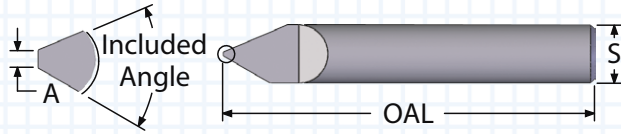


ENGRAVING TOOLS - SOLID CARBIDE



- The tool tip (A) is held to ± 0.001 inch tolerance
- ALTiN+ coating extends tool life
- Made with premium submicron carbide

INCLUDED ANGLE	"S" SHANK DIA.	OAL	"A" TIP DIA.	ORDER #		EDP #	
				UNCOATED	ALTiN+	UNCOATED	ALTiN+
30°	0.1250	1.50	0.005	EN125-30	EN125-30A	500804	500894
30°	0.1875	2.00	0.007	EN187-30	EN187-30A	500819	500909
30°	0.2500	2.50	0.009	EN250-30	EN250-30A	500834	500924
30°	0.3125	2.50	0.011	EN312-30	EN312-30A	500849	500939
30°	0.3750	2.50	0.013	EN375-30	EN375-30A	500864	500954
30°	0.5000	3.00	0.015	EN500-30	EN500-30A	500879	500969
40°	0.1250	1.50	0.005	EN125-40	EN125-40A	500807	500897
40°	0.1875	2.00	0.007	EN187-40	EN187-40A	500822	500912
40°	0.2500	2.50	0.009	EN250-40	EN250-40A	500837	500927
40°	0.3125	2.50	0.011	EN312-40	EN312-40A	500852	500942
40°	0.3750	2.50	0.013	EN375-40	EN375-40A	500867	500957
40°	0.5000	3.00	0.015	EN500-40	EN500-40A	500882	500972
60°	0.1250	1.50	0.005	EN125-60	EN125-60A	500810	500900
60°	0.1875	2.00	0.007	EN187-60	EN187-60A	500825	500915
60°	0.2500	2.50	0.009	EN250-60	EN250-60A	500840	500930
60°	0.3125	2.50	0.011	EN312-60	EN312-60A	500855	500945
60°	0.3750	2.50	0.013	EN375-60	EN375-60A	500870	500960
60°	0.5000	3.00	0.015	EN500-60	EN500-60A	500885	500975
90°	0.1250	1.50	0.005	EN125-90	EN125-90A	500813	500903
90°	0.1875	2.00	0.007	EN187-90	EN187-90A	500828	500918
90°	0.2500	2.50	0.009	EN250-90	EN250-90A	500843	500933
90°	0.3125	2.50	0.011	EN312-90	EN312-90A	500858	500948
90°	0.3750	2.50	0.013	EN375-90	EN375-90A	500873	500963
90°	0.5000	3.00	0.015	EN500-90	EN500-90A	500888	500978
120°	0.1250	1.50	0.005	EN125-120	EN125-120A	500801	500891
120°	0.1875	2.00	0.007	EN187-120	EN187-120A	500816	500906
120°	0.2500	2.50	0.009	EN250-120	EN250-120A	500831	500921
120°	0.3125	2.50	0.011	EN312-120	EN312-120A	500846	500936
120°	0.3750	2.50	0.013	EN375-120	EN375-120A	500861	500951
120°	0.5000	3.00	0.015	EN500-120	EN500-120A	500876	500966

THREAD MILLS

SINGLE POINT

INDEXABLE TOOLS

PORT - CAVITY

SPECIALTY END MILLS
ENGRAVER

SPECIALTY TOOL - HELICAL CHAMFER MILL

TECHNICAL INFORMATION

MATERIAL	ROCKWELL HARDNESS	SPEED (SFM) UNCOATED	SPEED (SFM) AITiN+	FEED (Inches per tooth)							
				CALCULATED CUTTING DIAMETER							
				<.125	.125-.1875	.1875-.250	.250-.3125	.3125-.375	.375-.500	.500-.625	.625-.750
Gray Cast Iron	85Rb	250	450	0.0012	0.0022	0.0035	0.0045	0.0050	0.0055	0.0070	0.0090
Ductile Cast Iron	85Rb	180	375	0.0007	0.0015	0.0020	0.0028	0.0035	0.0040	0.0055	0.0070
Carbon Steel	18Rc	225	450	0.0007	0.0015	0.0022	0.0028	0.0035	0.0045	0.0055	0.0070
Alloy Steel	20Rc	200	400	0.0006	0.0012	0.0020	0.0025	0.0030	0.0040	0.0050	0.0060
Heat Treated Alloys	40Rc	100	200	0.0003	0.0007	0.0010	0.0012	0.0018	0.0020	0.0028	0.0035
Tool Steel	20Rc	150	325	0.0006	0.0010	0.0018	0.0022	0.0028	0.0035	0.0045	0.0055
300 Stainless Steel	80Rb	120	250	0.0005	0.0009	0.0015	0.0018	0.0022	0.0028	0.0035	0.0045
400 Stainless Steel	95Rb	140	325	0.0004	0.0009	0.0012	0.0018	0.0022	0.0025	0.0035	0.0045
Nickel Alloy	20Rc	120	175	0.0005	0.0009	0.0012	0.0018	0.0022	0.0028	0.0035	0.0045
Cobalt Alloy	20Rc	140	225	0.0003	0.0006	0.0009	0.0012	0.0015	0.0018	0.0022	0.0030
Titanium	25Rc	160	250	0.0005	0.0009	0.0012	0.0018	0.0022	0.0028	0.0035	0.0045
Aluminum	60Rb	1000	1900	0.0010	0.0028	0.0040	0.0055	0.0070	0.0080	0.0110	0.0130
Brass, Zinc, Copper	41Rb	320	600	0.0008	0.0015	0.0022	0.0030	0.0040	0.0045	0.0060	0.0080

Determining the Calculated Cutting Diameter

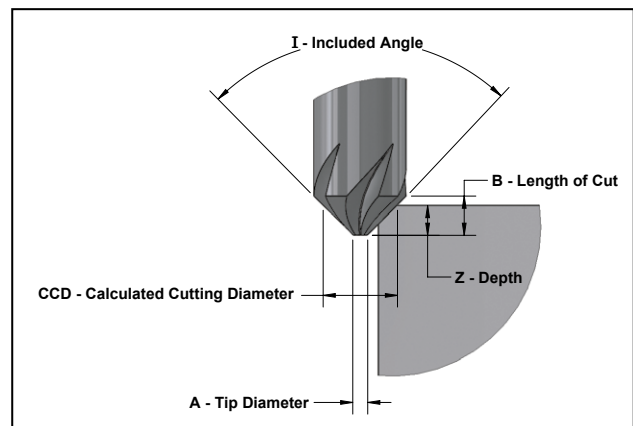
Surface footage and chip load should be calculated at the "Calculated Cutting Diameter" or CCD. The CCD is the largest diameter of the tool that engages the part.

$$\text{Calculated Cutting Diameter} = 2 \times \text{Depth} \times \tan(\text{Included Angle} / 2) + \text{Tip Diameter}$$

$$\text{CCD} = 2 \times Z \times \tan(I/2) + A$$

Choose a "Z - Depth" based on the "B - Length of Cut" of the selected tool. This should result in the part only contacting the included angle of the tool. The part should never touch the shank or tip of the tool. Using a Z - Depth that results in a larger CCD (closer to the shank) is preferred over a smaller CCD (closer to the tip). Find tool dimensions in chart on the product page.

RPM and IPM should be calculated using the Calculated Cutting Diameter.



Example:

Tool: HC50003-090A

I - Included Angle: 90°

A - Tip Diameter: 0.080"

B - Length of Cut: 0.210"

Chosen Z - Depth: 0.200"

Calculation:

$$\text{CCD} = 2 \times Z \times \tan(I/2) + A$$

$$\text{CCD} = 2 \times 0.200" \times \tan(90^\circ/2) + 0.080"$$

$$\text{CCD} = 0.480"$$

SPECIALTY TOOL - CORNER ROUNDING END MILL FEED AND SPEED CHART

MATERIAL	ROCKWELL HARDNESS	SPEED (SFM) UNCOATED	SPEED (SFM) AITiN+	FEED (Inches per tooth)				
				Tool Size				
				CR125	CR187	CR250	CR375	CR500
Cast Iron	85Rb	200	350	0.0004	0.0005	0.0009	0.0015	0.0017
Carbon Steel	18Rc	200	400	0.0004	0.0005	0.0008	0.0013	0.0015
Alloy Steel	20Rc	160	330	0.0003	0.0004	0.0007	0.0012	0.0014
Heat Treated Alloys (38-45Rc)	40Rc	60	100	0.0002	0.0003	0.0004	0.0007	0.0009
Tool Steel	20Rc	125	150	0.0002	0.0003	0.0004	0.0007	0.0009
Stainless Steel	95Rb	120	250	0.0003	0.0004	0.0007	0.0012	0.0014
Titanium	25Rc	110	150	0.0002	0.0003	0.0004	0.0007	0.0009
Aluminum	60Rb	450	750	0.0008	0.0011	0.0017	0.0028	0.0033
Brass, Zinc,	41Rb	300	500	0.0007	0.0010	0.0015	0.0025	0.0030

SPECIALTY TOOL - ENGRAVING TOOL FEED AND SPEED CHART

MATERIAL	RPM	FEED (Inches per tooth)									
		INCLUDED ANGLE									
		30°		40°		60°		90°		120°	
		SHANK DIAMETER									
		.125-.187	.250-.500	.125-.187	.250-.500	.125-.187	.250-.500	.125-.187	.250-.500	.125-.187	.250-.500
Cast Iron	6000+	0.0011	0.0014	0.0012	0.0016	0.0016	0.0020	0.0017	0.0022	0.0019	0.0024
Carbon Steel	6000+	0.0006	0.0008	0.0007	0.0009	0.0009	0.0012	0.0010	0.0013	0.0011	0.0014
Alloy Steel	6000+	0.0005	0.0006	0.0005	0.0007	0.0007	0.0009	0.0007	0.0009	0.0008	0.0010
Heat Treated Alloys	6000+	0.0002	0.0003	0.0003	0.0004	0.0004	0.0005	0.0004	0.0005	0.0004	0.0006
Tool Steel	6000+	0.0004	0.0005	0.0005	0.0006	0.0006	0.0008	0.0007	0.0008	0.0007	0.0009
Stainless Steel	6000+	0.0005	0.0007	0.0006	0.0008	0.0008	0.0010	0.0008	0.0011	0.0009	0.0012
Titanium	6000+	0.0005	0.0007	0.0006	0.0008	0.0008	0.0010	0.0008	0.0011	0.0009	0.0012
Aluminum	6000+	0.0011	0.0014	0.0012	0.0016	0.0016	0.0020	0.0017	0.0022	0.0019	0.0024
Plastics	6000+	0.0016	0.0021	0.0019	0.0024	0.0024	0.0030	0.0026	0.0033	0.0028	0.0036

Suggested chip loads reflect engraving depths up to .010". For depths of cut between .010"-.015", reduce suggested chip loads by 20%. For depths of cut between .015"-.020", reduce suggested chip load by 30%.

Ramping into the part is preferred but if plunge milling into the part, reduce suggested chip load by 50%.