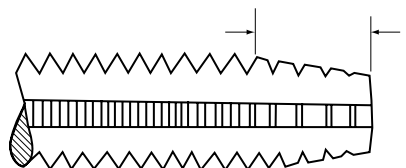
Tap Chamfers

Taper Chamfer
7 - 10 Threads



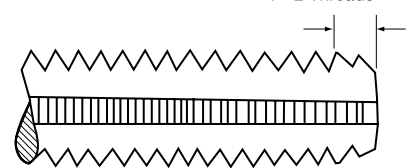
Taper (7 to 10 pitches) – The taper chamfer has the longest standard chamfer ensuring easier starting. It requires less tapping torque because of more working teeth.

Plug Chamfer
3 - 5 Threads



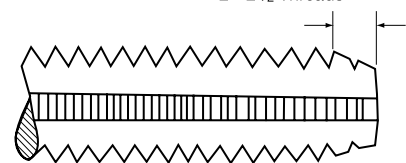
Plug (3 to 5 pitches) – The most common chamfer for use by hand or machine in through or blind holes. This chamfer is more efficient than a bottoming or modified-bottoming chamfer.

Bottoming Chamfer
1 - 2 Threads



Bottoming (1 to 2 pitches) – For threading close to the bottom of blind holes, the bottoming chamfer is the least efficient chamfer available.

Modified Bottoming Chamfer
2 - 2 1/2 Threads



Modified-Bottoming (2 to 2 1/2 pitches) – This short chamfer allows for threading close to the bottom of blind holes. Due to the slightly longer chamfer and more working teeth, this chamfer is more efficient than a bottoming chamfer.

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Tap Nomenclature (continued)

Land

One of the threaded sections between the flutes of a tap.

Lead of Thread

The distance a screw thread advances axially in one complete turn. On a single start tap the lead and pitch are identical. On a multiple start tap the lead is the multiple of the pitch.

Major Diameter

The diameter of the major cylinder or cone, at a given position on the axis, that bounds the crests of an external thread or the roots of an internal thread.

Minor Diameter

The diameter of the minor cylinder or cone, at a given position on the axis, that bounds the roots of an external thread or the crests of an internal thread.

Pitch Diameter

The diameter of an imaginary cylinder or cone, at a given point on the axis, of such a diameter and location of its axis that its surface would pass through the thread in such a manner as to make the thread ridge and the thread groove equal and, therefore, is located equidistant between the sharp major and minor cylinders or cones of a given thread form. On a theoretically perfect thread, these widths are equal to one half of the basic pitch (measured parallel to the axis). See illustration below

Plug Tap

A tap with 3 to 5 chamfered threads.

Spiral Point

The angular fluting in the cutting face of the land at the chamfered end. It is formed at an angle with respect to the tap axis of opposite hand to that of rotation. Its length is usually greater than the chamfer length and its angle with respect to the tap axis is usually made great enough to direct the chips ahead of the tap. The tap may or may not have longitudinal flutes.

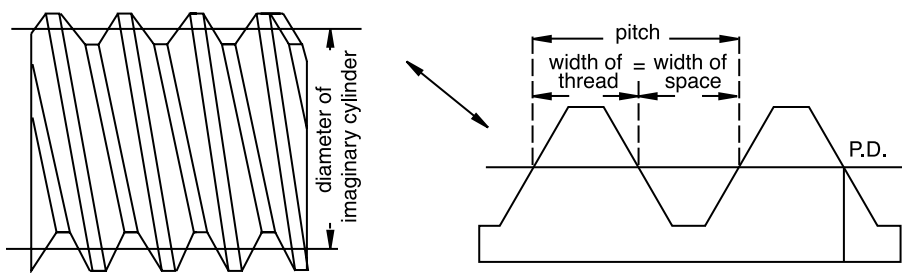
Square

Four driving flats parallel to the axis on a tap shank forming a square or square with round corners.

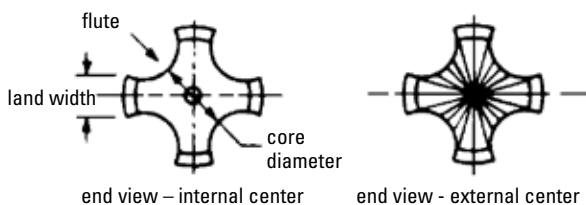
Taper Tap

A tap having a chamfer length of 7 to 10 threads.

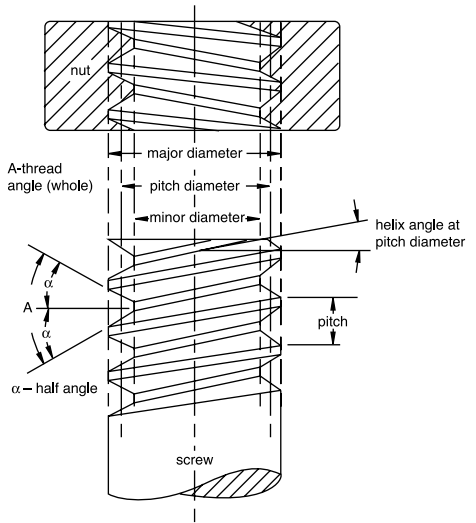
Pitch Diameter



Tap End Views



Screw Thread Tolerances



It is generally recognized that, in mass production, it is impossible to reproduce in exact detail the theoretically perfect product as laid out on the drawing board. The allowed slight variation between the theoretically perfect product and each unit of the actual product is called the **TOLERANCE**.

Allowance

An intentional difference in correlated dimensions of mating parts. It is the minimum clearance or maximum interference between such parts.

Angle of Thread

The angle included between the flanks of the thread measured in an axial plane.

Half Angle of Thread

The angle included between a flank of the thread and the normal (90°) to the axis, measured in an axial plane.

Lead of Thread

The distance a screw thread advances axially in one turn. On a single-thread screw the lead and pitch are identical. On a double thread the lead is 2X pitch, on a triple thread the lead is 3X pitch, etc.

Major Diameter

The largest diameter of a straight screw thread.

Minor Diameter

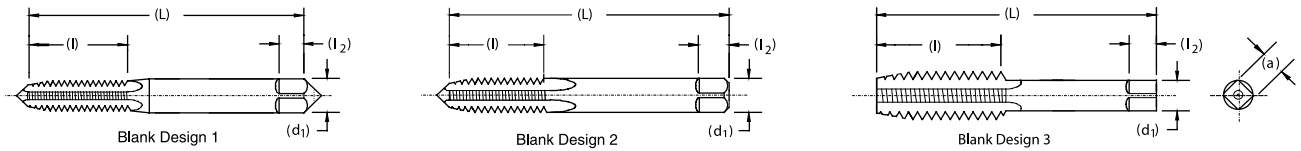
The smallest diameter of a straight screw thread.

Pitch

The distance from a point on a screw thread to a corresponding point on the next thread measured parallel to the axis.

The pitch in inches = $\frac{1}{\text{no. of threads per inch}}$

USCTI Table 302 Standard Tap Dimensions, Ground Thread

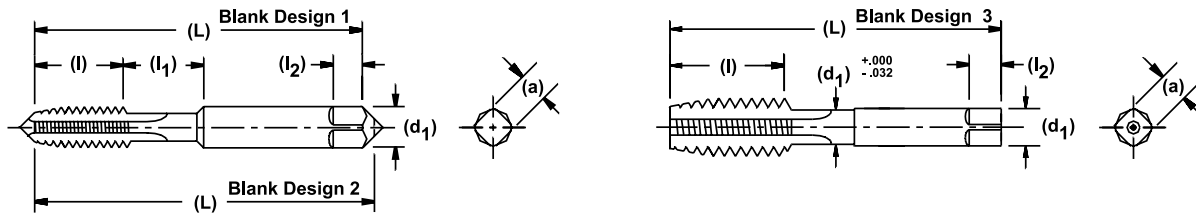


Nominal Diameter Range Inches Over To (inc.)	Machine Screw Size Number inches	Nominal Fractional Diameter inches	Nominal Metric Diameter millimeters, inches	Blank Design no.	Overall Length L	Thread Length l	Square Length l2	Shank Diameter d1	Square Size a
.052 .065	0 (.0600)		M1.6 (.0630)	1	1.63	.31	.19	.1410	.110
.065 .078	1 (.0730)		M1.8 (.0709)	1	1.69	.38	.19	.1410	.110
.078 .091	2 (.0860)		M2 (0787), M2.2 (.0866)	1	1.75	.44	.19	.1410	.110
.091 .104	3 (.0990)		M2.5 (.0984)	1	1.81	.50	.19	.1410	.110
.104 .117	4 (.1120)			1	1.88	.56	.19	.1410	.110
.117 .130	5 (.1250)		M3 (.1181)	1	1.94	.63	.19	.1410	.110
.130 .145	6 (.1380)		M3.5 (.1378)	1	2.00	.69	.19	.1410	.110
.145 .171	8 (.1640)		M4 (.1575)	1	2.13	.75	.25	.1680	.131
.171 .197	10 (.1900)		M4.5 (.1772), M5 (.1969)	1	2.38	.88	.25	.1940	.152
.197 .223	12 (.2160)			1	2.38	.94	.28	.2200	.165
.223 .260		1/4 (.2500)	M6 (.2362)	2	2.50	1.00	.31	.2550	.191
.260 .323		5/16 (.3125)	M7 (.2756), M8 (.3150)	2	2.72	1.13	.38	.3180	.238
.323 .395		3/8 (.3750)	M10 (.3937)	2	2.94	1.25	.44	.3810	.286
.395 .448		7/16 (.4375)		3	3.16	1.44	.41	.3230	.242
.448 .510		1/2 (.5000)	M12 (.4724)	3	3.38	1.66	.44	.3670	.275
.510 .573		9/16 (.5625)	M14 (.5512)	3	3.59	1.66	.50	.4290	.322
.573 .635		5/8 (.6250)	M16 (.6299)	3	3.81	1.81	.56	.4800	.360
.635 .709		11/16 (.6875)	M18 (.7087)	3	4.03	1.81	.63	.5420	.406
.709 .760		3/4 (.7500)		3	4.25	2.00	.69	.5900	.442
.760 .823		13/16 (.8125)	M20 (.7874)	3	4.47	2.00	.69	.6520	.489
.823 .885		7/8 (.8750)	M22 (.8661)	3	4.69	2.22	.75	.6970	.523
.885 .948		15/16 (.9375)	M24 (.9449)	3	4.91	2.22	.75	.7600	.570
.948 1.010		1 (1.0000)	M25 (.9843)	3	5.13	2.50	.81	.8000	.600
1.010 1.073		1-1/16 (1.0625)	M27 (1.0630)	3	5.13	2.50	.88	.8960	.672
1.073 1.135		1-1/8 (1.1250)		3	5.44	2.56	.88	.8960	.672
1.135 1.198		1-3/16 (1.1875)	M30 (1.1811)	3	5.44	2.56	1.00	1.0210	.766
1.198 1.260		1-1/4 (1.2500)		3	5.75	2.56	1.00	1.0210	.766
1.260 1.323		1-5/16 (1.3125)	M33 (1.2992)	3	5.75	2.56	1.06	1.1080	.831
1.323 1.385		1-3/8 (1.3750)		3	6.06	3.00	1.06	1.1080	.831
1.385 1.448		1-7/16 (1.4375)	M36 (1.4173)	3	6.06	3.00	1.13	1.2330	.925
1.448 1.510		1-1/2 (1.5000)		3	6.38	3.00	1.13	1.2330	.925
1.510 1.635		1-5/8 (1.6250)	M39 (1.5354)	3	6.69	3.19	1.13	1.3050	.979
1.635 1.760		1-3/4 (1.7500)	M42 (1.6535)	3	7.00	3.19	1.25	1.4300	1.072
1.760 1.885		1-7/8 (1.8750)		3	7.31	3.56	1.25	1.5190	1.139
1.885 2.010		2 (2.0000)	M48 (1.8898)	3	7.63	3.56	1.38	1.6440	1.233
2.010 2.135		2 1/8 (2.1250)		3	8.00	3.56	1.38	1.7690	1.327
2.135 2.260		2 1/4 (2.2500)	M56 (2.2047)	3	8.25	3.56	1.44	1.8940	1.420
2.260 2.385		2 3/8 (2.3750)		3	8.50	4.00	1.44	2.0190	1.514
2.385 2.510		2 1/2 (2.5000)		3	8.75	4.00	1.50	2.1000	1.575
2.510 2.635		2 5/8 (2.6250)	M64 (2.5197)	3	8.75	4.00	1.50	2.2250	1.669
2.635 2.760		2 3/4 (2.7500)		3	9.25	4.00	1.56	2.3500	1.762
2.760 2.885		2 7/8 (2.8750)	M72 (2.8346)	3	9.25	4.00	1.56	2.4750	1.856
2.885 3.010		3 (3.0000)		3	9.75	4.56	1.63	2.5430	1.907
3.010 3.135		3 1/8 (3.1250)		3	9.75	4.56	1.63	2.6680	2.001
3.135 3.260		3 1/4 (3.2500)	M80 (3.1496)	3	10.00	4.56	1.75	2.7930	2.095
3.260 3.385		3 3/8 (3.3750)		3	10.00	4.56	1.75	2.8830	2.162
3.385 3.510		3 1/2 (3.5000)		3	10.25	4.94	2.00	3.0080	2.256
3.510 3.635		3 5/8 (3.6250)	M90 (3.5433)	3	10.25	4.94	2.00	3.1330	2.350
3.635 3.760		3 3/4 (3.7500)		3	10.50	5.31	2.13	3.2170	2.413
3.760 3.885		3 7/8 (3.8750)		3	10.50	5.31	2.13	3.3420	2.506
3.885 4.010		4 (4.0000)	M100 (3.9370)	3	10.75	5.31	2.25	3.4670	2.600

USCTI Table 302 Standard Tap Dimensions (continued) – Tolerances

Element	Nominal Diameter Range in inches		Direction	Tolerance inches
	Over	To (inc.)		
Length Overall - L	.0520	1.0100	Plus or Minus	.031
	1.0100	4.0100	Plus or Minus	.063
Length of Thread - l	.0520	.2230	Plus or Minus	.047
	.2230	.5100	Plus or Minus	.063
	.5100	1.5100	Plus or Minus	.094
	1.5100	4.0100	Plus or Minus	.125
Length of square - l2	.0520	1.0100	Plus or Minus	.031
	1.0100	4.0100	Plus or Minus	.063
Diameter of shank - d1	.0520	.2230	Minus	.0015
	.2230	.6350	Minus	.0015
	.6350	1.0100	Minus	.0020
	1.0100	1.5100	Minus	.0020
	1.5100	2.0100	Minus	.0030
	2.0100	4.0100	Minus	.0030
Size of square - a	.0520	.5100	Minus	.004
	.5100	1.0100	Minus	.006
	1.0100	2.0100	Minus	.008
	2.0100	4.0100	Minus	.010

USCTI Table 302A Optional Neck and Optional Shortened Thread Length Dimensions



Nominal Diameter Range Inches Over To (inc.)	Machine Screw Size Number inches	Nominal Fractional Diameter inches	Nominal Metric Diameter millimeters, inches	Blank Design No.	Overall Length L	Thread Length l	Neck Length l1	Square Length l2	Shank Diameter d1	Square Size a
.104 .117	4 (.1120)			1	1.88	.31	.25	.19	.1410	.110
.117 .130	5 (.1250)		M3 (.1181)	1	1.94	.31	.31	.19	.1410	.110
.130 .145	6 (.1380)		M3.5 (.1378)	1	2.00	.38	.31	.19	.1410	.110
.145 .171	8 (.1640)		M4 (.1575)	1	2.13	.38	.38	.25	.1680	.131
.171 .197	10 (.1900)		M4.5 (.1772)	1	2.38	.50	.38	.25	.1940	.152
			M5 (.1969)							
.197 .223	12 (.2160)			1	2.38	.50	.44	.28	.2200	.165
.223 .260		1/4 (.2500)	M6 (.2362)	2	2.50	.63	.38	.31	.2550	.191
.260 .323		5/16 (.3125)	M7(.2756) M8(.3150)	2	2.72	.69	.44	.38	.3180	.238
.323 .395		3/8 (.3750)	M10 (.3937)	2	2.94	.75	.50	.44	.3810	.286
.395 .448		7/16 (.4375)		3	3.16	.88	—	.41	.3230	.242
.448 .510		1/2 (.5000)	M12 (.4724)	3	3.38	.94	—	.44	.3670	.275
.510 .573		9/16 (.5625)	M14 (.5541)	3	3.59	1.00	—	.50	.4290	.322
.573 .635		5/8 (.6250)	M16 (.6299)	3	3.81	1.09	—	.56	.4800	.360
.635 .709		11/16 (.6875)	M18 (.7087)	3	4.03	1.09	—	.63	.5420	.406
.709 .760		3/4 (.7500)		3	4.25	1.22	—	.69	.5900	.442
.760 .823		13/16 (.8125)	M20 (.7874)	3	4.47	1.22	—	.69	.6520	.489
.823 .885		7/8 (.8750)	M22 (.8661)	3	4.69	1.34	—	.75	.3670	.523
.885 .948		15/16 (.9375)	M24 (.9449)	3	4.91	1.34	—	.75	.7600	.570
.948 1.010		1 (1.0000)	M25 (.9843)	3	5.13	1.50	—	.81	.8000	.600



Tap – Drill Recommendations

Inch Sizes (all measurements in inches)

Tap Size and Pitch	Cutting Taps		Forming Taps	
	Drill Size	Dec. Equiv.	Drill Size	Dec. Equiv.
0-80	3/64	.0469	54	.0550
1-64	53	.0595	51	.0670
1-72	53	.0595	51	.0670
2-56	50	.0700	5/64	.0781
2-64	50	.0700	47	.0785
3-48	47	.0785	43	.0890
3-56	46	.0810	2.30	.0905
4-40	43	.0890	38	.1015
4-48	42	.0935	2.60	.1024
5-40	38	.1015	33	.1130
5-44	37	.1040	2.90	.1142
6-32	36	.1065	1/8	.1250
6-40	33	.1130	3.25	.1280
8-32	29	.1360	25	.1495
8-36	29	.1360	24	.1520
10-24	26	.1470	11/64	.1719
10-32	21	.1590	16	.1770
12-24	16	.1770	8	.1990
12-28	15	.1800	7	.2010
1/4-20	7	.2010	1	.2280
1/4-28	3	.2130	15/64	.2340
5/16-18	F	.2570	L	.2900
5/16-24	I	.2720	M	.2950
3/8-16	5/16	.3125	S	.3480
3/8-24	Q	.3320	T	.3580
7/16-14	U	.3680	Y	.4040
7/16-20	25/64	.3906	Z	.4130
1/2-13	27/64	.4219	15/32	.4682
1/2-20	29/64	.4531	12.25	.4823
9/16-12	31/64	.4844	17/32	.5312
9/16-18	33/64	.5156	13.50	.5315
5/8-11	17/32	.5312	14.75	.5807
5/8-18	37/64	.5781	15.25	.6004
3/4-10	21/32	.6562	45/64	.7031
3/4-16	11/16	.6875	23/32	.7188
7/8-9	49/64	.7656	*	*
7/8-14	13/16	.8125	*	*
1-8	7/8	.8750	*	*
1-12	59/64	.9219	*	*
1-1/8 - 7	63/64	.9844	*	*
1-1/8 - 12	1 3/64	1.0469	*	*
1-1/4 - 7	1 7/64	1.1094	*	*
1-1/4 - 12	1 11/64	1.1719	*	*
1-3/8 - 6	1 7/32	1.2188	*	*
1-3/8 - 12	1 19/64	1.2969	*	*
1-1/2 - 6	1 11/32	1.3438	*	*
1-1/2 - 12	1 27/64	1.4219	*	*

* Contact Technical Service for recommendations.
Hole sizes shown may not suit UNJ and MJ hole requirements.

Metric Sizes (measurements in millimeters and inches)

Tap Size and Pitch	Cutting Taps		Forming Taps	
	Drill Size	Dec. Equiv.	Drill Size	Dec. Equiv.
mm	mm	in	mm/in	in
M1.6 x 0.35	1.25	.0492	1.45	.0571
M1.8 x 0.35	1.45	.0571	1.65	.0650
M2 x 0.40	1.60	.0630	1.80	.0709
M2.2 x 0.45	1.75	.0689	2.00	.0787
M2.5 x 0.45	2.05	.0807	2.30	.0906
M3 x 0.50	2.50	.0984	7/64	.1094
M3.5 x 0.60	2.90	.1142	3.20	.1260
M4 x 0.70	3.30	.1299	3.70	.1476
M4.5 x 0.75	3.70	.1476	4.10	.1614
M5 x 0.80	4.20	.1654	14	.1820
M6 x 1.00	5.00	.1969	7/32	.2188
M7 x 1.00	6.00	.2362	F	.2570
M8 x 1.25	6.70	.2638	7.40	.2913
M8 x 1.00	7.00	.2756	19/64	.2969
M10 x 1.50	8.50	.3346	U	.3680
M10 x 1.25	8.70	.3425	9.40	.3701
M12 x 1.75	10.20	.4016	11.20	.4409
M12 x 1.25	10.80	.4252	11.50	.4528
M14 x 2.00	12.00	.4724	33/64	.5156
M16 x 2.00	14.00	.5512	19/32	.5938
M16 x 1.50	14.50	.5709	15.25	.6004
M18 x 2.50	15.50	.6102	39/64	.6094
M18 x 1.50	16.50	.6496	17.25	.6791
M20 x 2.50	17.50	.6890	*	*
M20 x 1.50	18.50	.7283	*	*
M22 x 2.50	19.50	.7677	*	*
M22 x 1.50	20.50	.8071	*	*
M24 x 3.00	21.00	.8268	*	*
M24 x 2.00	22.00	.8661	*	*
M27 x 3.00	24.00	.9449	*	*
M27 x 2.00	25.00	.9843	*	*
M30 x 3.50	26.50	1.0433	*	*
M30 x 2.00	28.00	1.1024	*	*
M33 x 3.50	29.50	1.1614	*	*
M33 x 2.00	31.00	1.2205	*	*
M36 x 4.00	32.00	1.2598	*	*
M36 x 3.00	33.00	1.2992	*	*
M39 x 4.00	35.00	1.3780	*	*
M39 x 3.00	36.00	1.4173	*	*

Pipe Tap Sizes (measurements in millimeters and inches)

Nominal Pipe Tap Size	NPT & NPTF				
	Without Reamer	With Reamer	NPSM	NPSC	NPSF
1/16-27	C (.242)	A (.234)	—	.250	D (.246)
1/8-27	Q (.332)	21/64	T (.358)	Q (.332)	R (.339)
1/4-18	7/16	27/64	15/32	7/16	7/16
3/8-18	9/16	9/16	.603 (special)	37/64	37/64
1/2-14	45/64	11/16	19.0 mm	18.0 mm	18.0 mm
3/4-14	29/32	57/64	61/64	59/64	59/64
1 – 11-1/2	1 9/64	1 1/8	1 13/64	1 5/32	1 5/32
1-1/4-11-1/2	1 31/64	1 15/32	1 35/64	1 1/2	—
1-1/2 – 11-1/2	1 23/32	1 45/64	1 25/32	1 47/64	—
2 – 11-1/2	2 3/16	2 11/64	2 1/4	2 13/64	—

Technical Information

Hardness Conversion Table

Use this table to match the hardness of your workpiece material to the correct tap.

10 M/M Ball 3000 Kg	120° Cone 150 Kg	1/16" Ball 100 Kg	Model C	1000 Lb. per Sq. In.	10 M/M Ball 3000 Kg	120° Cone 150 Kg	1/16" Ball 100 Kg	Model C	1000 Lb. per Sq. In.
Brinell	Rockwell C	Rockwell B	Shore Scleroscope	Tensile Strength	Brinell	Rockwell C	Rockwell B	Shore Scleroscope	Tensile Strength
800	72	—	100	—	276	30	105	42	136
780	71	—	99	—	269	29	104	41	132
760	70	—	98	—	261	28	103	40	129
745	68	—	97	367	258	27	102	39	127
725	67	—	96	357	255	26	102	39	125
712	66	—	95	350	249	25	101	38	123
682	65	—	93	337	245	24	100	37	119
668	64	—	91	326	240	23	99	36	117
652	63	—	89	318	237	23	99	35	115
626	62	—	87	306	229	22	98	34	113
614	61	—	85	299	224	21	97	33	110
601	60	—	83	292	217	20	96	33	107
590	59	—	81	290	211	19	95	32	104
576	57	—	79	281	206	18	94	32	102
552	56	—	76	270	203	17	94	31	100
545	55	—	75	268	200	16	93	31	98
529	54	—	74	259	196	15	92	30	96
514	53	120	72	254	191	14	92	30	94
502	52	119	70	247	187	13	91	29	92
495	51	119	69	244	185	12	91	29	91
477	49	118	67	233	183	11	90	28	90
461	48	117	66	227	180	10	89	28	89
451	47	117	65	223	175	9	88	27	86
444	46	116	64	219	170	7	87	27	84
427	45	115	62	209	167	6	87	27	82
415	44	115	60	204	165	5	86	26	81
401	43	114	58	196	163	4	85	26	80
388	42	114	57	191	160	3	84	25	78
375	41	113	55	184	156	2	83	25	76
370	40	112	54	182	154	1	82	25	75
362	39	111	53	179	152	—	82	24	74
351	38	111	51	173	150	—	81	24	74
346	37	110	50	170	147	—	80	24	72
341	37	110	49	168	145	—	79	23	71
331	36	109	47	163	143	—	79	23	70
323	35	109	46	158	141	—	78	23	69
311	34	108	46	153	140	—	77	22	69
301	33	107	45	148	135	—	75	22	67
293	32	106	44	144	130	—	72	22	65
285	31	105	43	140					

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Standard Tap Marking System

Taps, dies, and other threading tools will be marked with the nominal size, number of threads per inch, and the proper symbol to identify the thread form. The symbols below are in agreement with the ASME B1.7 1965 (R 1972) Standard on nomenclature, definitions and letter symbols for screw threads and other national standards.

Symbol	Reference	Symbol	Reference
ACME-C	Acme Thread-Centralizing	NPTF	Dryseal American National Standard Taper Pipe Thread
ACME-G	Acme Thread-General Purpose	NPTR	American National Standard Taper Pipe Thread for Railing Joints (Tap Marked NPT)
AMO	American Standard Microscope Objective Thread	NR	American National Thread with a 0.108p to 0.144p Controlled Root Radius
ANPT	Aeronautical National Form Taper Pipe Thread (Ground Thread Tap marked NPT)	NS	American National Thread-Special
BA	British Association Standard Thread	PTF-SAE	Short Dryseal SAE Short Taper Pipe Thread
BSF	British Standard Fine Thread Series	SGT	Special Gas Taper Thread
BSPP	British Standard Pipe (Parallel) Thread	SPL-PTF	Dryseal Special Taper Pipe Thread
BSPT	British Standard Taper Pipe Thread	STI	Special Thread for Helical Coil Wire Screw Thread Inserts
BSW	British Standard Whitworth Coarse Thread Series	Stub Acme	Stub Acme Thread
M	Metric Standard Threads	*UN	Unified Constant-Pitch Thread Series
N	American National 8, 12 and 16 Thread Series (8N, 12N, 16N)	*UNC	Unified Coarse Thread Series
N BUTT	American Buttress Thread	*UNEF	Unified Extra-Fine Thread Series
NC	American National Coarse Thread Series	*UNF	Unified Fine Thread Series
NEF	American National Extra-Fine Thread Series	UNJ	Unified Thread Series with a 0.150lp to 0.18042p Controlled Root Radius on External Thread only.
NF	American National Fine Thread Series	UNJC	Unified Coarse Thread Series with a 0.150lp to 0.18042p Controlled Root Radius on External Thread only.
NGO	National Gas Outlet Thread (specify right or left hand)	UNJF	Unified Fine Thread Series with a 0.150lp to 0.18042p Controlled Root Radius on External Thread only.
NGS	National Gas Straight Thread	UNM	Unified Miniature Thread Series
NGT	National Gas Taper Thread (See also "SGT")	UNR	Unified Constant-pitch Thread Series with a 0.108p to 0.144p Controlled Root Radius
NH	American National Hose Coupling & Firehose Coupling Threads	UNRC	Unified Coarse Thread Series with a 0.108p to 0.144p Controlled Root Radius
NPS	For Tap marking Only (See NPSC, NPSM)	UNRF	Unified Fine Thread Series with a 0.108p to 0.144p Controlled Root Radius
NPSC	American National Standard Straight Pipe Thread in Pipe Couplings (Tap Marked NPS)	*UNS	Unified Thread-Special
NPSF	Dryseal American National Standard Fuel Internal Straight Pipe Thread	V	A 60 "V" thread with Truncated Crest and Root. The theoretical "V" Form is usually flattened to the user's specifications.
NPSH	American National Standard Straight Pipe Thread for Hose Couplings		
NPSI	Dryseal American National Standard Intermediate Internal Straight Pipe Thread		
NPSL	American National Standard Straight Pipe Thread for Loose-Fitting Mechanical Joints with locknuts.		
NPSM	American National Standard Straight Pipe Threads for Free-Fitting Mechanical Joints for Fixtures (Tap Marked NPS)		
NPT	American National Standard Taper Pipe Thread (see ANPT, NPTR)		

**Taps are not marked with "U", but with the symbol for the corresponding American Standard thread form with which it is compatible.*

Technical Information

USCTI Table 327 • Ground Thread Unified and American National Form – Fractional Taps

Lead Tolerance

A maximum lead error of + / - .0005" in 1" of thread is permitted.

Pitch Diameter Limits

for taps through 1" diameter:

- H1 = basic to basic plus .0005"
- H2 = basic plus .0005" to basic plus .001"
- H3 = basic plus .001" to basic plus .0015"
- H4 = basic plus .0015" to basic plus .002"
- H5 = basic plus .002" to basic plus .0025"
- H6 = basic plus .0025" to basic plus .003"

for Taps over 1" Diameter Through 1-1/2" diameter:

- H4 = basic plus .001" to basic plus .002"

Angle Tolerance

Threads Per Inch

- 6 to 9 inclusive
- 10 to 28 inclusive

Error in Half Angle

- 25' + / -
- 30' + / -

Formulae (Approximate)

- Max. Major Diameter = Basic Major Diameter + A*
- Min. Major Diameter = Max. Major Diameter - B*

*See Table 331.

Thread Limits

Nom. Size	Threads per Inch			Major Diameter			Basic Pitch Diam.	Pitch Diameter Limits											
	NC UNC	NF UNF	NS UNS	Basic	Min.	Max.		H1 Limit Min. Max.	H2 Limit Min. Max.	H3 Limit Min. Max.	H4 Limit Min. Max.	H5 Limit Min. Max.	H6 Limit Min. Max.						
1/4	20	-	-	.2500	.2540	.2550	.2175	.2175	.2180	.2180	.2185	.2185	.2190	-	-	.2195	.2200	-	-
1/4	-	28	-	.2500	.2525	.2535	.2268	.2268	.2273	.2273	.2278	.2278	.2283	.2283	.2288	-	-	-	-
5/16	18	-	-	.3125	.3170	.3180	.2764	.2764	.2769	.2769	.2774	.2774	.2779	-	-	.2784	.2789	-	-
5/16	-	24	-	.3125	.3155	.3165	.2854	.2854	.2859	.2859	.2864	.2864	.2869	.2869	.2874	-	-	-	-
3/8	16	-	-	.3750	.3800	.3810	.3344	.3344	.3349	.3349	.3354	.3354	.3359	-	-	.3364	.3369	-	-
3/8	-	24	-	.3750	.3780	.3790	.3479	.3479	.3484	.3484	.3489	.3489	.3494	.3494	.3499	-	-	-	-
7/16	14	-	-	.4375	.4435	.4445	.3911	-	-	.3916	.3921	.3921	.3926	-	-	.3931	.3936	-	-
7/16	-	20	-	.4375	.4415	.4425	.4050	-	-	-	-	.4060	.4065	-	-	.4070	.4075	-	-
1/2	13	-	-	.5000	.5065	.5075	.4500	.4500	.4505	.4505	.4510	.4510	.4515	-	-	.4520	.4525	-	-
1/2	-	20	-	.5000	.5040	.5050	.4675	.4675	.4680	.4680	.4685	.4685	.4690	-	-	.4695	.4700	-	-
9/16	12	-	-	.5625	.5690	.5700	.5084	-	-	.5089	-	-	.5099	-	-	.5104	.5109	-	-
9/16	-	18	-	.5625	.5670	.5680	.5264	-	-	.5269	.5274	.5274	.5279	-	-	.5284	.5289	-	-
5/8	11	-	-	.6250	.6320	.6330	.5660	-	-	.5665	.5670	.5670	.5675	-	-	.5680	.5685	-	-
5/8	-	18	-	.6250	.6295	.6305	.5889	-	-	.5894	.5899	.5899	.5904	-	-	.5909	.5914	-	-
11/16	-	-	11	.6875	.6945	.6955	.6285	-	-	-	-	.6295	.6300	-	-	-	-	-	-
11/16	-	-	16	.6875	.6925	.6935	.6469	-	-	-	-	.6479	.6484	-	-	-	-	-	-
3/4	10	-	-	.7500	.7575	.7590	-	.6855	.6855	.6860	.6860	.6865	-	-	.6870	.6875	-	-	
3/4	-	16	-	.7500	.7550	.7560	.7094	.7094	.7099	.7099	.7104	.7104	.7109	-	-	.7114	.7119	-	-
7/8	9	-	-	.8750	.8835	.8850	.8028	-	-	-	-	-	-	.8043	.8048	-	-	.8053	.8058
7/8	-	14	-	.8750	.8810	.8820	.8286	-	-	.8291	.8296	-	-	.8301	.8306	-	-	.8311	.8316
1	8	-	-	1.0000	1.0095	1.0110	.9188	-	-	.9193	.9198	-	-	.9203	.9208	-	-	.9213	.9218
1	-	12	-	1.0000	1.0065	1.0075	.9459	-	-	-	-	-	-	.9474	.9479	-	-	-	-
1	-	-	14	1.0000	1.0060	1.0070	.9536	-	-	-	-	-	-	.9551	.9556	-	-	-	-
1-1/8	7	-	-	1.1250	1.1350	1.1370	1.0322	-	-	-	-	-	-	1.0332	1.0342	-	-	-	-
1-1/8	-	12	-	1.1250	1.132	1.1325	1.0709	-	-	-	-	-	-	1.0719	1.0729	-	-	-	-
1-1/4	7	-	-	1.2500	1.2600	1.2620	1.1572	-	-	-	-	-	-	1.1582	1.1592	-	-	-	-
1-1/4	-	12	-	1.2500	1.2565	1.2575	1.1959	-	-	-	-	-	-	1.1969	1.1979	-	-	-	-
1-3/8	6	-	-	1.3750	1.3870	1.3890	1.2667	-	-	-	-	-	-	1.2677	1.2687	-	-	-	-
1-3/8	-	12	-	1.3750	1.3815	1.3825	1.3209	-	-	-	-	-	-	1.3219	1.3229	-	-	-	-
1-1/2	6	-	-	1.5000	1.5120	1.5140	1.3917	-	-	-	-	-	-	1.3927	1.3937	-	-	-	-
1-1/2	-	12	-	1.5000	1.507	1.5075	1.4459	-	-	-	-	-	-	1.4469	1.4479	-	-	-	-

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USCTI Table 329 • Ground Thread Unified and American National Form – Machine Screw Taps

Lead Tolerance

A maximum lead error of $\pm .0005$ " in 1" of thread is permitted.

Pitch Diameter Limits:

H1 = basic to basic + .0005" to basic + .001"

H2 = basic + .0005" to basic + .001"

H3 = basic + .001" to basic + .0015"

H7 = basic + .003" to basic + .0035"

Angle Tolerance

Threads Per Inch

20 to 80 inclusive

Error in Half Angle

30' \pm –

Formulae

Max. Major Diameter = Basic Major Diameter + A

Min. Major Diameter = Max. Major Diameter – B

A = Constant to add: 45% of the theoretical truncation to nearest .0005"

B = Major diameter tolerance.

Thread Limits

Nom. Size	Threads per Inch			Major Diameter			Basic Pitch Diam.	H1 Limit		H2 Limit		H3 Limit		H7 Limit	
	NC UNC	NF UNF	NS UNS	Basic	Min.	Max.		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
0		80		.0600	.0605	.0615	.0519	.0519	.0524	.0524	.0529	-	-	-	-
1	64			.0730	.0735	.0745	.0629	.0629	.0634	.0634	.0639	-	-	-	-
1		72		.0730	.0735	.0745	.0640	.0640	.0645	.0645	.0650	-	-	-	-
2	56			.0860	.0865	.0875	.0744	.0744	.0749	.0749	.0754	-	-	-	-
2		64		.0860	.0865	.0875	.0759	-	-	.0764	.0769	-	-	-	-
3	48			.0990	.1000	.1010	.0855	.0855	.0860	.0860	.0865	-	-	-	-
3		56		.0990	.0995	.1005	.0874	.0874	.0879	.0879	.0884	-	-	-	-
4			36	.1120	.1135	.1145	.0940	-	-	.0945	.0950	-	-	-	-
4	40			.1120	.1135	.1145	.0958	.0958	.0963	.0963	.0968	-	-	-	-
4		48		.1120	.1130	.1140	.0985	.0985	.0990	.0990	.0995	-	-	-	-
5	40			.1250	.1265	.1275	.1088	.1088	.1093	.1093	.1098	-	-	-	-
5		44		.1250	.1260	.1270	.1102	-	-	.1107	.1112	-	-	-	-
6	32			.1380	.1400	.1410	.1177	.1177	.1182	.1182	.1187	.1187	.1192	.1207	.1212
6		40		.1380	.1395	.1405	.1218	.1218	.1223	.1223	.1228	-	-	-	-
8	32			.1640	.1660	.1670	.1437	.1437	.1442	.1442	.1447	.1447	.1452	.1467	.1472
8		36		.1640	.1655	.1665	.1460	-	-	.1465	.1470	-	-	-	-
10	24			.1900	.1930	.1940	.1629	.1629	.1634	.1634	.1639	.1639	.1644	.1659	.1664
10		32		.1900	.1920	.1930	.1697	.1697	.1702	.1702	.1707	.1707	.1712	.1727	.1732
12	24			.2160	.2190	.2200	.1889	-	-	-	-	.1899	.1904	-	-
12		28		.2160	.2185	.2195	.1928	-	-	-	-	.1938	.1943	-	-

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Technical Information

USCTI Table 341 • Ground Thread Tap Limits – Metric Taps

General

These tables and formulae are used in determining the limits and tolerances for ground thread metric taps unless otherwise specified. They apply only to metric threads having a 60° form with a P/8 flat at the major diameter of the basic thread form.

Note: When the tap major diameter must be determined from a specific tap pitch diameter, the minimum major diameter equals the maximum specified tap pitch diameter minus constant Y, plus the basic size height of thread (.64952P), plus constant W.

Lead Tolerance

A maximum lead error of + / - .0005" in 1" of thread is permitted.

Angle Tolerance

Pitch mm	Deviation in Half Angle
over 0.25 to 2.5 inclusive	30' + / -
over 2.5 to 4 inclusive	25' + / -
over 4 to 6 inclusive	20' + / -

Formulae

- Max. Major Diameter = Min. + X
- Min. Major Diameter = Basic + W
- Max. Pitch Diameter = Basic + Y
- Min. Pitch Diameter = Max. - Z

W = Constant to add to Basic Major Diameter (.080P converted to inches)

X = Major Diameter Tolerance

Y = Amount over Basic for Maximum Pitch Diameter

Z = Pitch Diameter Tolerance

Values for W, X, Y, and Z (inches)

Pitch mm	Inch Equivalent	W	X	Y	Y	Y	Y	Z	Z	Z	Z
		in	in	M1.6 thru M6.3	over M6.3 thru M25	over M25 thru M90	over M90	M1.6 thru M6.3	over M6.3 thru M25	over M25 thru M90	over M90
0.3	.01181	.0009	.0010	.0015	.0015	.0020	.0020	.0006	.0006	.0008	.0008
0.35	.01378	.0011	.0010	.0015	.0015	.0020	.0020	.0006	.0006	.0008	.0008
0.4	.01575	.0013	.0010	.0015	.0020	.0020	.0020	.0006	.0006	.0008	.0010
0.45	.01772	.0014	.0010	.0015	.0020	.0020	.0020	.0006	.0008	.0008	.0010
0.5	.01968	.0016	.0010	.0015	.0020	.0020	.0025	.0006	.0008	.0010	.0010
0.6	.02362	.0019	.0010	.0020	.0020	.0025	.0025	.0008	.0008	.0010	.0010
0.7	.02756	.0022	.0016	.0020	.0020	.0025	.0025	.0008	.0008	.0010	.0010
0.75	.02953	.0024	.0016	.0020	.0025	.0025	.0030	.0008	.0010	.0010	.0012
0.8	.03150	.0025	.0016	.0020	.0025	.0025	.0030	.0008	.0010	.0010	.0012
0.9	.03543	.0028	.0016	.0020	.0025	.0025	.0030	.0008	.0010	.0010	.0012
1	.03937	.0032	.0016	.0025	.0025	.0030	.0030	.0010	.0010	.0012	.0012
1.25	.04921	.0039	.0025	.0025	.0025	.0030	.0035	.0010	.0012	.0012	.0016
1.5	.05906	.0047	.0025	.0025	.0030	.0030	.0035	.0010	.0012	.0012	.0016
1.75	.06890	.0055	.0025	—	.0030	.0035	.0040	—	.0012	.0016	.0016
2	.07874	.0063	.0025	—	.0035	.0035	.0040	—	.0016	.0016	.0016
2.5	.09843	.0079	.0025	—	.0035	.0040	.0045	—	.0016	.0016	.0020
3	.11811	.0095	.0039	—	.0040	.0040	.0050	—	.0016	.0020	.0020
3.5	.13780	.0110	.0039	—	.0040	.0045	.0050	—	.0016	.0020	.0020
4	.15748	.0126	.0039	—	.0040	.0045	.0055	—	.0020	.0020	.0025
4.5	.17717	.0142	.0039	—	—	.0050	.0055	—	.0020	.0020	.0025
5	.19685	.0158	.0039	—	—	.0050	.0060	—	—	.0025	.0025
5.5	.21654	.0158	.0039	—	—	.0050	.0060	—	—	.0025	.0025
6	.23622	.0189	.0039	—	—	.0055	.0060	—	—	.0025	.0025

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USCTI Table 352 • Basic Thread Dimensions – Machine Screw Taps

Thread Dimensions

Nominal Size & Pitch	Basic Major Dia.	Basic Pitch Dia.	Basic Minor Dia.	Max Minor Dia. Class 3B Internal Thd
0 80	.0600	.0519	.0438	.0514
1 64	.0730	.0629	.0527	.0623
1 72	.0730	.0640	.0550	.0635
2 56	.0860	.0744	.0628	.0737
2 64	.0860	.0759	.0657	.0753
3 48	.0990	.0855	.0719	.0845
3 56	.0990	.0874	.0758	.0865
4 32	.1120	.0917	.0714	.0880
4 36	.1120	.0940	.0759	.0919
4 40	.1120	.0958	.0795	.0939
4 48	.1120	.0985	.0849	.0968
5 40	.1250	.1088	.0925	.1062
5 44	.1250	.1102	.0955	.1079

Nominal Size & Pitch	Basic Major Dia.	Basic Pitch Dia.	Basic Minor Dia.	Max Minor Dia. Class 3B Internal Thd
6 32	.1380	.1177	.0974	.1140
6 36	.1380	.1200	.1019	.1165
6 40	.1380	.1218	.1055	.1186
8 32	.1640	.1437	.1234	.1389
8 36	.1640	.1460	.1279	.1416
8 40	.1640	.1478	.1315	.1437
10 24	.1900	.1629	.1359	.1556
10 28	.1900	.1668	.1436	.1604
10 30	.1900	.1684	.1467	.1630
10 32	.1900	.1697	.1494	.1641
12 24	.2160	.1889	.1619	.1807
12 28	.2160	.1928	.1696	.1857
12 32	.2160	.1957	.1754	.1895
14 20	.2420	.2095	.1770	.1987
14 24	.2420	.2149	.1879	.2059

Constants for Finding Pitch Diameter and Minor Diameter of Screw Threads

Basic Pitch Diameter = Basic Major Diameter – Constant for Basic Pitch Diameter for TPI

Basic Minor Diameter = Basic Major Diameter – Constant for Basic Minor Diameter for TPI

Threads per Inch	Pitch		Constant for Basic Pitch Dia.		Constant for Basic Minor Dia.	
	in	mm	Unified	ISO	Unified	ISO
–	.0079	0.2	–	.00511	–	.01022
–	.0088	0.225	–	.00575	–	.01150
–	.0098	0.25	–	.00639	–	.01278
–	.0118	0.3	–	.00767	–	.01534
80	.0125	–	.00812	–	.01624	–
–	.0138	0.35	–	.00895	–	.01790
72	.0139	–	.00902	–	.01804	–
64	.0156	–	.01015	–	.02030	–
–	.0157	0.4	–	.01023	–	.02046
–	.0177	0.45	–	.01151	–	.02302
56	.0178	–	.01160	–	.02320	–
–	.0197	0.5	–	.01279	–	.02558
48	.0208	–	.01353	–	.02706	–
44	.0227	–	.01476	–	.02952	–
–	.0236	0.6	–	.01534	–	.03068
40	.0250	–	.01624	–	.03248	–
–	.0275	0.7	–	.01790	–	.03580
36	.0278	–	.01804	–	.03608	–
–	.0295	0.75	–	.01918	–	.03836
32	.0312	–	.02030	–	.04060	–
–	.0315	0.8	–	.02046	–	.04092
28	.0357	–	.02320	–	.04640	–
27	.0370	–	.02406	–	.04812	–
–	.0394	1.0	–	.02557	–	.05114
24	.0417	–	.02706	–	.05412	–
–	.0492	1.25	–	.03196	–	.06392

Threads per Inch	Pitch		Constant for Basic Pitch Dia.		Constant for Basic Minor Dia.	
	in	mm	Unified	ISO	Unified	ISO
20	.0500	–	.03248	–	.06496	–
18	.0555	–	.03608	–	.07216	–
–	.0590	1.5	–	.03836	–	.07672
16	.0625	–	.04060	–	.08120	–
–	.0689	1.75	–	.04475	–	.08950
14	.0714	–	.04639	–	.09278	–
13	.0769	–	.04996	–	.09992	–
–	.0787	2.0	–	.05117	–	.10228
12	.0833	–	.05413	–	.10826	–
11.5	.0869	–	.05648	–	.11296	–
11	.0909	–	.05905	–	.11810	–
–	.0984	2.5	–	.06393	–	.12786
10	.1000	–	.06495	–	.12990	–
9	.1111	–	.07217	–	.14434	–
–	.1181	3.0	–	.07672	–	.15344
8	.1250	–	.08119	–	.16238	–
–	.1378	3.5	–	.08950	–	.17900
7	.1428	–	.09279	–	.18558	–
–	.1575	4.0	–	.10229	–	.20458
6	.1667	–	.10825	–	.21650	–
–	.1772	4.5	–	.11507	–	.23014
–	.1968	5.0	–	.12786	–	.25572
5	.2000	–	.12990	–	.25980	–
–	.2165	5.5	–	.14064	–	.28128
4.5	.2222	–	.14434	–	.28868	–
–	.2362	6.0	–	.15343	–	.30353
4	.2500	–	.16238	–	.32476	–



DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Technical Information

USCTI Table 352 • Basic Thread Dimensions – Fractional Sizes Unified & American National Form

DRILLING

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Nominal Size and TPI	Basic Major Diameter	Basic Pitch Diameter	Basic Minor Diameter	Max Minor Diameter Class 3B Internal Thread
1/16 64	.0625	.0524	.0422	.0518
3/32 48	.0938	.0803	.0667	.0793
1/8 40	.1250	.1088	.0925	.1062
5/32 32	.1563	.1360	.1157	.1311
5/32 36	.1563	.1382	.1202	.1339
3/16 24	.1875	.1604	.1334	.1530
3/16 32	.1875	.1672	.1469	.1616
7/32 24	.2188	.1917	.1646	.1834
7/32 32	.2188	.1985	.1782	.1922
1/4 20	.2500	.2175	.1850	.2067
1/4 24	.2500	.2229	.1959	.2139
1/4 28	.2500	.2268	.2036	.2190
1/4 32	.2500	.2297	.2094	.2229
5/16 18	.3125	.2764	.2403	.2630
5/16 20	.3125	.2800	.2476	.2680
5/16 24	.3125	.2854	.2584	.2754
5/16 32	.3125	.2922	.2719	.2847
3/8 16	.3750	.3344	.2938	.3182
3/8 20	.3750	.3425	.3100	.3297
3/8 24	.3750	.3479	.3209	.3372
3/8 32	.3750	.3547	.3344	.3469
7/16 14	.4375	.3911	.3447	.3717
7/16 20	.4375	.4050	.3726	.3916
7/16 24	.4375	.4104	.3834	.3994
7/16 28	.4375	.4143	.3911	.4051
1/2 12	.5000	.4459	.3918	.4223
1/2 13	.5000	.4500	.4001	.4284
1/2 20	.5000	.4675	.4351	.4537
1/2 24	.5000	.4729	.4459	.4619
1/2 28	.5000	.4768	.4536	.4676
9/16 12	.5625	.5084	.4542	.4843
9/16 18	.5625	.5264	.4903	.5106
9/16 24	.5625	.5354	.5084	.5244
5/8 11	.6250	.5660	.5069	.5391
5/8 12	.6250	.5709	.5168	.5463
5/8 18	.6250	.5889	.5528	.5730
5/8 24	.6250	.5979	.5709	.5869
11/16 11	.6875	.6285	.5694	.6012
11/16 12	.6875	.6334	.5793	.6085
11/16 16	.6875	.6469	.6063	.6284
11/16 24	.6875	.6604	.6334	.6494
3/4 10	.7500	.6850	.6201	.6545
3/4 12	.7500	.6959	.6418	.6707
3/4 16	.7500	.7094	.6688	.6908
3/4 20	.7500	.7175	.6850	.7037
13/16 12	.8125	.7584	.7042	.7329
13/16 16	.8125	.7719	.7313	.7533
13/16 20	.8125	.7800	.7475	.7662

Nominal Size and TPI	Basic Major Diameter	Basic Pitch Diameter	Basic Minor Diameter	Max Minor Diameter Class 3B Internal Thread
7/8 9	.8750	.8028	.7307	.7681
7/8 12	.8750	.8209	.7668	.7952
7/8 14	.8750	.8286	.7822	.8068
7/8 16	.8750	.8344	.7938	.8158
7/8 18	.8750	.8389	.8028	.8230
7/8 20	.8750	.8425	.8100	.8287
15/16 12	.9375	.8834	.8293	.8575
15/16 16	.9375	.8969	.8563	.8783
15/16 20	.9375	.9050	.8725	.8912
1 8	1.0000	.9188	.8376	.8797
1 12	1.0000	.9459	.8918	.9198
1 14	1.0000	.9536	.9072	.9315
1 16	1.0000	.9594	.9188	.9408
1 20	1.0000	.9675	.9350	.9537
1-1/6 12	1.0625	1.0084	.9543	.9823
1-1/6 16	1.0625	1.0219	.9813	1.0033
1-1/6 18	1.0625	1.0264	.9903	1.0105
1-1/8 7	1.1250	1.0322	.9394	.9875
1-1/8 8	1.1250	1.0438	.9626	1.0047
1-1/8 12	1.1250	1.0709	1.0168	1.0448
1-1/8 16	1.1250	1.0844	1.0438	1.0658
1-1/8 18	1.1250	1.0889	1.0528	1.0730
1-3/16 12	1.1875	1.1334	1.0793	1.1073
1-3/16 16	1.1875	1.1469	1.1063	1.1283
1-3/16 18	1.1875	1.1514	1.1153	1.1355
1-1/4 7	1.2500	1.1572	1.0644	1.1125
1-1/4 8	1.2500	1.1688	1.0876	1.1297
1-1/4 12	1.2500	1.1959	1.1418	1.1698
1-1/4 16	1.2500	1.2094	1.1688	1.1908
1-1/4 18	1.2500	1.2139	1.1778	1.1980
1-5/16 12	1.3125	1.2584	1.2043	1.2323
1-5/16 16	1.3125	1.2719	1.2313	1.2533
1-5/16 18	1.3125	1.2764	1.2403	1.2605
1-3/8 6	1.3750	1.2667	1.1585	1.2146
1-3/8 8	1.3750	1.2938	1.2126	1.2547
1-3/8 12	1.3750	1.3209	1.2668	1.2948
1-3/8 16	1.3750	1.3344	1.2938	1.3158
1-3/8 18	1.3750	1.3389	1.3028	1.3230
1-7/16 12	1.4375	1.3834	1.3293	1.3573
1-7/16 16	1.4375	1.3969	1.3563	1.3783
1-7/16 18	1.4375	1.4014	1.3653	1.3855
1-1/2 6	1.5000	1.3917	1.2835	1.3396
1-1/2 8	1.5000	1.4188	1.3376	1.3797
1-1/2 12	1.5000	1.4459	1.3918	1.4198
1-1/2 16	1.5000	1.4594	1.4188	1.4408
1-1/2 18	1.5000	1.4639	1.4278	1.4480
1-1/2 16	1.5625	1.5219	1.4813	1.5033
1-1/2 18	1.5625	1.5264	1.4903	1.5105



Technical Information

USCTI Table 352 • Basic Thread Dimensions – Fractional Sizes (continued)

Nominal Size and TPI	Basic Major Diameter	Basic Pitch Diameter	Basic Minor Diameter	Max Minor Diameter Class 3B Internal Thread
1-5/8 6	1.6250	1.5167	1.4085	1.4646
1-5/8 8	1.6250	1.5438	1.4626	1.5047
1-5/8 12	1.6250	1.5709	1.5168	1.5448
1-5/8 16	1.6250	1.5844	1.5438	1.5658
1-5/8 18	1.6250	1.5889	1.5528	1.5730
1-11/16 16	1.6875	1.6469	1.6063	1.6283
1-11/16 18	1.6875	1.6514	1.6153	1.6355
1-3/4 5	1.7500	1.6201	1.4902	1.5575
1-3/4 8	1.7500	1.6688	1.5876	1.6297
1-3/4 12	1.7500	1.6959	1.6418	1.6698
1-3/4 16	1.7500	1.7094	1.6688	1.6908
1-13/16 16	1.8125	1.7719	1.7313	1.7533
1-7/8 8	1.8750	1.7938	1.7126	1.7547
1-7/8 12	1.8750	1.8209	1.7668	1.7948
1-7/8 16	1.8750	1.8344	1.7938	1.8158
1-15/16 16	1.9375	1.8969	1.8563	1.8783
2 4-1/2	2.0000	1.8557	1.7113	1.7861
2 8	2.0000	1.9188	1.8376	1.8797
2 12	2.0000	1.9459	1.8918	1.9198
2 16	2.0000	1.9594	1.9188	1.9408
2-1/16 16	2.0625	2.0219	1.9813	2.0033
2-1/8 8	2.1250	2.0438	1.9626	2.0047
2-1/8 12	2.1250	2.0709	2.0168	2.0448
2-1/8 16	2.1250	2.0844	2.0438	2.0658
2-3/16 16	2.1875	2.1469	2.1063	2.1283
2-1/4 4-1/2	2.2500	2.1057	1.9613	2.0361
2-1/4 8	2.2500	2.1688	2.0876	2.1297
2-1/4 12	2.2500	2.1959	2.1418	2.1698
2-1/4 16	2.2500	2.2094	2.1688	2.1908
2-5/16 16	2.3125	2.2719	2.2313	2.2533
2-3/8 12	2.3750	2.3209	2.2668	2.2948
2-3/8 16	2.3750	2.3344	2.2938	2.3158
2-7/16 16	2.4375	2.3969	2.3563	2.3783
2-1/2 4	2.5000	2.3376	2.1752	2.2594
2-1/2 8	2.5000	2.4188	2.3376	2.3797
2-1/2 12	2.5000	2.4459	2.3918	2.4198
2-1/2 16	2.5000	2.4594	2.4188	2.4408

Nominal Size and TPI	Basic Major Diameter	Basic Pitch Diameter	Basic Minor Diameter	Max Minor Diameter Class 3B Internal Thread
2-5/8 12	2.6250	2.5709	2.5168	2.5448
2-5/8 16	2.6250	2.5844	2.5438	2.5658
2-3/4 4	2.7500	2.5876	2.4252	2.5094
2-3/4 8	2.7500	2.6688	2.5876	2.6297
2-3/4 12	2.7500	2.6959	2.6418	2.6698
2-3/4 16	2.7500	2.7094	2.6688	2.6908
2-7/8 12	2.8750	2.8209	2.7668	2.7948
2-7/8 16	2.8750	2.8344	2.7938	2.8158
3 4	3.0000	2.8376	2.6752	2.7594
3 8	3.0000	2.9188	2.8376	2.8797
3 12	3.0000	2.9459	2.8918	2.9198
3 16	3.0000	2.9594	2.9188	2.9408
3-1/8 12	3.1250	3.0709	3.0168	3.0448
3-1/8 16	3.1250	3.0844	3.0438	3.0658
3-1/4 4	3.2500	3.0876	2.9252	3.0094
3-1/4 8	3.2500	3.1688	3.0876	3.1297
3-1/4 12	3.2500	3.1959	3.1418	3.1698
3-1/4 16	3.2500	3.2094	3.1688	3.1908
3-3/8 12	3.3750	3.3209	3.2668	3.2948
3-3/8 16	3.3750	3.3344	3.2938	3.3158
3-3/8 4	3.5000	3.3376	3.1752	3.2594
3-1/2 8	3.5000	3.4188	3.3376	3.3797
3-1/2 12	3.5000	3.4459	3.3918	3.4198
3-1/2 16	3.5000	3.4594	3.4188	3.4408
3-5/8 12	3.6250	3.5709	3.5168	3.5448
3-5/8 16	3.6250	3.5844	3.5438	3.5658
3-3/4 4	3.7500	3.5876	3.4252	3.5094
3-3/4 8	3.7500	3.6688	3.5876	3.6297
3-3/4 12	3.7500	3.6959	3.6418	3.6698
3-3/4 16	3.7500	3.7094	3.6688	3.6908
3-7/8 12	3.8750	3.8209	3.7669	3.7948
3-7/8 16	3.8750	3.8344	3.7938	3.8158
4 4	4.0000	3.8376	3.6752	3.7594
4 8	4.0000	3.9188	3.8376	3.8797
4 12	4.0000	3.9459	3.8918	3.9198
4 16	4.0000	3.9594	3.9188	3.9408
4 16	1.8125	1.7719	1.7313	1.7533

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End Mills

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Operating Parameters for End Mills

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Speeds and Feeds

Speeds and feeds are the most important factors to consider for best results in milling. Improper feeds and speeds often cause low production, poor work quality, and unnecessary damage to the cutter. Too high a speed or too light a feed leads to rapid wear and dulling of the cutter, reducing tool life.

In milling, **speed** is measured in peripheral feet per minute. Oftentimes, speed is referred to as cutting speed, surface speed, or peripheral speed. The relationship of peripheral speed to the diameter of the end mill and the rotational speed of the machine spindle are indicated in the table on page 201.

Feed is normally measured and stated in inches per minute (IPM). It is, as shown on page 201, the product of the number of cutting teeth in the end mill x the feed per tooth x the revolutions per minute. In establishing operating conditions, all feed rates should be calculated from the chip load or feed per tooth. The individual cutting tooth must be able to sustain the load or feed applied to it without fracturing, regardless of the number of teeth in the mill. Because feed per tooth affects thickness, it is a very important factor in tool life.

The highest possible feed per tooth will usually give longer tool life between grinds and greater production per grind. Excessive feeds may overload the mill teeth and cause breakage or chipping of the cutting edge. Reasonable safe starting feeds for end mills under 0.5000" diameter will range from 0.0002 to 0.002 inches per tooth. For end mills equal to or greater than 0.5000" diameter, starting feeds will range from 0.002 to 0.003 inches per tooth.

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Starting Points

All recommended speeds and feeds are suggested starting points. These may be increased or decreased depending upon variables, such as finish desired, condition of the milling machine, magnitude of the cut, rigidity of the part, use of coolant, power available, etc. Consider these points when choosing starting speeds and feeds.

Adjusting Starting Speeds and Feeds

Speed Adjustments

Use lower speeds for:	Use higher speeds for:
hard materials	softer materials
tough materials	better finishes
abrasive materials	small diameter mills
heavy cuts	light cuts
minimum tool wear	frail work piece or set-ups
maximum mill life	maximum production rates
	non metallics

Feed Adjustments

Use higher feeds for:	Use lighter feeds for:
heavy roughing cuts	light and finishing cuts
rigid set-ups	frail set-ups
easy to machine work materials	hard to machine work materials
rugged heavy duty mills	deep slots
high tensile strength materials	frail and small diameter mills
coarse tooth mills	low tensile strength materials
abrasive materials	

Milling Corrective Actions

Trouble	Corrective Action
lack of rigidity	increase speed, decrease feed
excessive abrasion of the tool	decrease speed, increase feed
chipping of the cutting edge	decrease feed per tooth
burning of the cutting edge	decrease speed
chatter	use other combinations of speed and feed



Operating Parameters for End Mills

Speed, Feed and Power Calculations		
To Find...	Known Values	Formulae
peripheral cutting speed – SFM	mill diameter, D rotational speed RPM	$SFM = 0.262 \times RPM \times D$ $SFM \text{ estimated} = (RPM \times D) / 4$
rotational speed – RPM	peripheral cutting speed, SFM mill diameter, D	$RPM = SFM / (0.262 \times D)$ $RPM \text{ estimated} = (4 \times SFM) / D$
machine feed rate - IPM	rotational speed, RPM number of flutes (Teeth), T feed per tooth, IPT	$IPM = T \times IPT \times RPM$
feed per tooth - IPT	machine feed rate, IPM rotational speed, RPM number of teeth, T	$IPT = IPM / (RPM \times T)$
feed per revolution - IPR	machine feed rate, IPM	$IPR = IPM / RPM$
cutting power input - HP	width of cut, WOC depth of cut, DOC machine feed rate, IPM workpiece material power constant, K	$HP = WOC \times DOC \times IPM \times K$

Power Constants * for Use in Power Calculations

Work Material	K (Constant)	Work Material	K (Constant)	Work Material	K (Constant)
Aluminum	.03	High Temp. Alloys		High Tensile Alloys	
Magnesium	.03	Ferritic	.17	180,000 - 220,000 psi	.20
Copper	.05	Austenitic	.20	220,000 - 260,000 psi	.25
Brass	.04	Nickel Base	.25	260,000 - 300,000 psi	.33
Bronze	.05	Cobalt Base	.25	Titanium	
Cast Irons		Steel		under 100,000 psi	.13
Ferritic	.07	up to 150 Brinell	.14	100,000 - 135,000 psi	.17
Pearlitic	.10	up to 300 Brinell	.17	135,000 psi & over	.25
Chilled	.17	up to 400 Brinell	.20	Stainless Steel	
Malleable Iron	.10	up to 500 Brinell	.25	Free Machining	.10
				Others	.17

*Horsepower required to remove one cubic inch of material per minute assuming a 60% power efficiency at the spindle nose and a 25% allowance for dulling of the end mill.

Definition of Symbols and Measurement Units

Attribute	Symbol	Measurement Unit
cutting speed	SFM	surface feet per minute
rotational speed	RPM	revolutions per minute
end mill diameter	D	inches
feed per tooth	IPT	inches per tooth
machine feed rate	IPM	inches per minute
feed per revolution	IPR	inches per revolution
cutting power input	HP	horsepower
power constant	K	horsepower/cubic inch/minute
width of cut	WOC	inches
depth of cut	DOC	inches
number of teeth	T	—

Operating Parameters for End Mills

Speed and Feed Data in Selected Materials – Regular HSS and Cobalt HSS End Mills

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MILLING

OTHER TOOLS

Material	Heat-Resistant Cobalt Base Alloys, High Tensile Steels (50-55C)		Heat-Resistant Austenitic Alloys, High Tensile Steels (46-50C)		Heat-Resistant Nickel Base Alloys, High Strength Stainless Steels, High Strength Titanium Alloys		High Strength Stainless Steels, High Tensile Steels (40-46C) Medium Strength Titanium Alloys		Heat-Resistant Ferritic Base Alloys, Medium Strength Stainless Steels, Unalloyed Titanium Tool Steels (30-40C)	
	End Mill Style	Cobalt HSS HSS 2 or more flute	Cobalt HSS HSS 2 or more flute	Cobalt HSS HSS 2 or more flute	Cobalt HSS HSS 2 or more flute	Cobalt HSS HSS 2 or more flute	HSS 2 or more flute			
Speed (all diameters)	5-10 SFM		10-15 SFM		15-20 SFM		20-40 SFM		40-60 SFM	
	Speed RPM	Feed Chip Load per Tooth	Speed RPM	Feed Chip Load per Tooth	Speed RPM	Feed Chip Load per Tooth	Speed RPM	Feed Chip Load per Tooth	Speed RPM	Feed Chip Load per Tooth
Mill Diameter										
1/16	*	*	*	*	*	*	1222-2444	.0002-.0005	2444-3667	.0002-.0005
3/32	*	*	*	*	611-815	.0002-.0005	815-1629	.0002-.0005	1629-2750	.0002-.0005
1/8	*	*	*	*	456-611	.0002-.0005	611-1222	.0002-.0005	1222-1833	.0002-.0005
3/16	*	*	204-306	.0002-.0005	306-407	.0002-.0005	407-815	.0002-.0005	815-1222	.0002-.0005
1/4	76-153	.0002-.0010	153-230	.0002-.0010	229-306	.0002-.0010	306-611	.0002-.0010	611-917	.0002-.0010
5/16	61-122	.0002-.0010	122-183	.0002-.0010	183-244	.0002-.0010	244-489	.0002-.0010	489-733	.0002-.0010
3/8	51-102	.0002-.0010	102-153	.0002-.0010	153-203	.0002-.0010	203-407	.0005-.0020	407-611	.0005-.0020
7/16	44-88	.0005-.0010	88-132	.0005-.0010	131-175	.0005-.0020	175-349	.0005-.0020	349-524	.0005-.0020
1/2	38-76	.0005-.0010	76-115	.0005-.0010	115-153	.0005-.0020	153-306	.0005-.0030	306-458	.0010-.0030
9/16	34-68	.0005-.0020	68-104	.0005-.0020	104-136	.0005-.0020	136-272	.0005-.0030	272-412	.0010-.0030
3/8	31-61	.0005-.0020	61-92	.0005-.0020	92-122	.0005-.0020	122-244	.0010-.0040	244-367	.0010-.0040
11/16	28-56	.0005-.0020	56-84	.0005-.0020	84-111	.0005-.0020	111-222	.0010-.0040	222-337	.0010-.0040
3/4	26-51	.0005-.0020	51-76	.0005-.0020	76-102	.0010-.0040	102-203	.0010-.0040	203-306	.0010-.0040
13/16	24-47	.0010-.0030	47-71	.0010-.0030	71-94	.0010-.0040	94-189	.0010-.0040	189-284	.0010-.0040
7/8	22-44	.0010-.0030	44-65	.0010-.0030	65-87	.0010-.0040	87-175	.0010-.0040	175-262	.0020-.0060
15/16	20-40	.0010-.0030	40-62	.0010-.0030	62-81	.0010-.0040	81-163	.0010-.0040	163-246	.0020-.0060
1	19-38	.0010-.0030	38-58	.0010-.0030	58-76	.0010-.0040	76-153	.0020-.0060	153-229	.0020-.0060
1-1/8	34	.0015-.0040	34-51	.0015-.0040	51-68	.0015-.0050	68-136	.0020-.0060	136-204	.0020-.0060
1-1/4	31	.0015-.0040	31-46	.0015-.0040	46-61	.0015-.0050	61-122	.0020-.0060	122-183	.0020-.0060
1-3/8	28	.0015-.0040	28-42	.0015-.0040	42-55	.0015-.0050	55-111	.0020-.0060	111-167	.0030 +
1-1/2	26	.0015-.0040	26-38	.0015-.0040	38-51	.0020 +	51-102	.0030 +	102-153	.0030 +
1-5/8	24	.0020 +	35	.0020 +	35-47	.0020 +	47-94	.0030 +	94-141	.0030 +
1-3/4	22	.0020 +	32	.0020 +	32-43	.0020 +	43-87	.0030 +	87-131	.0030 +
1-7/8	20	.0020 +	30	.0020 +	30-40	.0030 +	40-81	.0030 +	81-122	.0030 +
2	19	.0020 +	29	.0030 +	29-38	.0030 +	38-76	.0030 +	76-115	.0030 +
2-1/8	18	.0030 +	28	.0030 +	36	.0030 +	36-72	.0030 +	72-108	.0030 +
2-1/4	17	.0030 +	26	.0030 +	34	.0030 +	34-68	.0030 +	68-102	.0030 +
2-3/8	16	.0030 +	25	.0030 +	32	.0030 +	32-64	.0030 +	64-97	.0030 +
2-1/2	15	.0030 +	23	.0030 +	30	.0030 +	30-61	.0030 +	61-92	.0030 +
2-5/8	15	.0030 +	22	.0030 +	29	.0030 +	29-58	.0030 +	58-88	.0030 +
2-3/4	14	.0030 +	21	.0030 +	28	.0030 +	28-56	.0030 +	56-83	.0030 +
2-7/8	14	.0030 +	20	.0030 +	27	.0030 +	27-53	.0030 +	53-80	.0030 +
3	13	.0030 +	19	.0030 +	26	.0030 +	26-51	.0030 +	51-76	.0030 +

* For small diameter applications in materials harder than 46C consult Cleveland Technical Support.



Operating Parameters for End Mills

Speed and Feed Data in Selected Materials – Regular HSS and Cobalt HSS End Mills (continued)

Material	Machine Steel Hard Brass & Bronze Electrolytic Copper Mild Steel Forgings		Cast Iron Mild Steel Half-Hard Brass and Bronze		Brass and Bronze Alloyed Aluminum Abrasive Plastics		Aluminum Plastics Wood	
	End Mill Style		HSS surface treatment helpful in cast iron 2 or more flutes		High Helix HSS 1 to 6 flutes		High Helix HSS 1 to 6 flutes	
Speed (all diameters)	60-80 SFM		80-100 SFM		100-200 SFM		200-600 SFM	
	Speed RPM	Feed Chip Load per Tooth	Speed RPM	Feed Chip Load per Tooth	Speed RPM	Feed Chip Load per Tooth	Speed RPM	Feed Chip Load per Tooth
1/16	3667-4888	.0002-.0005	4888-6111	.0002-.0005	6111-12222	.0002-.0005	12222 +	.0002-.0005
3/32	2750-3259	.0002-.0005	3259-4073	.0002-.0005	4073-8146	.0002-.0005	8146 +	.0002-.0005
1/8	1833-2440	.0002-.0010	2440-3056	.0002-.0010	3056-6112	.0002-.0010	6112 +	.0002-.0010
3/16	1222-1625	.0002-.0010	1625-2037	.0002-.0010	2037-4074	.0002-.0010	4074-12222	.0002-.0010
1/4	917-1222	.0005-.0020	1222-1528	.0005-.0020	1528-3056	.0005-.0020	3056-9168	.0005-.0020
5/16	733-978	.0005-.0020	978-1222	.0005-.0020	1222-2444	.0005-.0020	2444-7332	.0005-.0020
3/8	611-815	.0010-.0030	815-1019	.0010-.0030	1019-2038	.0005-.0030	2038-6114	.0005-.0020
7/16	524-698	.0010-.0030	698-873	.0010-.0030	873-1746	.0005-.0030	1746-5238	.0005-.0020
1/2	458-611	.0010-.0030	611-764	.0010-.0030	764-1528	.0005-.0030	1528-4584	.0005-.0020
9/16	412-543	.0010-.0040	543-678	.0010-.0040	678-1356	.0005-.0040	1356-4071	.0005-.0030
3/8	367-489	.0010-.0040	489-611	.0010-.0040	611-1222	.0005-.0040	1222-3666	.0005-.0030
11/16	337-444	.0010-.0040	444-555	.0010-.0040	555-1110	.0005-.0040	1110-3330	.0005-.0030
3/4	306-407	.0010-.0040	407-509	.0020-.0060	509-1018	.0010-.0060	1018-3054	.0010-.0040
13/16	284-379	.0020-.0060	379-469	.0020-.0060	469-938	.0010-.0060	938-2814	.0010-.0040
7/8	262-349	.0020-.0060	349-436	.0020-.0060	436-872	.0010-.0060	872-2616	.0010-.0040
15/16	246-326	.0020-.0060	326-407	.0020-.0060	407-814	.0010-.0060	814-2442	.0010-.0040
1	229-306	.0020-.0060	306-382	.0020-.0060	382-764	.0020 +	764-2292	.0020 +
1-1/8	204-272	.0020-.0060	272-340	.0030 +	340-680	.0020 +	680-2040	.0020 +
1-1/4	183-244	.0030 +	244-306	.0030 +	306-612	.0020 +	612-1836	.0020 +
1-3/8	167-222	.0030 +	222-278	.0030 +	278-556	.0020 +	556-1668	.0020 +
1-1/2	153-204	.0030 +	204-255	.0030 +	255-510	.0030 +	510-1530	.0020 +
1-5/8	141-188	.0030 +	188-235	.0030 +	235-470	.0030 +	470-1410	.0020 +
1-3/4	131-175	.0030 +	175-218	.0030 +	218-436	.0030 +	436-1308	.0020 +
1-7/8	122-163	.0030 +	163-204	.0030 +	201-408	.0030 +	408-1224	.0030 +
2	115-153	.0030 +	153-191	.0030 +	191-382	.0030 +	382-1146	.0030 +
2-1/8	108-144	.0030 +	144-179	.0030 +	179-358	.0030 +	358-1074	.0030 +
2-1/4	102-136	.0030 +	136-170	.0030 +	170-340	.0030 +	340-1020	.0030 +
2-3/8	97-128	.0030 +	128-161	.0030 +	161-322	.0030 +	322-966	.0030 +
2-1/2	92-122	.0030 +	122-153	.0030 +	153-306	.0030 +	306-918	.0030 +
2-5/8	88-116	.0030 +	116-145	.0030 +	145-290	.0030 +	290-870	.0030 +
2-3/4	83-111	.0030 +	111-139	.0030 +	139-278	.0030 +	278-834	.0030 +
2-7/8	80-106	.0030 +	106-132	.0030 +	132-264	.0030 +	264-792	.0030 +
3	76-102	.0030 +	102-127	.0030 +	127-254	.0030 +	254-762	.0030 +

Operating Parameters for End Milling

Speed and Feed Data in Selected Materials – PM Plus™ Powder Metal End Mills

Material	Hardness		Surface Feet per Minute SFM			Chip Load Per Tooth by Cutting Diameter			
	BHN	Bright	TiN	TiCN	TiAlN	1/8"	1/4"	1/2"	1"
Titanium	300	60-75	75-94	90-113	120-150	.0015	.0025	.0050	.0070
Annealed Alloys	340	30-45	38-56	45-68	60-90	.0010	.0020	.0040	.0060
Sol. Trtd. & Aged	400	15-30	19-38	23-45	30-60	.0007	.0015	.0020	.0040
High Temp. Alloys	300	30-45	38-56	45-68	60-90	.0020	.0025	.0040	.0060
Inconel, Monel, Hastelloy	400	10-24	13-30	15-36	20-48	.0015	.0020	.0030	.0050
Tool Steels	370	40-55	50-69	60-83	80-110	.0005	.0007	.0012	.0020
Tool Steels	450	20-30	25-38	30-45	40-60	.0003	.0005	.0007	.0010
Free Machining Steel	200	90-120	113-150	135-180	180-240	.0010	.0020	.0040	.0060
Alloyed & UnAlloyed	275	75-90	94-113	90-135	150-180	.0007	.0012	.0030	.0050
Alloy Steels - Med. to Hard	400	40-50	50-63	60-75	80-100	.0010	.0015	.0020	.0040
Stainless Steel									
Work Hardening	Various	55-75	69-94	83-113	110-150	.0005	.0007	.0012	.0020
Precipitation Hardening	Various	35-50	44-63	53-75	70-100	.0005	.0007	.0012	.0020
Copper Alloys									
Long Chip	Various	250-500	313-625	375-750	500-1000	.0050	.0025	.0050	.0080
Short Chip	250	180-240	225-300	270-360	360-480	.0010	.0020	.0040	.0060
Aluminum, Soft Gummy		750	938	1125	1500	.0020	.0030	.0060	.0100
Heat Treated Aluminum Alloys									
Aircraft Alloys	Various	1000	1250	1500	2000	.0020	.0030	.0060	.0100

Operating parameters for PM Plus roughers are listed below.

Speed and Feed Data in Selected Materials – PM Plus and Cobalt HSS Roughing End Mills

	Surface Feet per Minute SFM			Chip Load Per Tooth by Cutting Diameter			
	Bright	TiCN	TiAlN	1/4"	1/2"	3/4"	1"
Coarse Profile Cobalt Roughers							
Steel < 20 HRc	98	230	262	.0006	.0022	.0033	.0039
Steels 20-30 HRc	82	180	197	.0005	.0019	.0032	.0039
Cast iron	82	180	197	.0005	.0019	.0032	.0039
Fine Profile Cobalt Roughers							
Steel < 20 HRc	96	230	295	.0006	.0021	.0031	.0043
Steels 20-30 HRc	82	131	246	.0005	.0019	.0028	.0038
Steels 32-40 HRc	49	131	147	.0005	.0016	.0024	.0031
Stainless Steels	33	82	115	.0004	.0016	.0024	.0031
Titanium > 40 HRc	33	82	82	.0004	.0016	.0024	.0031
PM Roughers							
Steels < 32 HRc	59	157	180	.0005	.0019	.0032	.0033
Steels 32-42 HRc	49	98	157	.0006	.0017	.0029	.0034
Cast Iron < 180 HR	59	157	180	.0005	.0019	.0032	.0033
Cast Iron > 180 HR	49	98	157	.0006	.0017	.0029	.0034
Stainless Steels	39	72	98	.0005	.0016	.0028	.0031
Titanium > 40 HRc	32	59	82	.0004	.0016	.0028	.0030
High-Temp Alloys	22	36	49	.0006	.0017	.0029	.0034
Aluminum Alloys	(see chart on page 213)						

Note: All the speeds and feeds shown are suggested starting points. They may be increased or decreased, dependent upon such variables as finish desired, condition of milling machine, magnitude of cut, coolant, etc. In many cases they may be increased slightly. The above speeds and feeds are applicable for slotting cuts, one (1) diameter deep. For deeper slotting cuts or cavity applications, feeds should be decreased.

Choosing the correct tool material

Cleveland end mills are available in a variety of tool materials: regular high speed steel, premium cobalt high speed steel, and PM/Plus powder metal cobalt high speed steel for higher production rates. The choice of tool material will depend on the following factors:

- Machinability of the workpiece
- Hardness and structure of the workpiece
- Shape and conditions of the workpiece
- Number of workpieces to be processed.

High speed steel end mills have low initial cost and general purpose versatility. End mills of high speed steel with cobalt have proven most effective in titanium alloys, alloy steels, Rc-40-50, high strength stainless steels, and thermal and heat resistant materials such as nickel or cobalt base alloys. PM/Plus end mills which use a special cobalt high speed steel coupled with a heat treatment and special mechanical designs, are capable of greater than normal feed rates and longer tool life in these same material groups.

Consider the number of flutes

To determine selection of either a two-flute or a multiple-flute end mill, several basics need to be considered.

- Type of cut
- Chip space required
- Production rate desired
- Surface finish required

Two-fluted end mills have greater chip handling capacity than multiple-fluted end mills. In order for an end mill to axially plunge-cut (drill), it must be manufactured as a center cutting tool. All two-flute end mills are center cutting. Multiple-flute end mills are available with center cutting or non-center cutting features.

When two-flute end mills and multiple-flute end mills are run at the same feed rate (inches per minute), multiple-flute end mills may produce finer finishes and longer tool life than two-flute end mills, owing to a lighter chip load per tooth. Some caution must be exercised to insure that the chip load does not become so light as to cause excessive wear. Generally for production runs where either a two-flute or multiple-flute end mill would be applicable, it is more economical to use the multiple-flute end mill.

Roughing versus finishing end mills

Roughing end mills are designed to be used in a variety of materials and to remove more cubic inches of material in the same period of time than conventional end mills. In order to achieve these rates of material removal, as well as to obtain full tool life, the feed rates employed must be heavier than with conventional end mills.

Selection of cutting fluids

Coolants control the temperatures of the end mill and the work, and provide a lubricant between the end mill, the chip and the workpiece. The proper type and application of coolant will protect the end mill cutting edges from damage, prevent deformation of the work piece through overheating, and improve finish by allowing cool, clean chip formation and efficient chip disposal.

The theory that a copious flow of coolant (or even total immersion of the workpiece in the coolant) is the surest way to provide proper cooling and lubrication, is not necessarily true. Recent tests have shown that multiple streams or jets of coolant, directed at strategic locations of the end mill rotating in or against the work, have greater cooling effects than a slow-moving copious flow.

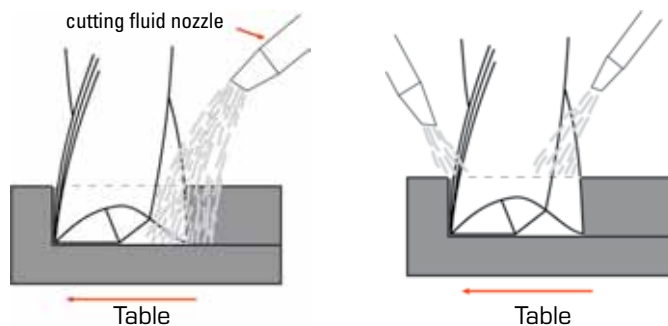
The optimum application of coolant is achieved by the use of coolant feeding end mills. These end mills are designed and manufactured to meet your specific need.

When using coolant, care should always be taken to insure that coolant lines are clean and free of obstructions, and that the coolant is both clean and free of fines.

No matter how well the cutting fluid is directed between the end mill and the work, a dull end mill will generate more heat than can be dissipated by adequate cooling. Proper cutting fluid application will protect a sharp cutting edge to insure maximum tool life per grind. An interrupted flow of cutting fluid can cause rapid damage to the cutting edges in a few revolutions of the end mill.

It is always wise to consult a cutting fluid supplier when experiencing problems of an unusual nature.

A cutting fluid or coolant is required when using high speed steel end mills for milling steel. For milling with high speed end mills, water emulsified cutting oil generally is considered the least expensive and most applicable coolant for nearly all materials except those that are milled dry. Some of the harder steel forgings and die steels may be milled with somewhat better results when mineral or lard oils, or sulfurized oils are used. Plastics and cast iron should be milled dry or with a jet of air, while aluminum and aluminum alloys are best milled with water emulsified cutting oil, either in a properly directed jet stream, or in a mist.



Powder Metal Finishers

Style PM-4DE • Double-End, 4-Flute, Center Cutting

formerly style 552

DRILLING

FEATURES

- ANSI SIZES**
- POWDER METAL SUBSTRATE**
- HIGH PERFORMANCE**
- BRIGHT**
- 4 FLUTE CC**
- TiN**
- 37°**
- TiCN**

APPLICATIONS

- ALLOY-TOOL STEEL**
- STAINLESS STEEL**
- TITANIUM ALLOYS**
- ALUMINUM**



Double productivity with double end mills.



Style PM-4DE Bright



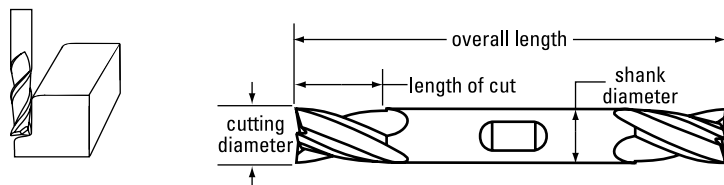
Style PM-4DE TiN-coated



Style PM-4DE TiCN-coated

Operating parameters on page 204.

HOLE FINISHING



THREADING

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/8	.1250	3.18	.375	9.53	.375	9.53	3.063	77.79	4	C52189	C31882	C31903
5/32	.1562	3.97	.375	9.53	.438	11.11	3.250	81.25	4	C39968	C31883	C31904
3/16	.1875	4.76	.375	9.53	.500	12.70	3.250	81.25	4	C52190	C31884	C31905
7/32	.2188	5.56	.375	9.53	.563	15.88	3.250	81.25	4	C39969	C31885	C31906
1/4	.2500	6.35	.375	9.53	.625	15.88	3.375	85.73	4	C52191	C31886	C31907
9/32	.2812	7.14	.375	9.53	.688	17.46	3.375	85.73	4	C39970	C31887	C31908
5/16	.3125	7.94	.375	9.53	.750	19.05	3.500	88.90	4	C52192	C31888	C31909
11/32	.3438	8.73	.375	9.53	.750	19.05	3.500	88.90	4	C39971	C31889	C31910
3/8	.3750	9.53	.375	9.53	.750	19.05	3.500	88.90	4	C52193	C31890	C31911
13/32	.4062	10.32	.500	12.70	1.000	25.40	4.125	104.78	4	C39972	C31891	C31912
7/16	.4375	11.11	.500	12.70	1.000	25.40	4.125	104.78	4	C52194	C31892	C31913
15/32	.4688	11.91	.500	12.70	1.000	25.40	4.125	104.78	4	C39973	C31893	—
1/2	.5000	12.70	.500	12.70	1.000	25.40	4.125	104.78	4	C52195	C31894	C31915
9/16	.5625	14.29	.625	15.88	1.375	34.93	5.000	127.00	4	C39974	C31895	C31916
5/8	.6250	15.88	.625	15.88	1.375	34.93	5.000	127.00	4	C52196	C31917	C31896
11/16	.6875	17.46	.750	19.05	1.625	41.28	5.625	142.88	4	C31879	—	C31918
3/4	.7500	19.05	.750	19.05	1.625	41.28	5.625	142.88	4	C52197	C31898	C31919
13/16	.8125	20.64	.875	22.23	1.875	47.63	6.125	155.58	4	C31880	C31899	—
7/8	.8750	22.23	.875	22.23	1.875	47.63	6.125	155.58	4	C52198	—	C31921
15/16	.9375	23.81	1.000	25.40	1.875	47.63	6.375	161.93	4	C31881	—	—
1	1.0000	25.40	1.000	25.40	1.875	47.63	6.375	161.93	4	C52199	C31902	C31923

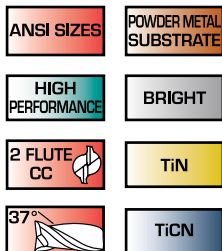
OTHER TOOLS



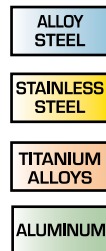
PM-Plus™ High-Performance End Mills Powder Metal Finishers

Style PM-2 • Single-End, 2-Flute, Center Cutting formerly style 510

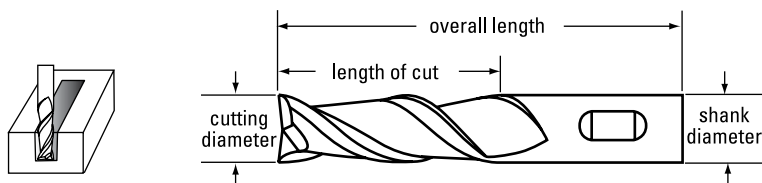
FEATURES



APPLICATIONS



Operating parameters on page 204.



Style PM-2 Bright

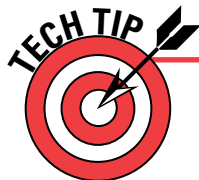


Style PM-2 TiN-coated



Style PM-2 TiCN-coated

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/8	.1250	3.18	.375	9.53	.375	9.53	2.313	58.74	2	C40792	C40809	C40826
3/16	.1875	4.76	.375	9.53	.500	12.70	2.375	60.33	2	C40793	C40810	C40827
1/4	.2500	6.35	.375	9.53	.625	15.88	2.438	61.91	2	C40794	C40811	C40828
5/16	.3125	7.94	.375	9.53	.750	19.05	2.500	63.50	2	C40795	C40812	C40829
3/8	.3750	9.53	.375	9.53	.750	19.05	2.500	63.50	2	C40796	C40813	C40830
7/16	.4375	11.11	.500	12.70	1.000	25.40	2.688	68.26	2	C40797	C40814	C40831
1/2	.5000	12.70	.500	12.70	1.250	31.75	3.250	82.55	2	C40798	C40815	C40832
9/16	.5625	14.29	.500	12.70	1.375	34.93	3.375	85.73	2	C40799	C40816	C40833
5/8	.6250	15.88	.625	15.88	1.625	41.28	3.250	82.55	2	C40800	C40817	C40834
11/16	.6875	17.46	.625	15.88	1.625	41.28	3.250	82.55	2	C40801	C40818	C40835
3/4	.7500	19.05	.750	19.05	1.625	41.28	3.875	98.43	2	C40802	C40819	C40836
7/8	.8750	22.23	.875	22.23	1.875	47.63	4.125	104.78	2	C40803	C40820	C40837
1	1.0000	25.40	1.000	25.40	2.000	50.80	4.500	114.30	2	C40804	C40821	C40838
1-1/8	1.1250	28.58	1.000	25.40	2.000	50.80	4.500	114.30	2	C40805	C40822	C40839
1-1/4	1.2500	31.75	1.250	31.75	2.000	50.80	4.500	114.30	2	C40806	C40823	C40840
1-1/2	1.5000	38.10	1.250	31.75	2.000	50.80	4.500	114.30	2	C40807	C40824	C40841
2	2.0000	50.80	1.250	31.75	2.000	50.80	4.500	114.30	2	C40808	C40825	C40842



PM Plus High-Performance End Mills Deliver Superior Performance

- 8% cobalt substrate.
- High vanadium for high red hardness means exceptional toughness and high shock resistance.
- Run at higher feeds than conventional HSS or cobalt end mills.
- Provide excellent heat and wear resistance.
- Freer cutting minimizes heat build up.
- Give excellent finish

DRILLING
 HOLE FINISHING
 THREADING
 MILLING
 OTHER TOOLS

Powder Metal Finishers

Style PM-3 • Single-End, 3-Flute, Center Cutting

formerly styles 533, 571

DRILLING

FEATURES

ANSI SIZES	POWDER METAL SUBSTRATE
HIGH PERFORMANCE	BRIGHT
3 FLUTE CC	TiN
42°	TiCN

APPLICATIONS

ALLOY STEEL
STAINLESS STEEL
TITANIUM ALLOYS
ALUMINUM



Style PM-3 Bright

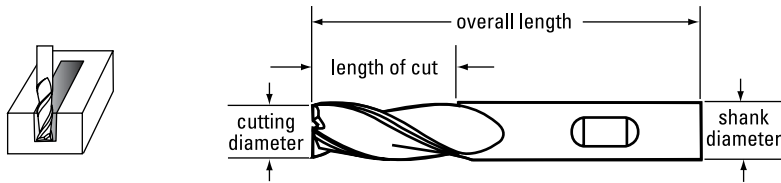


Style PM-3 TiN-coated



Style PM-3 TiCN-coated

Operating parameters on page 204.



HOLE FINISHING

THREADING

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/2	.5000	12.70	.500	12.70	1.250	31.75	3.250	82.55	3	C49272	C39944	C39950
5/8	.6250	15.88	.625	15.88	1.625	41.28	3.750	95.25	3	C49275	C39945	C39951
3/4	.7500	19.05	.750	19.05	1.625	41.28	3.875	98.43	3	C49277	C39946	C39952
3/4	.7500	19.05	.750	19.05	3.000	76.20	5.250	133.35	3	C49278	C39956	C39962
1	1.0000	25.40	1.000	25.40	2.000	50.80	4.500	114.30	3	C49283	C39947	C39953
1	1.0000	25.40	1.000	25.40	3.000	76.20	5.500	139.70	3	C49284	C39957	C39963
1	1.0000	25.40	1.000	25.40	4.000	101.60	6.500	165.10	3	C49285	C39958	C39964
1-1/4	1.2500	31.75	1.250	31.75	2.000	50.80	4.500	114.30	3	C49289	—	C39954
1-1/4	1.2500	31.75	1.250	31.75	4.000	101.60	6.500	165.10	3	C49291	C39959	C39965
1-1/2	1.5000	38.10	1.250	31.75	2.000	50.80	4.500	114.30	3	C49292	C39949	—
1-1/2	1.5000	38.10	1.250	31.75	4.000	101.60	6.500	165.10	3	C49294	C39960	C39966
2	2.0000	50.80	2.000	50.80	4.000	101.60	6.500	165.10	3	C49298	C39961	C39967

MILLING

OTHER TOOLS

PM-Plus™ High-Performance End Mills Powder Metal Finishers

Style PM-4 • Single-End, Multi-Flute, Center Cutting formerly styles 575, 553, 579

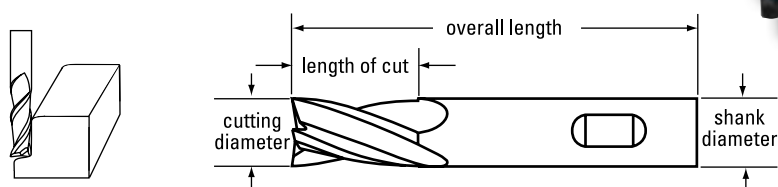
FEATURES

ANSI SIZES	POWDER METAL SUBSTRATE
HIGH PERFORMANCE	BRIGHT
4+ FLUTE CC	TiN
37°	TiCN

APPLICATIONS

ALLOY STEEL
STAINLESS STEEL
TITANIUM ALLOYS
ALUMINUM

Operating parameters on page 204.



Style PM-4 Bright



Style PM-4 TiN-coated



Style PM-4 TiCN-coated

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/8	.1250	3.18	.125	3.18	.250	6.35	2.188	55.56	4	C43208	C31924	C31939
1/8	.1250	3.18	.375	9.53	.375	9.53	2.313	58.74	4	C42500	C31960	C31987
5/32	.1562	3.97	.375	9.53	.500	12.70	2.375	60.33	4	C43280	C31961	C31988
3/16	.1875	4.76	.375	9.53	.250	6.35	2.125	53.98	4	C43209	C31925	C31940
3/16	.1875	4.76	.375	9.53	.500	12.70	2.375	60.33	4	C42502	C31962	C31989
7/32	.2188	5.56	.375	9.53	.625	15.88	2.438	61.91	4	C43281	C31963	C31990
1/4	.2500	6.35	.375	9.53	.250	6.35	2.063	52.39	4	C43210	C31926	C31941
1/4	.2500	6.35	.375	9.53	.625	15.88	2.438	61.91	4	C42504	C31964	C31991
1/4	.2500	6.35	.375	9.53	1.250	31.75	3.063	77.79	4	C43290	C32016	C32032
9/32	.2812	7.14	.375	9.53	.750	19.05	2.500	63.50	4	C43282	C31965	C31992
5/16	.3125	7.94	.375	9.53	.375	9.53	2.125	53.98	4	C43211	C31927	C31942
5/16	.3125	7.94	.375	9.53	.750	19.05	2.500	63.50	4	C42506	C31966	C31993
5/16	.3125	7.94	.375	9.53	1.375	34.93	3.125	79.38	4	C43291	C32017	C32033
11/32	.3438	8.73	.375	9.53	.750	19.05	2.500	63.50	4	C43283	C31967	C31994
3/8	.3750	9.53	.375	9.53	.375	9.53	2.125	53.98	4	C43212	C31928	C31943
3/8	.3750	9.53	.375	9.53	.750	19.05	2.500	63.50	4	C42508	C31968	C31995
3/8	.3750	9.53	.375	9.53	1.500	38.10	3.250	82.55	4	C43292	C32018	C32034
13/32	.4062	10.32	.500	12.70	1.000	25.40	2.688	68.26	4	C43284	C31969	C31996
7/16	.4375	11.11	.375	9.53	1.750	44.45	3.250	82.55	4	C32014	C32019	C32035
7/16	.4375	11.11	.500	12.70	.500	12.70	2.188	55.56	4	C43213	C31929	C31944
7/16	.4375	11.11	.500	12.70	1.000	25.40	2.688	68.26	4	C43285	C31970	C31997
15/32	.4688	11.91	.500	12.70	1.250	31.75	3.250	82.55	4	C31954	C31971	C31998
1/2	.5000	12.70	.500	12.70	.500	12.70	2.500	63.50	4	C43214	C31930	C31945
1/2	.5000	12.70	.500	12.70	1.250	31.75	3.500	88.90	4	C42510	C31972	C31999
1/2	.5000	12.70	.500	12.70	2.000	50.80	4.000	101.60	4	C43293	C32020	C32036
9/16	.5625	14.29	.500	12.70	1.375	34.93	3.375	85.73	4	C31955	C32000	C31973
5/8	.6250	15.88	.625	15.88	.625	15.88	2.750	69.85	4	C43215	C31931	C31946
5/8	.6250	15.88	.625	15.88	.625	15.88	2.750	69.85	6	C43216	C31932	C31947
5/8	.6250	15.88	.625	15.88	1.625	41.28	3.750	95.25	4	C42512	C31974	C32001
5/8	.6250	15.88	.625	15.88	2.500	63.50	4.625	117.48	4	C43294	C32021	C32037
11/16	.6875	17.46	.625	15.88	1.625	41.28	3.750	95.25	4	C31956	C31975	C32002

continued on next page

DRILLING
 HOLE FINISHING
 THREADING
 MILLING
 OTHER TOOLS

Powder Metal Finishers

Style PM-4 • Single-End, Multi-Flute, Center Cutting (continued)

formerly styles 575, 553, 579

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
3/4	.7500	19.05	.750	19.05	.750	19.05	3.000	76.20	4	C43217	C31933	C31948
3/4	.7500	19.05	.750	19.05	.750	19.05	3.000	76.20	6	C43218	C31934	C31949
3/4	.7500	19.05	.750	19.05	1.625	41.28	3.875	98.43	4	C42514	C31976	C32003
3/4	.7500	19.05	.750	19.05	1.625	41.28	3.875	98.43	6	C42516	C31977	C32004
3/4	.7500	19.05	.750	19.05	2.000	50.80	5.250	133.35	4	C43295	C32022	C32038
13/16	.8125	20.64	.875	22.23	1.875	47.63	4.125	104.78	4	C31957	C31978	C32005
7/8	.8750	22.23	.875	22.23	.875	22.23	3.125	79.38	4	C43219	C31935	C31950
7/8	.8750	22.23	.875	22.23	1.250	31.75	3.125	79.38	4	C43220	C31936	C31951
7/8	.8750	22.23	.875	22.23	1.875	47.63	4.125	104.78	4	C31958	C31979	C32006
7/8	.8750	22.23	.875	22.23	3.500	88.90	5.750	146.05	4	C32015	C32023	C32039
15/16	.9375	23.81	1.000	25.40	1.875	47.63	4.500	114.30	4	C31959	C31980	C32007
1	1.0000	25.40	1.000	25.40	1.000	25.40	3.500	88.90	4	C43221	C31938	C31953
1	1.0000	25.40	1.000	25.40	1.000	25.40	3.500	88.90	6	C43222	C31937	C31952
1	1.0000	25.40	1.000	25.40	2.000	50.80	4.500	114.30	4	C42518	C31981	C32008
1	1.0000	25.40	1.000	25.40	2.000	50.80	4.500	114.30	6	C42520	C31982	C32009
1	1.0000	25.40	1.000	25.40	2.000	50.80	5.500	139.70	4	C43286	C32024	C32040
1	1.0000	25.40	1.000	25.40	4.000	101.60	6.500	165.10	4	C43296	C32025	C32041
1	1.0000	25.40	1.000	25.40	4.000	101.60	6.500	165.10	6	C43277	C43278	C43279
1-1/8	1.1250	28.58	1.000	25.40	1.125	28.58	4.500	114.30	6	C43223	C31983	C32010
1-1/4	1.2500	31.75	1.250	31.75	2.000	50.80	4.500	114.30	6	C43224	C31984	C32011
1-1/4	1.2500	31.75	1.250	31.75	2.000	50.80	5.500	139.70	6	C43287	C32026	C32042
1-1/4	1.2500	31.75	1.250	31.75	4.000	101.60	6.500	165.10	6	C43297	C32027	C32043
1-1/4	1.2500	31.75	1.250	31.75	6.000	152.40	8.500	215.90	6	C43268	C43269	C43270
1-1/2	1.5000	38.10	1.250	31.75	1.500	38.10	4.500	114.30	6	C43225	C31985	C32012
1-1/2	1.5000	38.10	1.250	31.75	2.000	50.80	5.500	139.70	6	C43288	C32028	C32044
1-1/2	1.5000	38.10	1.250	31.75	4.000	101.60	6.500	165.10	6	C43298	C32029	C32045
2	2.0000	50.80	1.125	28.58	2.000	50.80	4.500	114.30	6	C43226	C31986	C32013
2	2.0000	50.80	2.000	50.80	2.000	50.80	5.750	146.05	6	C43227	-	C32047
2	2.0000	50.80	2.000	50.80	4.000	101.60	7.750	196.85	6	C43289	C32030	C32046
2	2.0000	50.80	2.000	50.80	6.000	152.40	9.750	247.65	6	C43271	C43272	C43273



PM-Plus™ High-Performance End Mills Powder Metal Finishers

Style PM-4B • Single-End, Multi-Flute, Center Cutting, Ball Nose formerly style 554

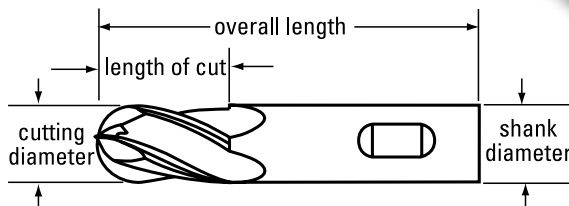
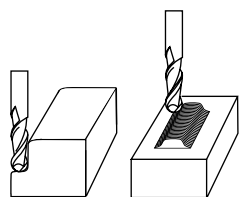
FEATURES

ANSI SIZES	POWDER METAL SUBSTRATE
HIGH PERFORMANCE	BRIGHT
4 FLUTE BALL CC	TiN
37°	TiCN

APPLICATIONS

ALLOY-TOOL STEEL
STAINLESS STEEL
TITANIUM ALLOYS
ALUMINUM

Operating parameters on page 204.



Style PM-4B Bright



Style PM-4B TiN-coated



Style PM-4B TiCN-coated

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/8	.1250	3.18	.375	9.53	.375	9.53	2.313	58.74	4	C42550	C32048	C32057
3/16	.1875	4.76	.375	9.53	.500	12.70	2.313	58.74	4	C42552	C32049	C32058
1/4	.2500	6.35	.375	9.53	.625	15.88	2.438	61.91	4	C42554	C32050	C32059
5/16	.3125	7.94	.375	9.53	.750	19.05	2.500	63.50	4	C42556	C32051	C32060
3/8	.3750	9.53	.375	9.53	.750	19.05	2.500	63.50	4	C42558	C32052	C32061
1/2	.5000	12.70	.500	12.70	1.250	31.75	3.250	82.55	4	C42560	C32053	C32062
5/8	.6250	15.88	.625	15.88	1.625	41.28	3.750	95.25	4	C42562	C32054	C32063
3/4	.7500	19.05	.750	19.05	1.625	41.28	3.875	98.43	4	C42564	C32055	C32064
1	1.0000	25.40	1.000	25.40	2.000	50.80	4.500	114.30	4	C42566	C32056	C32065

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Powder Metal Finishers

Style PM-539R • Single-End, 3-Flute, Center Cutting, High-Helix
formerly style 539R

DRILLING

FEATURES

ANSI SIZES	POWDER METAL SUBSTRATE
HIGH PERFORMANCE	BRIGHT
3 FLUTE CC	TiCN
42°	CORNER RADIUS

APPLICATIONS

ALUMINUM
NON-FERROUS MATERIALS

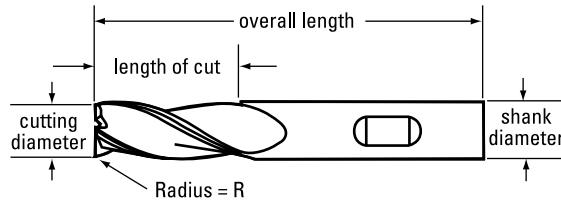
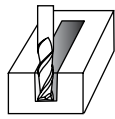


Style PM-539R Bright



Style PM-539R TiCN-coated

Operating parameters on next page.



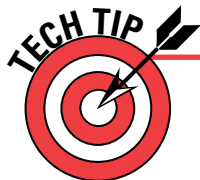
HOLE FINISHING

THREADING

MILLING

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number				
			in	mm	in	mm	in	mm		Bright 0° R	TiCN 0° R	TiCN .060° R	TiCN .090° R	TiCN .120° R
3/8	.3750	9.53	.375	9.53	.750	19.05	2.500	63.50	3	C40072	C40073	-	-	-
3/8	.3750	9.53	.375	9.53	1.500	38.10	3.250	82.55	3	C40074	C40075	-	-	-
1/2	.5000	12.70	.500	12.70	1.250	31.75	3.250	82.55	3	C40076	C40077	-	-	-
1/2	.5000	12.70	.500	12.70	2.000	50.80	4.000	101.60	3	C40078	C40079	-	-	-
1/2	.5000	12.70	.500	12.70	3.000	76.20	5.000	127.00	3	C40080	C40081	-	-	-
5/8	.6250	15.88	.625	15.88	1.625	41.28	3.875	98.43	3	C40082	C40083	-	-	-
5/8	.6250	15.88	.625	15.88	2.500	63.50	4.625	117.48	3	C40084	C40085	-	-	-
5/8	.6225	15.81	.625	15.88	3.000	76.20	5.125	130.18	3	C40086	C40087	-	-	-
3/4	.7500	19.05	.750	19.05	1.625	41.28	3.750	95.25	3	C40345	C40346	C40347	C40348	C40349
3/4	.7500	19.05	.750	19.05	2.250	57.15	4.500	114.30	3	C40390	C40391	C40392	C40393	C40394
3/4	.7500	19.05	.750	19.05	3.000	76.20	5.250	133.35	3	C40350	C40351	C40352	C40353	C40354
1	1.0000	25.40	1.000	25.40	2.000	50.80	4.500	114.30	3	C40355	C40356	C40357	C40358	C40359
1	1.0000	25.40	1.000	25.40	3.000	76.20	5.500	139.70	3	C40360	C40361	C40362	C40363	C40364
1	1.0000	25.40	1.000	25.40	4.000	101.60	6.500	165.10	3	C40365	C40366	C40367	C40368	C40369
1-1/4	1.2500	31.75	1.250	31.75	2.000	50.80	4.500	114.30	3	C40370	C40371	C40372	C40373	C40374
1-1/4	1.2500	31.75	1.250	31.75	3.000	76.20	5.500	139.70	3	C40375	C40376	C40377	C40378	C40379
1-1/4	1.2500	31.75	1.250	31.75	4.000	101.60	6.500	165.10	3	C40380	C40381	C40382	C40383	C40384
1-1/4	1.2500	31.75	1.250	31.75	6.000	152.40	8.500	215.90	3	C40385	C40386	C40387	C40388	C40389
1-1/2	1.5000	38.10	1.250	31.75	2.000	50.80	4.500	114.30	3	C40240	C40248	-	-	-
1-1/2	1.5000	38.10	1.250	31.75	3.000	76.20	5.500	139.70	3	C40241	C40249	-	-	-
1-1/2	1.5000	38.10	1.250	31.75	4.000	101.60	6.500	165.10	3	C40242	C40250	-	-	-
1-1/2	1.5000	38.10	1.250	31.75	6.000	152.40	8.500	215.90	3	C40243	C40251	-	-	-
2	2.0000	50.80	2.000	50.80	3.000	76.20	6.750	171.45	3	C40245	C40253	-	-	-
2	2.0000	50.80	2.000	50.80	4.000	101.60	7.750	196.85	3	C40246	C40254	-	-	-
2	2.0000	50.80	2.000	50.80	6.000	152.40	9.750	247.65	3	C40247	C40255	-	-	-

OTHER TOOLS



The PM-539 Advantage

- Exceptional speeds in aluminum.
- Quiet, chatter-free machining and high shear cutting.

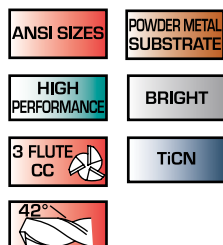


PM-Plus™ High-Performance End Mills

Powder Metal Finishers

Style PM-539L • Single-End, 3-Flute, Center Cutting, High-Helix, Left-Hand Spiral, Left-Hand Cut
formerly style 539L

FEATURES



APPLICATIONS

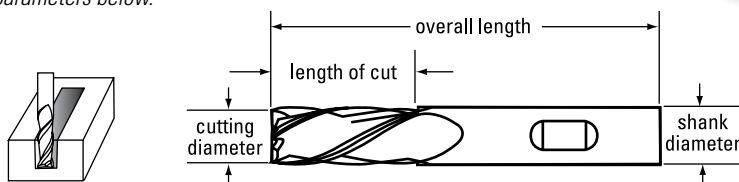


Style PM-539L Bright



Style PM-539L TiCN-coated

Operating parameters below.



Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number	
			in	mm	in	mm	in	mm		Bright	TiCN
1/2	.5000	12.70	.500	12.70	1.250	31.75	3.250	82.55	3	C40295	—
1/2	.5000	12.70	.500	12.70	2.000	50.80	4.000	101.60	3	C40296	—
1/2	.5000	12.70	.500	12.70	3.000	76.20	5.000	127.00	3	C40297	—
5/8	.6250	15.88	.625	15.88	1.625	41.28	3.875	98.43	3	C40298	—
5/8	.6250	15.88	.625	15.88	2.500	63.50	4.625	117.48	3	C40299	—
3/4	.7500	19.05	.750	19.05	1.625	41.28	3.875	98.43	3	C40300	C40301
3/4	.7500	19.05	.750	19.05	3.000	76.20	5.250	133.35	3	C40305	C40306
1	1.0000	25.40	1.000	25.40	2.000	50.80	4.500	114.30	3	C40310	C40311
1	1.0000	25.40	1.000	25.40	3.000	76.20	5.500	139.70	3	C40315	C40316
1	1.0000	25.40	1.000	25.40	4.000	101.60	6.500	165.10	3	C40320	C40321
1-1/4	1.2500	31.75	1.250	31.75	2.000	50.80	4.500	114.30	3	C40325	C40326
1-1/4	1.2500	31.75	1.250	31.75	3.000	76.20	5.500	139.70	3	C40330	C40331
1-1/4	1.2500	31.75	1.250	31.75	4.000	101.60	6.500	165.10	3	C40335	C40336
1-1/4	1.2500	31.75	1.250	31.75	6.000	152.40	8.500	215.90	3	C40340	C40341
1-1/2	1.5000	38.10	1.250	31.75	2.000	50.80	4.500	114.30	3	C40272	—
1-1/2	1.5000	38.10	1.250	31.75	3.000	76.20	5.500	139.70	3	C40273	—
1-1/2	1.5000	38.10	1.250	31.75	4.000	101.60	6.500	165.10	3	C40274	—
1-1/2	1.5000	38.10	1.250	31.75	6.000	152.40	8.500	215.90	3	C40275	—
2	2.0000	50.80	2.000	50.80	3.000	76.20	6.750	171.45	3	C40277	C40285
2	2.0000	50.80	2.000	50.80	4.000	101.60	7.750	196.85	3	C40278	C40286
2	2.0000	50.80	2.000	50.80	6.000	152.40	9.750	247.65	3	C40279	C40287

Speed and Feed Data in Selected Materials – PM Plus™ Series PM-539 and PM-538

Material	Surface Feet per Minute SFM		Chip Load Per Tooth by Cutting Diameter				
	Bright	TiCN	1/8"	1/4"	1/2"	1"	2"
Aluminum, soft/gummy	250-500	400-2500	.005"	.007"	.010"	.012"	.015"
Aluminum alloys < 10% silicon	250-750	500-3250	.005"	.007"	.010"	.012"	.015"
Aluminum alloys > 10% silicon	N/R	N/R	N/R	N/R	N/R	N/R	N/R
Copper alloys, long chipping	250-500	350-1500	.005"	.007"	.009"*	.012"	.015"
Copper alloys, short chipping	150-250	200-1250	.003"	.006"	.008"	.010"	.013"

*for Style 538, .010" is recommended.

DRILLING
HOLE FINISHING
THREADING
MILLING
OTHER TOOLS

Powder Metal Roughers

Style PMRC • Single-End, Multi-Flute, Non-Center Cutting, Coarse Profile

formerly style 578

DRILLING

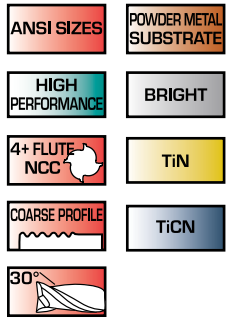
HOLE FINISHING

THREADING

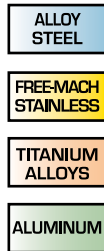
MILLING

OTHER TOOLS

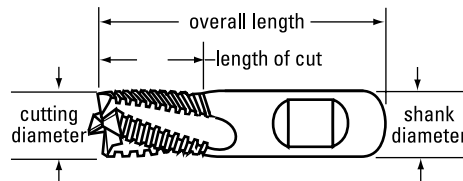
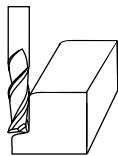
FEATURES



APPLICATIONS



Operating parameters on page 204.



Style PMRC Bright



Style PMRC TiN-coated



Style PMRC TiCN-coated

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/4	.2500	6.35	.375	9.53	.250	6.35	2.063	52.39	3	C43228	C32213	C32242
1/4	.2500	6.35	.375	9.53	.625	15.88	2.438	61.91	3	C43229	C32214	C32243
3/8	.3750	9.53	.375	9.53	.375	9.53	2.125	53.98	4	C43230	C32215	C32244
3/8	.3750	9.53	.375	9.53	.750	19.05	2.500	63.50	4	C43299	C32216	C32245
3/8	.3750	9.53	.375	9.53	1.500	38.10	3.250	82.55	4	C32210	C32217	C32246
1/2	.5000	12.70	.500	12.70	.500	12.70	2.500	63.50	4	C43231	C32218	C32247
1/2	.5000	12.70	.500	12.70	1.250	31.75	3.250	82.55	4	C43300	C32219	C32248
1/2	.5000	12.70	.500	12.70	2.000	50.80	4.000	101.60	4	C32211	C32220	C32249
5/8	.6250	15.88	.625	15.88	.625	15.88	2.750	69.85	4	C43232	C32221	C32250
5/8	.6250	15.88	.625	15.88	1.625	41.28	3.750	95.25	4	C43301	C32222	C32251
5/8	.6250	15.88	.625	15.88	2.500	63.50	4.625	117.48	4	C32212	C32223	C32252
3/4	.7500	19.05	.750	19.05	.750	19.05	3.000	76.20	4	C43233	C32224	C32253
3/4	.7500	19.05	.750	19.05	1.625	41.28	3.875	98.43	4	C43302	C32225	C32254
3/4	.7500	19.05	.750	19.05	3.000	76.20	5.250	133.35	4	C43303	C32226	C32255
7/8	.8750	22.23	.875	22.23	.875	22.23	3.125	79.38	5	C43234	C32227	C32256
1	1.0000	25.40	1.000	25.40	1.000	25.40	3.500	88.90	5	C43235	C32228	C32257
1	1.0000	25.40	1.000	25.40	2.000	50.80	4.500	114.30	5	C43236	C32229	C32258
1	1.0000	25.40	1.000	25.40	3.000	76.20	5.500	139.70	5	C43304	C32230	C32259
1	1.0000	25.40	1.000	25.40	4.000	101.60	6.500	165.10	5	C43305	C32231	C32260
1-1/8	1.1250	28.58	1.125	28.58	2.000	50.80	4.500	114.30	5	C43237	C32232	C32261
1-1/4	1.2500	31.75	1.250	31.75	2.000	50.80	4.500	114.30	5	C43238	C32233	C32262
1-1/4	1.2500	31.75	1.250	31.75	3.000	76.20	5.500	139.70	5	C43239	C32234	C32263
1-1/4	1.2500	31.75	1.250	31.75	4.000	101.60	6.500	165.10	5	C43306	C32235	C32264
1-1/2	1.5000	38.10	1.250	31.75	2.000	50.80	4.500	114.30	6	C43240	C32236	C32265
1-1/2	1.5000	38.10	1.250	31.75	4.000	101.60	6.500	165.10	6	C43309	C32237	C32266
2	2.0000	50.80	1.250	31.75	2.000	50.80	6.500	165.10	8	C43241	C32238	C32267
2	2.0000	50.80	2.000	50.80	2.000	50.80	4.500	114.30	8	C43242	C32239	C32268
2	2.0000	50.80	2.000	50.80	4.000	101.60	7.750	196.85	8	C43243	C32240	C32269
2	2.0000	50.80	2.000	50.80	6.000	152.40	9.750	247.65	8	C43311	C32241	C32270
2	2.0000	50.80	2.000	50.80	8.000	203.20	11.750	298.45	8	C43274	-	C43276

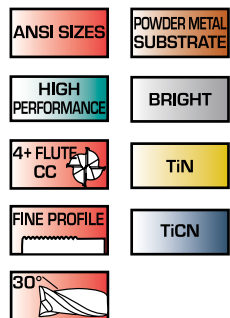


PM-Plus™ High-Performance End Mills

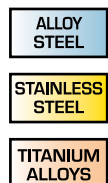
Powder Metal Roughers

Style PMRF-C • Single-End, Multi-Flute, Center Cutting, Fine Profile
formerly style 598

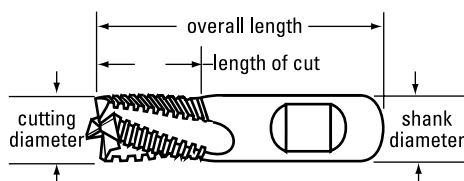
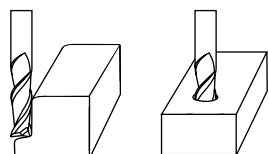
FEATURES



APPLICATIONS



Operating parameters on page 204.



Style PMRF Bright



Style PMRF TiCN-coated



Style PMRF TiAlN-coated

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiCN	TiAlN
3/8	.3750	9.53	.375	9.53	.750	19.05	2.500	63.50	4	C41122	C41145	C41168
3/8	.3750	9.53	.375	9.53	1.500	38.10	3.250	82.55	4	C41134	C41157	C41180
1/2	.5000	12.70	.500	12.70	1.250	31.75	3.250	82.55	4	C41123	C41146	C41169
1/2	.5000	12.70	.500	12.70	2.000	50.80	4.000	101.60	4	C41135	C41158	C41181
5/8	.6250	15.88	.625	15.88	1.625	41.28	3.750	95.25	4	C41124	C41147	C41170
5/8	.6250	15.88	.625	15.88	2.500	63.50	4.625	117.48	4	C41136	C41159	C41182
3/4	.7500	19.05	.750	19.05	1.625	41.28	3.875	98.43	4	C41125	C41148	C41171
3/4	.7500	19.05	.750	19.05	2.250	57.15	4.500	114.30	4	C41130	C41153	C41176
3/4	.7500	19.05	.750	19.05	3.000	76.20	5.250	133.35	4	C41137	C41160	C41183
7/8	.8750	22.23	.875	22.23	1.875	47.63	4.125	104.78	5	C41126	C41149	C41172
7/8	.8750	22.23	.875	22.23	3.500	88.90	5.750	146.05	5	C41138	C41161	C41184
1	1.0000	25.40	1.000	25.40	2.000	50.80	4.500	114.30	5	C41127	C41150	C41173
1	1.0000	25.40	1.000	25.40	3.000	76.20	5.500	139.70	5	C41131	C41154	C41177
1	1.0000	25.40	1.000	25.40	4.000	101.60	6.500	165.10	5	C41139	C41162	C41185
1-1/4	1.2500	31.75	1.250	31.75	2.000	50.80	4.500	114.30	6	C41128	C41151	C41174
1-1/4	1.2500	31.75	1.250	31.75	3.000	76.20	5.500	139.70	6	C41132	C41155	C41178
1-1/4	1.2500	31.75	1.250	31.75	4.000	101.60	6.500	165.10	6	C41140	C41163	C41186
1-1/2	1.5000	38.10	1.250	31.75	2.000	50.80	4.500	114.30	6	C41129	C41152	C41175
1-1/2	1.5000	38.10	1.250	31.75	3.000	76.20	5.500	139.70	6	C41133	C41156	C41179
1-1/2	1.5000	38.10	1.250	31.75	4.000	101.60	6.500	165.10	6	C41141	C41164	C41187
2	2.0000	50.80	2.000	50.80	3.000	76.20	6.750	171.45	6	C41142	C41165	C41188
2	2.0000	50.80	2.000	50.80	4.000	101.60	7.750	196.85	6	C41143	C41166	C41189
2	2.0000	50.80	2.000	50.80	6.000	152.40	9.750	247.65	6	C41144	C41167	C41190

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Powder Metal Roughers

Style PMRC-B • Single-End, Multi-Flute, Center Cutting, Coarse Profile Ball Nose

formerly style 503

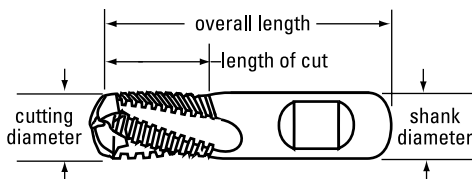
FEATURES

ANSI SIZES
HIGH PERFORMANCE
4+ FLUTE NCC
COARSE PROFILE

POWDER METAL SUBSTRATE
BRIGHT
TiN
TiCN

APPLICATIONS

ALLOY-TOOL STEEL
FREE-MACH STAINLESS
TITANIUM ALLOYS
ALUMINUM



Style PMRC-B Bright

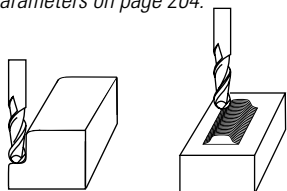


Style PMRC-B TiN-coated



Style PMRC-B TiCN-coated

Operating parameters on page 204.



Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/2	.5000	12.70	.500	12.70	1.250	31.75	3.250	82.55	4	C32334	C32340	C32346
5/8	.6250	15.88	.625	15.88	1.625	41.28	3.750	95.25	4	C32335	C32341	C32347
3/4	.7500	19.05	.750	19.05	1.625	41.28	3.875	98.43	4	C32336	C32342	C32348
1	1.0000	25.40	1.000	25.40	2.000	50.80	4.500	114.30	5	C32337	—	C32349
1-1/4	1.2500	31.75	1.250	31.75	2.000	50.80	4.500	114.30	5	C32338	—	C32350
1-1/2	1.5000	38.10	1.250	31.75	2.000	50.80	4.500	114.30	6	C32339	C32345	C32351

Style PMRF-B • Single-End, Multi-Flute, Center Cutting, Fine Profile Ball Nose

formerly style 505

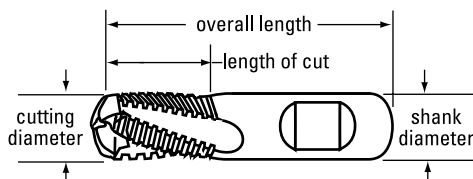
FEATURES

ANSI SIZES
HIGH PERFORMANCE
4+ FLUTE CC
FINE PROFILE

POWDER METAL SUBSTRATE
BRIGHT
TiN
TiCN

APPLICATIONS

ALLOY-TOOL STEEL
TITANIUM ALLOYS



Style PMRF-B Bright

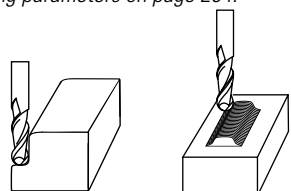


Style PMRF-B TiN-coated



Style PMRF-B TiCN-coated

Operating parameters on page 204.



Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/2	.5000	12.70	.500	12.70	1.250	31.75	3.250	82.55	4	C32352	C32358	C32364
5/8	.6250	15.88	.625	15.88	1.625	41.28	3.750	95.25	4	C32353	C32359	C32365
3/4	.7500	19.05	.750	19.05	1.625	41.28	3.875	98.43	4	C32354	C32360	C32366
1	1.0000	25.40	1.000	25.40	2.000	50.80	4.500	114.30	5	C32355	C32361	C32367
1-1/4	1.2500	31.75	1.250	31.75	2.000	50.80	4.500	114.30	6	C32356	—	C32368
1-1/2	1.5000	38.10	1.250	31.75	2.000	50.80	4.500	114.30	6	C32369	—	C32357

DRILLING

HOLE FINISHING

THREADING

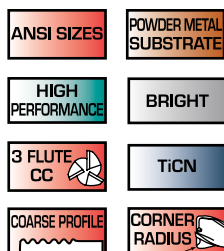
MILLING

OTHER TOOLS

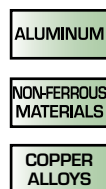
PM-Plus™ High-Performance End Mills Powder Metal Roughers

Style PM-538R • Single-End, Multi-Flute, Center Cutting, Fine Profile formerly style 538R

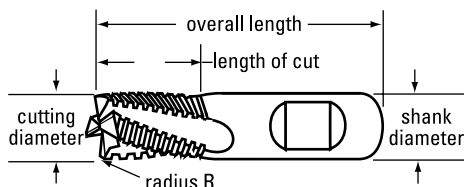
FEATURES



APPLICATIONS



for HIGH VOLUME aluminum roughing



Style PMR538R Bright



Style PMR538R TiCN-coated

Operating parameters on page 213.

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number				
										Bright 0° R	TiCN 0° R	TiCN .060° R	TiCN .090° R	TiCN .120° R
1/2	.5000	12.70	.500	12.70	1.250	31.75	3.250	82.55	3	C40003	C40015	-	-	-
1/2	.5000	12.70	.500	12.70	2.000	50.80	4.000	101.60	3	C40004	C40016	-	-	-
5/8	.6250	15.88	.625	15.88	1.625	41.28	3.750	95.25	3	C40005	C40017	-	-	-
5/8	.6250	15.88	.625	15.88	2.500	63.50	4.625	117.48	3	C40006	C40018	-	-	-
3/4	.7500	19.05	.750	19.05	1.625	41.28	3.875	98.43	3	C40007	C40019	C40033	C40034	C40035
3/4	.7500	19.05	.750	19.05	3.000	76.20	5.250	133.35	3	C40008	C40020	C40036	C40037	C40038
3/4	.7500	19.05	.750	19.05	2.250	57.15	4.750	120.65	3	C40062	C40063	C40064	C40065	C40066
1	1.0000	25.40	1.000	25.40	2.000	50.80	4.500	114.30	3	C40009	C40021	C40039	C40040	C40041
1	1.0000	25.40	1.000	25.40	3.000	76.20	5.500	139.70	3	C40010	C40022	C40042	C40043	C40044
1	1.0000	25.40	1.000	25.40	4.000	101.60	6.500	165.10	3	C40011	C40023	C40045	C40046	C40047
1-1/4	1.2500	31.75	1.250	31.75	2.000	50.80	4.500	114.30	3	C40048	C40049	C40050	C40051	C40052
1-1/4	1.2500	31.75	1.250	31.75	3.000	76.20	5.500	139.70	3	C40012	C40024	C40053	C40054	C40055
1-1/4	1.2500	31.75	1.250	31.75	4.000	101.60	6.500	165.10	3	C40013	C40025	C40056	C40057	C40058
1-1/4	1.2500	31.75	1.250	31.75	6.000	152.40	8.500	215.90	3	C40014	C40026	C40059	C40060	C40061
1-1/2	1.5000	38.10	1.250	31.75	2.000	50.80	4.500	114.30	3	C43244	C43246	-	-	-
1-1/2	1.5000	38.10	1.250	31.75	3.000	76.20	5.500	139.70	3	C43247	C43249	-	-	-
1-1/2	1.5000	38.10	1.250	31.75	4.000	101.60	6.500	165.10	3	C43250	C43252	-	-	-
1-1/2	1.5000	38.10	1.250	31.75	6.000	152.40	8.500	215.90	3	C43253	C43255	-	-	-
2	2.0000	50.80	2.000	50.80	2.000	50.80	5.750	146.05	3	C43256	C43258	-	-	-
2	2.0000	50.80	2.000	50.80	3.000	76.20	6.750	171.45	3	C43259	C43261	-	-	-
2	2.0000	50.80	2.000	50.80	4.000	101.60	7.750	196.85	3	C43262	C43264	-	-	-
2	2.0000	50.80	2.000	50.80	6.000	152.40	9.750	247.65	3	C43265	C43267	-	-	-

Style PM-538L • Single-End, Multi-Flute, Center Cutting, Fine Profile, LH Helix, LH Cut formerly style 538L

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number
										Bright 0° R
3/4	.7500	19.05	.750	19.05	1.625	41.28	3.875	98.43	3	C40400
3/4	.7500	19.05	.750	19.05	3.000	76.20	5.250	133.35	3	C40405
1	1.0000	25.40	1.000	25.40	2.000	50.80	4.500	114.30	3	C40410
1	1.0000	25.40	1.000	25.40	3.000	76.20	5.500	139.70	3	C40415
1	1.0000	25.40	1.000	25.40	4.000	101.60	6.500	165.10	3	C40420
1-1/4	1.2500	31.75	1.250	31.75	2.000	50.80	4.500	114.30	3	C40425
1-1/4	1.2500	31.75	1.250	31.75	3.000	76.20	5.500	139.70	3	C40430
1-1/4	1.2500	31.75	1.250	31.75	4.000	101.60	6.500	165.10	3	C40435
1-1/4	1.2500	31.75	1.250	31.75	6.000	152.40	8.500	215.90	3	C40440

DRILLING
 HOLE FINISHING
 THREADING
 MILLING
 OTHER TOOLS

Miniature End Mills

Style HMDC-2 • Cobalt, Double End, 2-Flute, Center Cutting

formerly styles 407, 408

DRILLING

FEATURES

- ANSI SIZES** M42 COBALT SUBSTRATE
- GENERAL PURPOSE** BRIGHT
- 2 FLUTE CC** TiN
- 30°** TiCN

APPLICATIONS

- TITANIUM ALLOYS
- NICKEL ALLOYS
- COBALT ALLOYS
- STAINLESS STEEL

High red hardness for high heat conditions.



Style HMDC-2 Bright

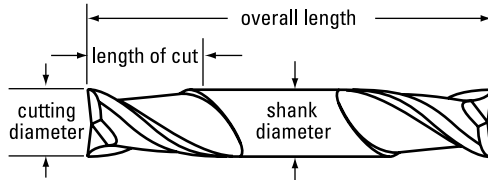


Style HMDC-2 TiN-coated



Style HMDC-2 TiCN-coated

HOLE FINISHING



THREADING

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/32	.0312	0.79	.188	4.76	.047	1.19	2.000	50.80	2	C40936	C40947	C40958
1/32	.0312	0.79	.188	4.76	.094	2.38	2.250	57.15	2	C40903	C40914	C40925
3/64	.0469	1.19	.188	4.76	.063	1.59	2.000	50.80	2	C40937	C40948	C40959
3/64	.0469	1.19	.188	4.76	.141	3.57	2.250	57.15	2	C40904	C40915	C40926
1/16	.0625	1.59	.188	4.76	.094	2.39	2.000	50.80	2	C40938	C40949	C40960
1/16	.0625	1.59	.188	4.76	.188	4.76	2.250	57.15	2	C40905	C40916	C40927
5/64	.0781	1.98	.188	4.76	.125	3.18	2.000	50.80	2	C40939	C40950	C40961
5/64	.0781	1.98	.188	4.76	.234	5.95	2.250	57.15	2	C40906	C40917	C40928
3/32	.0938	2.38	.188	4.76	.141	3.57	2.000	50.80	2	C40940	C40951	C40962
3/32	.0938	2.38	.188	4.76	.281	7.14	2.250	57.15	2	C40907	C40918	C40929
7/64	.1094	2.78	.188	4.76	.156	3.97	2.000	50.80	2	C40941	C40952	C40963
7/64	.1094	2.78	.188	4.76	.328	8.33	2.250	57.15	2	C40908	C40919	C40930
1/8	.1250	3.18	.188	4.76	.188	4.76	2.000	50.80	2	C40942	C40953	C40964
1/8	.1250	3.18	.188	4.76	.375	9.53	2.250	57.15	2	C40909	C40920	C40931
9/64	.1406	3.57	.188	4.76	.219	5.56	2.000	50.80	2	C40943	C40954	C40965
9/64	.1406	3.57	.188	4.76	.406	10.32	2.250	57.15	2	C40910	C40921	C40932
5/32	.1562	3.97	.188	4.76	.234	5.95	2.000	50.80	2	C40944	C40955	C40966
5/32	.1562	3.97	.188	4.76	.438	11.11	2.250	57.15	2	C40911	C40922	C40933
11/64	.1719	4.37	.188	4.76	.250	6.35	2.000	50.80	2	C40945	C40956	C40967
11/64	.1719	4.37	.188	4.76	.500	12.70	2.250	57.15	2	C40912	C40923	C40934
3/16	.1875	4.76	.188	4.76	.281	7.14	2.000	50.80	2	C40946	C40957	C40968
3/16	.1875	4.76	.188	4.76	.500	12.70	2.250	57.15	2	C40913	C40924	C40935

MILLING

OTHER TOOLS



Miniature End Mills

Style HMDC-4 • Cobalt, Double End, 4-Flute, Center Cutting


formerly styles 409, 410

FEATURES

ANSI SIZES	M42 COBALT SUBSTRATE
GENERAL PURPOSE	BRIGHT
4 FLUTE CC	TiN
30°	TiCN

APPLICATIONS

TITANIUM ALLOYS
NICKEL ALLOYS
COBALT ALLOYS
STAINLESS STEEL

 High red hardness for high heat conditions.



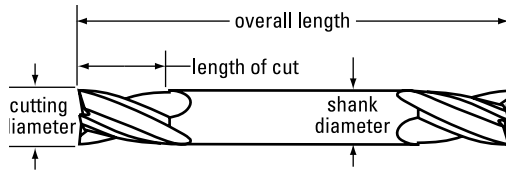
Style HMDC-4 Bright



Style HMDC-4 TiN-coated



Style HMDC-4 TiCN-coated



Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/16	.0625	1.59	.188	4.76	.094	2.39	2.000	50.80	4	C40984	C40989	C40994
1/16	.0625	1.59	.188	4.76	.188	4.76	2.250	57.15	4	C40969	C40974	C40979
3/32	.0938	2.38	.188	4.76	.141	3.57	2.000	50.80	4	C40985	C40990	C40995
3/32	.0938	2.38	.188	4.76	.281	7.14	2.250	57.15	4	C40970	C40975	C40980
1/8	.1250	3.18	.188	4.76	.188	4.76	2.000	50.80	4	C40986	C40991	C40996
1/8	.1250	3.18	.188	4.76	.375	9.53	2.250	57.15	4	C40971	C40976	C40981
5/32	.1562	3.97	.188	4.76	.234	5.95	2.000	50.80	4	C40987	C40992	C40997
5/32	.1562	3.97	.188	4.76	.438	11.11	2.250	57.15	4	C40972	C40977	C40982
3/16	.1875	4.76	.188	4.76	.281	7.14	2.000	50.80	4	C40988	C40993	C40998
3/16	.1875	4.76	.188	4.76	.500	12.70	2.250	57.15	4	C40973	C40978	C40983

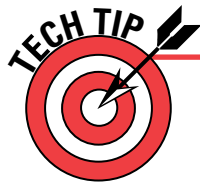
DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS



Miniature End Mills

- All miniature end mills feature 3/16" shanks.
- Only one holder size needed for all cutting diameters.
- Double end mills are available in multiple lengths.
- Double end mills have two cutting ends to reduce tool costs.



Miniature End Mills

Style HMD-2 • HSS, Double End, 2-Flute, Center Cutting

formerly styles 422, 426, 428

FEATURES

ANSI SIZES HSS SUBSTRATE

GENERAL PURPOSE BRIGHT

2 FLUTE CC TiN

30° TiCN

APPLICATIONS

ALLOY STEEL

TOOL STEEL

CARBON STEEL

CAST IRON



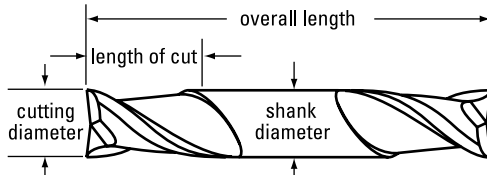
Style HMD-2 Bright



Style HMD-2 TiN-coated



Style HMD-2 TiCN-coated



Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/32	.0312	0.79	.188	4.76	.047	1.19	2.000	50.80	2	C41001	C39840	C39851
1/32	.0312	0.79	.188	4.76	.094	2.38	2.250	57.15	2	C41032	C39872	C39883
3/64	.0469	1.19	.188	4.76	.063	1.59	2.000	50.80	2	C41003	C39841	C39852
3/64	.0469	1.19	.188	4.76	.141	3.57	2.250	57.15	2	C41034	C39873	C39884
1/16	.0625	1.59	.188	4.76	.094	2.39	2.000	50.80	2	C41005	C39842	C39853
1/16	.0625	1.59	.188	4.76	.188	4.76	2.250	57.15	2	C41036	C39874	C39885
1/16	.0625	1.59	.188	4.76	.219	5.56	2.500	63.50	2	C41070	C39904	C39909
5/64	.0781	1.98	.188	4.76	.125	3.18	2.000	50.80	2	C41006	C39843	C39854
5/64	.0781	1.98	.188	4.76	.234	5.95	2.250	57.15	2	C41037	C39875	C39886
3/32	.0938	2.38	.188	4.76	.141	3.57	2.000	50.80	2	C41008	C39844	C39855
3/32	.0938	2.38	.188	4.76	.281	7.14	2.250	57.15	2	C41039	C39876	C39887
3/32	.0938	2.38	.188	4.76	.281	7.14	2.625	66.68	2	C41072	C39905	C39910
7/64	.1094	2.78	.188	4.76	.156	3.97	2.000	50.80	2	C41010	C39845	C39856
7/64	.1094	2.78	.188	4.76	.328	8.33	2.250	57.15	2	C41041	C39877	C39888
1/8	.1250	3.18	.188	4.76	.188	4.76	2.000	50.80	2	C41012	C39846	C39857
1/8	.1250	3.18	.188	4.76	.375	9.53	2.250	57.15	2	C41043	C39878	C39889
1/8	.1250	3.18	.188	4.76	.750	19.05	3.125	79.38	2	C41075	C39906	C39911
9/64	.1406	3.57	.188	4.76	.219	5.56	2.000	50.80	2	C41013	C39847	C39858
9/64	.1406	3.57	.188	4.76	.406	10.32	2.250	57.15	2	C41044	C39879	-
5/32	.1562	3.97	.188	4.76	.234	5.95	2.000	50.80	2	C41014	C39848	-
5/32	.1562	3.97	.188	4.76	.438	11.11	2.250	57.15	2	C41045	C39880	C39891
5/32	.1562	3.97	.188	4.76	.875	22.23	3.250	82.55	2	C41076	C39907	C39912
11/64	.1719	4.37	.188	4.76	.250	6.35	2.000	50.80	2	C41016	C39849	C39860
11/64	.1719	4.37	.188	4.76	.500	12.70	2.250	57.15	2	C41047	C39881	C39892
3/16	.1875	4.76	.188	4.76	.281	7.14	2.000	50.80	2	C41017	C39850	C39861
3/16	.1875	4.76	.188	4.76	.500	12.70	2.250	57.15	2	C41048	C39882	C39893

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

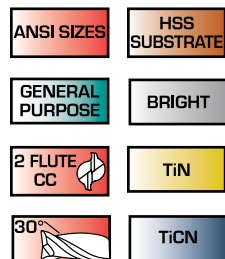


General Application End Mills

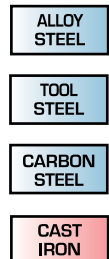
Miniature End Mills

Style HMD-2B • HSS, Double End, 2-Flute, Center Cutting, Ball Nose
formerly styles 423, 427

FEATURES



APPLICATIONS



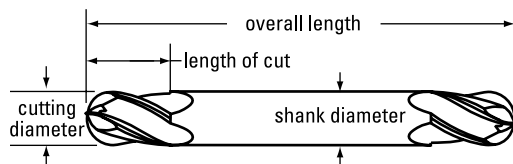
Style HMD-2B Bright



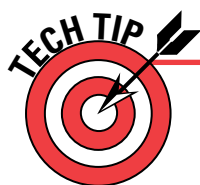
Style HMD-2B TiN-coated



Style HMD-2B TiCN-coated



Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/16	.0625	1.59	.188	4.76	.094	2.39	2.000	50.80	2	C41021	C39862	C39867
1/16	.0625	1.59	.188	4.76	.188	4.76	2.250	57.15	2	C41053	C39894	C39899
3/32	.0938	2.38	.188	4.76	.141	3.57	2.000	50.80	2	C41023	C39863	C39868
3/32	.0938	2.38	.188	4.76	.281	7.14	2.250	57.15	2	C41056	C39895	C39900
1/8	.1250	3.18	.188	4.76	.188	4.76	2.000	50.80	2	C41026	C39864	C39869
1/8	.1250	3.18	.188	4.76	.375	9.53	2.250	57.15	2	C41060	C39896	C39901
5/32	.1562	3.97	.188	4.76	.234	5.95	2.000	50.80	2	C41027	-	C39870
5/32	.1562	3.97	.188	4.76	.438	11.11	2.250	57.15	2	C41061	C39897	C39902
3/16	.1875	4.76	.188	4.76	.281	7.14	2.000	50.80	2	C41029	C39866	C39871
3/16	.1875	4.76	.188	4.76	.500	12.70	2.250	57.15	2	C41063	C39898	C39903



Miniature End Mills

- All miniature end mills feature 3/16" shanks.
- Only one holder size needed for all cutting diameters.
- Double end mills are available in multiple lengths.
- Double end mills have two cutting ends to reduce tool costs.

Miniature End Mills

Style HMD-4 • HSS, Double End, 4-Flute, Center Cutting

formerly styles 442, 446, 448

DRILLING

FEATURES

ANSI SIZES	HSS SUBSTRATE
GENERAL PURPOSE	BRIGHT
4 FLUTE CC	TiN
30°	TiCN

APPLICATIONS

ALLOY STEEL
TOOL STEEL
CARBON STEEL
CAST IRON



Style HMD-4 Bright

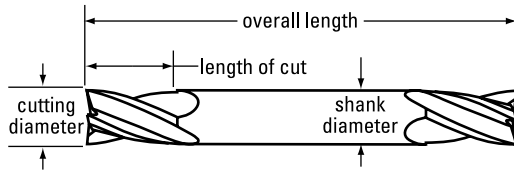


Style HMD-4 TiN-coated



Style HMD-4 TiCN-coated

HOLE FINISHING



THREADING

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/16	.0625	1.59	.188	4.76	.094	2.39	2.000	50.80	4	C41085	C39914	C39919
1/16	.0625	1.59	.188	4.76	.188	4.76	2.250	57.15	4	C41099	C39924	C39929
1/16	.0625	1.59	.188	4.76	.219	5.56	2.500	63.50	4	C41113	C39934	C39939
3/32	.0938	2.38	.188	4.76	.141	3.57	2.000	50.80	4	C41087	C39915	C39920
3/32	.0938	2.38	.188	4.76	.281	7.14	2.250	57.15	4	C41101	C39925	C39930
3/32	.0938	2.38	.188	4.76	.281	7.14	2.625	66.68	4	C41115	C39935	C39940
1/8	.1250	3.18	.188	4.76	.188	4.76	2.000	50.80	4	C41090	C39916	C39921
1/8	.1250	3.18	.188	4.76	.375	9.53	2.250	57.15	4	C41104	C39926	C39931
1/8	.1250	3.18	.188	4.76	.750	19.05	3.125	79.38	4	C41118	C39936	C39941
5/32	.1562	3.97	.188	4.76	.234	5.95	2.000	50.80	4	C41091	C39917	C39922
5/32	.1562	3.97	.188	4.76	.438	11.11	2.250	57.15	4	C41105	C39927	C39932
5/32	.1562	3.97	.188	4.76	.875	22.23	3.250	82.55	4	C41119	C39937	C39942
3/16	.1875	4.76	.188	4.76	.281	7.14	2.000	50.80	4	C41093	C39918	C39923
3/16	.1875	4.76	.188	4.76	.500	12.70	2.250	57.15	4	C41107	C39928	C39933

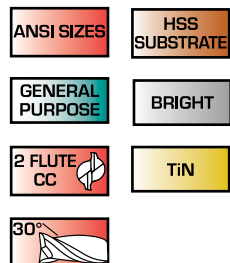
MILLING

OTHER TOOLS

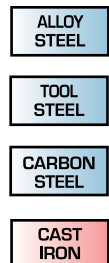


Style HMG-2 • HSS, Single End, 2-Flute, Center Cutting formerly style 405

FEATURES



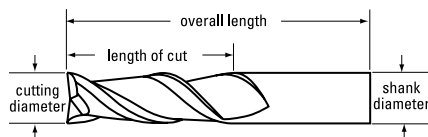
APPLICATIONS



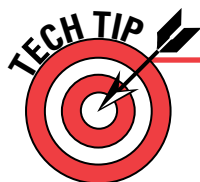
Style HMG-2 Bright



Style HMG-2 TiN-coated



Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number	
			in	mm	in	mm	in	mm		Bright	TiN
1/32	.0312	0.79	.188	4.76	.094	2.38	1.500	38.10	2	C40843	—
3/64	.0469	1.19	.188	4.76	.141	3.57	1.500	38.10	2	C40844	—
1/16	.0625	1.59	.188	4.76	.188	4.76	1.500	38.10	2	C40845	—
5/64	.0781	1.98	.188	4.76	.234	5.95	1.500	38.10	2	C40846	—
3/32	.0938	2.38	.188	4.76	.281	7.14	1.500	38.10	2	C40847	—
7/64	.1094	2.78	.188	4.76	.328	8.33	1.500	38.10	2	C40848	—
1/8	.1250	3.18	.188	4.76	.375	9.53	1.500	38.10	2	C40849	—
9/64	.1406	3.57	.188	4.76	.406	10.32	1.500	38.10	2	C40850	—
5/32	.1562	3.97	.188	4.76	.438	11.11	1.500	38.10	2	C40851	—
11/64	.1719	4.37	.188	4.76	.500	12.70	1.500	38.10	2	C40852	—
3/16	.1875	4.76	.188	4.76	.500	12.70	1.500	38.10	2	C40853	C40864



Miniature End Mills

- All miniature end mills feature 3/16" shanks.
- Only one holder size needed for all cutting diameters.

Miniature End Mills

Style HMG-4 • HSS, Single End, 4-Flute, Center Cutting
formerly style 406

DRILLING

FEATURES

ANSI SIZES	HSS SUBSTRATE
GENERAL PURPOSE	BRIGHT
4 FLUTE CC	TiN
30°	TiCN

APPLICATIONS

ALLOY STEEL
TOOL STEEL
CARBON STEEL
CAST IRON



Style HMG-4 Bright

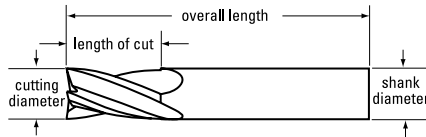


Style HMG-4 TiN-coated



Style HMG-4 TiCN-coated

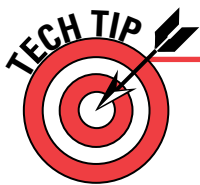
HOLE FINISHING



THREADING

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/16	.0625	1.59	.188	4.76	.188	4.76	1.500	38.10	4	C40876	C40885	C40894
5/64	.0781	1.98	.188	4.76	.234	5.95	1.500	38.10	4	C40877	C40886	C40895
3/32	.0938	2.38	.188	4.76	.281	7.14	1.500	38.10	4	C40878	C40887	C40896
7/64	.1094	2.78	.188	4.76	.328	8.33	1.500	38.10	4	C40879	C40888	C40897
1/8	.1250	3.18	.188	4.76	.375	9.53	1.500	38.10	4	C40880	C40889	C40898
9/64	.1406	3.57	.188	4.76	.406	10.32	1.500	38.10	4	C40881	C40890	C40899
5/32	.1562	3.97	.188	4.76	.438	11.11	1.500	38.10	4	C40882	C40891	C40900
11/64	.1719	4.37	.188	4.76	.500	12.70	1.500	38.10	4	C40883	C40892	C40901
3/16	.1875	4.76	.188	4.76	.500	12.70	1.500	38.10	4	C40884	C40893	C40902

MILLING



Miniature End Mills

- All miniature end mills feature 3/16" shanks.
- Only one holder size needed for all cutting diameters.

OTHER TOOLS



General Application End Mills


Double End Finishers

Style HDC-2 • Cobalt, Double End, 2-Flute, Center Cutting formerly style 565

FEATURES

ANSI SIZES	M42 COBALT SUBSTRATE	STAINLESS STEEL
GENERAL PURPOSE	BRIGHT	TITANIUM ALLOYS
2 FLUTE CC	TiN	NICKEL ALLOYS
30°	TiCN	COBALT ALLOYS

APPLICATIONS

 High red hardness for high heat conditions.



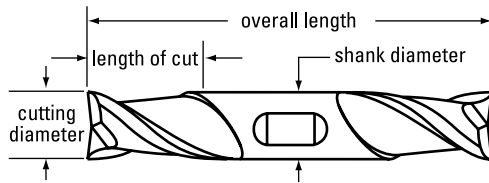
Style HDC-2 Bright



Style HDC-2 TiN-coated



Style HDC-2 TiCN-coated



Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/8	.1250	3.18	.375	9.53	.375	9.53	3.063	77.79	2	C52151	C32847	C32880
9/64	.1406	3.57	.375	9.53	.438	11.11	3.125	79.38	2	C32833	C32848	C32881
5/32	.1562	3.97	.375	9.53	.438	11.11	3.125	79.38	2	C52152	C32849	C32882
11/64	.1719	4.37	.375	9.53	.438	11.11	3.250	82.55	2	C32834	C32850	C32883
3/16	.1875	4.76	.375	9.53	.438	11.11	3.250	82.55	2	C52153	C32851	C32884
13/64	.2031	5.16	.375	9.53	.500	12.70	3.250	82.55	2	C32835	C32852	C32885
7/32	.2188	5.56	.375	9.53	.500	12.70	3.250	82.55	2	C52154	C32853	C32886
15/64	.2344	5.95	.375	9.53	.500	12.70	3.375	85.73	2	C32836	C32854	C32887
1/4	.2500	6.35	.375	9.53	.500	12.70	3.375	85.73	2	C52155	C32855	C32888
17/64	.2656	6.75	.375	9.53	.563	14.29	3.375	85.73	2	C32837	C32856	C32889
9/32	.2812	7.14	.375	9.53	.563	14.29	3.375	85.73	2	C52156	C32857	C32890
19/64	.2969	7.54	.375	9.53	.563	14.29	3.500	88.90	2	C32838	C32858	C32891
5/16	.3125	7.94	.375	9.53	.563	14.29	3.500	88.90	2	C52157	C32859	C32892
21/64	.3281	8.33	.375	9.53	.563	14.29	3.500	88.90	2	C32839	C32860	C32893
11/32	.3438	8.73	.375	9.53	.563	14.29	3.500	88.90	2	C52158	C32861	C32894
23/64	.3594	9.13	.375	9.53	.563	14.29	3.500	88.90	2	C32840	C32862	C32895
3/8	.3750	9.53	.375	9.53	.563	14.29	3.500	88.90	2	C52159	C32863	C32896
25/64	.3906	9.92	.500	12.70	.813	20.64	4.125	104.78	2	C32841	C32864	C32897
13/32	.4062	10.32	.500	12.70	.813	20.64	4.125	104.78	2	C52160	C32865	C32898
27/64	.4219	10.72	.500	12.70	.813	20.64	4.125	104.78	2	C32842	C32866	C32899
7/16	.4375	11.11	.500	12.70	.813	20.64	4.125	104.78	2	C52161	C32867	C32900
29/64	.4531	11.51	.500	12.70	.813	20.64	4.125	104.78	2	C32843	C32868	C32901
15/32	.4688	11.91	.500	12.70	.813	20.64	4.125	104.78	2	C52162	C32869	C32902
31/64	.4844	12.30	.500	12.70	.813	20.64	4.125	104.78	2	C32844	C32870	-
1/2	.5000	12.70	.500	12.70	.813	20.64	4.125	104.78	2	C52163	C32871	C32904
9/16	.5625	14.29	.625	15.88	1.125	28.58	5.000	127.00	2	C52164	C32872	C32905
5/8	.6250	15.88	.625	15.88	1.125	28.58	5.000	127.00	2	C52165	C32873	C32906
11/16	.6875	17.46	.750	19.05	1.313	33.34	5.625	142.88	2	C52166	C32874	C32907
3/4	.7500	19.05	.750	19.05	1.313	33.34	5.625	142.88	2	C52167	C32875	C32908
13/16	.8125	20.64	.875	22.23	1.563	39.69	6.125	155.58	2	C32845	C32876	C32909
7/8	.8750	22.23	.875	22.23	1.563	39.69	6.125	155.58	2	C52168	C32877	C32910
15/16	.9375	23.81	1.000	25.40	1.625	41.28	6.375	161.93	2	C32846	C32878	C32911
1	1.0000	25.40	1.000	25.40	1.625	41.28	6.375	161.93	2	C52169	C32879	C32912

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Double End Finishers

Style HDC-4C • Cobalt, Double End, 4-Flute, Center Cutting

formerly style 567

DRILLING

FEATURES

ANSI SIZES M42 COBALT SUBSTRATE

GENERAL PURPOSE BRIGHT

4 FLUTE CC TiN

30° TiCN

APPLICATIONS

STAINLESS STEEL

TITANIUM ALLOYS

NICKEL ALLOYS

COBALT ALLOYS

High red hardness for high heat conditions.



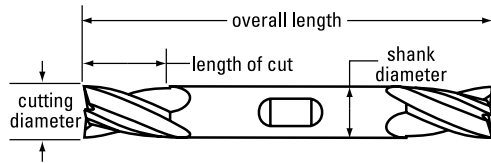
Style HDC-2 Bright



Style HDC-2 TiN-coated



Style HDC-2 TiCN-coated



HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/8	.1250	3.18	.375	9.53	.375	9.53	3.063	77.79	4	C52170	C32941	C32974
9/64	.1406	3.57	.375	9.53	.438	11.11	3.125	79.38	4	C32927	C32942	C32975
5/32	.1562	3.97	.375	9.53	.438	11.11	3.125	79.38	4	C52171	C32943	C32976
11/64	.1719	4.37	.375	9.53	.500	12.70	3.250	82.55	4	C32928	C32944	C32977
3/16	.1875	4.76	.375	9.53	.500	12.70	3.250	82.55	4	C52172	C32945	C32978
13/64	.2031	5.16	.375	9.53	.563	14.29	3.250	82.55	4	C32929	C32946	C32979
7/32	.2188	5.56	.375	9.53	.563	14.29	3.250	82.55	4	C52173	C32947	C32980
15/64	.2344	5.95	.375	9.53	.625	15.88	3.375	85.73	4	C32930	C32948	C32981
1/4	.2500	6.35	.375	9.53	.625	15.88	3.375	85.73	4	C52174	C32949	C32982
17/64	.2656	6.75	.375	9.53	.688	17.46	3.375	85.73	4	C32931	C32950	C32983
9/32	.2812	7.14	.375	9.53	.688	17.46	3.375	85.73	4	C52175	C32951	C32984
19/64	.2969	7.54	.375	9.53	.750	19.05	3.500	88.90	4	C32932	C32952	C32985
5/16	.3125	7.94	.375	9.53	.750	19.05	3.500	88.90	4	C52176	C32953	C32986
21/64	.3281	8.33	.375	9.53	.750	19.05	3.500	88.90	4	C32933	C32954	C32987
11/32	.3438	8.73	.375	9.53	.750	19.05	3.500	88.90	4	C52177	C32955	C32988
23/64	.3594	9.13	.375	9.53	.750	19.05	3.500	88.90	4	C32934	C32956	C32989
3/8	.3750	9.53	.375	9.53	.750	19.05	3.500	88.90	4	C52178	C32957	C32990
25/64	.3906	9.92	.500	12.70	1.000	25.40	4.500	114.30	4	C32935	C32958	C32991
13/32	.4062	10.32	.500	12.70	1.000	25.40	4.500	114.30	4	C52179	C32959	C32992
27/64	.4219	10.72	.500	12.70	1.000	25.40	4.500	114.30	4	C32936	C32960	C32993
7/16	.4375	11.11	.500	12.70	1.000	25.40	4.500	114.30	4	C52180	C32961	C32994
29/64	.4531	11.51	.500	12.70	1.000	25.40	4.500	114.30	4	C32937	C32962	C32995
15/32	.4688	11.91	.500	12.70	1.000	25.40	4.500	114.30	4	C52181	C32963	C32996
31/64	.4844	12.30	.500	12.70	1.000	25.40	4.500	114.30	4	C32938	C32964	C32997
1/2	.5000	12.70	.500	12.70	1.000	25.40	4.500	114.30	4	C52182	C32965	C32998
9/16	.5625	14.29	.625	15.88	1.375	34.93	5.000	127.00	4	C52183	C32966	C32999
5/8	.6250	15.88	.625	15.88	1.375	34.93	5.000	127.00	4	C52184	C32967	C33000
11/16	.6875	17.46	.750	19.05	1.625	41.28	5.625	142.88	4	C52185	C32968	C33001
3/4	.7500	19.05	.750	19.05	1.625	41.28	5.625	142.88	4	C52186	C32969	C33002
13/16	.8125	20.64	.875	22.23	1.875	47.63	6.125	155.58	4	C32939	C32970	C33003
7/8	.8750	22.23	.875	22.23	1.875	47.63	6.125	155.58	4	C52187	C32971	C33004
15/16	.9375	23.81	1.000	25.40	1.875	47.63	6.375	161.93	4	C32940	C32972	C33005
1	1.0000	25.40	1.000	25.40	1.875	47.63	6.375	161.93	4	C52188	C32973	C33006



General Application End Mills Double End Finishers

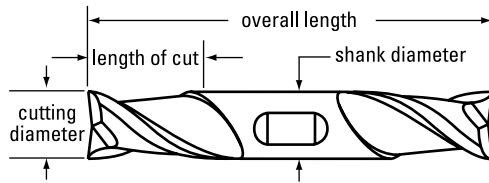
Style HD-2 • HSS, Double End, 2-Flute, Center Cutting formerly styles 684, 693

FEATURES

ANSI SIZES	HSS SUBSTRATE
GENERAL PURPOSE	BRIGHT
2 FLUTE CC	TiN
30°	TiCN

APPLICATIONS

ALLOY STEEL
TOOL STEEL
CARBON STEEL
CAST IRON



Style HD-2 Bright



Style HD-2 TiN-coated



Style HD-2 TiCN-coated

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/8	0.1250	3.18	0.375	9.53	0.188	4.76	2.750	69.85	2	C42096	C39044	C39049
1/8	0.1250	3.18	0.375	9.53	0.375	9.53	3.063	77.79	2	C42051	C33648	C33689
9/64	0.1406	3.57	0.375	9.53	0.438	11.11	3.125	79.38	2	C33626	C33649	C33690
5/32	0.1562	3.97	0.375	9.53	0.234	5.95	2.750	69.85	2	C42097	C39045	C39050
5/32	0.1562	3.97	0.375	9.53	0.438	11.11	3.125	79.38	2	C42052	C33650	C33691
11/64	0.1719	4.37	0.375	9.53	0.438	11.11	3.250	82.55	2	C33627	C33651	C33692
3/16	0.1875	4.76	0.375	9.53	0.281	7.14	2.750	69.85	2	C42099	C39046	C39051
3/16	0.1875	4.76	0.375	9.53	0.438	11.11	3.250	82.55	2	C42054	C33652	C33693
13/64	0.2031	5.16	0.375	9.53	0.500	12.70	3.250	82.55	2	C42055	C33653	C33694
7/32	0.2188	5.56	0.375	9.53	0.328	8.33	2.875	73.03	2	C42101	C39047	C39052
7/32	0.2188	5.56	0.375	9.53	0.500	12.70	3.250	82.55	2	C42056	C33654	C33695
15/64	0.2344	5.95	0.375	9.53	0.500	12.70	3.375	85.73	2	C33629	C33655	C33696
1/4	0.2500	6.35	0.375	9.53	0.375	9.53	2.875	73.03	2	C42103	C39048	C39053
1/4	0.2500	6.35	0.375	9.53	0.500	12.70	3.375	85.73	2	C42058	C33656	C33697
17/64	0.2656	6.75	0.375	9.53	0.563	14.29	3.375	85.73	2	C33630	C33657	C33698
9/32	0.2812	7.14	0.375	9.53	0.563	14.29	3.375	85.73	2	C42060	C33658	C33699
19/64	0.2969	7.54	0.375	9.53	0.563	14.29	3.500	88.90	2	C33631	C33659	C33700
5/16	0.3125	7.94	0.375	9.53	0.563	14.29	3.500	88.90	2	C42061	C33660	C33701
21/64	0.3281	8.33	0.375	9.53	0.563	14.29	3.500	88.90	2	C33632	C33661	C33702
11/32	0.3438	8.73	0.375	9.53	0.563	14.29	3.500	88.90	2	C42063	C33662	C33703
23/64	0.3594	9.13	0.375	9.53	0.563	14.29	3.500	88.90	2	C33633	C33663	C33704
3/8	0.3750	9.53	0.375	9.53	0.563	14.29	3.500	88.90	2	C42065	C33664	C33705
25/64	0.3906	9.92	0.500	12.70	0.813	20.64	4.125	104.78	2	C33634	C33665	C33706
13/32	0.4062	10.32	0.500	12.70	0.813	20.64	4.125	104.78	2	C42067	C33666	C33707
27/64	0.4219	10.72	0.500	12.70	0.813	20.64	4.125	104.78	2	C33635	C33667	C33708
7/16	0.4375	11.11	0.500	12.70	0.813	20.64	4.125	104.78	2	C42069	C33668	C33709
29/64	0.4531	11.51	0.500	12.70	0.813	20.64	4.125	104.78	2	C33636	C33669	C33710
15/32	0.4688	11.91	0.500	12.70	0.813	20.64	4.125	104.78	2	C42070	C33670	C33711
31/64	0.4844	12.30	0.500	12.70	0.813	20.64	4.125	104.78	2	C33637	C33671	C33712
1/2	0.5000	12.70	0.500	12.70	0.813	20.64	4.125	104.78	2	C42072	C33672	C33713
17/32	0.5312	13.49	0.625	15.88	1.125	28.58	5.000	127.00	2	C33638	C33673	C33714
9/16	0.5625	14.29	0.625	15.88	1.125	28.58	5.000	127.00	2	C42074	C33674	C33715

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DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Double End Finishers

Style HD-2 • HSS, Double End, 2-Flute, Center Cutting (continued)

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
19/32	.5938	15.08	.625	15.88	1.125	28.58	5.000	127.00	2	C33639	C33675	C33716
5/8	.6250	15.88	.625	15.88	1.125	28.58	5.000	127.00	2	C42076	C33676	C33717
21/32	.6562	16.67	.750	19.05	1.313	33.34	5.625	142.88	2	C33640	C33677	C33718
11/16	.6875	17.46	.750	19.05	1.313	33.34	5.625	142.88	2	C42078	C33678	C33719
23/32	.7188	18.26	.750	19.05	1.313	33.34	5.625	142.88	2	C33641	C33679	C33720
3/4	.7500	19.05	.750	19.05	1.313	33.34	5.625	142.88	2	C42080	C33680	C33721
25/32	.7812	19.84	.875	22.23	1.563	39.69	6.125	155.58	2	C33642	C33681	C33722
13/16	.8125	20.64	.875	22.23	1.563	39.69	6.125	155.58	2	C33643	C33682	C33723
27/32	.8438	21.43	.875	22.23	1.563	39.69	6.125	155.58	2	C42084	C33683	C33724
7/8	.8750	22.23	.875	22.23	1.563	39.69	6.125	155.58	2	C33644	C33684	C33725
29/32	.9062	23.02	1.000	25.40	1.563	39.69	6.375	161.93	2	C33645	C33685	C33726
15/16	.9375	23.81	1.000	25.40	1.625	41.28	6.375	161.93	2	C33646	C33686	C33727
31/32	.9688	24.61	1.000	25.40	1.625	41.28	6.375	161.93	2	C33647	C33687	C33728
1	1.0000	25.40	1.000	25.40	1.625	41.28	6.375	161.93	2	C42088	C33688	C33729

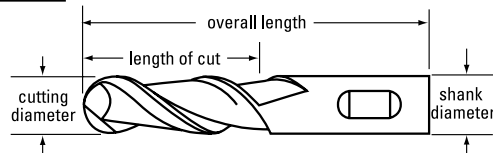
Style HD-2B • HSS, Double End, 2-Flute, Center Cutting Ball Nose formerly style 697

FEATURES

- ANSI SIZES**
- HSS SUBSTRATE**
- GENERAL PURPOSE**
- BRIGHT**
- 2 FLUTE CC**
- TiN**
- 30°**
- TiCN**

APPLICATIONS

- ALLOY STEEL**
- TOOL STEEL**
- CARBON STEEL**
- CAST IRON**



Style HD-2B Bright



Style HD-2B TiN-coated



Style HD-2B TiCN-coated

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/8	.1250	3.18	.375	9.53	.375	9.53	3.063	77.79	2	C42184	C39142	C39158
5/32	.1562	3.97	.375	9.53	.438	11.11	3.125	79.38	2	C39136	C39143	C39159
3/16	.1875	4.76	.375	9.53	.438	11.11	3.250	82.55	2	C42186	C39144	C39160
7/32	.2188	5.56	.375	9.53	.500	12.70	3.250	82.55	2	C39137	C39145	C39161
1/4	.2500	6.35	.375	9.53	.500	12.70	3.375	85.73	2	C42189	C39146	C39162
9/32	.2812	7.14	.375	9.53	.563	14.29	3.375	85.73	2	C39138	C39147	C39163
5/16	.3125	7.94	.375	9.53	.563	14.29	3.500	88.90	2	C42191	C39148	C39164
11/32	.3438	8.73	.375	9.53	.563	14.29	3.500	88.90	2	C39139	C39149	C39165
3/8	.3750	9.53	.375	9.53	.563	14.29	3.500	88.90	2	C42194	C39150	C39166
13/32	.4062	10.32	.500	12.70	.813	20.64	4.125	104.78	2	C39140	C39151	C39167
7/16	.4375	11.11	.500	12.70	.813	20.64	4.125	104.78	2	C42197	C39152	C39168
1/2	.5000	12.70	.500	12.70	.813	20.64	4.125	104.78	2	C42199	C39153	C39169
5/8	.6250	15.88	.625	15.88	1.125	28.58	5.000	127.00	2	C42202	C39154	C39170
3/4	.7500	19.05	.750	19.05	1.313	33.34	5.625	142.88	2	C42205	C39155	C39171
7/8	.8750	22.23	.875	22.23	1.563	39.69	6.125	155.58	2	C39141	C39156	C39172
1	1.0000	25.40	1.000	25.40	1.625	41.28	6.375	161.93	2	C42212	C39157	C39173

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS



General Application End Mills

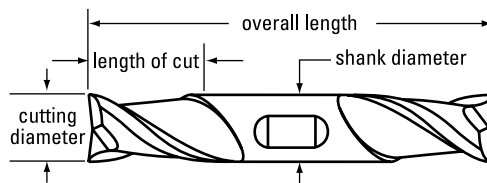
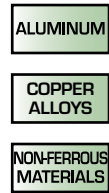
Double End Finishers

Style HDA-2 • HSS, Double End, 2-Flute, Center Cutting, High-Helix for Aluminum
formerly style 668

FEATURES



APPLICATIONS



Style HDA-2 Bright



Style HDA-2 TiN-coated



Style HDA-2 TiCN-coated

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/8	.1250	3.18	.375	9.53	.375	9.53	3.063	77.79	2	C41965	C33546	C33561
3/16	.1875	4.76	.375	9.53	.438	11.11	3.250	82.55	2	C41967	C33547	C33562
1/4	.2500	6.35	.375	9.53	.500	12.70	3.375	85.73	2	C41970	C33548	C33563
5/16	.3125	7.94	.375	9.53	.563	14.29	3.500	88.90	2	C41972	C33549	C33564
3/8	.3750	9.53	.375	9.53	.563	14.29	3.500	88.90	2	C41975	C33550	C33565
7/16	.4375	11.11	.500	12.70	.813	20.64	4.125	104.78	2	C41978	C33551	C33566
1/2	.5000	12.70	.500	12.70	.813	20.64	4.125	104.78	2	C41980	C33552	C33567
9/16	.5625	14.29	.625	15.88	1.125	28.58	5.000	127.00	2	C41982	C33553	C33568
5/8	.6250	15.88	.625	15.88	1.125	28.58	5.000	127.00	2	C41984	C33554	C33569
11/16	.6875	17.46	.750	19.05	1.313	33.34	5.625	142.88	2	C41986	C33555	C33570
3/4	.7500	19.05	.750	19.05	1.313	33.34	5.625	142.88	2	C41988	C33556	C33571
13/16	.8125	20.64	.875	22.23	1.563	39.69	6.125	155.58	2	C41990	C33557	C33572
7/8	.8750	22.23	.875	22.23	1.563	39.69	6.125	155.58	2	C41993	C33558	C33573
15/16	.9375	23.81	1.000	25.40	1.625	41.28	6.375	161.93	2	C41995	C33559	C33574
1	1.0000	25.40	1.000	25.40	1.625	41.28	6.375	161.93	2	C41998	C33560	C33575

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Double End Finishers

Style HD-3 • HSS, Double End, 3-Flute, Center Cutting
formerly style 587

DRILLING

FEATURES

ANSI SIZES: HSS SUBSTRATE

GENERAL PURPOSE: BRIGHT

3 FLUTE CC: TiN

30°: TiCN

APPLICATIONS

ALLOY STEEL

CARBON STEEL

CAST IRON

MAGNESIUM



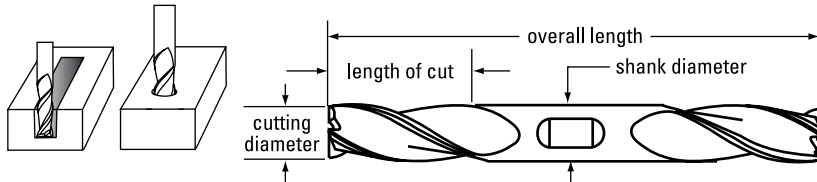
Style HD-3 Bright



Style HD-3 TiN-coated



Style HD-3 TiCN-coated

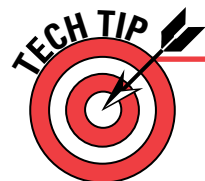


HOLE FINISHING

THREADING

MILLING

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/8	.1250	3.18	.375	9.53	.375	9.53	3.063	77.79	3	C39575	C39596	C39617
5/32	.1562	3.97	.375	9.53	.438	11.11	3.250	82.55	3	C39576	C39597	C39618
3/16	.1875	4.76	.375	9.53	.500	12.70	3.250	82.55	3	C39577	C39598	C39619
7/32	.2188	5.56	.375	9.53	.563	14.29	3.250	82.55	3	C39578	C39599	C39620
1/4	.2500	6.35	.375	9.53	.625	15.88	3.375	85.73	3	C39579	C39600	C39621
9/32	.2812	7.14	.375	9.53	.688	17.46	3.375	85.73	3	C39580	C39601	C39622
5/16	.3125	7.94	.375	9.53	.750	19.05	3.500	88.90	3	C39581	C39602	C39623
11/32	.3438	8.73	.375	9.53	.750	19.05	3.500	88.90	3	C39582	C39603	C39624
3/8	.3750	9.53	.375	9.53	.750	19.05	3.500	88.90	3	C39583	C39604	C39625
13/32	.4062	10.32	.500	12.70	1.000	25.40	4.125	104.78	3	C39584	C39605	C39626
7/16	.4375	11.11	.500	12.70	1.000	25.40	4.125	104.78	3	C39585	C39606	C39627
15/32	.4688	11.91	.500	12.70	1.000	25.40	4.125	104.78	3	C39586	-	C39628
1/2	.5000	12.70	.500	12.70	1.000	25.40	4.125	104.78	3	C39587	C39608	C39629
9/16	.5625	14.29	.625	15.88	1.375	34.93	5.000	127.00	3	C39588	C39609	C39630
5/8	.6250	15.88	.625	15.88	1.375	34.93	5.000	127.00	3	C39589	C39610	C39631
11/16	.6875	17.46	.750	19.05	1.625	41.28	5.625	142.88	3	C39590	C39611	C39632
3/4	.7500	19.05	.750	19.05	1.625	41.28	5.625	142.88	3	C39591	C39612	C39633
13/16	.8125	20.64	.875	22.23	1.875	47.63	6.125	155.58	3	C39592	C39613	-
7/8	.8750	22.23	.875	22.23	1.875	47.63	6.125	155.58	3	C39593	C39614	C39635
15/16	.9375	23.81	1.000	25.40	1.875	47.63	6.375	161.93	3	C39594	C39615	-
1	1.0000	25.40	1.000	25.40	1.875	47.63	6.375	161.93	3	C39595	C39616	C39637



Benefits of Multi-Flute End Mills

- Generally, multi-flute end mills give smoother finishes than 2-flute end mills.
- Increased number of flutes mean more cutting edges, providing more cutting action.

OTHER TOOLS



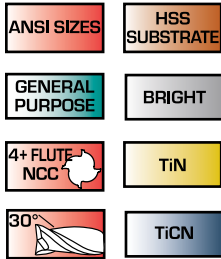
General Application End Mills

Double End Finishers

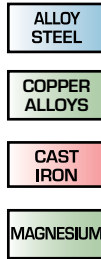
Style HD-4 • HSS, Double End, 4-Flute, Non-Center Cutting

formerly styles 682, 695

FEATURES



APPLICATIONS



Heavy cross-section for high rigidity.



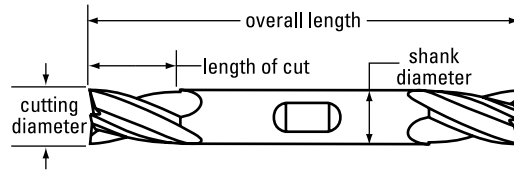
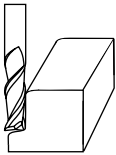
Style HD-4 Bright



Style HD-4 TiN-coated



Style HD-4 TiCN-coated



Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/8	.1250	3.18	.375	9.53	.188	4.76	2.750	69.85	4	C43374	C39054	C39059
1/8	.1250	3.18	.375	9.53	.375	9.53	3.063	77.79	4	C43307	C39318	C39359
9/64	.1406	3.57	.375	9.53	.438	11.11	3.125	79.38	4	C39297	C39319	C39360
5/32	.1562	3.97	.375	9.53	.234	5.95	2.750	69.85	4	C43375	C39055	C39060
5/32	.1562	3.97	.375	9.53	.438	11.11	3.125	79.38	4	C43308	C39320	C39361
11/64	.1719	4.37	.375	9.53	.500	12.70	3.250	82.55	4	C39298	C39321	C39362
3/16	.1875	4.76	.375	9.53	.281	7.14	2.750	69.85	4	C43377	C39056	C39061
3/16	.1875	4.76	.375	9.53	.500	12.70	3.250	82.55	4	C43310	C39322	C39363
13/64	.2031	5.16	.375	9.53	.563	14.29	3.250	82.55	4	C39299	C39323	C39364
7/32	.2188	5.56	.375	9.53	.328	8.33	2.875	73.03	4	C43379	C39057	C39062
7/32	.2188	5.56	.375	9.53	.563	14.29	3.250	82.55	4	C43312	C39324	C39365
15/64	.2344	5.95	.375	9.53	.625	15.88	3.375	85.73	4	C39300	C39325	C39366
1/4	.2500	6.35	.375	9.53	.375	9.53	2.875	73.03	4	C43381	C39058	C39063
1/4	.2500	6.35	.375	9.53	.625	15.88	3.375	85.73	4	C43314	C39326	C39367
17/64	.2656	6.75	.375	9.53	.688	17.46	3.375	85.73	4	C39301	C39327	C39368
9/32	.2812	7.14	.375	9.53	.688	17.46	3.375	85.73	4	C43316	C39328	C39369
19/64	.2969	7.54	.375	9.53	.750	19.05	3.500	88.90	4	C39302	C39329	C39370
5/16	.3125	7.94	.375	9.53	.750	19.05	3.500	88.90	4	C43317	C39330	C39371
21/64	.3281	8.33	.375	9.53	.750	19.05	3.500	88.90	4	C39303	C39331	C39372
11/32	.3438	8.73	.375	9.53	.750	19.05	3.500	88.90	4	C43319	C39332	C39373
23/64	.3594	9.13	.375	9.53	.750	19.05	3.500	88.90	4	C39304	C39333	-
3/8	.3750	9.53	.375	9.53	.750	19.05	3.500	88.90	4	C43321	C39334	C39375
25/64	.3906	9.92	.500	12.70	1.000	25.40	4.500	114.30	4	C39305	C39335	-
13/32	.4062	10.32	.500	12.70	1.000	25.40	4.500	114.30	4	C43323	C39336	C39377
27/64	.4219	10.72	.500	12.70	1.000	25.40	4.500	114.30	4	C39306	C39337	C39378
7/16	.4375	11.11	.500	12.70	1.000	25.40	4.500	114.30	4	C43325	C39338	C39379
29/64	.4531	11.51	.500	12.70	1.000	25.40	4.500	114.30	4	C39307	C39339	C39380
15/32	.4688	11.91	.500	12.70	1.000	25.40	4.500	114.30	4	C43326	C39340	-
31/64	.4844	12.30	.500	12.70	1.000	25.40	4.500	114.30	4	C39308	C39341	-
1/2	.5000	12.70	.500	12.70	1.000	25.40	4.500	114.30	4	C43328	C39342	C39383
17/32	.5312	13.49	.625	15.88	1.375	34.93	5.000	127.00	4	C39309	C39343	-
9/16	.5625	14.29	.625	15.88	1.375	34.93	5.000	127.00	4	C43330	C39344	C39385

continued on next page

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Double End Finishers

Style HD-4 • HSS, Double End, 4-Flute, Non-Center Cutting (continued)

formerly styles 682, 695

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
19/32	.5938	15.08	.625	15.88	1.375	34.93	5.000	127.00	4	C39310	C39345	-
5/8	.6250	15.88	.625	15.88	1.375	34.93	5.000	127.00	4	C43332	C39346	C39387
21/32	.6562	16.67	.750	19.05	1.625	41.28	5.625	142.88	4	C39311	C39347	-
11/16	.6875	17.46	.750	19.05	1.625	41.28	5.625	142.88	4	C43334	C39348	C39389
23/32	.7188	18.26	.750	19.05	1.625	41.28	5.625	142.88	4	C39312	C39349	C39390
3/4	.7500	19.05	.750	19.05	1.625	41.28	5.625	142.88	4	C43336	C39350	C39391
25/32	.7812	19.84	.875	22.23	1.875	47.63	6.125	155.58	4	C39313	C39351	-
13/16	.8125	20.64	.875	22.23	1.875	47.63	6.125	155.58	4	C43338	C39352	C39393
27/32	.8438	21.43	.875	22.23	1.875	47.63	6.125	155.58	4	C39314	C39353	-
7/8	.8750	22.23	.875	22.23	1.875	47.63	6.125	155.58	4	C43341	C39354	C39395
29/32	.9062	23.02	1.000	25.40	1.875	47.63	6.375	161.93	4	C39315	C39355	-
15/16	.9375	23.81	1.000	25.40	1.875	47.63	6.375	161.93	4	C39316	C39356	C39397
31/32	.9688	24.61	1.000	25.40	1.875	47.63	6.375	161.93	4	C39317	-	-
1	1.0000	25.40	1.000	25.40	1.875	47.63	6.375	161.93	4	C43345	C39358	C39399

Style HD-4LH • HSS, Double End, 4-Flute, Non-Center Cutting, Left-Hand Helix, Left-Hand Cut

formerly styles 682LH

FEATURES

- ANSI SIZES
- HSS SUBSTRATE
- GENERAL PURPOSE
- BRIGHT
- 4+ FLUTE NCC
- TiN
- 30°
- TiCN
- LHH/LHC

APPLICATIONS

- ALLOY STEEL
- COPPER ALLOYS
- CAST IRON
- MAGNESIUM



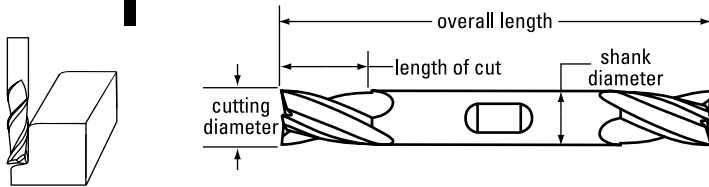
Style HD-4LH Bright



Style HD-4LH TiN-coated



Style HD-4LH TiCN-coated



Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/8	.1250	3.18	.375	9.53	.375	9.53	3.063	77.79	4	C43348	C33581	C33595
5/32	.1562	3.97	.375	9.53	.438	11.11	3.125	79.38	4	C43349	C33582	C33596
3/16	.1875	4.76	.375	9.53	.500	12.70	3.250	82.55	4	C43351	C33583	C33597
7/32	.2188	5.56	.375	9.53	.563	14.29	3.250	82.55	4	C33576	C33584	C33598
1/4	.2500	6.35	.375	9.53	.625	15.88	3.375	85.73	4	C43354	C33585	C33599
5/16	.3125	7.94	.375	9.53	.750	19.05	3.500	88.90	4	C43356	C33586	C33600
3/8	.3750	9.53	.375	9.53	.750	19.05	3.500	88.90	4	C43359	C33587	C33601
7/16	.4375	11.11	.500	12.70	1.000	25.40	4.500	114.30	4	C33577	C33588	C33602
1/2	.5000	12.70	.500	12.70	1.000	25.40	4.500	114.30	4	C43363	C33589	C33603
9/16	.5625	14.29	.625	15.88	1.375	34.93	5.000	127.00	4	C33578	C33590	C33604
5/8	.6250	15.88	.625	15.88	1.375	34.93	5.000	127.00	4	C43366	C33591	C33605
3/4	.7500	19.05	.750	19.05	1.625	41.28	5.625	142.88	4	C43369	C33592	C33606
7/8	.8750	22.23	.875	22.23	1.875	47.63	6.125	155.58	4	C33579	C33593	C33607
1	1.0000	25.40	1.000	25.40	1.875	47.63	6.375	161.93	4	C33580	C33594	C33608



General Application End Mills

Double End Finishers

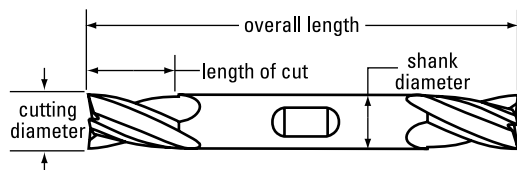
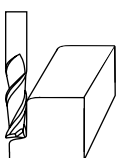
Style HD-4C • HSS, Double End, 4-Flute, Center Cutting formerly style 582

FEATURES

ANSI SIZES	HSS SUBSTRATE
GENERAL PURPOSE	BRIGHT
4 FLUTE CC	TiN
30°	TiCN

APPLICATIONS

ALLOY STEEL
COPPER ALLOYS
CAST IRON
MAGNESIUM



Style HD-4C Bright



Style HD-4C TiN-coated



Style HD-4C TiCN-coated

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/8	.1250	3.18	.375	9.53	.375	9.53	3.063	77.79	4	C41202	C33059	C33100
9/64	.1406	3.57	.375	9.53	.438	11.11	3.125	79.38	4	C33028	C33060	C33101
5/32	.1562	3.97	.375	9.53	.438	11.11	3.125	79.38	4	C33029	C33061	C33102
11/64	.1719	4.37	.375	9.53	.500	12.70	3.250	82.55	4	C33030	C33062	C33103
3/16	.1875	4.76	.375	9.53	.500	12.70	3.250	82.55	4	C41204	C33063	C33104
13/64	.2031	5.16	.375	9.53	.563	14.29	3.250	82.55	4	C33031	C33064	C33105
7/32	.2188	5.56	.375	9.53	.563	14.29	3.250	82.55	4	C33032	C33065	C33106
15/64	.2344	5.95	.375	9.53	.625	15.88	3.375	85.73	4	C33033	C33066	C33107
1/4	.2500	6.35	.375	9.53	.625	15.88	3.375	85.73	4	C41207	C33067	C33108
17/64	.2656	6.75	.375	9.53	.688	17.46	3.375	85.73	4	C33034	C33068	C33109
9/32	.2812	7.14	.375	9.53	.688	17.46	3.375	85.73	4	C33035	C33069	C33110
19/64	.2969	7.54	.375	9.53	.750	19.05	3.500	88.90	4	C33036	C33070	C33111
5/16	.3125	7.94	.375	9.53	.750	19.05	3.500	88.90	4	C41209	C33071	C33112
21/64	.3281	8.33	.375	9.53	.750	19.05	3.500	88.90	4	C33037	C33072	C33113
11/32	.3438	8.73	.375	9.53	.750	19.05	3.500	88.90	4	C33038	C33073	C33114
23/64	.3594	9.13	.375	9.53	.750	19.05	3.500	88.90	4	C33039	C33074	C33115
3/8	.3750	9.53	.375	9.53	.750	19.05	3.500	88.90	4	C41212	C33075	C33116
25/64	.3906	9.92	.500	12.70	1.000	25.40	4.500	114.30	4	C33040	C33076	C33117
13/32	.4062	10.32	.500	12.70	1.000	25.40	4.500	114.30	4	C33041	C33077	C33118
27/64	.4219	10.72	.500	12.70	1.000	25.40	4.500	114.30	4	C33042	C33078	C33119
7/16	.4375	11.11	.500	12.70	1.000	25.40	4.500	114.30	4	C33043	C33079	C33120
29/64	.4531	11.51	.500	12.70	1.000	25.40	4.500	114.30	4	C33044	C33080	C33121
15/32	.4688	11.91	.500	12.70	1.000	25.40	4.500	114.30	4	C33045	C33081	C33122
31/64	.4844	12.30	.500	12.70	1.000	25.40	4.500	114.30	4	C33046	C33082	C33123
1/2	.5000	12.70	.500	12.70	1.000	25.40	4.500	114.30	4	C41216	C33083	C33124
17/32	.5312	13.49	.625	15.88	1.375	34.93	5.000	127.00	4	C33047	C33084	C33125
9/16	.5625	14.29	.625	15.88	1.375	34.93	5.000	127.00	4	C33048	C33085	C33126
19/32	.5938	15.08	.625	15.88	1.375	34.93	5.000	127.00	4	C33049	C33086	C33127
5/8	.6250	15.88	.625	15.88	1.375	34.93	5.000	127.00	4	C41219	C33087	C33128
21/32	.6562	16.67	.750	19.05	1.625	41.28	5.625	142.88	4	C33050	C33088	C33129
11/16	.6875	17.46	.750	19.05	1.625	41.28	5.625	142.88	4	C33051	C33089	C33130
23/32	.7188	18.26	.750	19.05	1.625	41.28	5.625	142.88	4	C33052	C33090	C33131

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DRILLING
HOLE FINISHING
THREADING
MILLING
OTHER TOOLS

Double End Finishers

Style HD-4C • HSS, Double End, 4-Flute, Center Cutting (continued)

formerly style 582

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
3/4	.7500	19.05	.750	19.05	1.625	41.28	5.625	142.88	4	C41223	C33091	C33132
25/32	.7812	19.84	.875	22.23	1.875	47.63	6.125	155.58	4	C33053	C33092	–
13/16	.8125	20.64	.875	22.23	1.875	47.63	6.125	155.58	4	C33054	C33093	C33134
27/32	.8438	21.43	.875	22.23	1.875	47.63	6.125	155.58	4	C33055	C33094	C33135
7/8	.8750	22.23	.875	22.23	1.875	47.63	6.125	155.58	4	C41227	C33095	C33136
29/32	.9062	23.02	1.000	25.40	1.875	47.63	6.375	161.93	4	C33056	C33096	C33137
15/16	.9375	23.81	1.000	25.40	1.875	47.63	6.375	161.93	4	C33057	C33097	–
31/32	.9688	24.61	1.000	25.40	1.875	47.63	6.375	161.93	4	C33058	C33098	–
1	1.0000	25.40	1.000	25.40	1.875	47.63	6.375	161.93	4	C41231	C33099	C33140

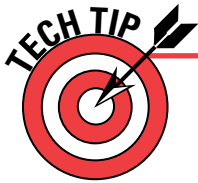
DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS



End Mill Finishes and Their Applications

- Cleveland's cutting tools with TiN or TiCN coatings provide exceptional performance benefits. Coatings are matched with designs which are intended for aggressive material removal with significant increases in tool life and machining rates.
 - Coatings reduce heat and abrasion to increase tool life.
 - The increased lubricity of the coating surface reduces material adhesion and built-up edge, enabling even higher feed rates.
 - Coatings reduce the amount of torque required for machining to allow more efficient use of equipment.
 - Increase machining speeds to achieve optimum performance when using Cleveland coatings.
- Straw finish
 - bronze color
 - for general machining
 - operate at conventional cobalt speeds and heavier feed rates.
- TiN (titanium nitride) coating
 - gold color
 - intended for aggressive machining
 - increase machining speed 25% to 30% versus bright speeds
- TiCN (titanium carbonitride) coating
 - blue-gray color
 - for very aggressive machining of stainless steels and non-ferrous materials
 - extremely hard, wear resistant
 - increase machining speeds 35% to 50% versus bright speeds
- TiAlN (titanium aluminum nitride) coating
 - violet/blue-gray color
 - for aggressive machining of stainless steels, high alloy carbon steels, nickel-based high-temperature alloys, and titanium alloys
 - increase machining speeds 75% to 100% versus bright speeds.



General Application End Mills


Single End Finishers


Style HGC-2 • Cobalt, Single End, 2-Flute, Center Cutting formerly style 555

FEATURES

ANSI SIZES M42 COBALT SUBSTRATE

GENERAL PURPOSE BRIGHT

2 FLUTE CC 

30° 

TiN

TiCN


APPLICATIONS

TITANIUM ALLOYS

NICKEL ALLOYS

COBALT ALLOYS

STAINLESS STEEL

 High red hardness for high heat conditions.



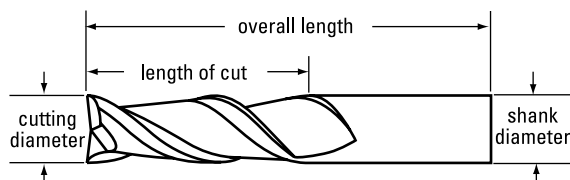
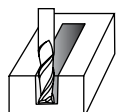
Style HGC-2 Bright



Style HGC-2 TiN-coated



Style HGC-2 TiCN-coated



Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/8	.1250	3.18	.375	9.53	.375	9.53	2.313	58.74	2	C42602	C32498	C32527
5/32	.1562	3.97	.375	9.53	.438	11.11	2.375	60.33	2	C32480	C32499	C32528
11/64	.1719	4.37	.375	9.53	.438	11.11	2.375	60.33	2	C32481	C32500	C32529
3/16	.1875	4.76	.375	9.53	.438	11.11	2.375	60.33	2	C42604	C32501	C32530
13/64	.2031	5.16	.375	9.53	.500	12.70	2.438	61.91	2	C32482	C32502	C32531
7/32	.2188	5.56	.375	9.53	.500	12.70	2.438	61.91	2	C32483	C32503	C32532
15/64	.2344	5.95	.375	9.53	.500	12.70	2.438	61.91	2	C32484	C32504	C32533
1/4	.2500	6.35	.375	9.53	.500	12.70	2.438	61.91	2	C42607	C32505	C32534
17/64	.2656	6.75	.375	9.53	.563	14.29	2.500	63.50	2	C32485	C32506	C32535
9/32	.2812	7.14	.375	9.53	.563	14.29	2.500	63.50	2	C32486	C32507	C32536
19/64	.2969	7.54	.375	9.53	.563	14.29	2.500	63.50	2	C32487	C32508	C32537
5/16	.3125	7.94	.375	9.53	.563	14.29	2.500	63.50	2	C42609	C32509	C32538
21/64	.3281	8.33	.375	9.53	.563	14.29	2.500	63.50	2	C32488	C32510	C32539
11/32	.3438	8.73	.375	9.53	.563	14.29	2.500	63.50	2	C32489	C32511	C32540
23/64	.3594	9.13	.375	9.53	.563	14.29	2.500	63.50	2	C32490	C32512	C32541
3/8	.3750	9.53	.375	9.53	.563	14.29	2.500	63.50	2	C42612	C32513	C32542
25/64	.3906	9.92	.375	9.53	.813	20.64	2.688	68.26	2	C32491	C32514	C32543
13/32	.4062	10.32	.375	9.53	.813	20.64	2.688	68.26	2	C32492	C32515	C32544
27/64	.4219	10.72	.375	9.53	.813	20.64	2.688	68.26	2	C32493	C32516	C32545
7/16	.4375	11.11	.375	9.53	.813	20.64	2.688	68.26	2	C32494	C32517	C32546
29/64	.4531	11.51	.500	12.70	1.000	25.40	3.250	82.55	2	C32495	C32518	C32547
15/32	.4688	11.91	.500	12.70	1.000	25.40	3.250	82.55	2	C32496	C32519	C32548
31/64	.4844	12.30	.500	12.70	1.000	25.40	3.250	82.55	2	C32497	C32520	-
1/2	.5000	12.70	.500	12.70	1.000	25.40	3.250	82.55	2	C42616	C32521	C32550
5/8	.6250	15.88	.625	15.88	1.313	33.34	3.250	82.55	2	C42619	C32522	C32551
3/4	.7500	19.05	.750	19.05	1.313	33.34	3.875	98.43	2	C42622	C32523	C32552
1	1.0000	25.40	1.000	25.40	1.625	41.28	4.500	114.30	2	C42629	C32524	C32553
1-1/4	1.2500	31.75	1.250	31.75	1.625	41.28	4.500	114.30	2	C42633	C32525	C32554
1-1/2	1.5000	38.10	1.250	31.75	1.625	41.28	4.500	114.30	2	C42639	C32526	C32555

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Single End Finishers

Style HGC-2B • Cobalt, Single End, 2-Flute, Center Cutting, Ball Nose

formerly style 559

DRILLING

FEATURES

ANSI SIZES M42 COBALT SUBSTRATE

GENERAL PURPOSE BRIGHT

2 FLUTE BALL CC TiN

30° TiCN

APPLICATIONS

TITANIUM ALLOYS

NICKEL ALLOYS

COBALT ALLOYS

STAINLESS STEEL

High red hardness for high heat conditions.



Style HGC-2B Bright

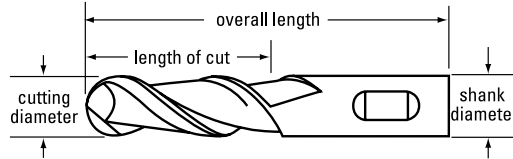
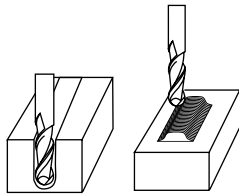


Style HGC-2B TiN-coated



Style HGC-2B TiCN-coated

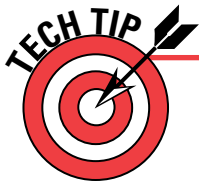
HOLE FINISHING



THREADING

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/8	.1250	3.18	.375	9.53	.375	9.53	2.313	58.74	2	C42643	C32737	C32749
3/16	.1875	4.76	.375	9.53	.500	12.70	2.375	60.33	2	C42645	C32738	C32750
1/4	.2500	6.35	.375	9.53	.625	15.88	2.438	61.91	2	C42648	C32739	C32751
5/16	.3125	7.94	.375	9.53	.750	19.05	2.500	63.50	2	C42650	C32740	C32752
3/8	.3750	9.53	.375	9.53	.750	19.05	2.500	63.50	2	C42653	C32741	C32753
1/2	.5000	12.70	.500	12.70	1.000	25.40	3.250	82.55	2	C42657	C32742	C32754
5/8	.6250	15.88	.625	15.88	1.375	34.93	3.250	82.55	2	C42660	C32743	C32755
3/4	.7500	19.05	.750	19.05	1.625	41.28	3.875	98.43	2	C42663	C32744	C32756
7/8	.8750	22.23	.875	22.23	2.000	50.80	4.250	107.95	2	C32736	C32745	C32757
1	1.0000	25.40	1.000	25.40	2.250	57.15	4.500	114.30	2	C42670	C32746	C32758
1-1/4	1.2500	31.75	1.250	31.75	2.500	63.50	4.500	114.30	2	C42674	C32747	C32759
1-1/2	1.5000	38.10	1.250	31.75	2.500	63.50	4.500	114.30	2	C42680	C32748	C32760

MILLING



Two-Flute versus Multi-Flute End Mills

- Two-flute end mills
 - have greater chip ejection capacity
 - are ideal for slotting
- Multi-flute end mills
 - deliver a smoother finish
 - are better for peripheral cuts
 - have a heavy-duty cross section for better rigidity

OTHER TOOLS

General Application End Mills Single End Finishers

Style HGC-4C • Cobalt, Single End, Multi-Flute, Center Cutting formerly styles 556, 557, 558

FEATURES

ANSI SIZES	M42 COBALT SUBSTRATE
GENERAL PURPOSE	BRIGHT
4+ FLUTE CC	TiN
30°	TiCN

APPLICATIONS

TITANIUM ALLOYS
NICKEL ALLOYS
COBALT ALLOYS
STAINLESS STEEL

High red hardness for high heat conditions.

Heavy cross-section for high rigidity.



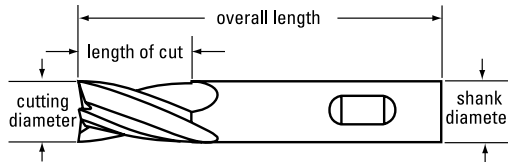
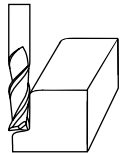
Style HGC-4C Bright



Style HGC-4C TiN-coated



Style HGC-4C TiCN-coated



Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/8	.1250	3.18	.375	9.53	.375	9.53	2.313	58.74	4	C42684	C32574	C32610
5/32	.1562	3.97	.375	9.53	.500	12.70	2.375	60.33	4	C32556	C32575	C32611
11/64	.1719	4.37	.375	9.53	.500	12.70	2.375	60.33	4	C32557	C32576	C32612
3/16	.1875	4.76	.375	9.53	.500	12.70	2.375	60.33	4	C42686	C32577	C32613
13/64	.2031	5.16	.375	9.53	.625	15.88	2.438	61.91	4	C32558	C32578	C32614
7/32	.2188	5.56	.375	9.53	.625	15.88	2.438	61.91	4	C32559	C32579	C32615
15/64	.2344	5.95	.375	9.53	.625	15.88	2.438	61.91	4	C32560	C32580	C32616
1/4	.2500	6.35	.375	9.53	.625	15.88	2.438	61.91	4	C42689	C32581	C32617
1/4	.2500	6.35	.375	9.53	1.250	31.75	3.063	77.79	4	C32646	C32655	C32673
1/4	.2500	6.35	.375	9.53	1.750	44.45	3.563	90.49	4	C32691	C32700	C32718
17/64	.2656	6.75	.375	9.53	.750	19.05	2.500	63.50	4	C32561	C32582	C32618
9/32	.2812	7.14	.375	9.53	.750	19.05	2.500	63.50	4	C32562	C32583	C32619
9/32	.2812	7.14	.375	9.53	1.375	34.93	3.125	79.38	4	C32647	C32656	C32674
9/32	.2812	7.14	.375	9.53	2.000	50.80	3.250	82.55	4	C32692	C32701	C32719
19/64	.2969	7.54	.375	9.53	.750	19.05	2.500	63.50	4	C32563	C32584	C32620
5/16	.3125	7.94	.375	9.53	.750	19.05	2.500	63.50	4	C42691	C32585	C32621
5/16	.3125	7.94	.375	9.53	1.375	34.93	3.125	79.38	4	C32648	C32657	C32675
5/16	.3125	7.94	.375	9.53	2.000	50.80	3.250	82.55	4	C32693	C32702	C32720
21/64	.3281	8.33	.375	9.53	.750	19.05	2.500	63.50	4	C32564	C32586	C32622
11/32	.3438	8.73	.375	9.53	.750	19.05	2.500	63.50	4	C32565	C32587	C32623
11/32	.3438	8.73	.375	9.53	1.500	38.10	3.250	82.55	4	C32649	C32658	C32676
11/32	.3438	8.73	.375	9.53	2.500	63.50	4.250	107.95	4	C32694	C32703	C32721
23/64	.3594	9.13	.375	9.53	.750	19.05	2.500	63.50	4	C32566	C32588	C32624
3/8	.3750	9.53	.375	9.53	.750	19.05	2.500	63.50	4	C42694	C32589	C32625
3/8	.3750	9.53	.375	9.53	1.500	38.10	3.250	82.55	4	C42857	C32659	C32677
3/8	.3750	9.53	.375	9.53	2.500	63.50	4.250	107.95	4	C42913	C32704	C32722
25/64	.3906	9.92	.375	9.53	1.000	25.40	2.688	68.26	4	C32567	C32590	C32626
13/32	.4062	10.32	.375	9.53	1.000	25.40	2.688	68.26	4	C32568	C32591	C32627
13/32	.4062	10.32	.375	9.53	1.750	44.45	3.250	82.55	4	C32650	C32660	C32678
13/32	.4062	10.32	.375	9.53	2.750	69.85	4.500	114.30	4	C32695	C32705	C32723
27/64	.4219	10.72	.375	9.53	1.000	25.40	2.688	68.26	4	C32569	C32592	C32628

continued on next page

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

General Application End Mills

Single End Finishers

Style HGC-4C • Cobalt, Single End, Multi-Flute, Center Cutting (continued)

formerly styles 556, 557, 558

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
7/16	.4375	11.11	.375	9.53	1.000	25.40	2.688	68.26	4	C32570	C32593	C32629
7/16	.4375	11.11	.375	9.53	1.750	44.45	3.250	82.55	4	C32651	C32661	C32679
7/16	.4375	11.11	.375	9.53	2.750	69.85	4.500	114.30	4	C32696	C32706	C32724
29/64	.4531	11.51	.500	12.70	1.250	31.75	3.250	82.55	4	C32571	C32594	C32630
15/32	.4688	11.91	.500	12.70	1.250	31.75	3.250	82.55	4	C32572	C32595	C32631
15/32	.4688	11.91	.500	12.70	2.000	50.80	4.000	101.60	4	C32652	C32662	C32680
15/32	.4688	11.91	.500	12.70	2.000	50.80	5.000	127.00	4	C32697	C32707	C32725
31/64	.4844	12.30	.500	12.70	1.250	31.75	3.250	82.55	4	C32573	C32596	C32632
1/2	.5000	12.70	.500	12.70	1.250	31.75	3.250	82.55	4	C42699	C32597	C32633
1/2	.5000	12.70	.500	12.70	1.250	31.75	3.250	82.55	6	C42698	C32598	C32634
1/2	.5000	12.70	.500	12.70	2.000	50.80	4.000	101.60	4	C42861	C32663	C32681
1/2	.5000	12.70	.500	12.70	2.000	50.80	5.000	127.00	4	C42917	C32708	C32726
5/8	.6250	15.88	.625	15.88	1.625	41.28	3.250	82.55	4	C42703	C32599	C32635
5/8	.6250	15.88	.625	15.88	1.625	41.28	3.250	82.55	6	C42702	C32600	C32636
5/8	.6250	15.88	.625	15.88	2.500	63.50	4.625	117.48	4	C42864	C32664	C32682
5/8	.6250	15.88	.625	15.88	4.000	101.60	6.125	155.58	4	C42920	C32709	C32727
3/4	.7500	19.05	.750	19.05	1.625	41.28	3.875	98.43	4	C42707	C32601	C32637
3/4	.7500	19.05	.750	19.05	1.625	41.28	3.875	98.43	6	C42706	C32602	C32638
3/4	.7500	19.05	.750	19.05	2.000	50.80	5.250	133.35	4	C42868	C32665	C32683
3/4	.7500	19.05	.750	19.05	2.000	50.80	5.250	133.35	6	C42867	C32666	C32684
3/4	.7500	19.05	.750	19.05	4.000	101.60	6.250	158.75	4	C42924	C32710	C32728
3/4	.7500	19.05	.750	19.05	4.000	101.60	6.250	158.75	6	C42923	C32711	C32729
7/8	.8750	22.23	.875	22.23	3.500	88.90	5.750	146.05	4	C32653	C32667	C32685
7/8	.8750	22.23	.875	22.23	3.500	88.90	5.750	146.05	6	C32654	C32668	C32686
1	1.0000	25.40	1.000	25.40	2.000	50.80	4.500	114.30	4	C42715	C32603	C32639
1	1.0000	25.40	1.000	25.40	2.000	50.80	4.500	114.30	6	C42714	C32604	C32640
1	1.0000	25.40	1.000	25.40	4.000	101.60	6.500	165.10	4	C42876	C32669	C32687
1	1.0000	25.40	1.000	25.40	4.000	101.60	6.500	165.10	6	C42875	C32670	C32688
1	1.0000	25.40	1.000	25.40	6.000	152.40	8.500	215.90	4	C42932	C32712	C32730
1	1.0000	25.40	1.000	25.40	6.000	152.40	8.500	215.90	6	C42931	C32713	C32731
1-1/4	1.2500	31.75	1.250	31.75	2.000	50.80	4.500	114.30	4	C42720	C32605	C32641
1-1/4	1.2500	31.75	1.250	31.75	2.000	50.80	4.500	114.30	6	C42719	C32606	C32642
1-1/4	1.2500	31.75	1.250	31.75	4.000	101.60	6.500	165.10	4	C42881	C32671	C32689
1-1/4	1.2500	31.75	1.250	31.75	4.000	101.60	6.500	165.10	6	C42880	C32672	C32690
1-1/4	1.2500	31.75	1.250	31.75	6.000	152.40	8.500	215.90	4	C42937	C32714	C32732
1-1/4	1.2500	31.75	1.250	31.75	6.000	152.40	8.500	215.90	6	C42936	C32715	C32733
1-1/2	1.5000	38.10	1.250	31.75	2.000	50.80	4.500	114.30	4	C42727	C32607	C32643
1-1/2	1.5000	38.10	1.250	31.75	2.000	50.80	4.500	114.30	6	C42726	C32608	C32644
1-1/2	1.5000	38.10	1.250	31.75	8.000	203.20	10.500	266.70	4	C32698	C32716	C32734
1-1/2	1.5000	38.10	1.250	31.75	8.000	203.20	10.500	266.70	6	C32699	C32717	C32735
2	2.0000	50.80	2.000	50.80	4.000	101.60	7.750	196.85	6	C42731	C32609	C32645



General Application End Mills

Single End Finishers

Style HGC-4B • Cobalt, Single End, Multi-Flute, Center Cutting, Ball Nose formerly style 560

FEATURES

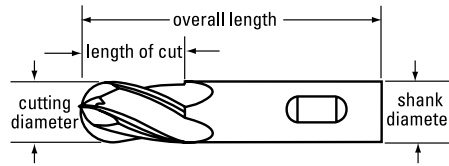
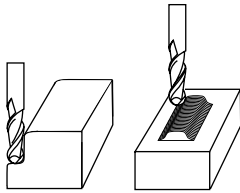
ANSI SIZES	M42 COBALT SUBSTRATE
GENERAL PURPOSE	BRIGHT
4 FLUTE BALL CC	TiN
30°	TiCN

APPLICATIONS

TITANIUM ALLOYS
NICKEL ALLOYS
COBALT ALLOYS
STAINLESS STEEL

High red hardness for high heat conditions.

Heavy cross-section for high rigidity.



Style HGC-4B Bright



Style HGC-4B TiN-coated



Style HGC-4B TiCN-coated

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/8	.1250	3.18	.375	9.53	.375	9.53	2.313	58.74	4	C42778	C32763	C32776
3/16	.1875	4.76	.375	9.53	.500	12.70	2.375	60.33	4	C42780	C32764	C32777
1/4	.2500	6.35	.375	9.53	.625	15.88	2.438	61.91	4	C42783	C32765	C32778
5/16	.3125	7.94	.375	9.53	.750	19.05	2.500	63.50	4	C42785	C32766	C32779
3/8	.3750	9.53	.375	9.53	.750	19.05	2.500	63.50	4	C42788	C32767	C32780
1/2	.5000	12.70	.500	12.70	1.250	31.75	3.250	82.55	4	C42792	C32768	C32781
5/8	.6250	15.88	.625	15.88	1.625	41.28	3.250	82.55	4	C42795	C32769	C32782
3/4	.7500	19.05	.750	19.05	1.625	41.28	3.875	98.43	4	C42799	C32770	C32783
3/4	.7500	19.05	.750	19.05	1.625	41.28	3.875	98.43	6	C42798	C32771	C32784
1	1.0000	25.40	1.000	25.40	2.000	50.80	4.500	114.30	4	C42807	C32772	C32785
1	1.0000	25.40	1.000	25.40	2.000	50.80	4.500	114.30	6	C42806	C32773	C32786
1-1/4	1.2500	31.75	1.250	31.75	2.000	50.80	4.500	114.30	6	C32761	C32774	C32787
1-1/2	1.5000	38.10	1.250	31.75	2.000	50.80	4.500	114.30	6	C32762	C32775	C32788

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Single End Finishers

Style HG-2 • HSS, Single End, 2-Flute, Center Cutting

formerly styles 685, 696

DRILLING

FEATURES

ANSI SIZES	HSS SUBSTRATE
GENERAL PURPOSE	BRIGHT
2 FLUTE CC	TiN
30°	TiCN

APPLICATIONS

ALLOY STEEL
TOOL STEEL
CARBON STEEL
CAST IRON



Style HG-2 Bright

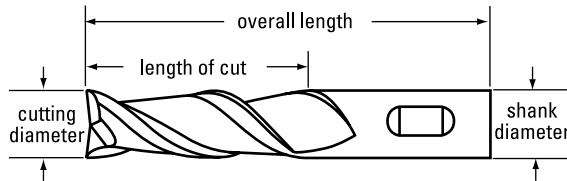


Style HG-2 TiN-coated



Style HG-2 TiCN-coated

HOLE FINISHING



THREADING

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/8	.1250	3.18	.375	9.53	.375	9.53	2.313	58.74	2	C41602	C41550	C33803
5/32	.1562	3.97	.375	9.53	.438	11.11	2.375	60.33	2	C33730	C33754	C33804
11/64	.1719	4.37	.375	9.53	.438	11.11	2.375	60.33	2	C33731	C33755	C33805
3/16	.1875	4.76	.375	9.53	.438	11.11	2.375	60.33	2	C41604	C41551	C33806
3/16	.1875	4.76	.375	9.53	1.250	31.75	3.063	77.79	2	C39064	C39078	C39107
13/64	.2031	5.16	.375	9.53	.500	12.70	2.438	61.91	2	C33732	C33756	C33807
7/32	.2188	5.56	.375	9.53	.500	12.70	2.438	61.91	2	C33733	C33757	C33808
7/32	.2188	5.56	.375	9.53	1.250	31.75	3.063	77.79	2	C39065	C39079	C39108
15/64	.2344	5.95	.375	9.53	.500	12.70	2.438	61.91	2	C33734	C33758	C33809
1/4	.2500	6.35	.375	9.53	.500	12.70	2.438	61.91	2	C41607	C41552	C33810
1/4	.2500	6.35	.375	9.53	1.250	31.75	3.063	77.79	2	C39066	C39080	C39109
17/64	.2656	6.75	.375	9.53	.563	14.29	2.500	63.50	2	C33735	C33759	C33811
9/32	.2812	7.14	.375	9.53	.563	14.29	2.500	63.50	2	C33736	C33760	C33812
9/32	.2812	7.14	.375	9.53	1.375	34.93	3.125	79.38	2	C39067	C39081	C39110
19/64	.2969	7.54	.375	9.53	.563	14.29	2.500	63.50	2	C33737	C33761	C33813
5/16	.3125	7.94	.375	9.53	.563	14.29	2.500	63.50	2	C41609	C41553	C33814
5/16	.3125	7.94	.375	9.53	1.375	34.93	3.125	79.38	2	C39068	C39082	C39111
21/64	.3281	8.33	.375	9.53	.563	14.29	2.500	63.50	2	C33738	C33762	C33815
11/32	.3438	8.73	.375	9.53	.563	14.29	2.500	63.50	2	C33739	C33763	C33816
11/32	.3438	8.73	.375	9.53	1.500	38.10	3.250	82.55	2	C39069	C39083	C39112
23/64	.3594	9.13	.375	9.53	.563	14.29	2.500	63.50	2	C33740	C33764	C33817
3/8	.3750	9.53	.375	9.53	.563	14.29	2.500	63.50	2	C41612	C41554	C33818
3/8	.3750	9.53	.375	9.53	1.500	38.10	3.250	82.55	2	C41714	C39084	C39113
25/64	.3906	9.92	.375	9.53	.813	20.64	2.688	68.26	2	C33741	C33765	C33819
13/32	.4062	10.32	.375	9.53	.813	20.64	2.688	68.26	2	C33742	C33766	C33820
13/32	.4062	10.32	.500	12.70	1.750	44.45	3.250	82.55	2	C39070	C39085	C39114
27/64	.4219	10.72	.375	9.53	.813	20.64	2.688	68.26	2	C33743	C33767	C33821
7/16	.4375	11.11	.375	9.53	.813	20.64	2.688	68.26	2	C41615	C33768	C33822
7/16	.4375	11.11	.500	12.70	1.750	44.45	3.250	82.55	2	C39071	C39086	C39115
29/64	.4531	11.51	.500	12.70	.813	20.64	3.250	82.55	2	C33744	C33769	C33823
15/32	.4688	11.91	.500	12.70	.813	20.64	3.250	82.55	2	C33745	C33770	C33824
15/32	.4688	11.91	.500	12.70	2.000	50.80	4.000	101.60	2	C39072	C39087	C39116
31/64	.4844	12.30	.500	12.70	.813	20.64	3.250	82.55	2	C33746	C33771	C33825

OTHER TOOLS

continued on next page

General Application End Mills

Single End Finishers

Style HG-2 • HSS, Single End, 2-Flute, Center Cutting (continued) formerly styles 685, 696

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Bright	Order Number		
			in	mm	in	mm	in	mm			TiN	TiCN	
1/2	.5000	12.70	.375	9.53	.813	20.64	2.688	68.26	2	C41617	C33772	C33826	
1/2	.5000	12.70	.500	12.70	1.000	25.40	3.250	82.55	2	C41618	C41555	C33827	
1/2	.5000	12.70	.500	12.70	2.000	50.80	4.000	101.60	2	C41718	C39088	C39117	
33/64	.5156	13.10	.500	12.70	1.125	28.58	3.375	85.73	2	C33747	C33773	C33828	
17/32	.5312	13.49	.500	12.70	1.125	28.58	3.375	85.73	2	C33748	C33774	C33829	
17/32	.5312	13.49	.625	15.88	2.000	50.80	4.125	104.78	2	C39073	C39089	C39118	
35/64	.5469	13.89	.500	12.70	1.125	28.58	3.375	85.73	2	C33749	C33775	C33830	
9/16	.5625	14.29	.500	12.70	1.125	28.58	3.375	85.73	2	C41620	C33776	C33831	
9/16	.5625	14.29	.625	15.88	2.000	50.80	4.125	104.78	2	C39074	C39090	C39119	
37/64	.5781	14.68	.500	12.70	1.125	28.58	3.375	85.73	2	C33750	C33777	C33832	
19/32	.5938	15.08	.500	12.70	1.125	28.58	3.375	85.73	2	C33751	C33778	C33833	
39/64	.6094	15.48	.500	12.70	1.125	28.58	3.375	85.73	2	C33752	C33779	C33834	
5/8	.6250	15.88	.500	12.70	1.125	28.58	3.375	85.73	2	C41622	C33780	C33835	
5/8	.6250	15.88	.625	15.88	1.313	33.34	3.250	82.55	2	C41623	C41556	C33836	
5/8	.6250	15.88	.625	15.88	2.000	50.80	4.125	104.78	2	C41721	C39091	C39120	
11/16	.6875	17.46	.500	12.70	1.313	33.34	3.625	92.08	2	C41625	C33781	C33837	
11/16	.6875	17.46	.625	15.88	1.313	33.34	3.250	82.55	2	C41626	C33782	C33838	
11/16	.6875	17.46	.750	19.05	2.250	57.15	4.500	114.30	2	C39075	C39092	C39121	
3/4	.7500	19.05	.500	12.70	1.313	33.34	3.250	82.55	2	C41628	C33783	C33839	
3/4	.7500	19.05	.625	15.88	1.313	33.34	3.750	98.43	2	C41629	C33784	C33840	
3/4	.7500	19.05	.750	19.05	1.313	33.34	3.625	92.08	2	C41630	C41557	C33841	
3/4	.7500	19.05	.750	19.05	2.250	57.15	4.500	114.30	2	C41724	C39093	C39122	
13/16	.8125	20.64	.625	15.88	1.500	38.10	4.000	101.60	2	C41632	C33785	C38900	
13/16	.8125	20.64	.875	22.23	2.500	63.50	4.750	120.65	2	C39076	C39094	C39123	
7/8	.8750	22.23	.625	15.88	1.500	38.10	4.125	104.78	2	C41635	C33786	C38901	
7/8	.8750	22.23	.750	19.05	1.500	38.10	4.125	104.78	2	C41636	C33787	C38902	
7/8	.8750	22.23	.875	22.23	1.500	38.10	4.000	101.60	2	C41637	C33788	C38903	
7/8	.8750	22.23	.875	22.23	2.500	63.50	4.750	120.65	2	C41728	C39095	C39124	
15/16	.9375	23.81	.875	22.23	1.500	38.10	4.125	104.78	2	C33753	C33789	C38904	
15/16	.9375	23.81	1.000	25.40	3.000	76.20	5.500	139.70	2	C39077	C39096	C39125	
1	1.0000	25.40	.625	15.88	1.500	38.10	4.125	104.78	2	C41641	C33790	C38905	
1	1.0000	25.40	.750	19.05	1.500	38.10	4.000	101.60	2	C41642	C33791	C38906	
1	1.0000	25.40	.875	22.23	1.500	38.10	4.125	104.78	2	C41643	C33792	C38907	
1	1.0000	25.40	1.000	25.40	1.625	41.28	4.500	114.30	2	C41644	C41558	C38908	
1	1.0000	25.40	1.000	25.40	3.000	76.20	5.500	139.70	2	C41732	C39097	C39126	
1-1/8	1.1250	28.58	.875	22.23	1.625	41.28	4.125	104.78	2	C41647	C33793	C38909	
1-1/8	1.1250	28.58	1.000	25.40	1.625	41.28	4.500	114.30	2	C41648	C33794	C38910	
1-1/8	1.1250	28.58	1.000	25.40	3.000	76.20	5.500	139.70	2	C41735	C39098	C39127	
1-1/4	1.2500	31.75	.875	22.23	1.625	41.28	4.125	104.78	2	C41650	C33795	C38911	
1-1/4	1.2500	31.75	1.000	25.40	1.625	41.28	4.500	114.30	2	C41651	C33796	C38912	
1-1/4	1.2500	31.75	1.000	25.40	3.000	76.20	5.500	139.70	2	C41737	C39099	C39128	
1-1/4	1.2500	31.75	1.250	31.75	2.000	50.80	6.500	165.10	2	C41652	C33797	C38913	
1-1/4	1.2500	31.75	1.250	31.75	3.000	76.20	5.500	139.70	2	C41738	C39100	C39129	
1-3/8	1.3750	34.93	1.000	25.40	1.625	41.28	4.500	114.30	2	C41655	C33798	C38914	
1-3/8	1.3750	34.93	1.000	25.40	3.000	76.20	5.500	139.70	2	C41741	C39101	C39130	
1-1/2	1.5000	38.10	1.000	25.40	1.625	41.28	4.500	114.30	2	C41659	C33799	C38915	
1-1/2	1.5000	38.10	1.250	31.75	1.625	41.28	4.500	114.30	2	C41660	C33800	C38916	
1-1/2	1.5000	38.10	1.250	31.75	3.000	76.20	5.500	139.70	2	C41745	C39102	C39131	
1-5/8	1.6250	41.28	1.250	31.75	3.000	76.20	5.500	139.70	2	C41747	C39103	C39132	
1-3/4	1.7500	44.45	1.250	31.75	1.625	41.28	4.500	114.30	2	C41662	C33801	C38917	
1-3/4	1.7500	44.45	1.250	31.75	3.000	76.20	5.500	139.70	2	C41748	C39104	C39133	
1-7/8	1.8750	47.63	1.250	31.75	3.000	76.20	5.500	139.70	2	C41750	C39105	C39134	

continued on next page



DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Single End Finishers

Style HG-2 • HSS, Single End, 2-Flute, Center Cutting (continued)

formerly styles 685, 696

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
2	2.0000	50.80	1.250	31.75	1.625	41.28	4.500	114.30	2	C41665	C33802	C38918
2	2.0000	50.80	1.250	31.75	3.000	76.20	5.500	139.70	2	C41752	C39106	C39135
2	2.0000	50.80	2.000	50.80	2.000	50.80	5.750	146.05	2	C43478	—	C32796
2	2.0000	50.80	2.000	50.80	3.000	76.20	6.750	171.45	2	C32789	—	C32797
2	2.0000	50.80	2.000	50.80	4.000	101.60	7.750	196.85	2	C43479	—	C32798
2	2.0000	50.80	2.000	50.80	6.000	152.40	9.750	247.65	2	C43480	C32793	C32799
2-1/2	2.5000	63.50	2.000	50.80	4.000	101.60	7.750	196.85	2	C43487	—	—
2-1/2	2.5000	63.50	2.000	50.80	6.000	152.40	9.750	247.65	2	C43488	—	C32801

Style HG-2B • HSS, Single End, 2-Flute, Center Cutting, Ball Nose

formerly styles 690, 698

FEATURES

ANSI SIZES	HSS SUBSTRATE	ALLOY STEEL
GENERAL PURPOSE	BRIGHT	TOOL STEEL
2 FLUTE BALL CC	TiN	CARBON STEEL
30°	TiCN	CAST IRON

APPLICATIONS

ALLOY STEEL
TOOL STEEL
CARBON STEEL
CAST IRON



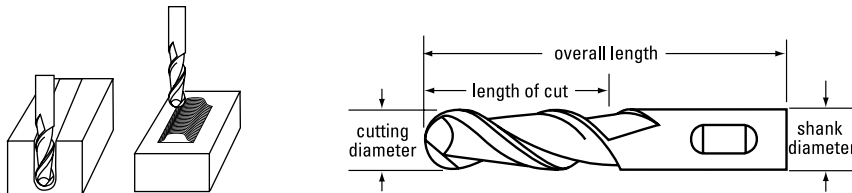
Style HG-2B Bright



Style HG-2B TiN-coated



Style HG-2B TiCN-coated



Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/8	.1250	3.18	.375	9.53	.375	9.53	2.313	58.74	2	C42109	C39010	C39027
3/16	.1875	4.76	.375	9.53	.500	12.70	2.375	60.33	2	C42111	C39011	C39028
1/4	.2500	6.35	.375	9.53	.625	15.88	2.438	61.91	2	C42114	C39012	C39029
5/16	.3125	7.94	.375	9.53	.750	19.05	2.500	63.50	2	C42116	C39013	C39030
3/8	.3750	9.53	.375	9.53	.750	19.05	2.500	63.50	2	C42119	C39014	C39031
7/16	.4375	11.11	.500	12.70	1.000	25.40	3.250	82.55	2	C42122	C39015	C39032
1/2	.5000	12.70	.500	12.70	1.000	25.40	3.250	82.55	2	C42124	C39016	C39033
9/16	.5625	14.29	.500	12.70	1.125	28.58	3.375	85.73	2	C42126	C39017	C39034
5/8	.6250	15.88	.500	12.70	1.125	28.58	3.375	85.73	2	C42128	C39018	C39035
5/8	.6250	15.88	.625	15.88	1.375	34.93	3.250	82.55	2	C42129	C39019	C39036
3/4	.7500	19.05	.500	12.70	1.313	33.34	3.625	92.08	2	C42132	C39020	C39037
3/4	.7500	19.05	.750	19.05	1.625	41.28	3.875	98.43	2	C42133	C39021	C39038
7/8	.8750	22.23	.875	22.23	2.000	50.80	4.250	107.95	2	C42137	C39022	C39039
1	1.0000	25.40	1.000	25.40	2.250	57.15	4.500	114.30	2	C42141	C39023	C39040
1-1/8	1.1250	28.58	1.000	25.40	2.250	57.15	4.500	114.30	2	C42144	C39024	C39041
1-1/4	1.2500	31.75	1.250	31.75	2.500	63.50	4.500	114.30	2	C42146	C39025	C39042
1-1/2	1.5000	38.10	1.250	31.75	2.500	63.50	4.500	114.30	2	C42152	C39026	C39043

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

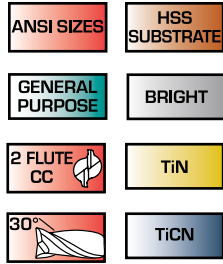


General Application End Mills

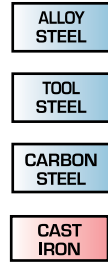
Single End Finishers

Style HG-2K • HSS, Single End, 2-Flute, Center Cutting, Keyway Tolerance (+.00 / -.0015)
formerly style 686

FEATURES



APPLICATIONS



+.00 / -.0015 tolerances for correct keystock fit



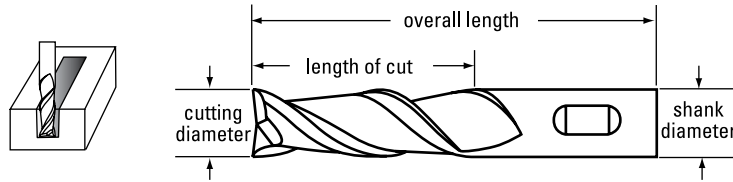
Style HG-2K Bright



Style HG-2K TiN-coated



Style HG-2K TiCN-coated



Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/8	.1250	3.18	.375	9.53	.375	9.53	2.313	58.74	2	C41671	C38932	C38957
3/16	.1875	4.76	.375	9.53	.438	11.11	2.375	60.33	2	C41673	C38933	C38958
7/32	.2188	5.56	.375	9.53	.500	12.70	2.438	61.91	2	C38919	C38934	C38959
1/4	.2500	6.35	.375	9.53	.500	12.70	2.438	61.91	2	C41676	C38935	C38960
9/32	.2812	7.14	.375	9.53	.563	14.29	2.500	63.50	2	C38920	C38936	C38961
5/16	.3125	7.94	.375	9.53	.563	14.29	2.500	63.50	2	C41678	C38937	C38962
11/32	.3438	8.73	.375	9.53	.563	14.29	2.500	63.50	2	C38921	C38938	C38963
3/8	.3750	9.53	.375	9.53	.563	14.29	2.500	63.50	2	C41681	C38939	C38964
13/32	.4062	10.32	.375	9.53	.813	20.64	2.688	68.26	2	C38922	C38940	C38965
7/16	.4375	11.11	.375	9.53	.813	20.64	2.688	68.26	2	C38923	C38941	C38966
15/32	.4688	11.91	.500	12.70	1.000	25.40	3.250	82.55	2	C38924	C38942	C38967
1/2	.5000	12.70	.500	12.70	1.000	25.40	3.250	82.55	2	C41685	C38943	C38968
17/32	.5312	13.49	.500	12.70	1.250	31.75	3.375	85.73	2	C38925	C38944	C38969
9/16	.5625	14.29	.500	12.70	1.250	31.75	3.375	85.73	2	C38926	C38945	C38970
5/8	.6250	15.88	.625	15.88	1.313	33.34	3.250	82.55	2	C41688	C38946	C38971
11/16	.6875	17.46	.625	15.88	1.313	33.34	3.250	82.55	2	C38927	C38947	C38972
3/4	.7500	19.05	.750	19.05	1.313	33.34	3.875	98.43	2	C41691	C38948	C38973
13/16	.8125	20.64	.625	15.88	1.500	38.10	4.000	101.60	2	C38928	C38949	C38974
7/8	.8750	22.23	.875	22.23	1.500	38.10	4.125	104.78	2	C41695	C38950	C38975
15/16	.9375	23.81	.875	22.23	1.500	38.10	4.125	104.78	2	C38929	C38951	C38976
1	1.0000	25.40	1.000	25.40	1.625	41.28	4.500	114.30	2	C41699	C38952	C38977
1-1/8	1.1250	28.58	1.000	25.40	1.625	41.28	4.500	114.30	2	C38930	C38953	C38978
1-1/4	1.2500	31.75	1.250	31.75	1.625	41.28	4.500	114.30	2	C41703	C38954	C38979
1-3/8	1.3750	34.93	1.000	25.40	1.625	41.28	4.500	114.30	2	C38931	C38955	C38980
1-1/2	1.5000	38.10	1.250	31.75	1.625	41.28	4.500	114.30	2	C41709	C38956	C38981

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Single End Finishers

Style HGN-2 • HSS, Single End, 2-Flute, Center Cutting, Extended Neck
formerly style 689

DRILLING

FEATURES

ANSI SIZES HSS SUBSTRATE

GENERAL PURPOSE BRIGHT

2 FLUTE CC TiN

30° TiCN

APPLICATIONS

ALLOY STEEL

TOOL STEEL

CARBON STEEL

CAST IRON



Style HGN-2 Bright

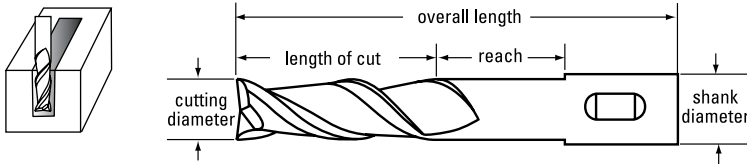


Style HGN-2 TiN-coated



Style HGN-2 TiCN-coated

HOLE FINISHING



THREADING

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		Reach		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/8	.1250	3.18	.375	9.53	.375	9.53	2.313	58.74	.813	20.64	2	C38982	C38986	C38998
3/16	.1875	4.76	.375	9.53	.500	12.70	2.688	68.26	1.125	28.58	2	C38983	C38987	C38999
1/4	.2500	6.35	.375	9.53	.625	15.88	3.063	77.79	1.500	38.10	2	C41772	C38988	C39000
5/16	.3125	7.94	.375	9.53	.750	19.05	3.313	84.14	1.750	44.45	2	C41774	C38989	C39001
3/8	.3750	9.53	.375	9.53	.750	19.05	3.313	84.14	1.750	44.45	2	C41777	C38990	C39002
7/16	.4375	11.11	.500	12.70	1.000	25.40	3.250	82.55	1.875	47.63	2	C38984	C38991	C39003
1/2	.5000	12.70	.500	12.70	1.000	25.40	4.000	101.60	2.250	57.15	2	C41781	C38992	C39004
5/8	.6250	15.88	.625	15.88	1.375	34.93	4.625	117.48	2.750	69.85	2	C41784	C38993	C39005
3/4	.7500	19.05	.750	19.05	1.625	41.28	5.250	133.35	3.375	85.73	2	C41787	C38994	C39006
7/8	.8750	22.23	.875	22.23	2.500	63.50	5.750	146.05	4.000	101.60	2	C38985	C38995	C39007
1	1.0000	25.40	1.000	25.40	2.500	63.50	7.250	184.15	5.000	127.00	2	C41795	C38996	C39008
1-1/4	1.2500	31.75	1.250	31.75	2.000	50.80	7.250	184.15	5.000	127.00	2	C41799	C38997	C39009

MILLING

OTHER TOOLS



General Application End Mills

Single End Finishers

Style HGN-2B • HSS, Single End, 2-Flute, Center Cutting, Extended Neck, Ball Nose
formerly style 698

FEATURES

ANSI SIZES	HSS SUBSTRATE
GENERAL PURPOSE	BRIGHT
2 FLUTE BALL CC	TiN
30°	TiCN

APPLICATIONS

ALLOY STEEL
TOOL STEEL
CARBON STEEL
CAST IRON



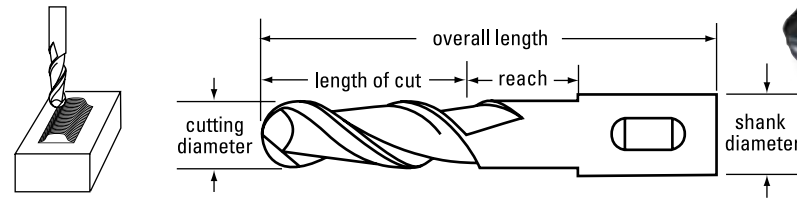
Style HGN-2 Bright



Style HGN-2 TiN-coated



Style HGN-2 TiCN-coated



Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		Reach		No. of Flutes	Bright	Order Number	
			in	mm	in	mm	in	mm	in	mm			TiN	TiCN
1/8	.1250	3.18	.375	9.53	.375	9.53	2.375	60.33	.813	20.64	2	C42158	C39176	C39188
3/16	.1875	4.76	.375	9.53	.500	12.70	2.688	68.26	1.125	28.58	2	C42160	C39177	C39189
1/4	.2500	6.35	.375	9.53	.625	15.88	3.063	77.79	1.500	38.10	2	C42163	C39178	C39190
5/16	.3125	7.94	.375	9.53	.750	19.05	3.313	84.14	1.750	44.45	2	C42165	C39179	C39191
3/8	.3750	9.53	.375	9.53	.750	19.05	3.313	84.14	1.750	44.45	2	C42168	C39180	C39192
7/16	.4375	11.11	.500	12.70	1.000	25.40	3.250	82.55	1.875	47.63	2	C42171	C39181	C39193
1/2	.5000	12.70	.500	12.70	1.000	25.40	4.000	101.60	2.250	57.15	2	C42173	C39182	C39194
5/8	.6250	15.88	.625	15.88	1.375	34.93	4.625	117.48	2.750	69.85	2	C42176	C39183	C39195
3/4	.7500	19.05	.750	19.05	1.625	41.28	5.375	136.53	3.375	85.73	2	C42179	C39184	C39196
7/8	.8750	22.23	.875	22.23	2.500	63.50	5.750	146.05	4.000	101.60	2	C39174	C39185	C39197
1	1.0000	25.40	1.000	25.40	2.500	63.50	7.250	184.15	5.000	127.00	2	C42181	C39186	C39198
1-1/4	1.2500	31.75	1.250	31.75	2.000	50.80	7.250	184.15	5.000	127.00	2	C39175	C39187	C39199

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Single End Finishers

Style HGA-2 • HSS, Single End, 2-Flute, Center Cutting, High-Helix

formerly styles 665, 666, 667

FEATURES

ANSI SIZES HSS SUBSTRATE

GENERAL PURPOSE BRIGHT

2 FLUTE CC TiN

37° TiCN

APPLICATIONS

ALUMINUM

COPPER ALLOYS

MAGNESIUM

BRASS



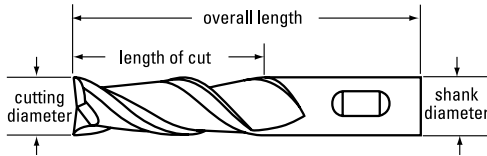
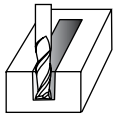
Style HGA-2 Bright



Style HGA-2 TiN-coated



Style HGA-2 TiCN-coated



Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/4	.2500	6.35	.375	9.53	.625	15.88	2.437	61.89	2	C41843	C33476	C33488
1/4	.2500	6.35	.375	9.53	1.250	31.75	3.063	77.79	2	C41888	C33500	C33511
1/4	.2500	6.35	.375	9.53	1.750	44.45	3.563	90.49	2	C41930	C33524	C33535
5/16	.3125	7.94	.375	9.53	.750	19.05	2.500	63.50	2	C41845	C33477	C33489
5/16	.3125	7.94	.375	9.53	1.375	34.93	3.125	79.38	2	C41890	C33501	C33512
5/16	.3125	7.94	.375	9.53	2.000	50.80	3.250	82.55	2	C41932	C33525	C33536
3/8	.3750	9.53	.375	9.53	.750	19.05	2.500	63.50	2	C41848	C33478	C33490
3/8	.3750	9.53	.375	9.53	1.500	38.10	3.250	82.55	2	C41893	C33502	C33513
3/8	.3750	9.53	.375	9.53	2.500	63.50	4.250	107.95	2	C41935	C33526	C33537
7/16	.4375	11.11	.375	9.53	1.000	25.40	2.688	68.26	2	C41851	C33479	C33491
7/16	.4375	11.11	.500	12.70	1.750	44.45	3.250	82.55	2	C41896	C33503	C33514
7/16	.4375	11.11	.375	9.53	2.750	69.85	4.500	114.30	2	C33522	C33527	C33538
1/2	.5000	12.70	.500	12.70	1.250	31.75	3.250	82.55	2	C41853	C33480	C33492
1/2	.5000	12.70	.500	12.70	2.000	50.80	4.000	101.60	2	C41898	C33504	C33515
1/2	.5000	12.70	.500	12.70	3.000	76.20	5.000	127.00	2	C41939	C33528	C33539
5/8	.6250	15.88	.875	22.23	1.625	41.28	3.250	82.55	2	C41856	C33481	C33493
5/8	.6250	15.88	.875	22.23	2.500	63.50	4.625	117.48	2	C41901	C33505	C33516
5/8	.6250	15.88	.875	22.23	4.000	101.60	6.125	155.58	2	C41942	C33529	C33540
3/4	.7500	19.05	.750	19.05	1.625	41.28	3.875	98.43	2	C41859	C33482	C33494
3/4	.7500	19.05	.750	19.05	2.000	50.80	5.250	133.35	2	C41904	C33506	C33517
3/4	.7500	19.05	.750	19.05	4.000	101.60	6.250	158.75	2	C41945	C33530	C33541
7/8	.8750	22.23	.875	22.23	1.875	47.63	4.125	104.78	2	C41863	C33483	C33495
7/8	.8750	22.23	.875	22.23	3.500	88.90	5.750	146.05	2	C32066	C33507	C33518
7/8	.8750	22.23	.875	22.23	5.000	127.00	7.250	184.15	2	C33523	C33531	C33542
1	1.0000	25.40	1.000	25.40	2.000	50.80	4.500	114.30	2	C41867	C33484	C33496
1	1.0000	25.40	1.000	25.40	4.000	101.60	6.500	165.10	2	C41911	C33508	C33519
1	1.0000	25.40	1.000	25.40	6.000	152.40	8.500	215.90	2	C41952	C33532	C33543
1-1/4	1.2500	31.75	1.250	31.75	2.000	50.80	4.500	114.30	2	C41871	C33485	C33497
1-1/4	1.2500	31.75	1.250	31.75	4.000	101.60	6.500	165.10	2	C41915	C33509	C33520
1-1/4	1.2500	31.75	1.250	31.75	6.000	152.40	8.500	215.90	2	C41956	C33533	C33544
1-1/2	1.5000	38.10	1.250	31.75	2.000	50.80	4.500	114.30	2	C41877	C33486	C33498
1-1/2	1.5000	38.10	1.250	31.75	4.000	101.60	6.500	165.10	2	C41921	C33510	C33521
1-1/2	1.5000	38.10	1.250	31.75	8.000	203.20	10.500	266.70	2	C41962	C33534	C33545
2	2.0000	50.80	1.250	31.75	2.000	50.80	4.500	114.30	2	C41882	C33487	C33499
2	2.0000	50.80	1.250	31.75	4.000	101.60	6.500	165.10	2	C41925	C32067	C32068

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

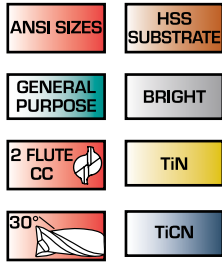


General Application End Mills

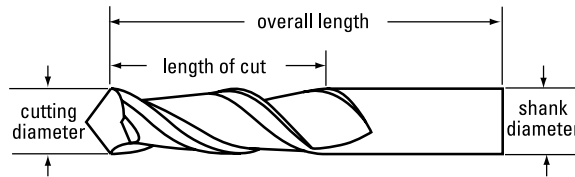
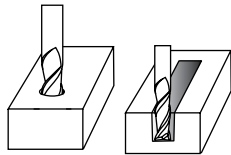
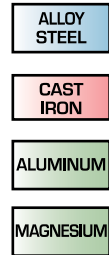
Single End Finisher

Style HPDM-2 • HSS, Single End, 2-Flute, Center Cutting Drill Mill formerly style 507

FEATURES



APPLICATIONS



Style HPDM-2 Bright

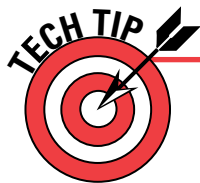


Style HPDM-2 TiN-coated



Style HPDM-2 TiCN-coated

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/4	.2500	6.35	.375	9.53	.500	12.70	2.313	58.74	2	C32430	C40506	C40519
5/16	.3125	7.94	.375	9.53	.563	14.29	2.313	58.74	2	C32431	C40507	C40520
3/8	.3750	9.53	.375	9.53	.563	14.29	2.313	58.74	2	C32432	C40508	C40521
7/16	.4375	11.11	.375	9.53	.813	20.64	2.500	63.50	2	C32433	C40509	C40522
1/2	.5000	12.70	.500	12.70	1.000	25.40	2.000	50.80	2	C32434	C40510	C40523
9/16	.5625	14.29	.500	12.70	1.125	28.58	3.125	79.38	2	C32435	C40511	C40524
5/8	.6250	15.88	.625	15.88	1.313	33.34	3.438	87.31	2	C32436	C40512	C40525
11/16	.6875	17.46	.625	15.88	1.313	33.34	3.438	87.31	2	C32437	C40513	C40526
3/4	.7500	19.05	.750	19.05	1.313	33.34	3.563	90.49	2	C32438	C40514	C40527
13/16	.8125	20.64	.750	19.05	1.500	38.10	3.250	82.55	2	C32439	C40515	C40528
7/8	.8750	22.23	.750	19.05	1.500	38.10	3.250	82.55	2	C32440	C40516	C40529
15/16	.9375	23.81	.750	19.05	1.500	38.10	3.250	82.55	2	C32441	C40517	C40530
1	1.0000	25.40	.750	19.05	1.500	38.10	3.250	82.55	2	C40505	C40518	C40531



Using Drill Mills

- 90° point allows for rapid plunge cuts.
- Also good for slotting applications.
- 2-flutes deliver enhanced chip ejection.

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Single End Finishers

Style HG-3 • HSS, Single End, 3-Flute, Center Cutting

formerly styles 585, 586

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

FEATURES

ANSI SIZES HSS SUBSTRATE

GENERAL PURPOSE BRIGHT

3 FLUTE CC TiN

30° TiCN

APPLICATIONS

ALLOY STEEL

COPPER ALLOYS

CAST IRON

MAGNESIUM



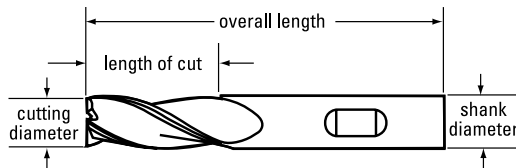
Style HG-3 Bright



Style HG-3 TiN-coated



Style HG-3 TiCN-coated



Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/8	.1250	3.18	.375	9.53	.375	9.53	2.313	58.74	3	C39638	C39669	C39700
5/32	.1562	3.97	.375	9.53	.500	12.70	2.375	60.33	3	C39639	C39670	C39701
3/16	.1875	4.76	.375	9.53	.500	12.70	2.375	60.33	3	C39640	C39671	C39702
3/16	.1875	4.76	.375	9.53	1.250	31.75	3.063	77.79	3	C39731	C39753	C39775
7/32	.2188	5.56	.375	9.53	.625	15.88	2.438	61.91	3	C39641	C39672	C39703
7/32	.2188	5.56	.375	9.53	1.250	31.75	3.063	77.79	3	C39732	C39754	C39776
1/4	.2500	6.35	.375	9.53	.625	15.88	2.438	61.91	3	C39642	C39673	C39704
1/4	.2500	6.35	.375	9.53	1.250	31.75	3.063	77.79	3	C39733	C39755	C39777
9/32	.2812	7.14	.375	9.53	.750	19.05	2.500	63.50	3	C39643	C39674	C39705
9/32	.2812	7.14	.375	9.53	1.375	34.93	3.125	79.38	3	C39734	C39756	C39778
5/16	.3125	7.94	.375	9.53	.750	19.05	2.500	63.50	3	C39644	C39675	C39706
5/16	.3125	7.94	.375	9.53	1.375	34.93	3.125	79.38	3	C39735	C39757	C39779
11/32	.3438	8.73	.375	9.53	.750	19.05	2.500	63.50	3	C39645	C39676	C39707
11/32	.3438	8.73	.375	9.53	1.500	38.10	3.250	82.55	3	C39736	C39758	C39780
3/8	.3750	9.53	.375	9.53	.750	19.05	2.500	63.50	3	C39646	C39677	C39708
3/8	.3750	9.53	.375	9.53	1.500	38.10	3.250	82.55	3	C39737	C39759	C39781
13/32	.4062	10.32	.375	9.53	1.000	25.40	2.688	68.26	3	C39647	C39678	C39709
13/32	.4062	10.32	.500	12.70	1.750	44.45	3.250	82.55	3	C39738	C39760	C39782
7/16	.4375	11.11	.375	9.53	1.000	25.40	2.688	68.26	3	C39648	C39679	C39710
7/16	.4375	11.11	.500	12.70	1.750	44.45	3.250	82.55	3	C39739	C39761	C39783
15/32	.4688	11.91	.500	12.70	1.250	31.75	3.250	82.55	3	C39649	C39680	C39711
15/32	.4688	11.91	.500	12.70	2.000	50.80	4.000	101.60	3	C39740	C39762	C39784
1/2	.5000	12.70	.375	9.53	1.000	25.40	2.688	68.26	3	C39650	C39681	C39712
1/2	.5000	12.70	.500	12.70	1.250	31.75	3.250	82.55	3	C39651	C39682	C39713
1/2	.5000	12.70	.500	12.70	2.000	50.80	4.000	101.60	3	C39741	C39763	C39785
9/16	.5625	14.29	.500	12.70	1.375	34.93	3.375	85.73	3	C39652	C39683	C39714
5/8	.6250	15.88	.625	15.88	1.625	41.28	3.250	82.55	3	C39653	C39684	C39715
5/8	.6250	15.88	.625	15.88	2.500	63.50	4.625	117.48	3	C39742	C39764	C39786
11/16	.6875	17.46	.625	15.88	1.625	41.28	3.250	82.55	3	C39654	C39685	C39716
3/4	.7500	19.05	.750	19.05	1.625	41.28	3.875	98.43	3	C39655	C39686	C39717
3/4	.7500	19.05	.750	19.05	2.000	50.80	5.250	133.35	3	C39743	C39765	C39787

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General Application End Mills

Single End Finishers

Style HG-3 • HSS, Single End, 3-Flute, Center Cutting (continued) formerly styles 585, 586

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Bright	Order Number	
			in	mm	in	mm	in	mm			TiN	TiCN
13/16	.8125	20.64	.625	15.88	1.875	47.63	4.000	101.60	3	C39656	C39687	C39718
7/8	.8750	22.23	.875	22.23	1.875	47.63	4.125	104.78	3	C39657	C39688	C39719
7/8	.8750	22.23	.875	22.23	3.500	88.90	5.750	146.05	3	C39744	C39766	C39788
15/16	.9375	23.81	.875	22.23	1.875	47.63	4.125	104.78	3	C39658	C39689	C39720
1	1.0000	25.40	.750	19.05	1.875	47.63	4.125	104.78	3	C39659	C39690	C39721
1	1.0000	25.40	1.000	25.40	2.000	50.80	4.500	114.30	3	C39660	C39691	C39722
1	1.0000	25.40	1.000	25.40	4.000	101.60	6.500	165.10	3	C39745	C39767	C39789
1-1/8	1.1250	28.58	1.000	25.40	2.000	50.80	4.500	114.30	3	C39661	C39692	C39723
1-1/8	1.1250	28.58	1.000	25.40	4.000	101.60	6.500	165.10	3	C39746	C39768	C39790
1-1/4	1.1250	28.58	1.000	25.40	2.000	50.80	4.500	114.30	3	C39662	C39693	C39724
1-1/4	1.1250	28.58	1.250	31.75	2.000	50.80	4.500	114.30	3	C39663	—	C39725
1-1/4	1.1250	28.58	1.000	25.40	4.000	101.60	6.500	165.10	3	C39747	C39769	C39791
1-1/4	1.1250	28.58	1.250	31.75	4.000	101.60	6.500	165.10	3	C39748	C39770	C39792
1-3/8	1.3750	34.93	1.000	25.40	2.000	50.80	4.500	114.30	3	C39664	C39695	C39726
1-1/2	1.5000	38.10	1.000	25.40	2.000	50.80	4.500	114.30	3	C39665	C39696	C39727
1-1/2	1.5000	38.10	1.250	31.75	2.000	50.80	4.500	114.30	3	C39666	C39697	C39728
1-1/2	1.5000	38.10	1.000	25.40	4.000	101.60	6.500	165.10	3	C39749	C39771	C39793
1-1/2	1.5000	38.10	1.250	31.75	4.000	101.60	6.500	165.10	3	C39750	C39772	C39794
1-3/4	1.7500	44.45	1.250	31.75	2.000	50.80	4.500	114.30	3	C39667	C39698	C39729
1-3/4	1.7500	44.45	1.250	31.75	4.000	101.60	6.500	165.10	3	C39751	C39773	C39795
2	2.0000	50.80	1.250	31.75	2.000	50.80	4.500	114.30	3	C39668	C39699	C39730
2	2.0000	50.80	1.250	31.75	2.000	50.80	6.750	171.45	3	C32802	—	—
2	2.0000	50.80	1.250	31.75	4.000	101.60	6.500	165.10	3	C39752	C39774	C39796
2	2.0000	50.80	1.250	31.75	4.000	101.60	7.750	196.85	3	C43501	—	—
2	2.0000	50.80	1.250	31.75	6.000	152.40	9.750	247.65	3	C43502	—	—
2	2.0000	50.80	1.250	31.75	8.000	203.20	11.750	298.45	3	C32803	—	—
2-1/2	2.5000	63.50	1.250	31.75	4.000	101.60	7.750	196.85	3	C43510	—	—
2-1/2	2.5000	63.50	1.250	31.75	6.000	152.40	9.750	247.65	3	C32804	—	—

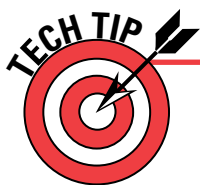
DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS



Benefits of Multi-Flute End Mills

- Generally, multi-flute end mills give smoother finishes than 2-flute end mills.
- Increased number of flutes mean more cutting edges, providing more cutting action.

Single End Finishers

Style HG-4 • HSS, Single End, 4-Flute, Non-Center Cutting


formerly styles 570, 683, 688, 691

FEATURES

- ANSI SIZES**
- HSS SUBSTRATE**
- GENERAL PURPOSE**
- BRIGHT**
- 4+ FLUTE NCC**
- TiN**
- 30°**
- TiCN**

APPLICATIONS

- ALLOY STEEL**
- TOOL STEEL**
- CAST IRON**
- COPPER ALLOYS**

 Heavy cross-section for high rigidity.



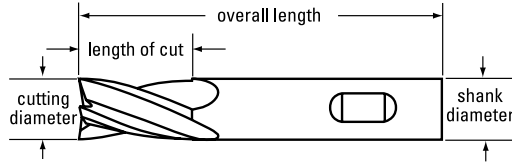
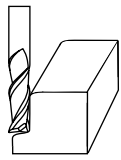
Style HG-4 Bright



Style HG-4 TiN-coated



Style HG-4 TiCN-coated



Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/8	.1250	3.18	.375	9.53	.375	9.53	2.313	58.74	4	C42220	C39427	C39488
9/64	.1406	3.57	.375	9.53	.500	12.70	2.313	58.74	4	C39400	C39428	C39489
5/32	.1562	3.97	.375	9.53	.500	12.70	2.375	60.33	4	C39401	C39429	C39490
11/64	.1719	4.37	.375	9.53	.500	12.70	2.375	60.33	4	C39402	C39430	C39491
3/16	.1875	4.76	.375	9.53	.500	12.70	2.375	60.33	4	C42222	C39431	C39492
3/16	.1875	4.76	.375	9.53	1.250	31.75	3.063	77.79	4	C39247	C39253	C39275
3/16	.1875	4.76	.375	9.53	1.750	44.45	3.563	90.49	4	C39200	C39209	C39228
13/64	.2031	5.16	.375	9.53	.625	15.88	2.438	61.91	4	C39403	C39432	C39493
7/32	.2188	5.56	.375	9.53	.625	15.88	2.438	61.91	4	C39404	C39433	C39494
7/32	.2188	5.56	.375	9.53	1.250	31.75	3.063	77.79	4	C39248	C39254	C39276
7/32	.2188	5.56	.375	9.53	1.750	44.45	3.563	90.49	4	C39201	C39210	C39229
15/64	.2344	5.95	.375	9.53	.625	15.88	2.438	61.91	4	C39405	C39434	C39495
1/4	.2500	6.35	.375	9.53	.625	15.88	2.438	61.91	4	C42225	C39435	C39496
1/4	.2500	6.35	.375	9.53	1.250	31.75	3.063	77.79	4	C42316	C39255	C39277
1/4	.2500	6.35	.375	9.53	1.750	44.45	3.563	90.49	4	C42364	C39211	C39230
17/64	.2656	6.75	.375	9.53	.750	19.05	2.500	63.50	4	C39406	C39436	C39497
9/32	.2812	7.14	.375	9.53	.750	19.05	2.500	63.50	4	C39407	C39437	C39498
9/32	.2812	7.14	.375	9.53	1.375	34.93	3.125	79.38	4	C39249	C39256	C39278
9/32	.2812	7.14	.375	9.53	2.000	50.80	3.750	95.25	4	C39202	C39212	C39231
19/64	.2969	7.54	.375	9.53	.750	19.05	2.500	63.50	4	C39408	C39438	C39499
5/16	.3125	7.94	.375	9.53	.750	19.05	2.500	63.50	4	C42227	C39439	C39500
5/16	.3125	7.94	.375	9.53	1.375	34.93	3.125	79.38	4	C42318	C39257	C39279
5/16	.3125	7.94	.375	9.53	2.000	50.80	3.750	95.25	4	C42366	C39213	C39232
21/64	.3281	8.33	.375	9.53	.750	19.05	2.500	63.50	4	C39409	C39440	C39501
11/32	.3438	8.73	.375	9.53	.750	19.05	2.500	63.50	4	C39410	C39441	C39502
11/32	.3438	8.73	.375	9.53	1.500	38.10	3.250	82.55	4	C39250	C39258	C39280
11/32	.3438	8.73	.375	9.53	2.500	63.50	4.250	107.95	4	C39203	C39214	C39233
23/64	.3594	9.13	.375	9.53	.750	19.05	2.500	63.50	4	C39411	C39442	C39503
3/8	.3750	9.53	.375	9.53	.750	19.05	2.500	63.50	4	C42230	C39443	C39504
3/8	.3750	9.53	.375	9.53	1.500	38.10	3.250	82.55	4	C42321	C39259	C39281
3/8	.3750	9.53	.375	9.53	2.500	63.50	4.250	107.95	4	C42369	C39215	C39234

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General Application End Mills

Single End Finishers

Style HG-4 • HSS, Single End, 4-Flute, Non-Center Cutting (continued)

formerly styles 570, 683, 688, 691

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Bright	Order Number	
			in	mm	in	mm	in	mm			TiN	TiCN
25/64	.3906	9.92	.375	9.53	1.000	25.40	2.688	68.26	4	C39412	C39444	C39505
13/32	.4062	10.32	.375	9.53	1.000	25.40	2.688	68.26	4	C39413	C39445	C39506
13/32	.4062	10.32	.375	9.53	1.750	44.45	3.750	95.25	4	C39251	C39260	C39282
13/32	.4062	10.32	.375	9.53	2.750	69.85	4.500	114.30	4	C39204	C39216	C39235
27/64	.4219	10.72	.375	9.53	1.000	25.40	2.688	68.26	4	C39414	C39446	C39507
7/16	.4375	11.11	.375	9.53	1.000	25.40	2.688	68.26	4	C42233	C39447	C39508
7/16	.4375	11.11	.375	9.53	2.750	69.85	4.500	114.30	4	C39205	C39217	C39236
7/16	.4375	11.11	.500	12.70	1.750	44.45	3.750	95.25	4	C42324	C39261	C39283
29/64	.4531	11.51	.500	12.70	1.250	31.75	3.250	82.55	4	C39415	C39448	C39509
15/32	.4688	11.91	.500	12.70	1.250	31.75	3.250	82.55	4	C39416	C39449	C39510
15/32	.4688	11.91	.500	12.70	3.000	76.20	5.000	127.00	4	C39206	C39218	C39237
15/32	.4688	11.91	.500	12.70	2.000	50.80	4.000	101.60	4	C39252	C39262	C39284
31/64	.4844	12.30	.500	12.70	1.250	31.75	3.250	82.55	4	C39417	C39450	C39511
1/2	.5000	12.70	.375	9.53	1.000	25.40	2.688	68.26	4	C42235	C39451	C39512
1/2	.5000	12.70	.500	12.70	1.250	31.75	3.250	82.55	4	C42236	C39452	C39513
1/2	.5000	12.70	.500	12.70	3.000	76.20	5.000	127.00	4	C42373	C39219	C39238
1/2	.5000	12.70	.500	12.70	2.000	50.80	4.000	101.60	4	C42326	C39263	C39285
17/32	.5312	13.49	.500	12.70	1.375	34.93	3.375	85.73	4	C39418	C39453	C39514
9/16	.5625	14.29	.500	12.70	1.375	34.93	3.375	85.73	4	C42238	C39454	C39515
19/32	.5938	15.08	.500	12.70	1.375	34.93	3.375	85.73	4	C39419	C39455	C39516
5/8	.6250	15.88	.500	12.70	1.375	34.93	3.375	85.73	4	C42240	C39456	C39517
5/8	.6250	15.88	.625	15.88	1.625	41.28	3.750	95.25	4	C42241	C39457	C39518
5/8	.6250	15.88	.625	15.88	2.500	63.50	4.625	117.48	4	C42329	C39264	C39286
5/8	.6250	15.88	.625	15.88	4.000	101.60	6.125	155.58	4	C42376	C39220	C39239
21/32	.6562	16.67	.625	15.88	1.625	41.28	3.750	95.25	4	C39420	C39458	C39519
11/16	.6875	17.46	.500	12.70	.875	22.23	2.875	73.03	4	C39817	C39818	C39821
11/16	.6875	17.46	.500	12.70	1.625	41.28	3.625	92.08	4	C42243	C39459	C39520
11/16	.6875	17.46	.625	15.88	1.625	41.28	3.250	82.55	4	C42244	C39460	C39521
23/32	.7188	18.26	.750	19.05	1.625	41.28	3.875	98.43	4	C39421	C39461	C39522
3/4	.7500	19.05	.500	12.70	.875	22.23	2.875	73.03	4	C39816	C39819	C39822
3/4	.7500	19.05	.500	12.70	1.625	41.28	3.625	92.08	4	C42246	C39462	C39523
3/4	.7500	19.05	.625	15.88	1.625	41.28	3.250	82.55	4	C42247	C39463	C39524
3/4	.7500	19.05	.750	19.05	.875	22.23	3.000	76.20	4	C39815	C39820	C39823
3/4	.7500	19.05	.750	19.05	1.625	41.28	3.875	98.43	4	C42248	C39464	C39525
3/4	.7500	19.05	.750	19.05	3.000	76.20	5.250	133.35	4	C42332	C39265	C39287
3/4	.7500	19.05	.750	19.05	4.000	101.60	6.250	158.75	4	C42379	C39221	C39240
25/32	.7812	19.84	.750	19.05	1.875	47.63	4.125	104.78	4	C39422	C39465	C39526
13/16	.8125	20.64	.625	15.88	1.875	47.63	4.000	101.60	4	C42250	C39466	C39527
27/32	.8438	21.43	.875	22.23	1.875	47.63	4.000	101.60	4	C39423	—	C39528
7/8	.8750	22.23	.625	15.88	1.875	47.63	4.000	101.60	6	C42253	C39468	C39529
7/8	.8750	22.23	.750	19.05	1.000	25.40	3.250	82.55	4	C39814	C39839	C39824
7/8	.8750	22.23	.750	19.05	1.875	47.63	4.125	104.78	4	C42254	C39469	C39530
7/8	.8750	22.23	.875	22.23	1.875	47.63	4.125	104.78	4	C42255	C39470	C39531
7/8	.8750	22.23	.875	22.23	3.500	88.90	5.750	146.05	4	C42336	C39266	C39288
7/8	.8750	22.23	.875	22.23	5.000	127.00	7.250	184.15	4	C42383	C39222	C39241
29/32	.9062	23.02	.875	22.23	1.875	47.63	4.125	104.78	4	C39424	C39471	—
15/16	.9375	23.81	.875	22.23	1.875	47.63	4.125	104.78	4	C39425	C39472	C39533
31/32	.9688	24.61	1.000	25.40	2.000	50.80	4.500	114.30	4	C39426	—	C39534

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DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

General Application End Mills

Single End Finishers

Style HG-4 • HSS, Single End, 4-Flute, Non-Center Cutting (continued)

formerly styles 570, 683, 688, 691

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1	1.0000	25.40	.625	15.88	1.875	47.63	4.000	101.60	4	C42259	C39474	C39535
1	1.0000	25.40	.750	19.05	1.000	25.40	3.250	82.55	6	C39813	C39838	C39825
1	1.0000	25.40	.750	19.05	1.875	47.63	4.125	104.78	4	C42260	C39475	C39536
1	1.0000	25.40	.875	22.23	1.875	47.63	4.125	104.78	4	C42261	C39476	C39537
1	1.0000	25.40	1.000	25.40	2.000	50.80	4.500	114.30	4	C42262	C39477	C39538
1	1.0000	25.40	1.000	25.40	4.000	101.60	6.500	165.10	4	C42340	C39267	C39289
1	1.0000	25.40	1.000	25.40	6.000	152.40	8.500	215.90	4	C42387	C39223	C39242
1-1/8	1.1250	28.58	.750	19.05	1.375	34.93	3.625	92.08	4	C39812	C39837	C39826
1-1/8	1.1250	28.58	.875	22.23	2.000	50.80	4.250	107.95	4	C42265	C39478	C39539
1-1/8	1.1250	28.58	1.000	25.40	2.000	50.80	4.500	114.30	4	C42266	C39479	C39540
1-1/8	1.1250	28.58	1.000	25.40	4.000	101.60	6.500	165.10	4	C42343	C39268	C39290
1-1/4	1.2500	31.75	.750	19.05	1.375	34.93	3.625	92.08	4	C39811	C39836	C39827
1-1/4	1.2500	31.75	.875	22.23	2.000	50.80	4.250	107.95	6	C42268	C39480	C39541
1-1/4	1.2500	31.75	1.000	25.40	2.000	50.80	4.500	114.30	6	C42269	C39481	C39542
1-1/4	1.2500	31.75	1.000	25.40	4.000	101.60	6.500	165.10	4	C42345	C39269	C39291
1-1/4	1.2500	31.75	1.250	31.75	2.000	50.80	4.500	114.30	6	C42270	C39482	C39543
1-1/4	1.2500	31.75	1.250	31.75	4.000	101.60	6.500	165.10	4	C42346	C39271	C39293
1-1/4	1.2500	31.75	1.250	31.75	6.000	152.40	8.500	215.90	4	C39207	C39224	C39243
1-1/4	1.2500	31.75	1.250	31.75	6.000	152.40	8.500	215.90	6	C42391	C39225	C39244
1-3/8	1.3750	34.93	.750	19.05	1.375	34.93	3.625	92.08	6	C39810	C39835	C39828
1-3/8	1.3750	34.93	1.000	25.40	2.000	50.80	4.500	114.30	6	C42273	C39483	C39544
1-1/2	1.5000	38.10	.750	19.05	1.375	34.93	3.625	92.08	6	C39809	C39834	C39829
1-1/2	1.5000	38.10	1.000	25.40	2.000	50.80	4.500	114.30	6	C42277	C39484	C39545
1-1/2	1.5000	38.10	1.000	25.40	4.000	101.60	6.500	165.10	4	C42352	C39270	-
1-1/2	1.5000	38.10	1.250	31.75	2.000	50.80	4.500	114.30	4	C42278	C39485	C39546
1-1/2	1.5000	38.10	1.250	31.75	4.000	101.60	6.500	165.10	4	C42353	C39272	C39294
1-1/2	1.5000	38.10	1.250	31.75	6.000	152.40	8.500	215.90	4	C39208	C39226	C39245
1-1/2	1.5000	38.10	1.250	31.75	8.000	203.20	10.500	266.70	6	C42397	C39227	C39246
1-3/4	1.7500	44.45	.750	19.05	1.375	34.93	3.625	92.08	6	C39808	C39833	C39830
1-3/4	1.7500	44.45	1.250	31.75	2.000	50.80	4.500	114.30	6	C42280	C39486	C39547
1-3/4	1.7500	44.45	1.250	31.75	4.000	101.60	6.500	165.10	4	C42355	C39273	C39295
2	2.0000	50.80	.750	19.05	1.625	41.28	3.625	92.08	6	C39807	C39832	C39831
2	2.0000	50.80	1.250	31.75	2.000	50.80	4.500	114.30	8	C42283	C39487	C39548
2	2.0000	50.80	1.250	31.75	4.000	101.60	6.500	165.10	4	C42358	C39274	C39296
2	2.0000	50.80	2.000	50.80	2.000	50.80	5.750	146.05	4	C43548	C32913	-
2	2.0000	50.80	2.000	50.80	2.000	50.80	5.750	146.05	6	C43534	-	-
2	2.0000	50.80	2.000	50.80	4.000	101.60	7.750	196.85	4	C43549	C32914	-
2	2.0000	50.80	2.000	50.80	4.000	101.60	7.750	196.85	6	C43535	-	-
2	2.0000	50.80	2.000	50.80	6.000	152.40	9.750	247.65	4	C43550	C32915	-
2	2.0000	50.80	2.000	50.80	6.000	152.40	9.750	247.65	6	C43536	-	-
2	2.0000	50.80	2.000	50.80	8.000	203.20	11.750	298.45	4	C43551	-	-
2	2.0000	50.80	2.000	50.80	8.000	203.20	11.750	298.45	6	C32817	C32822	-
2-1/2	2.5000	63.50	2.000	50.80	4.000	101.60	7.750	196.85	4	C43541	C32823	-
2-1/2	2.5000	63.50	2.000	50.80	4.000	101.60	7.750	196.85	6	C43558	C32917	-
2-1/2	2.5000	63.50	2.000	50.80	6.000	152.40	9.750	247.65	4	C43542	-	-
2-1/2	2.5000	63.50	2.000	50.80	6.000	152.40	9.750	247.65	6	C43559	-	-
2-1/2	2.5000	63.50	2.000	50.80	8.000	203.20	11.750	298.45	4	C32818	-	-
2-1/2	2.5000	63.50	2.000	50.80	8.000	203.20	11.750	298.45	6	C43560	-	-
2-1/2	2.5000	63.50	2.500	63.50	4.000	101.60	8.000	203.20	6	C43583	-	-
2-1/2	2.5000	63.50	2.500	63.50	6.000	152.40	10.000	254.00	6	C43584	-	-
2-1/2	2.5000	63.50	2.500	63.50	8.000	203.20	12.000	304.80	6	C43585	-	-
2-1/2	2.5000	63.50	2.500	63.50	10.000	254.00	14.000	355.60	6	C43586	-	-



General Application End Mills

Single End Finishers

Style HG-4C • HSS, Single End, 4-Flute, Center Cutting
formerly styles 583, 588, 591

FEATURES

ANSI SIZES	HSS SUBSTRATE
GENERAL PURPOSE	BRIGHT
4+ FLUTE CC	TiN
30°	TiCN

APPLICATIONS

ALLOY STEEL
TOOL STEEL
CAST IRON
COPPER ALLOYS

Heavy cross-section for high rigidity.



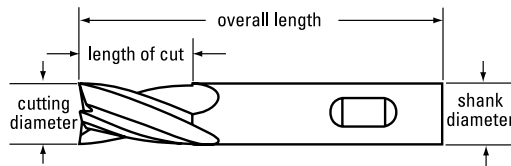
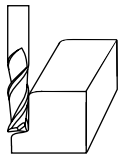
Style HG-4C Bright



Style HG-4C TiN-coated



Style HG-4C TiCN-coated



Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/8	.1250	3.18	.375	9.53	.375	9.53	2.313	58.74	4	C41243	C41520	C33240
9/64	.1406	3.57	.375	9.53	.500	12.70	2.313	58.74	4	C33141	C33188	C33241
5/32	.1562	3.97	.375	9.53	.500	12.70	2.375	60.33	4	C33142	C33189	C33242
11/64	.1719	4.37	.375	9.53	.500	12.70	2.375	60.33	4	C33143	C33190	C33243
3/16	.1875	4.76	.375	9.53	.500	12.70	2.375	60.33	4	C41245	C41521	C33244
3/16	.1875	4.76	.375	9.53	1.250	31.75	3.063	77.79	4	C33371	C33384	C33406
3/16	.1875	4.76	.375	9.53	1.750	44.45	3.563	90.49	4	C33428	C33438	C33457
13/64	.2031	5.16	.375	9.53	.625	15.88	2.438	61.91	4	C33144	C33191	C33245
7/32	.2188	5.56	.375	9.53	.625	15.88	2.438	61.91	4	C33145	C33192	C33246
7/32	.2188	5.56	.375	9.53	1.250	31.75	3.063	77.79	4	C33372	C33385	C33407
7/32	.2188	5.56	.375	9.53	1.750	44.45	3.563	90.49	4	C33429	C33439	C33458
15/64	.2344	5.95	.375	9.53	.625	15.88	2.438	61.91	4	C33146	C33193	C33247
1/4	.2500	6.35	.375	9.53	.625	15.88	2.438	61.91	4	C41248	C41522	C33248
1/4	.2500	6.35	.375	9.53	1.250	31.75	3.063	77.79	4	C41326	C33386	C33408
1/4	.2500	6.35	.375	9.53	1.750	44.45	3.563	90.49	4	C41381	C33440	C33459
17/64	.2656	6.75	.375	9.53	.750	19.05	2.500	63.50	4	C33147	C33194	C33249
9/32	.2812	7.14	.375	9.53	.750	19.05	2.500	63.50	4	C33148	C33195	C33250
9/32	.2812	7.14	.375	9.53	1.375	34.93	3.125	79.38	4	C33373	C33387	C33409
9/32	.2812	7.14	.375	9.53	2.000	50.80	3.250	82.55	4	C33430	C33441	C33460
19/64	.2969	7.54	.375	9.53	.750	19.05	2.500	63.50	4	C33149	C33196	C33251
5/16	.3125	7.94	.375	9.53	.750	19.05	2.500	63.50	4	C41250	C41523	C33252
5/16	.3125	7.94	.375	9.53	1.375	34.93	3.125	79.38	4	C41328	C33388	C33410
5/16	.3125	7.94	.375	9.53	2.000	50.80	3.250	82.55	4	C41383	C33442	C33461
21/64	.3281	8.33	.375	9.53	.750	19.05	2.500	63.50	4	C33150	C33197	C33253
11/32	.3438	8.73	.375	9.53	.750	19.05	2.500	63.50	4	C33151	C33198	C33254
11/32	.3438	8.73	.375	9.53	1.500	38.10	3.250	82.55	4	C33374	C33389	C33411
11/32	.3438	8.73	.375	9.53	2.500	63.50	4.250	107.95	4	C33431	C33443	C33462
23/64	.3594	9.13	.375	9.53	.750	19.05	2.500	63.50	4	C33152	C33199	C33255
3/8	.3750	9.53	.375	9.53	.750	19.05	2.500	63.50	4	C41253	C41524	C33256
3/8	.3750	9.53	.375	9.53	1.500	38.10	3.250	82.55	4	C41331	C33390	C33412
3/8	.3750	9.53	.375	9.53	2.500	63.50	4.250	107.95	4	C41386	C33444	C33463
25/64	.3906	9.92	.375	9.53	1.000	25.40	2.688	68.26	4	C33153	C33200	C33257

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DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

General Application End Mills

Single End Finishers

Style HG-4C • HSS, Single End, 4-Flute, Center Cutting (continued)

formerly styles 583, 588, 591

	Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
				in	mm	in	mm	in	mm		Bright	TiN	TiCN
DRILLING	13/32	.4062	10.32	.375	9.53	1.000	25.40	2.688	68.26	4	C33154	C33201	C33258
	13/32	.4062	10.32	.375	9.53	2.750	69.85	4.500	114.30	4	C33432	C33445	C33464
	13/32	.4062	10.32	.500	12.70	1.750	44.45	3.750	95.25	4	C33375	C33391	C33413
	27/64	.4219	10.72	.375	9.53	1.000	25.40	2.688	68.26	4	C33155	C33202	C33259
	7/16	.4375	11.11	.375	9.53	1.000	25.40	2.688	68.26	4	C41254	C33203	C33260
	7/16	.4375	11.11	.375	9.53	2.750	69.85	4.500	114.30	4	C33433	C33446	C33465
	7/16	.4375	11.11	.500	12.70	1.750	44.45	3.750	95.25	4	C33376	C33392	C33414
	29/64	.4531	8.71	.500	12.70	1.250	31.75	3.250	82.55	4	C33157	C33204	C33261
	15/32	.4688	11.91	.500	12.70	1.250	31.75	3.250	82.55	4	C33158	C33205	C33262
	15/32	.4688	11.91	.500	12.70	2.000	50.80	5.000	127.00	4	C33434	C33447	C33466
HOLE FINISHING	15/32	.4688	11.91	.500	12.70	2.000	50.80	4.000	101.60	4	C33377	C33393	C33415
	31/64	.4844	12.30	.500	12.70	1.250	31.75	3.250	82.55	4	C33159	C33206	C33263
	1/2	.5000	12.70	.375	9.53	1.000	25.40	2.688	68.26	4	C33160	C33207	C33264
	1/2	.5000	12.70	.500	12.70	1.250	31.75	3.250	82.55	4	C41257	C41525	C33265
	1/2	.5000	12.70	.500	12.70	2.000	50.80	5.000	127.00	4	C41390	C33448	C33467
	1/2	.5000	12.70	.500	12.70	2.000	50.80	4.000	101.60	4	C41335	C33394	C33416
	17/32	.5312	13.49	.500	12.70	1.375	34.93	3.375	85.73	4	C33161	C33208	C33266
	9/16	.5625	14.29	.500	12.70	1.375	34.93	3.375	85.73	4	C33162	C33209	C33267
	19/32	.5938	15.08	.500	12.70	1.375	34.93	3.375	85.73	4	C33163	C33210	C33268
	5/8	.6250	15.88	.500	12.70	1.375	34.93	3.375	85.73	4	C33164	C33211	C33269
THREADING	5/8	.6250	15.88	.625	15.88	1.625	41.28	3.750	95.25	4	C41260	C41526	C33270
	5/8	.6250	15.88	.625	15.88	2.500	63.50	4.625	117.48	4	C41338	C33395	C33417
	5/8	.6250	15.88	.625	15.88	4.000	101.60	6.125	155.58	4	C41393	C33449	C33468
	21/32	.6562	16.67	.625	15.88	1.625	41.28	3.750	95.25	4	C33165	C33212	C33271
	11/16	.6875	17.46	.500	12.70	1.625	41.28	3.375	85.73	4	C33166	C33213	C33272
	11/16	.6875	17.46	.625	15.88	1.625	41.28	3.750	95.25	4	C41262	C33214	C33273
	23/32	.7188	18.26	.750	19.05	1.625	41.28	3.875	98.43	4	C33167	C33215	C33274
	3/4	.7500	19.05	.500	12.70	1.625	41.28	3.375	85.73	4	C33168	C33216	C33275
	3/4	.7500	19.05	.625	15.88	1.625	41.28	3.750	95.25	4	C33169	C33217	C33276
	3/4	.7500	19.05	.750	19.05	1.625	41.28	3.875	98.43	4	C41264	C41527	C33277
MILLING	3/4	.7500	19.05	.750	19.05	3.000	76.20	5.240	133.10	4	C41341	C33396	C33418
	3/4	.7500	19.05	.750	19.05	4.000	101.60	6.250	158.75	4	C41396	C33450	C33469
	25/32	.7812	19.84	.750	19.05	1.875	47.63	4.125	104.78	4	C33170	C33218	C33278
	13/16	.8125	20.64	.625	15.88	1.875	47.63	4.000	101.60	4	C33171	C33219	C33279
	27/32	.8438	21.43	.875	22.23	1.875	47.63	4.000	101.60	4	C33172	C33220	C33280
	7/8	.8750	22.23	.625	15.88	1.875	47.63	4.000	101.60	4	C33173	C33221	C33281
	7/8	.8750	22.23	.750	19.05	1.875	47.63	4.125	104.78	4	C33174	C33222	C33282
	7/8	.8750	22.23	.875	22.23	1.875	47.63	4.125	104.78	4	C41268	C33223	C33283
	7/8	.8750	22.23	.875	22.23	3.500	88.90	5.750	146.05	4	C41345	C33397	C33419
	7/8	.8750	22.23	.875	22.23	5.000	127.00	7.250	184.15	4	C41400	C33451	C33470
OTHER TOOLS	29/32	.9062	23.02	.875	22.23	1.875	47.63	4.125	104.78	4	C33175	C33224	C33284
	15/16	.9375	23.81	.875	22.23	1.875	47.63	4.125	104.78	4	C33176	C33225	C33285
	31/32	.9688	24.61	1.000	25.40	2.000	50.80	4.500	114.30	4	C33177	C33226	C33286
	1	1.0000	25.40	.625	15.88	1.875	47.63	4.000	101.60	4	C33178	C33227	C33287
	1	1.0000	25.40	.750	19.05	1.875	47.63	4.125	104.78	4	C33179	C33228	C33288
	1	1.0000	25.40	.875	22.23	1.875	47.63	4.125	104.78	4	C33180	C33229	C33289
	1	1.0000	25.40	1.000	25.40	2.000	50.80	4.500	114.30	4	C41272	C41528	C33290
	1	1.0000	25.40	1.000	25.40	4.000	101.60	6.500	165.10	4	C41349	C33398	C33420
	1	1.0000	25.40	1.000	25.40	6.000	152.40	8.500	215.90	4	C41404	C33452	C33471

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General Application End Mills

Single End Finishers

Style HG-4C • HSS, Single End, 4-Flute, Center Cutting (continued)

formerly styles 583, 588, 591

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1-1/8	1.1250	28.58	.875	22.23	2.000	50.80	4.500	114.30	4	C33181	C33230	C33291
1-1/8	1.1250	28.58	1.000	25.40	2.000	50.80	4.500	114.30	4	C41275	C33231	C33292
1-1/8	1.1250	28.58	1.000	25.40	4.000	101.60	6.500	165.10	4	C33378	C33399	C33421
1-1/4	1.1250	28.58	1.250	31.75	4.000	101.60	6.500	165.10	4	C41353	C33401	C33423
1-1/4	1.2500	31.75	.875	22.23	2.000	50.80	4.500	114.30	4	C33182	C33232	C33293
1-1/4	1.2500	31.75	1.000	25.40	2.000	50.80	4.500	114.30	4	C33183	C33233	C33294
1-1/4	1.2500	31.75	1.000	25.40	4.000	101.60	6.500	165.10	4	C33379	C33400	C33422
1-1/4	1.2500	31.75	1.250	31.75	2.000	50.80	4.500	114.30	4	C41277	C33234	C33295
1-1/4	1.2500	31.75	1.250	31.75	6.000	152.40	8.500	215.90	4	C41408	C33453	C33472
1-1/4	1.2500	31.75	1.250	31.75	6.000	152.40	8.500	215.90	6	C33435	C33454	C33473
1-3/8	1.3750	34.93	1.000	25.40	2.000	50.80	4.500	114.30	4	C33184	C33235	C33296
1-1/2	1.5000	38.10	1.000	25.40	2.000	50.80	4.500	114.30	6	C33185	C33236	C33297
1-1/2	1.5000	38.10	1.000	25.40	4.000	101.60	6.500	165.10	4	C33380	C33402	C33424
1-1/2	1.5000	38.10	1.250	31.75	2.000	50.80	4.500	114.30	4	C41283	C33237	C33298
1-1/2	1.5000	38.10	1.250	31.75	4.000	101.60	6.500	165.10	4	C33381	C33403	C33425
1-1/2	1.5000	38.10	1.250	31.75	8.000	203.20	10.500	266.70	4	C33436	C33455	C33474
1-1/2	1.5000	38.10	1.250	31.75	8.000	203.20	10.500	266.70	6	C33437	C33456	C33475
1-3/4	1.7500	44.45	1.250	31.75	2.000	50.80	4.500	114.30	6	C33186	C33238	C33299
1-3/4	1.7500	44.45	1.250	31.75	4.000	101.60	6.500	165.10	4	C33382	C33404	C33426
2	2.0000	50.80	1.250	31.75	2.000	50.80	4.500	114.30	8	C33187	C33239	C33300
2	2.0000	50.80	1.250	31.75	4.000	101.60	6.500	165.10	4	C33383	C33405	C33427

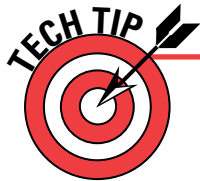
DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS



Benefits of Multi-Flute End Mills

- Generally, multi-flute end mills give smoother finishes than 2-flute end mills.
- Increased number of flutes mean more cutting edges, providing more cutting action.

Single End Finishers

Style HG-4B • HSS, Single End, 4-Flute, Center Cutting, Ball Nose


formerly styles 581, 584, 589

DRILLING

FEATURES

ANSI SIZES	HSS SUBSTRATE	ALLOY STEEL
GENERAL PURPOSE	BRIGHT	TOOL STEEL
4 FLUTE BALL CO	TiN	CAST IRON
30°	TiCN	COPPER ALLOYS

APPLICATIONS

 Heavy cross-section for high rigidity.



Style HG-4B Bright

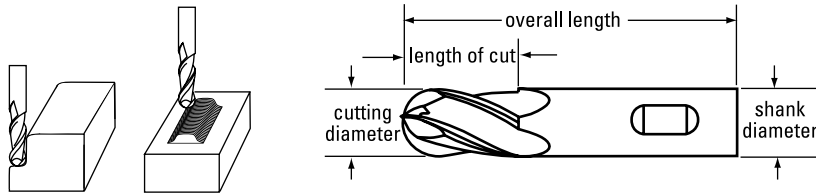


Style HG-4B TiN-coated



Style HG-4B TiCN-coated

HOLE FINISHING



THREADING

MILLING

OTHER TOOLS

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
1/4	.2500	6.35	.375	9.53	.625	15.88	2.438	61.91	4	C33301	C33303	C33313
1/4	.2500	6.35	.375	9.53	1.250	31.75	3.063	77.79	4	C33323	C33326	C33335
1/4	.2500	6.35	.375	9.53	1.750	44.45	3.563	90.49	4	C33344	C33353	C33362
5/16	.3125	7.94	.375	9.53	.750	19.05	2.500	63.50	4	C33302	C33304	C33314
5/16	.3125	7.94	.375	9.53	1.375	34.93	3.125	79.38	4	C33324	C33327	C33336
5/16	.3125	7.94	.375	9.53	2.000	50.80	3.250	82.55	4	C33345	C33354	C33363
3/8	.3750	9.53	.375	9.53	.750	19.05	2.500	63.50	4	C33325	C33328	C33337
3/8	.3750	9.53	.375	9.53	1.500	38.10	3.250	82.55	4	C33346	C33355	C33364
3/8	.3750	9.53	.375	9.53	2.500	63.50	4.250	107.95	4	C41289	C33305	C33315
1/2	.5000	12.70	.500	12.70	1.250	31.75	3.250	82.55	4	C41293	C33306	C33316
1/2	.5000	12.70	.500	12.70	2.000	50.80	4.000	101.60	4	C41358	C33329	C33338
1/2	.5000	12.70	.500	12.70	2.000	50.80	5.000	127.00	4	C33347	C33356	C33365
5/8	.6250	15.88	.625	15.88	1.625	41.28	3.250	82.55	4	C33348	C33357	C33366
5/8	.6250	15.88	.625	15.88	2.500	63.50	4.625	117.48	4	C41297	C33307	C33317
5/8	.6250	15.88	.625	15.88	4.000	101.60	6.125	155.58	4	C41361	C33330	C33339
3/4	.7500	19.05	.750	19.05	1.625	41.28	3.875	98.43	4	C41300	C33308	C33318
3/4	.7500	19.05	.750	19.05	2.000	50.80	5.250	133.35	4	C41364	C33331	C33340
3/4	.7500	19.05	.750	19.05	4.000	101.60	6.250	158.75	4	C33349	C33358	C33367
7/8	.8750	22.23	.875	22.23	1.875	47.63	4.125	104.78	4	C41304	C33309	C33319
1	1.0000	25.40	1.000	25.40	2.000	50.80	4.500	114.30	4	C41308	C33310	C33320
1	1.0000	25.40	1.000	25.40	4.000	101.60	6.500	165.10	4	C41371	C33332	C33341
1	1.0000	25.40	1.000	25.40	6.000	152.40	8.500	215.90	4	C33350	C33359	C33368
1-1/4	1.2500	31.75	1.250	31.75	2.000	50.80	4.500	114.30	4	C41312	C33311	C33321
1-1/4	1.2500	31.75	1.250	31.75	4.000	101.60	6.500	165.10	4	C41375	C33333	C33342
1-1/4	1.2500	31.75	1.250	31.75	6.000	152.40	8.500	215.90	4	C33351	C33360	C33369
1-1/2	1.5000	38.10	1.250	31.75	2.000	50.80	4.500	114.30	4	C41318	C33312	C33322
1-1/2	1.5000	38.10	1.250	31.75	4.000	101.60	6.500	165.10	4	C41377	C33334	C33343
1-1/2	1.5000	38.10	1.250	31.75	9.000	228.60	10.500	266.70	4	C33352	C33361	C33370
2	2.0000	50.80	1.250	31.75	2.000	50.80	6.750	171.45	4	C33007	C33010	C33015
2	2.0000	50.80	1.250	31.75	4.000	101.60	7.750	196.85	4	C33008	-	C33016
2	2.0000	50.80	1.250	31.75	5.000	127.00	8.750	222.25	4	C43564	-	-
2	2.0000	50.80	1.250	31.75	6.000	152.40	9.750	247.65	4	C33009	-	-
2-1/2	2.5000	63.50	1.250	31.75	5.000	127.00	8.750	222.25	4	C43567	-	C33019

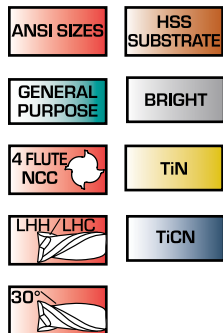


General Application End Mills

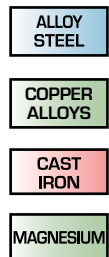
Single End Finishers

Style HG-4LL • HSS, Single End, 4-Flute, Non-Center Cutting, Left-Hand Helix, Left-Hand Cut
formerly style 683-LH

FEATURES



APPLICATIONS



Heavy cross-section for high rigidity.



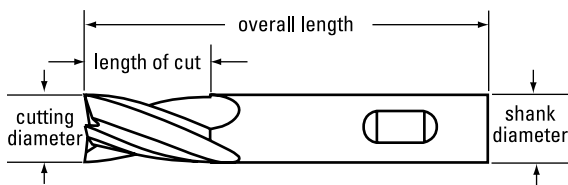
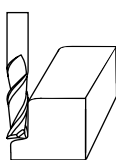
Style HG-4LL Bright



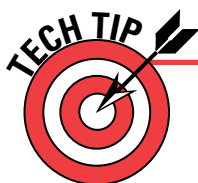
Style HG-4LL TiN-coated



Style HG-4LL TiCN-coated



Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiN	TiCN
3/16	.1875	4.76	.375	9.53	.500	12.70	2.375	60.33	4	C42294	C33610	C33618
1/4	.2500	6.35	.375	9.53	.625	15.88	2.438	61.91	4	C42297	C33611	C33619
5/16	.3125	7.94	.375	9.53	.750	19.05	2.500	63.50	4	C42299	C33612	C33620
3/8	.3750	9.53	.375	9.53	.750	19.05	2.500	63.50	4	C42302	C33613	C33621
7/16	.4375	11.11	.375	9.53	1.000	25.40	2.688	68.26	4	C33609	C33614	C33622
1/2	.5000	12.70	.500	12.70	1.250	31.75	3.250	82.55	4	C42306	C33615	C33623
5/8	.6250	15.88	.625	15.88	1.625	41.28	3.250	82.55	4	C42309	C33616	C33624
3/4	.7500	19.05	.750	19.05	1.625	41.28	3.875	98.43	4	C42312	C33617	C33625



Using Style HG-4LL End Mills

- 32° left-hand helix for reverse spindle operation.
- 4-flute design delivers smoother finish.

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Cobalt Roughers

Style RG5, RG5-TC, RG5-TA • Multi-Flute, Non-Center Cutting, Fine Profile

formerly style 501

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

FEATURES

ANSI SIZES M42 COBALT SUBSTRATE
 HEAVY DUTY BRIGHT
 4+ FLUTE NCC TICN
 FINE PROFILE TiALN
 30°

APPLICATIONS

STAINLESS STEEL
 TITANIUM ALLOYS
 NICKEL ALLOYS
 COBALT ALLOYS

✓ High red hardness for high heat conditions.
 ✓ Heavy cross-section for high rigidity.



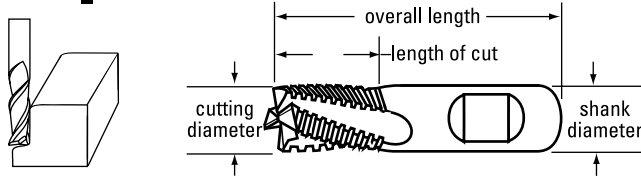
Style RG5 Bright



Style RG5-TC TiCN-coated



Style RG5-TA TiAlN-coated



Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiCN	TiAlN
9/16	.5625	14.29	.500	12.70	1.375	34.93	3.375	85.73	4	C31154	-	-
5/8	.6250	15.88	.625	15.88	.625	15.88	2.438	61.91	4	C43410	-	-
5/8	.6250	15.88	.625	15.88	1.625	41.28	3.750	95.25	4	C31155	C31274	C31220
5/8	.6250	15.88	.625	15.88	2.500	63.50	4.625	117.48	4	C31156	C31275	C31221
3/4	.7500	19.05	.750	19.05	.750	19.05	2.875	73.03	4	C43411	-	-
3/4	.7500	19.05	.750	19.05	1.625	41.28	3.875	98.43	4	C31157	C31276	C30999
3/4	.7500	19.05	.750	19.05	3.000	76.20	5.250	133.35	4	C31158	C31277	C31000
3/4	.7500	19.05	.750	19.05	4.000	101.60	6.250	158.75	4	C31159	C31278	C31224
7/8	.8750	22.23	.750	19.05	1.875	47.63	4.125	104.78	5	C30902	C31047	-
7/8	.8750	22.23	.875	22.23	1.875	47.63	4.125	104.78	5	C30903	C31048	C30970
1	1.0000	25.40	.750	19.05	2.000	50.80	4.250	107.95	5	C30904	-	-
1	1.0000	25.40	1.000	25.40	1.000	25.40	3.500	88.90	5	C43412	-	-
1	1.0000	25.40	1.000	25.40	2.000	50.80	4.500	114.30	5	C30905	C31049	C31085
1	1.0000	25.40	1.000	25.40	3.000	76.20	5.500	139.70	5	C30906	C31050	C31094
1	1.0000	25.40	1.000	25.40	4.000	101.60	6.500	165.10	5	C30907	C31051	C31086
1	1.0000	25.40	1.000	25.40	6.000	152.40	8.500	215.90	5	C30908	C31052	-
1 1/4	1.2500	31.75	.750	19.05	2.000	50.80	4.250	107.95	6	C30847	-	-
1 1/4	1.2500	31.75	1.250	31.75	2.000	50.80	4.500	114.30	6	C30841	C30990	-
1 1/4	1.2500	31.75	1.250	31.75	3.000	76.20	5.500	139.70	6	C30842	C30991	C31095
1 1/4	1.2500	31.75	1.250	31.75	4.000	101.60	6.500	165.10	6	C30845	C30993	C31062
1 1/4	1.2500	31.75	1.250	31.75	6.000	152.40	8.500	215.90	6	C30846	C30994	-
1 1/2	1.5000	38.10	1.250	31.75	2.000	50.80	4.500	114.30	6	C30848	C30995	C30925
1 1/2	1.5000	38.10	1.250	31.75	3.000	76.20	5.500	139.70	6	C30849	-	C31096
1 1/2	1.5000	38.10	1.250	31.75	4.000	101.60	6.500	165.10	6	C30850	C30997	C31097
1 1/2	1.5000	38.10	1.250	31.75	6.000	152.40	8.500	215.90	6	C30851	C30998	-
1 3/4	1.7500	44.45	1.250	31.75	2.000	50.80	4.500	114.30	6	C30868	-	-
2	2.0000	50.80	1.250	31.75	2.000	50.80	4.500	114.30	8	C30852	-	-
2	2.0000	50.80	1.250	31.75	4.000	101.60	6.500	165.10	8	C30853	-	-
2	2.0000	50.80	2.000	50.80	2.000	50.80	5.750	146.05	8	C30854	-	C30930
2	2.0000	50.80	2.000	50.80	3.000	76.20	6.750	171.45	8	C30855	C31002	C30933
2	2.0000	50.80	2.000	50.80	4.000	101.60	7.750	196.85	8	C30856	C31003	C31068
2	2.0000	50.80	2.000	50.80	6.000	152.40	9.750	247.65	8	C30857	C31004	C31066
2	2.0000	50.80	2.000	50.80	8.000	203.20	11.750	298.45	8	C30843	-	-



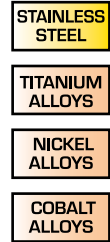
General Application End Mills Cobalt Roughers

Style RG6, RG6-TC, RG6-TA • Multi-Flute, Center Cutting, Fine Profile

FEATURES



APPLICATIONS



- High red hardness for high heat conditions.
- Heavy cross-section for high rigidity.
- Center cutting design for rapid plunge cutting



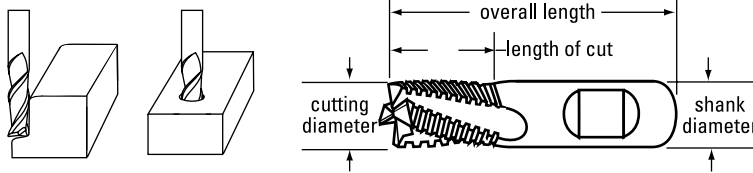
Style RG6 Bright



Style RG6 -TC TiCN-coated



Style RG6-TA TiAlN-coated



Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiCN	TiAlN
3/16	.1875	4.76	.375	9.53	.500	12.70	2.375	60.33	4	C30733	—	—
1/4	.2500	6.35	.375	9.53	.250	6.35	2.063	52.39	4	C31160	C31279	—
1/4	.2500	6.35	.375	9.53	.625	15.88	2.438	61.91	4	C30826	C30976	—
1/4	.2500	6.35	.375	9.53	1.250	31.75	3.125	79.38	4	C30827	—	—
5/16	.3125	7.94	.375	9.53	.750	19.05	2.500	63.50	4	C30828	C30977	—
3/8	.3750	9.53	.375	9.53	.375	9.53	2.156	54.77	4	C31161	C31280	C31060
3/8	.3750	9.53	.375	9.53	.750	19.05	2.500	63.50	4	C30829	C30978	C31054
3/8	.3750	9.53	.375	9.53	1.500	38.10	3.250	82.55	4	C30830	C30979	—
7/16	.4375	11.11	.500	12.70	1.250	31.75	3.250	82.55	4	C30734	—	—
1/2	.5000	12.70	.500	12.70	.500	12.70	2.500	63.50	4	C31162	C31281	C31056
1/2	.5000	12.70	.500	12.70	1.250	31.75	3.250	82.55	4	C30831	C30980	C31055
1/2	.5000	12.70	.500	12.70	2.000	50.80	4.000	101.60	4	C30832	C30981	—
5/8	.6250	15.88	.625	15.88	.625	15.88	2.750	69.85	4	C31163	C31282	C31053
5/8	.6250	15.88	.625	15.88	1.625	41.28	3.750	95.25	4	C30833	C30982	C31044
5/8	.6250	15.88	.625	15.88	2.500	63.50	4.625	117.48	4	C30834	C30983	—
3/4	.7500	19.05	.750	19.05	.750	19.05	2.875	73.03	4	C30837	C30986	C31058
3/4	.7500	19.05	.750	19.05	1.625	41.28	3.875	98.43	4	C30835	C30984	C31057
3/4	.7500	19.05	.750	19.05	3.000	76.20	5.250	133.35	4	C30836	C30985	—
7/8	.8750	22.23	.875	22.23	.875	22.23	3.125	79.38	5	C31164	C31283	—
7/8	.8750	22.23	.875	22.23	1.875	47.63	4.125	104.78	5	C31165	—	—
1	1.0000	25.40	1.000	25.40	1.000	25.40	3.500	88.90	5	C31166	C31284	C31063
1	1.0000	25.40	1.000	25.40	2.000	50.80	4.500	114.30	5	C30838	C30987	C31059
1	1.0000	25.40	1.000	25.40	3.000	76.20	5.500	139.70	5	C30839	C30988	C31087
1	1.0000	25.40	1.000	25.40	4.000	101.60	6.500	165.10	5	C30840	C30989	—
1-1/4	1.2500	31.75	1.250	31.75	2.000	50.80	4.500	114.30	6	C31167	C31285	C31064
1-1/4	1.2500	31.75	1.250	31.75	3.000	76.20	5.500	139.70	6	C31168	C31286	C31098
1-1/4	1.2500	31.75	1.250	31.75	4.000	101.60	6.500	165.10	6	C31169	C31287	—
2	2.0000	50.80	2.000	50.80	3.000	76.20	6.750	171.45	6	C31170	C31288	—
2	2.0000	50.80	2.000	50.80	4.000	101.60	7.750	196.85	6	C31171	C31289	—
2	2.0000	50.80	2.000	50.80	6.000	152.40	9.750	247.65	6	C31172	C31290	—

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Cobalt Roughers

Style RG6B, RG6B-TC • Multi-Flute, Center Cutting, Fine Profile, Ball Nose

DRILLING

FEATURES

- ANSI SIZES**
- M42 COBALT SUBSTRATE**
- HEAVY DUTY**
- BRIGHT**
- 4 FLUTE BALL CO**
- TiCN**
- FINE PROFILE**
- 30°**

APPLICATIONS

- STAINLESS STEEL**
- TITANIUM ALLOYS**
- NICKEL ALLOYS**
- COBALT ALLOYS**

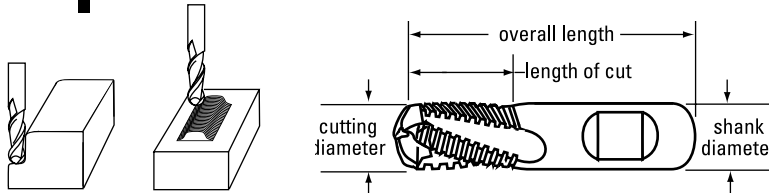
- High red hardness for high heat conditions.
- Heavy cross-section for high rigidity.



Style RG6B Bright



Style RG6B-TC TiCN-coated



HOLE FINISHING

THREADING

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number	
			in	mm	in	mm	in	mm		Bright	TiCN
1/2	.5000	12.70	.500	12.70	1.250	31.75	3.250	82.55	4	C30858	C31005
5/8	.6250	15.88	.625	15.88	1.625	41.28	3.750	95.25	4	C30859	C30001
3/4	.7500	19.05	.750	19.05	1.625	41.28	3.875	98.43	4	C30860	C31006
3/4	.7500	19.05	.750	19.05	3.000	76.20	5.250	133.35	4	C30895	C31040
1	1.0000	25.40	1.000	25.40	2.000	50.80	4.500	114.30	5	C30861	C31007
1	1.0000	25.40	1.000	25.40	4.000	101.60	6.500	165.10	5	C30896	C31041
1-1/4	1.2500	31.75	1.250	31.75	2.000	50.80	4.500	114.30	6	C30862	C31008
1-1/4	1.2500	31.75	1.250	31.75	4.000	101.60	6.500	165.10	6	C30897	C31042
2	2.0000	50.80	2.000	50.80	4.000	101.60	7.750	196.85	6	C30898	-
2	2.0000	50.80	2.000	50.80	6.000	152.40	9.750	247.65	6	C30899	-

MILLING

OTHER TOOLS



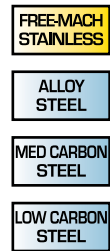
General Application End Mills Cobalt Roughers

Style RG7, RG7-TC, RG7-TA • Multi-Flute, Non-Center Cutting, Coarse Profile
formerly styles 577

FEATURES



APPLICATIONS



- High red hardness for high heat conditions.
- Heavy cross-section for high rigidity.



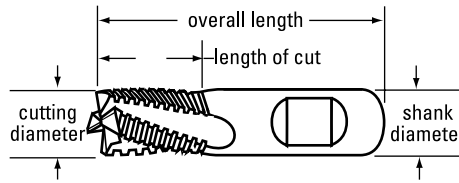
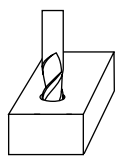
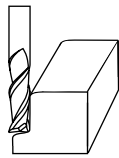
Style RG7 Bright



Style RG7-TC TiCN-coated



Style RG7-TA TiAlN-coated



Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiCN	TiAlN
9/16	.5625	14.29	.500	12.70	1.375	34.93	3.375	85.73	4	C30738	-	-
5/8	.6250	15.88	.625	15.88	1.625	41.28	3.750	95.25	4	C30755	C31127	-
5/8	.6250	15.88	.625	15.88	2.500	63.50	4.625	117.48	4	C30756	C31128	-
3/4	.7500	19.05	.750	19.05	1.625	41.28	3.875	98.43	4	C30757	C31129	C31077
3/4	.7500	19.05	.750	19.05	3.000	76.20	5.250	133.35	4	C30758	C31130	C31099
3/4	.7500	19.05	.750	19.05	4.000	101.60	6.250	158.75	4	C30739	C31101	-
7/8	.8750	22.23	.750	19.05	1.875	47.63	4.125	104.78	5	C30761	C31093	-
7/8	.8750	22.23	.875	22.23	1.875	47.63	4.125	104.78	5	C30759	C31131	-
7/8	.8750	22.23	.875	22.23	3.500	88.90	5.750	146.05	5	C30760	-	-
1	1.0000	25.40	.750	19.05	2.000	50.80	4.250	107.95	5	C30714	-	-
1	1.0000	25.40	1.000	25.40	2.000	50.80	4.500	114.30	5	C30762	C31133	C31079
1	1.0000	25.40	1.000	25.40	3.000	76.20	5.500	139.70	5	C30740	C31102	C31103
1	1.0000	25.40	1.000	25.40	4.000	101.60	6.500	165.10	5	C30763	C31134	C31080
1	1.0000	25.40	1.000	25.40	6.000	152.40	8.500	215.90	5	C30741	-	-
1 1/8	1.1250	28.58	.750	19.05	2.000	50.80	4.250	107.95	6	C30742	-	-
1 1/4	1.2500	31.75	.750	19.05	2.000	50.80	4.250	107.95	6	C30767	-	-
1 1/4	1.2500	31.75	1.250	31.75	2.000	50.80	4.500	114.30	6	C30764	C31135	C31081
1 1/4	1.2500	31.75	1.250	31.75	3.000	76.20	5.500	139.70	6	C30743	C31104	C31105
1 1/4	1.2500	31.75	1.250	31.75	4.000	101.60	6.500	165.10	6	C30765	C31136	C31082
1 1/4	1.2500	31.75	1.250	31.75	6.000	152.40	8.500	215.90	6	C30744	-	-
1 1/2	1.5000	38.10	.750	19.05	2.000	50.80	4.250	107.95	6	C30770	-	-
1 1/2	1.5000	38.10	1.250	31.75	2.000	50.80	4.250	107.95	6	C30768	C31137	-
1 1/2	1.5000	38.10	1.250	31.75	3.000	76.20	5.500	139.70	6	C30745	-	C31107
1 1/2	1.5000	38.10	1.250	31.75	4.000	101.60	6.500	165.10	6	C30769	C31138	C31108
1 1/2	1.5000	38.10	1.250	31.75	6.000	152.40	8.500	215.90	6	C30746	-	-
1 3/4	1.7500	44.45	1.250	31.75	2.000	50.80	4.500	114.30	6	C30747	-	-
2	2.0000	50.80	.750	19.05	0.750	19.05	3.000	76.20	8	C30773	-	-
2	2.0000	50.80	1.250	31.75	2.000	50.80	4.500	114.30	8	C30771	-	-
2	2.0000	50.80	1.250	31.75	4.000	101.60	6.500	165.10	8	C30772	-	-
2	2.0000	50.80	2.000	50.80	2.000	50.80	5.750	146.05	8	C30748	-	-
2	2.0000	50.80	2.000	50.80	3.000	76.20	6.750	171.45	8	C30749	C31100	-
2	2.0000	50.80	2.000	50.80	4.000	101.60	7.750	196.85	8	C30774	C31140	C31083
2	2.0000	50.80	2.000	50.80	6.000	152.40	9.750	247.65	8	C30775	C31141	C31084
2	2.0000	50.80	2.000	50.80	8.000	203.20	11.750	298.45	8	C30776	-	-

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Cobalt Roughers

Style RG8, RG8-TC, RG8-TA • Multi-Flute, Center Cutting, Coarse Profile

formerly style 506

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

FEATURES



APPLICATIONS

- FREE-MACH STAINLESS
- ALLOY STEEL
- MED CARBON STEEL
- LOW CARBON STEEL
- High red hardness for high heat conditions.
- Heavy cross-section for high rigidity.
- Center cutting design for rapid plunge cutting



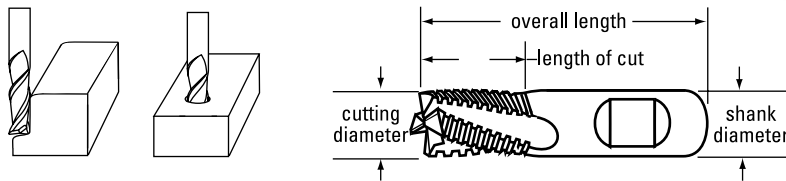
Style RG8 Bright



Style RG8-TC TiCN-coated



Style RG8-TA TiAlN-coated



Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number		
			in	mm	in	mm	in	mm		Bright	TiCN	TiAlN
3/16	.1875	4.76	.375	9.53	.500	12.70	2.375	60.33	4	C30709	-	-
1/4	.2500	6.35	.375	9.53	.250	6.35	2.063	52.39	3	C31173	C31291	-
1/4	.2500	6.35	.375	9.53	.625	15.88	2.438	61.91	4	C31174	C31292	-
1/4	.2500	6.35	.375	9.53	1.250	31.75	3.125	79.38	4	C31175	-	-
5/16	.3125	7.94	.375	9.53	.750	19.05	2.500	63.50	4	C31176	C31293	-
3/8	.3750	9.53	.375	9.53	.375	9.53	2.156	54.77	4	C31177	C31294	C31065
3/8	.3750	9.53	.375	9.53	.750	19.05	2.500	63.50	4	C31178	C31295	C31067
3/8	.3750	9.53	.375	9.53	1.500	38.10	3.250	82.55	4	C31179	C31296	-
7/16	.4375	11.11	.500	12.70	1.250	31.75	3.250	82.55	4	C30710	-	-
1/2	.5000	12.70	.500	12.70	.500	12.70	2.500	63.50	4	C31180	C31297	C31069
1/2	.5000	12.70	.500	12.70	1.250	31.75	3.250	82.55	4	C31181	C31298	C31070
1/2	.5000	12.70	.500	12.70	2.000	50.80	4.000	101.60	4	C31182	C31299	C31109
1/2	.5000	12.70	.500	12.70	3.000	76.20	5.000	127.00	4	C30732	-	-
5/8	.6250	15.88	.625	15.88	.625	15.88	2.750	69.85	4	C31183	C31300	C31071
5/8	.6250	15.88	.625	15.88	1.625	41.28	3.750	95.25	4	C31184	C31301	C31072
5/8	.6250	15.88	.625	15.88	2.500	63.50	4.625	117.48	4	C31190	C31302	-
3/4	.7500	19.05	.750	19.05	.750	19.05	2.875	73.03	4	C31193	C31303	C31074
3/4	.7500	19.05	.750	19.05	1.625	41.28	3.875	98.43	4	C31194	C31304	C31075
3/4	.7500	19.05	.750	19.05	3.000	76.20	5.250	133.35	4	C31195	C31305	-
1	1.0000	25.40	1.000	25.40	1.000	25.40	3.500	88.90	5	C31202	C31309	C31073
1	1.0000	25.40	1.000	25.40	2.000	50.80	4.500	114.30	5	C31197	C31306	C31076
1	1.0000	25.40	1.000	25.40	3.000	76.20	5.500	139.70	5	C31198	C31307	C31111
1	1.0000	25.40	1.000	25.40	4.000	101.60	6.500	165.10	5	C31199	C31308	-
1-1/4	1.2500	31.75	1.250	31.75	2.000	50.80	4.500	114.30	6	C31203	C31310	C31078
1-1/4	1.2500	31.75	1.250	31.75	3.000	76.20	5.500	139.70	6	C31204	C31311	C31112
1-1/4	1.2500	31.75	1.250	31.75	4.000	101.60	6.500	165.10	6	C31205	-	-
1-1/2	1.5000	38.10	1.250	31.75	3.000	76.20	5.500	139.70	6	C31206	-	-
2	2.0000	50.80	2.000	50.80	3.000	76.20	6.750	171.45	6	C31207	C31312	-
2	2.0000	50.80	2.000	50.80	4.000	101.60	7.750	196.85	6	C31208	C31313	-
2	2.0000	50.80	2.000	50.80	6.000	152.40	9.750	247.65	6	C31209	C31314	-



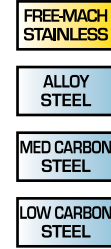
General Application End Mills Cobalt Roughers

Style RG8B, RG8B-TC • Multi-Flute, Center Cutting, Coarse Profile

FEATURES



APPLICATIONS



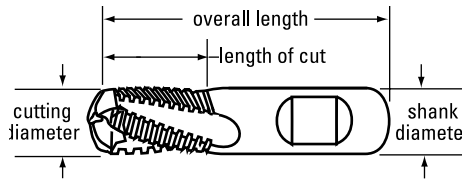
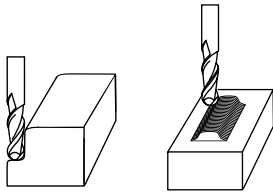
- High red hardness for high heat conditions.
- Heavy cross-section for high rigidity.



Style RG8B Bright



Style RG8B-TC TiCN-coated



Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number	
			in	mm	in	mm	in	mm		Bright	TiCN
1/2	.5000	12.70	.500	12.70	1.250	31.75	3.250	82.55	4	C30888	C31033
5/8	.6250	15.88	.625	15.88	1.625	41.28	3.750	95.25	4	C30889	-
3/4	.7500	19.05	.750	19.05	1.625	41.28	3.875	98.43	4	C30890	C31034
3/4	.7500	19.05	.750	19.05	3.000	76.20	5.250	133.35	4	C30900	C31045
1	1.0000	25.40	1.000	25.40	2.000	50.80	4.500	114.30	5	C30891	C31035
1	1.0000	25.40	1.000	25.40	4.000	101.60	6.500	165.10	5	C30901	C31046
1-1/4	1.2500	31.75	1.250	31.75	2.000	50.80	4.500	114.30	6	C30892	C31036
1-1/4	1.2500	31.75	1.250	31.75	4.000	101.60	6.500	165.10	6	C30708	C31037
2	2.0000	50.80	2.000	50.80	4.000	101.60	7.750	196.85	6	C30893	C31038
2	2.0000	50.80	2.000	50.80	6.000	152.40	9.750	247.65	6	C30894	C31039

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Cobalt Roughers

Style RG9, RG9-TC • 3-Flute, Center Cutting, Extra Coarse Profile for Aluminum

DRILLING

FEATURES

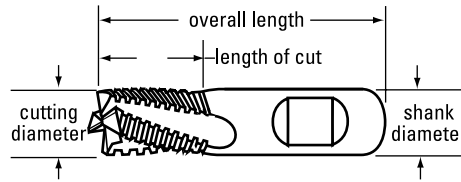
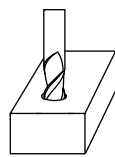
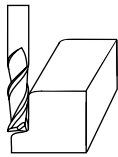
ANSI SIZES	M42 COBALT SUBSTRATE
HEAVY DUTY	BRIGHT
3 FLUTE CC	TiCN
COARSE PROFILE	45° CHAMFER
30°	

APPLICATIONS

ALUMINUM	<input checked="" type="checkbox"/> High red hardness for high heat conditions.
NON-FERROUS MATERIALS	<input checked="" type="checkbox"/> Heavy cross-section for high rigidity.
	<input checked="" type="checkbox"/> Center cutting design for rapid plunge cutting



HOLE FINISHING



THREADING

Cutting Diameter	Decimal Equiv.	Metric Equiv.	Shank Diameter		Length of Cut		Overall Length		No. of Flutes	Order Number	
			in	mm	in	mm	in	mm		Bright	TiCN
3/8	.3750	9.53	.375	9.53	.750	19.05	2.500	63.50	3	C30780	—
3/8	.3750	9.53	.375	9.53	1.500	38.10	3.250	82.55	3	C30720	—
1/2	.5000	12.70	.500	12.70	1.250	31.75	3.250	82.55	3	C30781	C31115
1/2	.5000	12.70	.500	12.70	2.000	50.80	4.000	101.60	3	C30782	—
1/2	.5000	12.70	.500	12.70	3.000	76.20	5.000	127.00	3	C30721	—
5/8	.6250	15.88	.625	15.88	1.625	41.28	3.750	95.25	3	C30783	C31117
5/8	.6250	15.88	.625	15.88	2.500	63.50	4.625	117.48	3	C30784	—
3/4	.7500	19.05	.750	19.05	1.625	41.28	3.875	98.43	3	C30785	C31119
3/4	.7500	19.05	.750	19.05	2.250	57.15	4.500	114.30	3	C30786	—
3/4	.7500	19.05	.750	19.05	3.000	76.20	5.250	133.35	3	C30722	C31106
3/4	.7500	19.05	.750	19.05	4.000	101.60	6.250	158.75	3	C30723	—
7/8	.8750	22.23	.750	19.05	1.500	38.10	3.750	95.25	3	C30788	—
7/8	.8750	22.23	.875	22.23	1.875	47.63	4.125	104.78	3	C30787	—
1	1.0000	25.40	.750	19.05	1.500	38.10	3.750	95.25	3	C30791	—
1	1.0000	25.40	1.000	25.40	2.000	50.80	4.500	114.30	3	C30789	C31121
1	1.0000	25.40	1.000	25.40	3.000	76.20	5.500	139.70	3	C30790	C31122
1	1.0000	25.40	1.000	25.40	4.000	101.60	6.500	165.10	3	C30724	—
1	1.0000	25.40	1.000	25.40	6.000	152.40	8.500	215.90	3	C30725	—
1-1/4	1.2500	31.75	.750	19.05	1.500	38.10	3.750	95.25	3	C30794	—
1-1/4	1.2500	31.75	1.250	31.75	2.000	50.80	4.500	114.30	3	C30792	—
1-1/4	1.2500	31.75	1.250	31.75	3.000	76.20	5.500	139.70	3	C30793	C31088
1-1/4	1.2500	31.75	1.250	31.75	4.000	101.60	6.500	165.10	3	C30726	C31110
1-1/4	1.2500	31.75	1.250	31.75	6.000	152.40	8.500	215.90	3	C30727	—
1-1/2	1.5000	38.10	.750	19.05	1.500	38.10	3.750	95.25	3	C30797	—
1-1/2	1.5000	38.10	1.250	31.75	2.000	50.80	4.500	114.30	3	C30795	C31089
1-1/2	1.5000	38.10	1.250	31.75	3.000	76.20	5.500	139.70	3	C30796	C31090
1-1/2	1.5000	38.10	1.250	31.75	4.000	101.60	6.500	165.10	3	C30728	—
2	2.0000	50.80	2.000	50.80	2.000	50.80	5.750	146.05	3	C30730	—
2	2.0000	50.80	2.000	50.80	3.000	76.20	6.750	171.45	3	C30798	C31091
2	2.0000	50.80	2.000	50.80	4.000	101.60	7.750	196.85	3	C30799	C31092
2	2.0000	50.80	2.000	50.80	6.000	152.40	9.750	247.65	3	C30731	—

MILLING

OTHER TOOLS



End Mill Nomenclature

An **end mill** is a straight or tapered shank milling cutter which extends or projects, unobstructed from the milling machine spindle. It is one of the most versatile of cutting tools, capable of milling, drilling, reaming, planning, shaping contour cutting, and more. Improvements in cutting efficiency, through both design and material changes, have increased the usage of this style tool over time.

Axial Relief

The relief measured in the axial direction between a plane perpendicular to the axis at the cutting edge and the relieved surface.

Clearance (Secondary Relief)

The additional space provided behind the relieved land to eliminate undesirable contact between the mill and workpiece.

Cutting Edge

The leading edge of the cutter tooth.

Flute

The chip space between the back of one tooth and the face of the following tooth.

Gash

Secondary cuts on a mill to provide chip room.

Hand of Cut

Right Hand, RH: When viewed from the cutting end of the mill, a counterclockwise rotation of the end mill is required in order to cut. Most end mills are right hand.

Left Hand, LH: When viewed from the cutting end of mill, a clockwise rotation of mill is required to cut.

Heel

The back edge of the relieved land.

Helix Angle

The cutting edge angle which a helical cutting edge makes with a plane containing the axis of a cylindrical mill. When viewed from the cutter end of the mill, the flute will move clockwise for a right hand helix.

Helical Rake

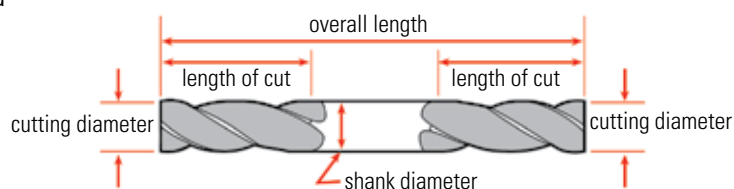
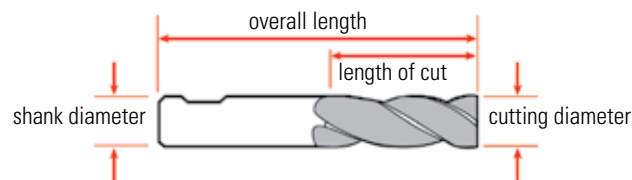
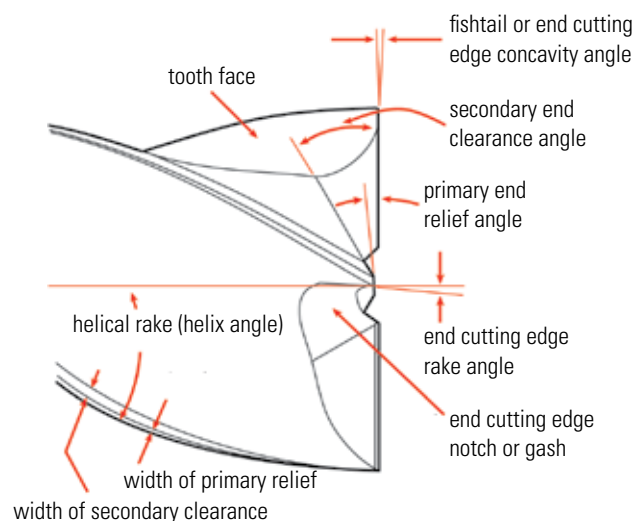
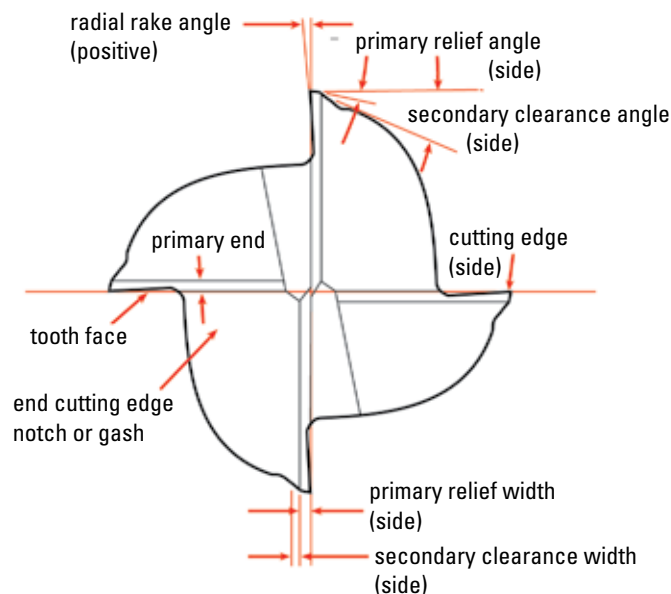
The helical rake at a given point on the flute face is the angle between the tool axis and a tangent plane at the given point.

Hook

A concave condition of a tooth face. The rake of a hooked tooth face must be determined at a given point.

Land

Used to define the width of a specified surface.



continued on next page

End Mill Nomenclature (continued)

DRILLING

Length of Cut

The effective axial length of the peripheral cutting edge which has been relieved to cut

Primary Relief

The relief measured in the axial direction between a plane perpendicular to the axis at the cutting edge and the relieved surface.

Primary Relief

The relief immediately behind the cutting edge.

Rake

The angular relationship between the tooth face or a tangent to the tooth face at a given point and a reference plane or line.

Radial Rake

The angle between the tooth face and a radial line passing through the cutting edge in a plane perpendicular to the cutting axis.

Relief

The result of the removal of tool material behind or adjacent to the cutting edge to provide clearance and prevent rubbing.

Relief Angle

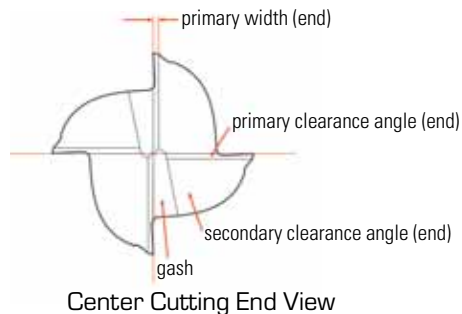
The angle formed between a relieved surface and a given plane tangent to the axis at the cutting edge or to a point on the cutting edge.

Shank

The projecting portion of a cutter which locates and drives the cutter from the machine spindle.

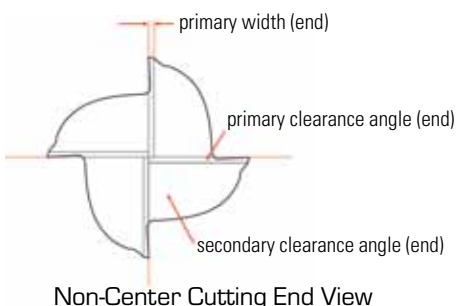
Tooth Face

The surface of the tooth on which the chip impinges.



Center Cutting End View

HOLE FINISHING



Non-Center Cutting End View

THREADING

MILLING

OTHER TOOLS

Regrinding End Mills

In every manufacturing plant today, large and small, an effective, organized end mill regrinding program is essential. No matter how large or small the end mill usage may be, an organized regrinding system will pay dividends in greater production per end mill.

General Information

End mills should be removed from the machine at the end of a predetermined production run, or when dull. If possible, a predetermined amount of stock should be removed on dull end mills (normal stock removal is .005" or .010" for each regrind) and color coding or size etching might be marked on the end mill to indicate its size. After several regrinds (this, too, can be predetermined) the end mill will tend to lose its effective rake angle and flute depth, and, at this point, the end mill must be scrapped.

Charts and data for the correct relief angles, relief widths, and rake angles for regrinding end mills are shown on pages 268 and 270.

After regrinding and inspection, all end mills should be dipped in rust-preventative oil, and, if suitable cartons are not available, they should be dipped in plastic coating for the full flute length. They should be stored in their original container, in separate bins or wooden containers. Small wooden containers that can be carried about are usually better than ordinary bin storage, as rough handling, in some cases, ruins more cutting edges than the actual milling operation.

The basic requirements for efficient end mill regrinding are:

- Tool grinding equipment in good condition.
- Adequate information for particular applications with reference to correct reliefs and rake angles.
- A workable tool conservation program.
- Adequate storage facilities and efficient handling techniques.

Nothing decreases the usable tool life of an end mill more than continued use of a dull end mill. The cutting action of a dull end mill is such that all the shearing qualities are gone and the material being milled is actually pushed on ahead of the individual cutting edges. This results in drawing the temper of the individual high-speed steel cutting edges, poorer finishes and accelerated wear. Continued use of a dull end mill makes it necessary to remove much more stock at regrinding to make the end mill usable once again. In the case of carbide end mills excessive dullness will chip and crater the cutting edges and will often cause breakage.

The point in the milling operation at which an end mill begins to dull can be determined in several ways. A dull end mill begins to spring or chatter, causes finishes to become poorer, and glazes or smears some materials. In addition, a wear land begins to form on the top of each individual cutting edge. Many milling machine operators can determine the first signs of end mill dulling by the sound of the cutting action, or by slight variations in machine vibrations.

Generally, an end mill is ready for resharpener when a wear land is visible on the top of the cutting edge. For smaller diameter end mills, and when milling some of the harder, ferrous materials, a wear land of approximately .005 may be used as an indication of the maximum allowable wear prior to resharpener. When using larger diameter end mills, and when milling in other classes of materials, a wider wear land may be used as an end point prior to regrinding.

In the final analysis, the many variables of each individual end mill application will determine the amount of cutting edge wear or degree of end mill dullness allowable before regrinding.

Regrinding Equipment

The tool cutter grinders on the market today are extremely versatile, and are capable of end mill regrinding between centers or off-the-shank. Tool and cutter grinders specifically designed for this type of work are easy to set up, operate and maintain, and versatile enough to regrind many types of cutting tools other than end mills. For a large volume of regrinding work some facilities utilize NC or CNC grinding equipment which maintains uniformity of reground mills at each regrinding.

Wheel Selection for Regrinding High Speed Steel End Mills

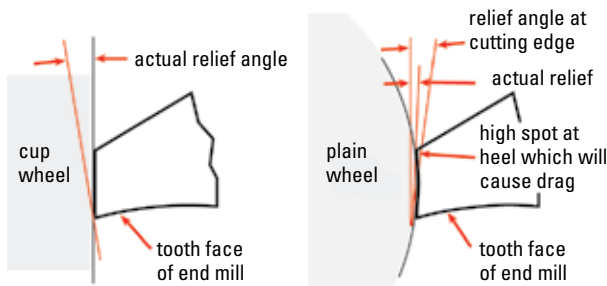
Efficient end mill regrinding is possible without the necessity of stocking a large inventory of various wheel types. For general purpose regrinding, aluminum oxide wheels of 46 to 80 grit are usually satisfactory, although, for finer finishes finer grit wheels may be used. When using wheels with a grit finer than 80, and particularly when resharpener thin cutting edges, approximately .002" should be the maximum amount of stock removal. Heavier cuts than .002" with fine grit wheels usually cause wheel loading and cutting edge burning. CBN wheels are recommended for minimum heat generation and may allow greater stock removal on roughing operations.

continued on next page

Regrinding End Mills (continued)

Wheel Selection for HSS End Mills (continued)

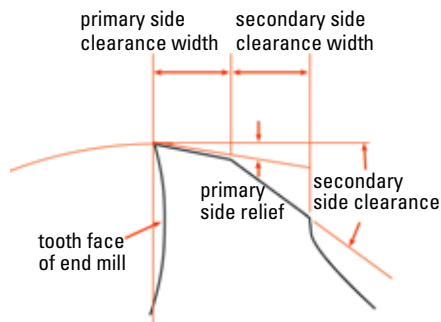
Two basic types of wheels may be used: plain or cupped. The cutting edge sections shown below are those which will be produced on the end mill cutting edges by each of these wheels. For a conventional type of regrinding, cup-shaped wheels are often preferred. This preference is caused by the fact that regrinding with a plain wheel tends to leave a high heel portion on the cutting edge, which might cause drag. If the heel portion is too high, it must be cleared also, requiring an additional regrinding setup and operation. Then too, the relief ground on an end mill cutting edge with a cupped wheel is easier to measure, as this type of regrinding leaves a flat, angular relief.



Effect of Wheel Shape on End Mill Relief Angle
Cup Wheel versus Plain Wheel

Regrinding the Sides

Producing the correct relief angle on an end mill is accomplished by establishing the proper location of the wheel and the end mill. On NC or CNC equipment, this relationship is established through use of a probe or other locating type device. On tool and cutter grinding equipment, a finger or flute rest is used as the locating device. The location of the flute finger should be such that it is mounted in proximity to the wheel. It must be adjustable but not attached to the table. The flute finger may be mounted on the table only when regrinding straight fluted end mills, and then its use is confined to that of an indexing finger.



In actual regrinding, after the flute finger and wheel-to-flute location have been set, each flute is traversed past the wheel, taking a light cut and maintaining a steady motion. After the first light cut, the end mill should be measured to make certain that no taper is being added to the end mill. After the proper amounts of stock have been removed, to resharpen the end mill completely, a very light cut should be taken on all flutes, to make certain that roundness and concentricity is maintained.

In choosing the correct relief for the milling job at hand, it is best to regrind end mills to produce just enough primary relief to eliminate drag. Drag will cause friction and overheating of the cutting edges, and usually some buildup of the material on the heel of the primary relief. On the other hand, too much relief will cause the end mill to chatter and the cutting edges will tend to deteriorate rapidly. Too much relief is the least objectionable of the two choices, but the ideal situation is to have just enough relief. The amount of secondary clearance necessary is usually dependent on the size of the end mill, the width of the primary relief, and the feeds being used. For example, if the feed per tooth per revolution is .004", the heel of the secondary clearance must be at least .005" below the cutting edge. The table below lists the approximate side relief for various end mills.

The best resharpening procedure is to first regrind the primary relief until all of the wear has been removed, taking care to avoid excessive diameter loss. Next, the secondary clearance is ground to bring the primary relief land to the desired widths. After grinding the secondary clearance, it is often desirable that the primary relief surfaces be given a light finish grind to refine the cutting edges. To minimize runout, this light finishing cut should be made at one machine sitting, going completely around the end mill.

Side Relief Angles

	End Mill Diameter	Primary Clearance	Primary Width	Secondary Clearance Angle
HSS and Cobalt End Mills	1/8" - 1/4"	13° - 10°	.005" - .011"	26°
	1/2" - 3/4"	10° - 9°	.012" - .024"	17°
	1" - 2"	9° - 7°	.020" - .035"	15°
HSS High-Helix End Mills	1/8" - 1/4"	14°	.017" - .013"	27°
	1/2" - 3/4"	13° - 12°	.015" - .027"	21°
	1" - 2"	11° - 10°	.022" - .040"	18°
PM Plus Powder Metal End Mills	1/8" - 1/4"	22° - 18°	.004" - .013"	29°
	1/2" - 3/4"	16° - 12°	.010" - .018"	22°
	1" - 2"	11° - 10°	.015" - .030"	19°

Regrinding End Mills (continued)

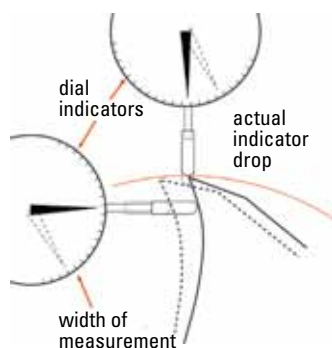
Checking Relief Angles

The universally accepted method of checking relief angles on the sides of end mills is to mount the end mill to rotate about its axis. Position a dial indicator above or to the side of the end mill, (with the dial indicator finger at right angles to the axis of the end mill being checked) and measure the indicator drop in thousandths of an inch on the primary relief.

This method, shown in the illustration, may be used for any type of side relief, be it dish shaped, flat, or radial. The measurable width of primary relief may be any predetermined amount.

The table below shows the amount of indicator drop for various primary relief angles when the cutting edge of the end mill is moved or rotated the tabulated measured primary width.

Off-hand side relief regrinding of end mills for any milling application should never be done under any circumstances.



Primary Relief Angle for Side Teeth of End Mills

End Mill Diameter	Measured Primary Relief Width	Indicator Drop in Measured Primary Relief Width					
		4°	6°	8°	10°	12°	15°
1/8	1/64	.0000	.0000	.0002	.0008	.0015	.0021
3/16	1/64	.0000	.0003	.0009	.0014	.0020	.0028
1/4	1/64	.0001	.0007	.0012	.0018	.0023	.0031
5/16	1/64	.0003	.0009	.0014	.0019	.0025	.0033
3/8	1/64	.0004	.0010	.0015	.0021	.0026	.0034
7/16	1/64	.0005	.0011	.0016	.0022	.0027	.0035
1/2	1/64	.0006	.0012	.0017	.0022	.0028	.0036
5/8	1/32	.0006	.0017	.0028	.0039	.0050	.0066
3/4	1/32	.0009	.0020	.0029	.0042	.0052	.0069
7/8	1/32	.0011	.0022	.0032	.0043	.0054	.0070
1	1/32	.0012	.0023	.0034	.0045	.0056	.0072
1-1/8	1/32	.0013	.0024	.0035	.0046	.0057	.0073
1-1/4	3/64	.0015	.0032	.0048	.0064	.0080	.0105
1-3/8	3/64	.0017	.0033	.0050	.0066	.0082	.0106
1-1/2	3/64	.0018	.0034	.0051	.0067	.0083	.0107
1-3/4	3/64	.0020	.0037	.0053	.0069	.0085	.0109
2	3/64	.0022	.0038	.0054	.0071	.0087	.0111
2-1/4	1/16	.0027	.0048	.0070	.0092	.0113	.0145
2-1/2	1/16	.0028	.0050	.0072	.0093	.0115	.0147
2-3/4	1/16	.0029	.0051	.0073	.0095	.0116	.0148
3	1/16	.0031	.0052	.0074	.0096	.0117	.0150

Regrinding the Ends

Regrinding of the ends of end mills does not differ too much from regrinding of the sides, in that the basic principles still apply. However the method of grinding varies in that nearly all regrinding is done off of the shank. The task at hand is to reproduce an end that may be non-center cutting, center cutting, square end, ball nose or square end with corner radius. Almost any of the tool or cutter grinders may be used to produce accurate regrinding and renotching of the square end style and some are built to also permit accurate reproduction of ball and radius ends. NC or CNC equipment can be programmed to achieve all of the required end configurations during regrinding.

Whenever possible, end notching or gashing cuts should be produced with grinding wheels which have corner radii so as to reduce stress concentration at the bottom of the gash. End tooth notch angles should produce about 0° to 5° positive axial rake.

In resharpener of end teeth the first step is always the removal of the wear on the end teeth and at the corner intersection of the end and peripheral teeth. Particular care must be taken so that all of the corner wear is removed.

Once the wear has been removed, it then is a matter of using the proper set-up and wheel shapes to produce the desired end configuration, be it with a center or non-center cutting capability. On center cutting end mills one or more teeth must be cleared to cut to or past center. A gash is normally provided on the center cutting teeth to aid chip removal and prevent chip packing in the center of the end mill.

Ball end mills present resharpener problems due to their relieved radius form and roughly spherical form of the secondary clearance. Most users will end up using a machine to generate the cleared form and then hand clear the secondary and trailing heel. Care must always be exercised in regrinding the ends regardless of its shape to avoid generating any chip pockets.

Primary relief land widths of end teeth will be approximately 1-1/2 to 3 times that recommended for peripheral teeth. The table on the next page is a listing of typical details for clearing the ends of end mills

continued on next page

Regrinding End Mills (continued)

DRILLING

Regrinding the Ends (continued)

Primary end relief is usually increased for softer materials and decreased as the hardness of the work material increases or the machinability of the work material decreases. Primary end relief angles should also be increased on small diameter mills used for plunge-cutting.

Secondary End Clearance

Secondary end clearance depends on the material being milled and the type of operation. Some tracer milling operations, requiring comparatively heavy in-feeds, will necessitate additional secondary clearance, whereas shallow traversing cuts would require less secondary end clearance.

In addition, milling of the higher density steels require less secondary end clearance, but aluminum and other non-ferrous milling applications require increased secondary end clearances. In most cases, off hand grinding of secondary end clearances on end mills is the quickest and most economical method, as no absolute degree of accuracy is required. For combination notching and secondary end clearing of end mills, however, where the side of the wheel makes contact with the cutting face of one of the end teeth, care must be exercised, and some users prefer to notch and clear end teeth in one grinding operation, by machine.

HOLE FINISHING

THREADING

End Relief Angles

	End Mill Diameter	Primary Clearance	Primary Width	Secondary Clearance Angle
HSS, Cobalt and PM Plus End Mills	1/8" - 1/4"	6° - 8°	.025" - .035"	25° - 30°
	1/2" - 3/4"	6° - 8°	.035" - .050"	25° - 30°
	1" - 2"	6° - 8°	.045" - .075"	25° - 30°
HSS	1/8" - 1/4"	8° - 10°	.025" - .045"	30°
High-Helix End Mills	1/2" - 3/4"	8° - 10°	.035" - .060"	23°
	1" - 2"	8° - 10°	.050" - .100"	23°

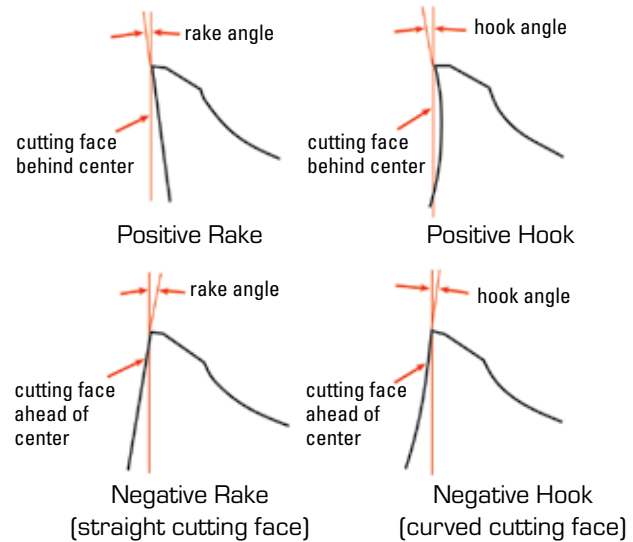
MILLING

OTHER TOOLS

Regrinding End Mill Tooth Rake Angles

While correct relief angles on end mill teeth are essential for economical milling, too often little attention is given to maintaining the correct rake angles. Rake angles or hook angles are shown below.

As the illustration shows, the term rake is commonly used when referring to a comparatively straight cutting face. The rake or hook angle formed by the side cutting faces of an end mill is often referred to as radial rake.



Most end mills are manufactured with a hook rather than a rake because the curved cutting face aids in curling and ejecting the chips. The proper rake angle is governed by the material being cut and the material from which the end mill is made. Most high-speed steel end mills usually have generous positive rake angles on the side cutting teeth, whereas tungsten carbide types of end mills are usually manufactured with lower positive or even negative rake angles. Softer materials usually will allow higher rake angles to be used, whereas the harder, tougher materials require lower rake angles.

Radial rake is not to be confused with axial or helical rake. Axial rake is that angle formed about the axis of the mill by a straight cutting edge at one given point, whereas helical rake is that helical angle formed around the axis of the mill by the cutting edge.

Axial rake is formed by a straight angular cutting edge, and is not constant, whereas helical rake is formed by a helical cutting edge and is constant. Helix angles or helical rake angles for end mills may range, from 0° up to 60°. For general purpose milling, helix angles of 25° to 35° are the most popular.

Regrinding End Mills (continued)

Regrinding Tooth Rake Angles (continued)

During manufacturing a specific radial rake is built into each end mill type based upon its intended area of work material application. As an end mill is reground on outside diameter, there is a continual reduction in the radial rake present in the tool, resulting in higher cutting forces and generally shorter tool life. An end mill generally can only be reduced in cutting diameter by about 10% to 15% of the original diameter before the mill must be discarded or the correct radial rake reground into face of the flute.

Width of Tooth Face being Measured

Rake Angle	Indicator Drop in Thousandths of an Inch			
	1/32"	1/16"	3/32"	1/8"
1°	.0005	.0011	.0016	.0022
2°	.0011	.0022	.0034	.0044
3°	.0016	.0033	.0049	.0065
4°	.0022	.0044	.0066	.0087
5°	.0027	.0054	.0082	.0108
6°	.0033	.0065	.0099	.0131
7°	.0038	.0076	.0115	.0152
8°	.0044	.0087	.0132	.0174
9°	.0049	.0098	.0148	.0195
10°	.0055	.0109	.0165	.0217
11°	.0061	.0119	.0182	.0238
12°	.0066	.0130	.0200	.0260
15°	.0084	.0162	.0251	.0323
20°	.0114	.0227	.0341	.0455

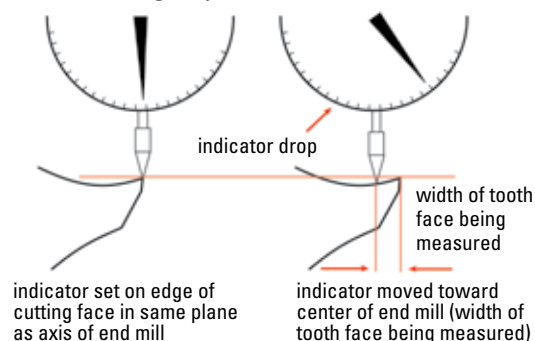
Regrinding Radial Rake Angles

The practice of regrinding radial rake or hook angles on end mills of diameters below 1/2" is usually not economical, unless large quantities of the same size are involved. Thus the regrinding of radial rake is usually confined to end mills of larger sizes. There are three accurate methods of regrinding the rake angles in the helical flutes of an end mill.

1. Use of a tool room grinder with a spiral lead attachment.
2. Use of a fixture, mounted on a tool room grinder having a former (a bar grooved with the same lead as the end mill) which rotates the end mill at the correct helix angle as it moves forward into the grinding wheel.
3. Use of a properly programmed CNC grinder.

Inspecting Radial Rake Angles

The illustration shows one method of inspecting the radial hook or rake in the side tooth of an end mill, when the end mill is located in inspection centers or in an accurate horizontal spindle. This method measures the amount of rake of the tooth being measured in indicator drop. Convert this amount of indicator drop to the angular equivalent of the actual rake angle by reference to the table at left.

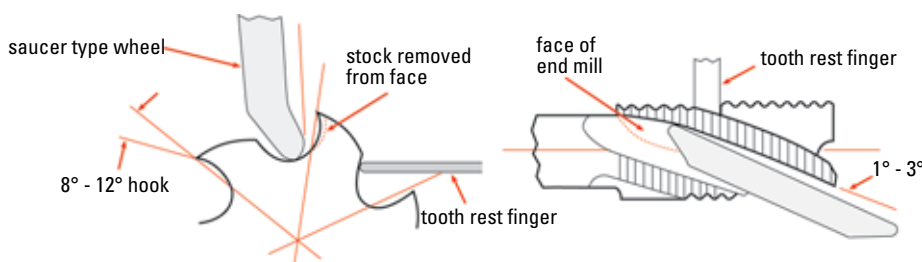


Sharpening Roughing End Mills

Roughing end mills are designed as form-relieved cutters, and as such, the OD wear is removed by grinding the radial rake face of the teeth and fillet of the flute. Generally this is accomplished on a tool and cutter grinding machine. If a roughing end mill is center or end cutting, the end teeth are resharpened the same way as end teeth on standard end mills.

A saucer-shaped grinding wheel, dressed to match the form of the flute face from OD to the fillet, is used. The grinding head is turned to an angle 1° to 3° greater than the helix angle of the mill. This will allow the leading edge of the wheel to hollow grind the rake face. (Typically the finished hook is 8° to 12°).

A tooth support finger or lead-generating device may be used to ensure that the proper lead is maintained. The support finger rides on the back of the tooth being sharpened, located below the form. Unless equal stock is removed from each rake face, the resharpened mill will have more radial runout during use. Normally this should not prove to be a problem, provided enough stock is left on the roughed out part for finishing.

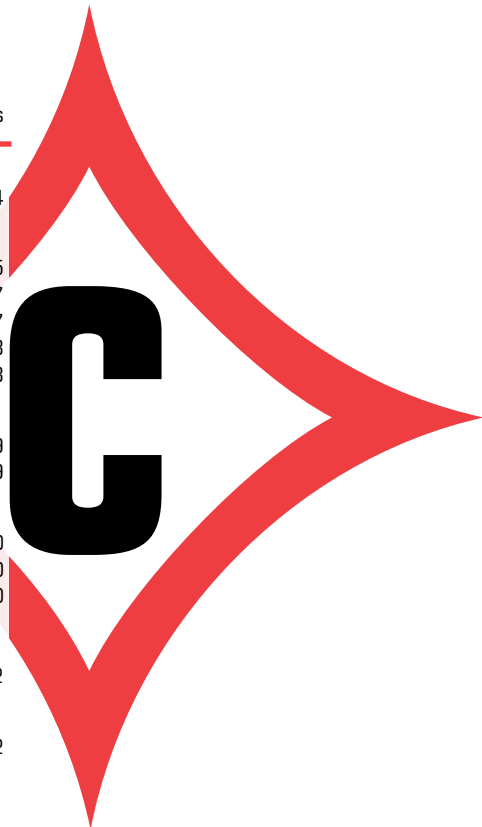




Other Tools

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DRILLING

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Screw Extractors

Style 192 • Ezy-Out® Screw Extractor

DRILLING

FEATURES

- ANSI SIZES
- ALLOY STEEL SUBSTRATE
- HEAVY DUTY

APPLICATIONS

- ALLOY-TOOL STEEL
- MED CARBON STEEL
- LOW CARBON STEEL
- CAST IRON



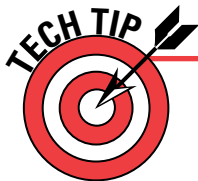
Style 192

HOLE FINISHING

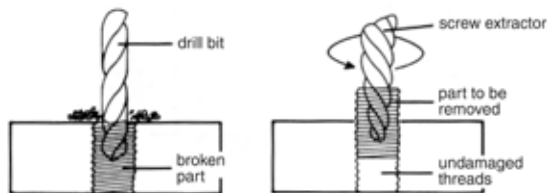
Extractor Number	Small End		Large End		Overall Length		Screw Size	Pipe Size	Use This Drill Size	Order Number
	in	mm	in	mm	in	mm				
#1	.054	1.37	.156	3.97	2.000	50.80	#8 - 1/4	--	5/64	C53651
#2	.080	2.03	.188	4.76	2.375	60.33	#12 - 5/16	--	7/64	C53652
#3	.125	3.18	.250	6.35	2.688	68.26	5/16 - 7/16	--	5/32	C53653
#4	.188	4.76	.328	8.33	2.875	73.03	7/16 - 9/16	--	1/4	C53654
#5	.250	6.35	.438	11.11	3.375	85.73	9/16 - 3/4	1/8, 1/4	9/32	C53655
#6	.375	9.53	.594	15.08	3.750	95.25	3/4 - 1	3/8	13/32	C53656
#7	.500	12.70	.750	19.05	4.125	104.78	1 - 1-3/8	1/2	17/32	C53657
#8	.750	19.05	1.000	25.40	4.375	111.13	1-3/8 - 1-3/4	3/4	13/16	C53658
#9	1.000	25.40	1.281	32.54	4.625	117.48	1-3/4 - 2-1/8	1	1-1/16	C53659
#10	1.250	31.75	1.563	39.69	5.000	127.00	2-1/8 - 2-1/2	1-1/4	1-5/16	C53660
#11	1.500	38.10	1.875	47.63	5.625	142.88	2-1/2 - 3	1-1/2	1-9/16	C53661
#12	1.875	47.63	2.313	58.74	6.250	158.75	3 - 3-1/2	2	1-15/16	C53662

NOTE: Recommended drill size and extractor size shown above are for normal conditions. Unusual conditions will require the use of other size extractors and drills, depending on the length of the broken section and the depth of the hole. In general, use the largest possible screw extractor.

THREADING



Use Screw Extractors to Remove Broken Screws and Bolts

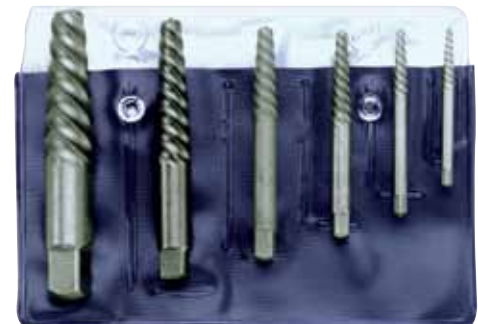


Screw extractors are often used in maintenance departments, machine shops, garages, and workshops to remove broken screws, bolts, or other threaded parts. To remove a broken screw, follow this procedure.

- Drill a hole into the broken screw using the recommended drill size from the table above.
- Insert the proper screw extractor into the hole and start a counter-clockwise (left-hand) rotation using a tap wrench on the square on the shank.
- The extractor will grip the wall of the hole in the screw and back the screw out without damaging the threads.
- A penetrating oil can be helpful in removing rusty or corroded parts.

Sets

No. of Pieces	Tool Style	Sizes	Order Number
5	192	#1, through #5	C00906
6	192	#1 through #6	C00907
4	192	#6 through #9	C00908
3	192	#4 through #6	C00909
12	192	#1 through #6 plus drills 5/64", 7/64", 5/32", 1/4", 9/32", 13/32"	C00910



MILLING

OTHER TOOLS



Styles 850, 855, 860, 3507 • Square Tool Bits

Style 850 Mo-Max® HSS

FEATURES

ANSI SIZES | HSS SUBSTRATE
GENERAL PURPOSE

APPLICATIONS

ALLOY STEEL | CAST IRON
TOOL STEEL



Style 850 Mo-Max® HSS

Style 855 Mo-Max® Cobalt

FEATURES

ANSI SIZES | M42 COBALT SUBSTRATE
GENERAL PURPOSE

APPLICATIONS

ALLOY STEEL | CAST IRON
TOOL STEEL | STAINLESS STEEL



Style 855 Mo-Max® Cobalt

Style 860 Super Mo-Max® Cobalt

FEATURES

ANSI SIZES | M42 COBALT SUBSTRATE
HEAVY DUTY

APPLICATIONS

NICKEL ALLOYS
STAINLESS STEEL



Style 860 Super Mo-Max® Cobalt

Style 3507 Super Cle-Max® Cobalt

FEATURES

ANSI SIZES | T-15 SUBSTRATE
HEAVY DUTY

APPLICATIONS

TOUGH ALLOYS



Style 3507 Super Cle-Max® Cobalt

Tool Bit Size	Overall Length		Order Number					
			Style 850	Style 855	Style 860	Style 3507		
fractional	in	mm	M2 HSS	M42 Cobalt	M42 Cobalt	T15		
1/8	.1250	3.18	2.500	63.50	C44505	C44536	C44567	–
3/16	.1875	4.76	2.500	63.50	C44509	C44540	C44571	C44671
1/4	.2500	6.35	2.500	63.50	C44513	C44544	C44575	C44672
5/16	.3125	7.94	2.500	63.50	C44514	C44545	C44576	C44673
3/8	.3750	9.53	3.000	76.20	C44516	C44547	C44578	C44674
7/16	.4375	11.11	3.500	88.90	C44518	C44549	C44580	C44675
1/2	.5000	12.70	4.000	101.60	C44520	C44551	C44582	C44676
5/8	.6250	15.88	4.500	114.30	C44522	C44553	C44584	C44677
3/4	.7500	19.05	5.000	127.00	C44525	C44556	C44587	C44678
7/8	.8750	22.23	6.000	152.40	C44527	C44558	C44589	–
1	1.0000	25.40	7.000	177.80	C44528	C44559	C44590	C44679
1-1/4	1.2500	31.75	9.000	228.60	C44530	C44561	C44592	–

Ground Tool Bits

Styles 851, 856, 861, 3517 • Rectangular Tool Bits

DRILLING

Style 851 Mo-Max® HSS

FEATURES

ANSI SIZES	HSS SUBSTRATE
GENERAL PURPOSE	

APPLICATIONS

ALLOY STEEL	CAST IRON
TOOL STEEL	



Style 851 Mo-Max® HSS

HOLE FINISHING

Style 856 Mo-Max® Cobalt

FEATURES

ANSI SIZES	M42 COBALT SUBSTRATE
GENERAL PURPOSE	

APPLICATIONS

ALLOY STEEL	CAST IRON
TOOL STEEL	STAINLESS STEEL



Style 856 Mo-Max® Cobalt

THREADING

Style 861 Super Mo-Max® Cobalt

FEATURES

ANSI SIZES	M42 COBALT SUBSTRATE
HEAVY DUTY	

APPLICATIONS

NICKEL ALLOYS
STAINLESS STEEL



Style 861 Super Mo-Max® Cobalt

MILLING

Style 3517 Super Cle-Max® Cobalt

FEATURES

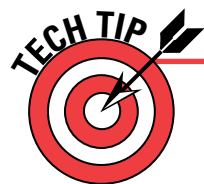
ANSI SIZES	T-15 SUBSTRATE
HEAVY DUTY	

APPLICATIONS

TOUGH ALLOYS



Style 3517 Super Cle-Max® Cobalt



Ground Tool Bits

- Mo-Max tool bits are designed for general-purpose work in moderate materials.
- Mo-Max Cobalt tool bits are ideal for general-purpose work in harder materials.
- Super Mo-Max Cobalt tool bits are designed for heavy-duty work in high-temp alloys.
- Super Cle-Max Cobalt tool bits are meant for the heaviest duty work in tough materials.

OTHER TOOLS

Ground Tool Bits

Styles 851, 856, 861, 3517 • Rectangular Tool Bits (continued)

Tool Bit Size fractional	Width		Height		Overall Length		Order Number			
	in	mm	in	mm	in	mm	Style 851 M2 HSS	Style 856 M42 Cobalt	Style 861 M42 Cobalt	Style 3517 T15
1/4 x 3/8	.250	6.35	.375	9.53	2.500	63.50	C44600	C44601	C44602	–
1/4 x 3/8	.250	6.35	.375	9.53	3.000	76.20	–	–	–	C44685
1/4 x 1/2	.250	6.35	.500	12.70	4.000	101.60	C44606	C44607	C44608	C44686
1/4 x 1/2	.250	6.35	.500	12.70	6.000	152.40	C44609	C44610	C44611	–
1/4 x 3/4	.250	6.35	.750	19.05	5.000	127.00	–	–	–	C44687
5/16 x 1/2	.313	7.94	.500	12.70	3.000	76.20	C44616	C44617	C44618	–
3/8 x 1/2	.375	9.53	.500	12.70	3.000	76.20	C44619	C44620	C44621	–
3/8 x 1/2	.375	9.53	.500	12.70	4.000	101.60	C44622	C44623	C44624	C44689
3/8 x 1/2	.375	9.53	.500	12.70	6.000	152.40	C44625	C44626	C44627	–
3/8 x 5/8	.375	9.53	.625	15.88	4.000	101.60	C44628	C44629	C44630	–
3/8 x 5/8	.375	9.53	.625	15.88	4.500	114.30	–	–	–	C44690
3/8 x 5/8	.375	9.53	.625	15.88	5.000	127.00	C44631	C44632	C44633	–
3/8 x 5/8	.375	9.53	.625	15.88	6.000	152.40	C44634	C44635	C44636	–
3/8 x 3/4	.375	9.53	.750	19.05	4.000	101.60	C44637	C44638	–	–
3/8 x 3/4	.375	9.53	.750	19.05	6.000	152.40	C44640	C44641	C44642	–
1/2 x 3/4	.500	12.70	.750	19.05	5.000	127.00	–	–	–	C44692
1/2 x 3/4	.500	12.70	.750	19.05	4.000	101.60	C44644	C44645	C44646	–
1/2 x 3/4	.500	12.70	.750	19.05	6.000	152.40	C44647	C44648	C44649	–
1/2 x 1	.500	12.70	1.000	25.40	7.000	177.80	–	–	–	C44693
1/2 x 1	.500	12.70	1.000	25.40	8.000	203.20	C44650	C44651	C44652	–
5/8 x 3/4	.625	15.88	.750	19.05	5.000	127.00	C44653	C44654	C44655	C44694
5/8 x 7/8	.625	15.88	.875	22.23	6.000	152.40	C44656	C44657	C44658	–
3/4 x 1	.750	19.05	1.000	25.40	6.000	152.40	C44659	C44660	C44661	–
3/4 x 1	.750	19.05	1.000	25.40	7.000	177.80	–	–	–	C44696
1 x 1-1/4	1.000	25.40	1.250	31.75	6.000	152.40	–	–	–	C44697

Styles BRZT-CT • Carbide-Tipped Braze Tool Bits



	Order Number			Order Number	
	C2 Grade	C5 Grade		C2 Grade	C5 Grade
BRZT-AL – Left Hand					
AL-5	C49607	–	C-7	–	C49663
AL-6	C49609	C49611	C-10	–	C49667
AL-7	C49613	–	BRZT-D – Neutral		
AL-8	C49617	C49619	D-5	–	C49673
BRZT-AR – Right Hand					
AR-4	–	C49602	D-6	–	C49675
AR-5	–	C49606	D-8	–	C49679
AR-6	C49608	C49610	BRZT-E – Neutral		
AR-7	C49612	C49614	E-5	C49686	C49687
AR-8	C49616	C49618	E-6	–	C49689
AR-10	–	C49622	E-10	–	C49695
BRZT-BL – Left Hand					
BL-6	–	C49639			

Ground Cut-Off Blades

Styles 852, 857 • Cut-Off Blades

Style 852 Mo-Max® HSS

FEATURES

ANSI SIZES HSS SUBSTRATE
GENERAL PURPOSE BEVEL 10°

APPLICATIONS

ALLOY STEEL CAST IRON
TOOL STEEL



Style 852 Mo-Max® HSS

Style 857 Mo-Max® Cobalt

FEATURES

ANSI SIZES M42 COBALT SUBSTRATE
GENERAL PURPOSE BEVEL 10°

APPLICATIONS

ALLOY STEEL CAST IRON
TOOL STEEL STAINLESS STEEL



Style 857 Mo-Max® Cobalt

Blade Size fractional	Nominal Thickness		Nominal Height in mm	Overall Length		Order Number	
	in	mm		in	mm	Style 852 M2 HSS	Style 857 M42 Cobalt
1/16 x 1/2 x 4-1/2	.0625	1.59	.500	12.70	4.500	114.30	C44701 C44702
1/16 x 11/16 x 5	.0625	1.59	.688	17.46	5.000	127.00	C44703 C44704
1/16 x 13/16 x 6	.0625	1.59	.813	20.64	6.000	152.40	C44705 C44706
3/32 x 1/2 x 4-1/2	.0938	2.38	.500	12.70	4.500	114.30	C44707 C44708
3/32 x 11/16 x 5	.0938	2.38	.688	17.46	5.000	127.00	C44709 C44710
1/8 x 11/16 x 5	.1250	3.18	.688	17.46	5.000	127.00	C44715 C44716
1/8 x 13/16 x 6	.1250	3.18	.813	20.64	6.000	152.40	C44717 C44718
1/8 x 1 x 6-1/2	.1250	3.18	1.000	25.40	6.500	165.10	C44719 C44720
5/32 x 13/16 x 6	.1562	3.97	.813	20.64	6.000	152.40	C44721 -
3/16 x 13/16 x 6	.1875	4.76	.813	20.64	6.000	152.40	C44723 C44724
3/16 x 1 x 6-1/2	.1875	4.76	1.000	25.40	6.500	165.10	C44725 C44726
1/4 x 1 x 6-1/2	.2500	6.35	1.000	25.40	6.500	165.10	C44731 -

Styles 853, 858 • Cut-Off Blades for Armstrong and Williams Holders

Style 853 Mo-Max® HSS

FEATURES

ANSI SIZES HSS SUBSTRATE
GENERAL PURPOSE BEVEL 10°

APPLICATIONS

ALLOY STEEL CAST IRON
TOOL STEEL



Style 853 Mo-Max® HSS

Style 858 Mo-Max® Cobalt

FEATURES

ANSI SIZES M42 COBALT SUBSTRATE
GENERAL PURPOSE BEVEL 10°

APPLICATIONS

ALLOY STEEL CAST IRON
TOOL STEEL STAINLESS STEEL



Style 858 Mo-Max® Cobalt

Blade Size fractional	Nominal Thickness		Nominal Height in mm	Overall Length		Order Number		Fitting Armstrong Holder No.	Fitting Williams Holder No.
	in	mm		in	mm	Style 853 M2 HSS	Style 858 M42 Cobalt		
3/32 x 1/2 x 4-1/2	.0938	2.38	.500	12.70	4.500	114.30	C44740 C44741	19, 29L, 29R	-
3/32 x 5/8 x 5	.0938	2.38	.625	15.88	5.000	127.00	C44742 C44743	20, 30L, 30R	N-20R, N30L, N30R
1/8 x 3/4 x 5	.1250	3.18	.750	19.05	5.000	127.00	C44744 C44745	21, 31L, 31R	N21-R, N-31L, N-31R
1/8 x 7/8 x 6	.1250	3.18	.875	22.23	6.000	152.40	C44746 C44747	22, 32L, 32R	N-22R, N-32L, N-32R
3/16 x 1 x 6-1/2	.1875	4.76	1.000	25.40	6.500	165.10	C44748 -	23, 33L, 33R	N-23R, N-33R, N-33L

DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS



Drill and Reamer Blanks

Style 902 • Oversize Reamer Blank Tolerance $+.0002/- .0000$

FEATURES



APPLICATIONS



Style 902 Bright

Blank Diameter	Width		Height		Order Number
	in	mm	in	mm	
3/64	.0469	1.19	1.750	44.45	C19271
#51	.0670	1.70	2.000	50.80	C19288
1/8	.1250	3.18	2.750	69.85	C19335
5/32	.1562	3.97	3.125	79.38	C19355
3/16	.1875	4.76	3.500	88.90	C19377
7/32	.2188	5.56	3.750	95.25	C19398
1/4,E	.2500	6.35	4.000	101.60	C19416
5/16	.3125	7.94	4.500	114.30	C19449

Style 903 • Undersize Drill Blank Tolerance $+.0000/- .0003$

FEATURES

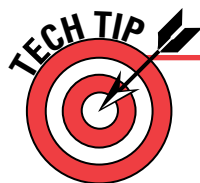


APPLICATIONS



Style 902 Bright

Blank Diameter	Width		Height		Order Number
	in	mm	in	mm	
#55	.0520	1.32	1.875	47.63	C19562
1/16	.0625	1.59	1.875	47.63	C19570
3/32	.0938	2.38	2.250	57.15	C19599
1/8	.1250	3.18	2.750	69.85	C19622
3/16	.1875	4.76	3.500	88.90	C19664
1/4,E	.2500	6.35	4.000	101.60	C19703
5/16	.3125	7.94	4.500	114.30	C19736
3/8	.3750	9.53	5.000	127.00	C19766
1/2	.5000	12.70	6.000	152.40	C19795



Drill and Reamer Blanks

- Ideal for use as drifts of dowel pins, for gauging purposes, and for making punches.
- Also can be used for round tool bits, countersinks, boring, or burring tools.

Milling Cutters

DRILLING

Style 305 • HSS Side Milling Cutter



For side milling and slotting.



Size No.	Width of Face		Cutter Dia.		Hole Size		Teeth	Order Number
	in	mm	in	mm	in	mm		
305-16	.2500	6.35	4.00	101.60	1.00	25.40	24	C45064
305-17	.3750	9.53	4.00	101.60	1.00	25.40	24	C45065
305-19	.5000	12.70	4.00	101.60	1.25	31.75	22	C45067
305-31	.7500	19.05	5.00	127.00	1.25	31.75	26	C45078

HOLE FINISHING

Style 307 • HSS Staggered Tooth Side Milling Cutter



For deep slotting.



Size No.	Width of Face		Cutter Dia.		Hole Size		Teeth	Order Number
	in	mm	in	mm	in	mm		
307-6	.2500	6.35	3.00	76.20	1.00	25.40	16	C45114
307-24	.5000	12.70	6.00	152.40	1.25	31.75	24	C45132

THREADING

Style 321 • HSS Woodruff Key Seat Cutters, 1/2" Shank



For milling Woodruff keys.



Furnished 1/32" large to allow for resharpening.

Size No./ Key No.	Width of Face		Nominal Dia.		Overall Length		Teeth	Order Number
	in	mm	in	mm	in	mm		
202	.2500	6.35	.063	1.59	2.063	52.39	8	C45481
202-1/2	.3125	7.94	.063	1.59	2.063	52.39	8	C45520
203	.3750	9.53	.063	1.59	2.063	52.39	8	C45482
204	.5000	12.70	.063	1.59	2.063	52.39	10	C45483
302-1/2	.3125	7.94	.094	2.38	2.094	53.18	8	C45521
304	.5000	12.70	.094	2.38	2.094	53.18	10	C45485
305	.6250	15.88	.094	2.38	2.094	53.18	10	C45486
403	.3750	9.53	.125	3.18	2.125	53.98	8	C45487
404	.5000	12.70	.125	3.18	2.125	53.98	10	C45488
405	.6250	15.88	.125	3.18	2.125	53.98	10	C45489
406	.7500	19.05	.125	3.18	2.125	53.98	10	C45490
506	.7500	19.05	.156	3.97	2.156	54.77	10	C45492
605	.6250	15.88	.188	4.76	2.188	55.56	10	C45494
606	.7500	19.05	.188	4.76	2.188	55.56	10	C45495
608	1.0000	25.40	.188	4.76	2.188	55.56	12	C45497
610	1.2500	31.75	.188	4.76	2.188	55.56	14	C45499
806	.7500	19.05	.250	6.35	2.250	57.15	10	C45504
807 (121)	.8750	22.23	.250	6.35	2.250	57.15	14	C45505
808 (141)	1.0000	25.40	.250	6.35	2.250	57.15	12	C45506
809	1.1250	28.58	.250	6.35	2.250	57.15	14	C45507
810	1.2500	31.75	.250	6.35	2.250	57.15	14	C45508
811	1.3750	34.93	.250	6.35	2.250	57.15	14	C45509
812	1.5000	38.10	.250	6.35	2.250	57.15	14	C45510
1008 (131)	1.0000	25.40	.313	7.94	2.313	58.74	12	C45511
1009 (161)	1.1500	29.21	.313	7.94	2.313	58.74	14	C45512
1010	1.2500	31.75	.313	7.94	2.313	58.74	14	C45513
1012	1.5000	38.10	.313	7.94	2.313	58.74	16	C45515
1210	1.2500	31.75	.375	9.53	2.375	60.33	14	C45517
1212	1.5000	38.10	.375	9.53	2.375	60.33	14	C45519

MILLING

OTHER TOOLS

Style 318 • HSS Screw Slotting Saws

Size No.	Width of Face		Cutter Dia.		Hole Size		Teeth	Wire Gage	Order Number
	in	mm	in	mm	in	mm			
318-79	.0160	0.41	1.75	44.45	.625	15.88	90	26	C45245
318-75	.0250	0.64	1.75	44.45	.625	15.88	90	22	C45241
318-72	.0360	0.91	1.75	44.45	.625	15.88	90	19	C45238
318-67	.0640	1.63	1.75	44.45	.625	15.88	90	14	C45233
318-61	.0360	0.91	2.25	57.15	.625	15.88	60	19	C45227
318-25	.0100	0.25	2.75	69.85	1.000	25.40	72	30	C45215
318-24	.0130	0.33	2.75	69.85	1.000	25.40	72	28	C45214
318-20	.0200	0.51	2.75	69.85	1.000	25.40	72	24	C45210
318-18	.0250	0.64	2.75	69.85	1.000	25.40	72	22	C45208
318-17	.0280	0.71	2.75	69.85	1.000	25.40	72	21	C45207
318-16	.0320	0.81	2.75	69.85	1.000	25.40	72	20	C45206
318-14	.0400	1.02	2.75	69.85	1.000	25.40	72	18	C45204
318-13	.0450	1.14	2.75	69.85	1.000	25.40	72	17	C45203
318-12	.0510	1.30	2.75	69.85	1.000	25.40	72	16	C45202
318-11	.0570	1.45	2.75	69.85	1.000	25.40	72	15	C45201
318-10	.0640	1.63	2.75	69.85	1.000	25.40	72	14	C45200
318-9909	.0720	1.83	2.75	69.85	1.000	25.40	56	13	C45308
318-8	.0810	2.06	2.75	69.85	1.000	25.40	72	12	C45198
318-7	.0910	2.31	2.75	69.85	1.000	25.40	72	11	C45197
318-6	.1020	2.59	2.75	69.85	1.000	25.40	72	10	C45196
318-4	.1280	3.25	2.75	69.85	1.000	25.40	72	8	C45194



For slotting screw and bolt heads.



Style 326 • HSS Plain Metal Slitting Saws

Size No.	Width of Face		Cutter Dia.		Hole Size		Teeth	Order Number
	in	mm	in	mm	in	mm		
326-9002	.0625	1.59	1.25	31.75	.500	12.70	28	C45523
326-9011	.0312	.79	2.00	50.80	.500	12.70	38	C45532
326-6	.0312	.79	3.00	76.20	1.000	25.40	36	C45542
326-7	.0469	1.19	3.00	76.20	1.000	25.40	36	C45543
326-8	.0625	1.59	3.00	76.20	1.000	25.40	36	C45544
326-9	.0938	2.38	3.00	76.20	1.000	25.40	36	C45545
326-10	.1250	3.18	3.00	76.20	1.000	25.40	36	C45546
326-11	.1562	3.97	3.00	76.20	1.000	25.40	36	C45547
326-12	.0312	.79	4.00	101.60	1.000	25.40	40	C45548
326-13	.0469	1.19	4.00	101.60	1.000	25.40	40	C45549
326-14	.0625	1.59	4.00	101.60	1.000	25.40	40	C45550
326-15	.0938	2.38	4.00	101.60	1.000	25.40	40	C45551
326-16	.1250	3.18	4.00	101.60	1.000	25.40	40	C45552
326-19	.0625	1.59	5.00	127.00	1.000	25.40	44	C45555
326-20	.0938	2.38	5.00	127.00	1.000	25.40	44	C45556
326-21	.1250	3.18	5.00	127.00	1.000	25.40	44	C45557
326-22	.1250	3.18	5.00	127.00	1.250	31.75	44	C45558
326-25	.0625	1.59	6.00	152.40	1.000	25.40	48	C45559
326-26	.0938	2.38	6.00	152.40	1.000	25.40	48	C45560



For slotting and cutoff operations.



DRILLING

HOLE FINISHING

THREADING

MILLING

OTHER TOOLS

Saws

Style 327 • HSS Side Chip Clearance Metal Slitting Saws

Size No.	Width of Face		Cutter Dia.		Hole Size		Teeth	Order Number
	in	mm	in	mm	in	mm		
327-2	.0938	2.38	2.50	63.50	.875	22.23	28	C45571
327-3	.1250	3.18	2.50	63.50	.875	22.23	28	C45572
327-4	.0625	1.59	3.00	76.20	1.000	25.40	32	C45573
327-5	.0938	2.38	3.00	76.20	1.000	25.40	32	C45574
327-6	.1250	3.18	3.00	76.20	1.000	25.40	32	C45575
327-7	.1562	3.97	3.00	76.20	1.000	25.40	32	C45576
327-8	.0625	1.59	4.00	101.60	1.000	25.40	36	C45577
327-9	.0938	2.38	4.00	101.60	1.000	25.40	36	C45578
327-10	.1250	3.18	4.00	101.60	1.000	25.40	36	C45579
327-15	.1250	3.18	5.00	127.00	1.000	25.40	40	C45584



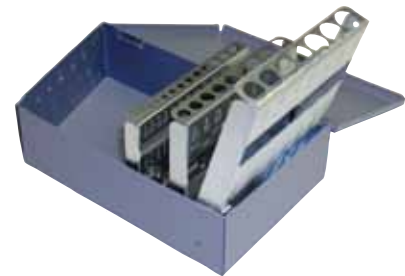
For slotting and cutoff operations.



Set Containers

Metal Drill Set Cases (No Drills)

Case Number	Holds No. of Pieces	Holds Drill Sizes	Order Number
#4115	115	1/64" to 1/2" x 1/64", A to Z letter, #1 to #60 wire	C00878
#413	13	1/16 to 1/4 x 1/64"	C00854
#415	15	1/16" to 1/2" x 1/32"	C00852
#421	21	1/16" to 3/8" x 1/64"	C00853
#426	26	A to Z letter	C00857
#429	29	1/16" to 1/2" x 1/64"	C00851
#460	60	#1 to #60 wire	C00855
#2001M	25	1.0mm to 13.0 mm x 0.5mm	C00865





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C16852	2575TN	15	C16917	2575TN	14	C16982	2075TA	8	C19915	3780TC	50	C24174	2635	106
C16853	2575TN	15	C16918	2575TN	15	C16983	2075TA	8	C19916	3780TC	50	C24175	2635	106
C16854	2575TN	15	C16919	2575TN	15	C16984	2075TA	8	C19917	3780TC	50	C24176	2635	106
C16855	2575TN	15	C16920	2575TN	15	C16985	2075TA	8	C19919	3780TC	50	C24177	2635	106
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C16859	2575TN	15	C16924	2575TN	15	C16989	2075TA	9	C19925	3780TC	50	C24181	2645	106
C16860	2575TN	15	C16925	2575TN	15	C16990	2075TA	9	C19927	3780TC	50	C24182	2645	106
C16861	2575TN	15	C16926	2575TN	15	C16991	2075TA	9	C19928	3780TC	50	C24183	2645	106
C16862	2575TN	15	C16927	2575TN	15	C16992	2075TA	9	C19929	3780TC	50	C24184	2645	106
C16863	2575TN	14	C16928	2575TN	15	C16993	2075TA	9	C19930	3780TC	50	C24185	2645	106
C16864	2575TN	14	C16929	2575TN	16	C16994	2075TA	9	C19931	3780TC	50	C24186	2645	106
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C16870	2575TN	14	C16935	2575TN	16	C17000	2075TA	10	C19944	3780TC	50	C24192	2645	106
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C39622	HD-3	230	C39689	HG-3	249	C39755	HG-3	248	C39830	HG-4	252	C39898	HMD-2B	221
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C39627	HD-3	230	C39695	HG-3	249	C39760	HG-3	248	C39835	HG-4	252	C39903	HMD-2B	221
C39628	HD-3	230	C39696	HG-3	249	C39761	HG-3	248	C39836	HG-4	252	C39904	HMD-2	220
C39629	HD-3	230	C39697	HG-3	249	C39762	HG-3	248	C39837	HG-4	252	C39905	HMD-2	220
C39630	HD-3	230	C39698	HG-3	249	C39763	HG-3	248	C39838	HG-4	252	C39906	HMD-2	220
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C74472	2331G	73	C91696	183	150	CL70374501316	3745	95			
C74473	2331G	73	C91697	183	150	CL70374501516	3745	95			
C74474	2331G	73	C91698	183	150	CL70374510000	3745	95			
C74475	2331G	73	C91699	183	150	CL70374510104	3745	95			

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Decimal Equivalents

DRILL SIZE	DECIMAL INCHES	DRILL SIZE	DECIMAL INCHES	DRILL SIZE	DECIMAL INCHES	DRILL SIZE	DECIMAL INCHES	DRILL SIZE	DECIMAL INCHES	DRILL SIZE	DECIMAL INCHES
0.30mm	.0118	1.40mm	.0551	3.20mm	.1260	7/32	.2188	8.60mm	.3386	37/64	.5781
0.32mm	.0126	1.45mm	.0571	30	.1285	5.60mm	.2205	R	.3390	14.75mm	.5807
80	.0135	1.50mm	.0591	3.30mm	.1299	2	.2210	8.70mm	.3425	15.00mm	.5906
0.35mm	.0138	53	.0595	3.40mm	.1339	5.70mm	.2244	11/32	.3438	19/32	.5938
79	.0145	1.55mm	.0610	29	.1360	1	.2280	8.80mm	.3465	15.25mm	.6004
0.38mm	.0150	1/16	.0625	3.50mm	.1378	5.80mm	.2283	S	.3480	39/64	.6094
1/64	.0156	1.60mm	.0630	28	.1405	5.90mm	.2323	8.90mm	.3504	15.50mm	.6102
0.40mm	.0157	52	.0635	9/64	.1406	A	.2340	9.00mm	.3543	15.75mm	.6201
78	.0160	1.65mm	.0650	3.60mm	.1417	15/64	.2344	T	.3580	5/8	.6250
0.42mm	.0165	1.70mm	.0669	27	.1440	6.00mm	.2362	9.10mm	.3583	16.00mm	.6299
0.45mm	.0177	51	.0670	3.70mm	.1457	B	.2380	23/64	.3594	16.25mm	.6398
77	.0180	1.75mm	.0689	26	.1470	6.10mm	.2402	9.20mm	.3622	41/64	.6406
0.48mm	.0189	50	.0700	25	.1495	C	.2420	9.30mm	.3661	16.50mm	.6496
0.50mm	.0197	1.80mm	.0709	3.80mm	.1496	6.20mm	.2441	U	.3680	21/32	.6562
76	.0200	1.85mm	.0728	24	.1520	D	.2460	9.40mm	.3701	16.75mm	.6594
75	.0210	49	.0730	3.90mm	.1535	6.30mm	.2480	9.50mm	.3740	17.00mm	.6693
0.55mm	.0217	1.90mm	.0748	23	.1540	1/4	.2500	3/8	.3750	43/64	.6719
74	.0225	48	.0760	5/32	.1562	E	.2500	V	.3770	17.25mm	.6791
0.60mm	.0236	1.95mm	.0768	22	.1570	6.40mm	.2520	9.60mm	.3780	11/16	.6875
73	.0240	5/64	.0781	4.00mm	.1575	6.50mm	.2559	9.70mm	.3819	17.50mm	.6890
0.62mm	.0244	47	.0785	21	.1590	F	.2570	9.80mm	.3858	45/64	.7031
72	.0250	2.00mm	.0787	20	.1610	6.60mm	.2598	W	.3860	18.00mm	.7087
0.65mm	.0256	2.05mm	.0807	4.10mm	.1614	G	.2610	9.90mm	.3898	23/32	.7188
71	.0260	46	.0810	4.20mm	.1654	6.70mm	.2638	25/64	.3906	18.50mm	.7283
0.70mm	.0276	45	.0820	19	.1660	17/64	.2656	1.00mm	.3937	47/64	.7344
70	.0280	2.10mm	.0827	4.30mm	.1693	H	.2660	X	.3970	19.00mm	.7480
69	.0292	2.15mm	.0846	18	.1695	6.80mm	.2677	1.20mm	.4016	3/4	.7500
0.75mm	.0295	44	.0860	11/64	.1719	6.90mm	.2717	Y	.4040	49/64	.7656
68	.0310	2.20mm	.0866	17	.1730	I	.2720	13/32	.4062	19.50mm	.7677
1/32	.0312	2.25mm	.0886	4.40mm	.1732	7.00mm	.2756	Z	.4130	25/32	.7812
0.80mm	.0315	43	.0890	16	.1770	J	.2770	10.50mm	.4134	20.00mm	.7874
67	.0320	2.30mm	.0906	4.50mm	.1772	7.10mm	.2795	27/64	.4219	51/64	.7969
66	.0330	2.35mm	.0925	15	.1800	K	.2810	10.80mm	.4252	20.50mm	.8071
0.85mm	.0335	42	.0935	4.60mm	.1811	9/32	.2812	11.00mm	.4331	13/16	.8125
65	.0350	3/32	.0938	14	.1820	7.20mm	.2835	7/16	.4375	21.00mm	.8268
0.90mm	.0354	2.40mm	.0945	4.70mm	.1850	7.30mm	.2874	11.20mm	.4409	53/64	.8281
64	.0360	41	.0960	13	.1850	L	.2900	11.50mm	.4528	27/32	.8438
63	.0370	2.45mm	.0965	3/16	.1875	7.40mm	.2913	29/64	.4531	21.50mm	.8465
0.95mm	.0374	40	.0980	12	.1890	M	.2950	11.80mm	.4646	55/64	.8594
62	.0380	2.50mm	.0984	4.8mm	.1890	7.50mm	.2953	15/32	.4688	22.00mm	.8661
61	.0390	39	.0995	11	.1910	19/64	.2969	12.00mm	.4724	7/8	.8750
1.00mm	.0394	38	.1015	4.90mm	.1929	7.60mm	.2992	12.20mm	.4803	22.50mm	.8858
60	.0400	2.60mm	.1024	10	.1935	N	.3020	31/64	.4844	57/64	.8906
59	.0410	37	.1040	9	.1960	7.70mm	.3031	12.50mm	.4921	23.00mm	.9055
1.05mm	.0413	2.70mm	.1063	5.00mm	.1969	7.80mm	.3071	1/2	.5000	29/32	.9062
58	.0420	36	.1065	8	.1990	7.90mm	.3110	12.80mm	.5039	59/64	.9219
57	.0430	7/64	.1094	5.10mm	.2008	5/16	.3125	13.00mm	.5118	23.50mm	.9252
1.10mm	.0433	35	.1100	7	.2010	8.00mm	.3150	33/64	.5156	15/16	.9375
1.15mm	.0453	2.80mm	.1102	13/64	.2031	O	.3160	13.20mm	.5197	24.00mm	.9449
56	.0465	34	.1110	6	.2040	8.10mm	.3189	17/32	.5312	61/64	.9531
3/64	.0469	33	.1130	5.20mm	.2047	8.20mm	.3228	13.50mm	.5315	24.50mm	.9646
1.20mm	.0472	2.90mm	.1142	5	.2055	P	.3230	13.80mm	.5433	31/32	.9688
1.25mm	.0492	32	.1160	5.30mm	.2087	8.30mm	.3268	35/64	.5469	25.00mm	.9843
1.30mm	.0512	3.00mm	.1181	4	.2090	21/64	.3281	14.00mm	.5512	63/64	.9844
55	.0520	31	.1200	5.40mm	.2126	8.40mm	.3307	14.25mm	.5610	1	1.0000
1.35mm	.0531	3.10mm	.1220	3	.2130	Q	.3320	9/16	.5625		
54	.0550	1/8	.1250	5.50mm	.2165	8.50mm	.3346	14.50mm	.5709		

FRACTIONAL - RED

WIRE GAGE - PURPLE

LETTER - BLUE

METRIC - GREEN



Metalcutting Safety (read this before using CLEVELAND products)

Modern metalcutting operations involve high energy, high spindle or cutter speeds, and high temperatures and cutting forces. Hot, flying chips may be projected from the workpiece during metalcutting. Although advanced cutting tool materials are designed and manufactured to withstand the high cutting forces and temperatures that normally occur in these operations, they are susceptible to fragmenting in service, particularly if they are subjected to over-stress, severe impact or otherwise abused. Therefore, precautions should be taken to adequately protect workers, observers and equipment against hot, flying chips, fragmented cutting tools, broken workpieces or other similar projectiles. Machines should be fully guarded and personal protective equipment should be used at all times.

When grinding advanced cutting tool materials, a suitable means for collection and disposal of dust, mist or sludge should be provided. Overexposure to dust or mist containing metallic particles can be hazardous to health particularly if exposure continues over an extended period of time and may cause eye, skin and mucous membrane irritation and temporary or permanent respiratory disease. Certain existing pulmonary and skin conditions may be aggravated by exposure to dust or mist. Adequate ventilation, respiratory protection and eye protection should be provided when grinding and workers should avoid breathing of and prolonged skin contact with dust or mist. General Industry

Safety and Health Regulations, Part 1910. U.S. Department of Labor, published in Title 29 of the Code of Federal Regulations should be consulted. Obtain from CLEVELAND and read the applicable Material Safety Data Sheet before grinding.

Cutting tools are only one part of the worker-machine-tool system. Many variables exist in machining operations, including the metal removal rate; the workpiece size, shape, strength and rigidity; the chucking and fixturing; the load carrying capability of centers; the cutter and spindle speed and torque limitations; the holder and boring bar overhang; the available power; and the condition of the tooling and the machine. A safe metalcutting operation must take all of these variables, and others, into consideration.

CLEVELAND has no control over the end use of its products or the environment into which those products are placed. CLEVELAND urges that its customers adhere to the recommended standards of use of their metalcutting machines and tools, and that they follow procedures that ensure safe metalcutting operations. The information included throughout this catalog under the heading "Technical Data" and other recommendations on machining practices referred to herein are only advisory in nature and do not constitute representations or warranties and are not necessarily appropriate for any particular work environment or application.



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