

ICE

Innovative Custom Engineering

SOLID CARBIDE END MILLS

2023/2024





Carbide End Mills engineered to the highest quality with the best raw material & coatings for demanding applications. High tech geometries manufactured on the most state of the art 5 Axis CNC Grinders in the world. Extremely rigid quality control to assure the tightest tolerances & consistency.

ECO ECONOMY

- General Purpose
- 30 deg Helix Carbide with honed edges
- 10% Micrograin Carbide
- Diameter Tolerances: +0.0000"/-0.0020"

P	●	Steel
M	○	Stainless Steel
K	●	Cast Iron
N	○	Non-Ferrous
S	○	High Temp. Alloys
H		Hardened Steel
● GOOD ○ OK ○ NOT OPTIMAL		



PER PERFORMANCE

- Special Helix Design with honed edges
- Variable Pitch to reduce chatter with special core design
- 10% Micrograin Carbide
- Diameter Tolerances: +0.0000"/-0.0020"

P	●	Steel
M	○	Stainless Steel
K	●	Cast Iron
N	○	Non-Ferrous
S	○	High Temp. Alloys
H		Hardened Steel
● BETTER ○ OK ○ NOT OPTIMAL		

PRO PROFESSIONAL

- Special Helix Design with honed edges
- Variable Pitch to reduce chatter with special core design
- 10% Ultra High Performance Micrograin Carbide with extremely high Transverse Rupture strength
- Diameter Tolerances: +0.0000"/-0.0015"

P	●	Steel
M	●	Stainless Steel
K	●	Cast Iron
N	○	Non-Ferrous
S	●	High Temp. Alloys
H	○	Hardened Steel
● BEST ○ OK ○ NOT OPTIMAL		

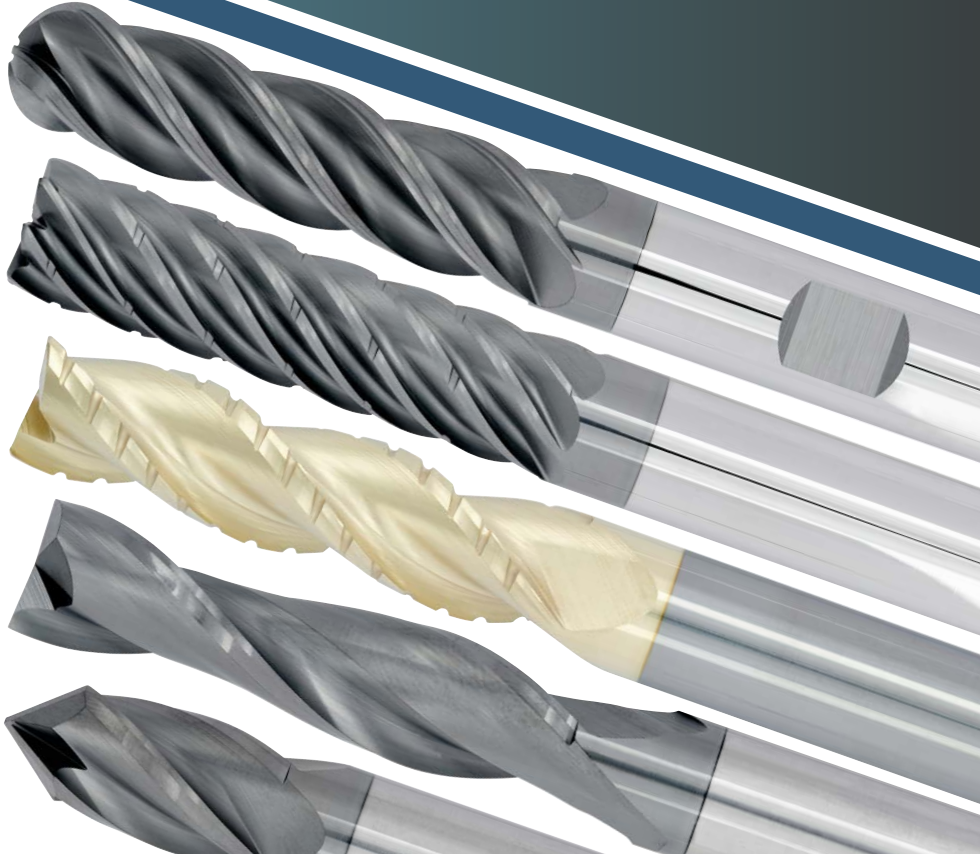
NFE NON-FERROUS

- Special Helix Design with Cylindrical Margin for improved stability in Aluminum & Non-Ferrous materials
- Variable Pitch to reduce chatter with special core design & chip breaker flute geometry
- Ultra High Performance Micrograin Carbide with special High Polished Finish to prevent built up edge
- Diameter Tolerances: +0.0000"/-0.0004"

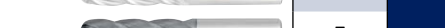
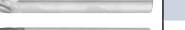
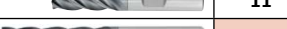
P		Steel
M		Stainless Steel
K		Cast Iron
N	●	Non-Ferrous
S		High Temp. Alloys
H		Hardened Steel
● BEST		

COATINGS:

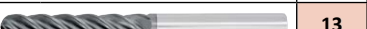
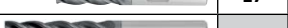
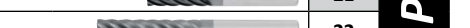
- **TiALN** (Titanium Aluminum Nitride) - Violet Color; Provides the benefits of high abrasion & heat resistance to improve tool life
- **ALL4** (Aluminum Chromium Titanium Nitride) - Grey Color; Ultra High Performance coating with extreme heat, abrasion & wear resistance in ferrous applications
- **ZrN** (Zirconium Nitride) - Pale Gold Color; Provides high lubricity for machining aluminum & non-ferrous materials
- **DLC** (Diamond Like Carbon) - Black Color; Extremely hard with very high wear resistance for finish machining aluminum, non-ferrous & composite materials



END MILL SERIES LISTING

Series	Description	Flutes		Pages	
ECO	Standard Carbide, Stub Length , Square, Single End Uncoated	2,3,4		1	ECONOMY
ECO	Standard Carbide, Stub Length , Square, Single End, TiALN coated	2,3,4		1	
ECO	Standard Carbide, Regular Length , Square, Single End Uncoated	2,3,4		1,2	
ECO	Standard Carbide, Regular Length , Square, Single End, TiALN coated	2,3,4		1,2	
ECO	Standard Carbide, Long Length , Square, Single End Uncoated	2,4		3	
ECO	Standard Carbide, Long Length , Square, Single End, TiALN coated	2,4		3	
ECO	Standard Carbide, Extra Long Length , Square, Single End Uncoated	2,4		3	
ECO	Standard Carbide, Extra Long Length , Square, Single End, TiALN coated	2,4		3	
ECO	Standard Carbide, Stub Length , Ball Nose, Single End Uncoated	2,3,4		5	
ECO	Standard Carbide, Stub Length , Ball Nose, Single End, TiALN coated	2,3,4		5	
ECO	Standard Carbide, Regular Length , Ball Nose, Single End Uncoated	2,3,4		5,6	
ECO	Standard Carbide, Regular Length , Ball Nose, Single End, TiALN coated	2,3,4		5,6	
ECO	Standard Carbide, Long Length , Ball Nose, Single End Uncoated	2,4		7	
ECO	Standard Carbide, Long Length , Ball Nose, Single End, TiALN coated	2,4		7	
ECO	Standard Carbide, Extra Long Length , Ball Nose, Single End Uncoated	2,4		7	
ECO	Standard Carbide, Extra Long Length , Ball Nose, Single End, TiALN coated	2,4		7	
ECO	Standard Carbide, Stub Length , Square, Double End Uncoated	2,4		8	
ECO	Standard Carbide, Stub Length , Square, Double End, TiALN coated	2,4		8	
ECO	Standard Carbide, Stub Length , Ball Nose, Double End Uncoated	2,4		9	
ECO	Standard Carbide, Stub Length , Ball Nose, Double End, TiALN coated	2,4		9	
ECO	Standard Carbide, Regular Length , Square, Double End Uncoated	2,4		8	
ECO	Standard Carbide, Regular Length , Square, Double End, TiALN coated	2,4		8	
ECO	Standard Carbide, Regular Length , Ball Nose, Double End Uncoated	2,4		9	
ECO	Standard Carbide, Regular Length , Ball Nose, Double End, TiALN coated	2,4		9	
ECO	METRIC - Standard Carbide, Regular Length , Square, Single End Uncoated	2,3,4		4	
ECO	METRIC - Standard Carbide, Regular Length , Square, Single End, TiALN coated	2,3,4		4	
ECO	METRIC - Standard Carbide, Long Length , Square, Single End Uncoated	2,4		4	
ECO	METRIC - Standard Carbide, Long Length , Square, Single End, TiALN coated	2,4		4	
ECO	METRIC - Standard Carbide, Extra Long Length , Square, Single End Uncoated	2,4		4	
ECO	METRIC - Standard Carbide, Extra Long Length , Square, Single End, TiALN coated	2,4		4	
ECO	METRIC - Standard Carbide, Regular Length , Ball Nose, Single End Uncoated	2,3,4		7	
ECO	METRIC - Standard Carbide, Regular Length , Ball Nose, Single End, TiALN coated	2,3,4		7	
ECO	Drill/Mill 90 Degree - Standard Carbide Uncoated	2,4		3	
ECO	Drill/Mill 90 Degree - Standard Carbide TiALN coated	2,4		3	
ECO	Engraving Tool - Standard Carbide TiALN coated, 30 Degree	1		8	
ECO	Spot Drill - Standard Carbide TiALN coated, 145 Degree Point	2		9	
Speeds & Feed Chart - ECONOMY				10	PERFORMANCE
PER	Performance Variable Pitch, Stub Length , Round Shk- TiALN	4		11	
PER	Performance Variable Pitch, Stub Length , Weldon Shk- TiALN	4		11	
PER	Performance Variable Pitch, Regular Length , Round Shk- TiALN <i>NEW</i>	4,5		11	
PER	Performance Variable Pitch, Regular Length , Weldon Shk- TiALN	4		11	
PER	Performance Variable Pitch, Long Length , Round Shk- TiALN <i>NEW</i>	4,5		12	
PER	Performance Variable Pitch, Long Length , Weldon Shk- TiALN	4		12	
PER	Performance Variable Pitch, Extra Long Length , Round Shk- TiALN <i>NEW</i>	4,5		12	
PER	Performance Variable Pitch, Regular Length , Ball Nose, Round Shk- TiALN	4		13	
PER	Performance Variable Pitch, Regular Length , Ball Nose, Weldon Shk- TiALN	4		13	

END MILL SERIES LISTING

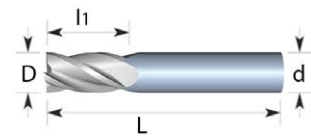
Series	Description	Flutes		Pages	
PER	Performance Variable Pitch, Long Length , Ball Nose, Round Shk- TiALN	4		13	PROFESSIONAL
PER	Performance Variable Pitch, Long Length , Ball Nose, Weldon Shk- TiALN	4		13	
PER	Performance Variable Pitch, Extra Long Length , Ball Nose, Round Shk- TiALN	4		13	
PER	Performance Variable Pitch, Long Reach Neck Relief , Round Shk- TiALN	4		14	
PER	Performance Variable Pitch, Long Reach Neck Relief , Ball Nose, Round Shk- TiALN	4		14	
Speeds & Feed Chart - PERFORMANCE				15	
PRO	Professional Variable Pitch, Stub Length , Round Shk- TiALN	4		17	PROFESSIONAL
PRO	Professional Variable Pitch, Stub Length , Weldon Shk- TiALN	4		17	
PRO	Professional Variable Pitch, Regular Length , Round Shk- TiALN <i>NEW</i>	4,5		17	
PRO	Professional Variable Pitch, Regular Length , Weldon Shk- TiALN	4		17	
PRO	Professional Variable Pitch, Long Length , Round Shk- TiALN <i>NEW</i>	4,5		18	
PRO	Professional Variable Pitch, Long Length , Weldon Shk- TiALN	4		18	
PRO	Professional Variable Pitch, Extra Long Length , Round Shk- TiALN <i>NEW</i>	4,5		18	
PRO	Professional Variable Pitch, Regular Length , Ball Nose, Round Shk- TiALN	4		19	
PRO	Professional Variable Pitch, Regular Length , Ball Nose, Weldon Shk- TiALN	4		19	
PRO	Professional Variable Pitch, Long Length , Ball Nose, Round Shk- TiALN	4		19	
PRO	Professional Variable Pitch, Long Length , Ball Nose, Weldon Shk- TiALN	4		19	
PRO	Professional Variable Pitch, Extra Long Length , Ball Nose, Round Shk- TiALN	4		19	
PRO	Professional Variable Pitch, Regular Length HEM , Round Shk- ALL4 <i>NEW</i>	5,6,7		21	
PRO	Professional Variable Pitch, Long Length HEM , Round Shk- ALL4 <i>NEW</i>	5,7		22	
PRO	Professional Variable Pitch, Extra Long Length HEM , Round Shk- ALL4 <i>NEW</i>	5,7		22	
PRO	Professional Variable Pitch, Regular Length HEM , Round Shk- ALL4 Chipbreaker <i>NEW</i>	5,7		21	
PRO	Professional Variable Pitch, Long Length HEM , Round Shk- ALL4 Chipbreaker <i>NEW</i>	5,7		22	
PRO	Professional Variable Pitch, Extra Long Length HEM , Round Shk- ALL4 Chipbreaker <i>NEW</i>	5,7		22	
Speeds & Feed Chart - PROFESSIONAL				20 & 24	
NFE	Medium/Finishing Variable Pitch & Helix, Regular Length , Uncoated - ALUMINUM	2,3		26	NON-FERROUS
NFE	Medium/Finishing Variable Pitch & Helix, Regular Length , ZrN Coated - ALUMINUM	2,3		26	
NFE	Medium/Finishing Variable Pitch & Helix, Regular Length , DLC Coated - ALUMINUM	2,3		26	
NFE	Medium/Finishing Variable Pitch & Helix, Long Length , Uncoated - ALUMINUM	2,3		26	
NFE	Medium/Finishing Variable Pitch & Helix, Long Length , ZrN Coated - ALUMINUM	2,3		26	
NFE	Medium/Finishing Variable Pitch & Helix, Extra Long Length , Uncoated - ALUMINUM	2,3		26	
NFE	Medium/Finishing Variable Pitch & Helix, Extra Long Length , ZrN Coated - ALUMINUM	2,3		26	
NFE	Medium/Finishing Variable Pitch & Helix, Regular Length , Ball Nose Uncoated - ALUMINUM	2,3		27	
NFE	Medium/Finishing Variable Pitch & Helix, Regular Length , Ball Nose ZrN Coated - ALUMINUM	2,3		27	
NFE	Medium/Finishing Variable Pitch & Helix, Long Length , Ball Nose Uncoated - ALUMINUM	2,3		27	
NFE	Medium/Finishing Variable Pitch & Helix, Long Length , Ball Nose ZrN Coated - ALUMINUM	2,3		27	
NFE	Medium/Finishing Variable Pitch & Helix, Extra Long Length , Ball Nose Uncoated - ALUMINUM	2,3		27	
NFE	Medium/Finishing Variable Pitch & Helix, Extra Long Length , Ball Nose ZrN Coated - ALUMINUM	2,3		27	
NFE	Medium/Roughing Variable Pitch, Regular Length , Uncoated - ALUMINUM	3		25	
NFE	Medium/Roughing Variable Pitch, Regular Length , ZrN Coated - ALUMINUM	3		25	
NFE	Medium/Roughing Variable Pitch, Long Length , Uncoated - ALUMINUM	3		25	
NFE	Medium/Roughing Variable Pitch, Long Length , ZrN Coated - ALUMINUM	3		25	
NFE	Medium/Roughing Variable Pitch, Regular Length , Uncoated Chipbreaker - ALUMINUM	3		25	
NFE	Medium/Roughing Variable Pitch, Regular Length , ZrN Coated Chipbreaker - ALUMINUM	3		25	
NFE	Medium/Roughing Variable Pitch, Long Length , Uncoated Chipbreaker - ALUMINUM	3		25	
NFE	Medium/Roughing Variable Pitch, Long Length , ZrN Coated Chipbreaker - ALUMINUM	3		25	
Speeds & Feed Chart - NON-FERROUS				28	



P	●	Steel
M	○	Stainless Steel
K	●	Cast Iron
N	○	Non-Ferrous
S	○	High Temp. Alloys
H	○	Hardened Steel
● GOOD ○ OK ○ NOT OPTIMAL		

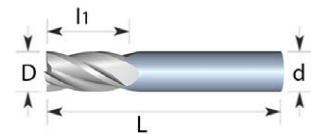
- 30 deg Helix Carbide with honed edges
- 10% Micrograin Carbide
- Diameter (D) Tolerance: +0.0000"/-0.0020"
- Shank (d) Tolerance: +0.0000"/-0.0004"

ECONOMY



Square End, Standard Carbide, Stub Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated				TiAlN Coated			
				2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price
1/32	1/8	1/16	1-1/2	ICE786324	ICE786325	ICE786326	\$6.51	ICE786420	ICE786421	ICE786422	\$8.45
3/64	1/8	3/32	1-1/2	ICE786327	ICE786328	ICE786329	\$6.51	ICE786423	ICE786424	ICE786425	\$8.45
1/16	1/8	1/8	1-1/2	ICE786330	ICE786331	ICE786332	\$5.21	ICE786426	ICE786427	ICE786428	\$7.15
3/32	1/8	3/16	1-1/2	ICE786333	ICE786334	ICE786335	\$4.57	ICE786429	ICE786430	ICE786431	\$6.49
1/8	1/8	1/4	1-1/2	ICE786339	ICE786340	ICE786341	\$4.34	ICE786435	ICE786436	ICE786437	\$6.28
5/32	3/16	5/16	2	ICE786342	ICE786343	ICE786344	\$9.66	ICE786438	ICE786439	ICE786440	\$12.49
3/16	3/16	3/8	2	ICE786345	ICE786346	ICE786347	\$9.34	ICE786441	ICE786442	ICE786443	\$12.15
7/32	1/4	7/16	2	ICE786348	ICE786349	ICE786350	\$11.28	ICE786444	ICE786445	ICE786446	\$16.33
1/4	1/4	1/2	2	ICE786351	ICE786352	ICE786353	\$9.23	ICE786447	ICE786448	ICE786449	\$14.28
5/16	3/8	1/2	2	ICE786354	ICE786355	ICE786356	\$12.47	ICE786450	ICE786451	ICE786452	\$19.60
3/8	3/8	5/8	2	ICE786357	ICE786358	ICE786359	\$15.85	ICE786453	ICE786454	ICE786455	\$22.95
7/16	7/16	5/8	2-1/2	ICE786360	ICE786361	ICE786362	\$21.70	ICE786456	ICE786457	ICE786458	\$31.89
1/2	1/2	5/8	2-1/2	ICE786363	ICE786364	ICE786365	\$27.13	ICE786459	ICE786460	ICE786461	\$37.30
5/8	5/8	3/4	3	ICE786366	ICE786367	ICE786368	\$55.34	ICE786462	ICE786463	ICE786464	\$71.22
3/4	3/4	1	3	ICE786369	ICE786370	ICE786371	\$77.04	ICE786465	ICE786466	ICE786467	\$95.18
1	1	1	3	ICE786336	ICE786337	ICE786338	\$136.59	ICE786432	ICE786433	ICE786434	\$170.62



Square End, Standard Carbide, Regular Length, Single End

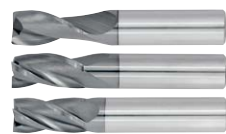
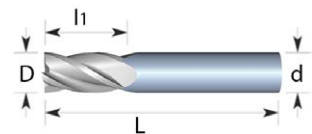
Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated				TiAlN Coated			
				2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price
1/32	1/8	3/32	1-1/2	ICE786471	ICE786472	ICE786473	\$6.85	ICE786867	ICE786868	ICE786869	\$8.88
3/64	1/8	1/8	1-1/2	ICE786474	ICE786475	ICE786476	\$6.85	ICE786870	ICE786871	ICE786872	\$8.88
1/16	1/8	3/16	1-1/2	ICE786477	ICE786478	ICE786479	\$5.48	ICE786873	ICE786874	ICE786875	\$7.51
5/64	1/8	1/4	1-1/2	ICE786480	ICE786481	ICE786482	\$5.14	ICE786876	ICE786877	ICE786878	\$7.31
3/32	1/8	3/8	1-1/2	ICE786483	ICE786484	ICE786485	\$4.80	ICE786879	ICE786880	ICE786881	\$6.83
7/64	1/8	3/8	1-1/2	ICE786490	ICE786491	ICE786492	\$4.80	ICE786886	ICE786887	ICE786888	\$6.85
1/8	1/8	1/2	1-1/2	ICE786493	ICE786494	ICE786495	\$4.57	ICE786889	ICE786890	ICE786891	\$6.60
9/64	3/16	9/16	2	ICE786497	ICE786498	ICE786499	\$10.62	ICE786893	ICE786894	ICE786895	\$14.14
5/32	3/16	9/16	2	ICE786500	ICE786501	ICE786502	\$10.16	ICE786896	ICE786897	ICE786898	\$13.13
11/64	3/16	9/16	2	ICE786503	ICE786504	ICE786505	\$10.62	ICE786899	ICE786900	ICE786901	\$13.66
3/16	3/16	5/8	2	ICE786506	ICE786507	ICE786508	\$9.82	ICE786902	ICE786903	ICE786904	\$12.79
13/64	1/4	5/8	2-1/2	ICE786510	ICE786511	ICE786512	\$13.45	ICE786906	ICE786907	ICE786908	\$18.89
7/32	1/4	5/8	2-1/2	ICE786513	ICE786514	ICE786515	\$11.88	ICE786909	ICE786910	ICE786911	\$17.20
15/64	1/4	3/4	2-1/2	ICE786516	ICE786517	ICE786518	\$13.45	ICE786912	ICE786913	ICE786914	\$18.64
1/4	1/4	3/4	2-1/2	ICE786519	ICE786520	ICE786521	\$9.71	ICE786915	ICE786916	ICE786917	\$15.03



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● GOOD ○ OK ○ NOT OPTIMAL		

- 30 deg Helix Carbide with honed edges
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- Diameter (D) Tolerance: +0.0000"/-0.0020"
- Shank (d) Tolerance: +0.0000"/-0.0004"

ECONOMY



Square End, Standard Carbide, Regular Length, Single End

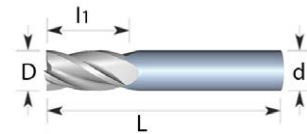
Cutter Diam. D	Shank Diam. d	Length Of Cut l ₁	O.A.L. L	Uncoated				TiAlN Coated			
				2 Flute  Part#	3 Flute  Part#	4 Flute  Part#	Price	2 Flute  Part#	3 Flute  Part#	4 Flute  Part#	Price
17/64	5/16	7/8	2-1/2	ICE786523	ICE786524	ICE786525	\$16.10	ICE786919	ICE786920	ICE786921	\$22.77
9/32	5/16	7/8	2-1/2	ICE786526	ICE786527	ICE786528	\$14.73	ICE786922	ICE786923	ICE786924	\$21.20
19/64	5/16	7/8	2-1/2	ICE786529	ICE786530	ICE786531	\$16.10	ICE786925	ICE786926	ICE786927	\$22.02
5/16	5/16	7/8	2-1/2	ICE786532	ICE786533	ICE786534	\$13.13	ICE786928	ICE786929	ICE786930	\$20.63
21/64	3/8	7/8	2-1/2	ICE786536	ICE786537	ICE786538	\$18.62	ICE786932	ICE786933	ICE786934	\$27.23
11/32	3/8	7/8	2-1/2	ICE786539	ICE786540	ICE786541	\$17.13	ICE786935	ICE786936	ICE786937	\$24.62
23/64	3/8	7/8	2-1/2	ICE786542	ICE786543	ICE786544	\$18.62	ICE786938	ICE786939	ICE786940	\$24.83
3/8	3/8	1	2-1/2	ICE786545	ICE786546	ICE786547	\$16.67	ICE786941	ICE786942	ICE786943	\$24.17
25/64	7/16	1	2-1/2	ICE786549	ICE786550	ICE786551	\$29.12	ICE786945	ICE786946	ICE786947	\$36.54
13/32	7/16	1	2-1/2	ICE786552	ICE786553	ICE786554	\$28.55	ICE786948	ICE786949	ICE786950	\$35.97
27/64	7/16	1	2-1/2	ICE786555	ICE786556	ICE786557	\$27.41	ICE786951	ICE786952	ICE786953	\$34.49
7/16	7/16	1	2-1/2	ICE786558	ICE786559	ICE786560	\$23.98	ICE786954	ICE786955	ICE786956	\$34.69
29/64	1/2	1	3	ICE786562	ICE786563	ICE786564	\$32.21	ICE786958	ICE786959	ICE786960	\$43.28
15/32	1/2	1	3	ICE786565	ICE786566	ICE786567	\$31.41	ICE786961	ICE786962	ICE786963	\$42.83
31/64	1/2	1	3	ICE786568	ICE786569	ICE786570	\$30.26	ICE786964	ICE786965	ICE786966	\$42.26
1/2	1/2	1	3	ICE786571	ICE786572	ICE786573	\$28.55	ICE786967	ICE786968	ICE786969	\$39.26
1/2	1/2	1-1/4	3			ICE790001	\$28.55			ICE790000	\$39.26
33/64	9/16	1-1/4	3-1/2	ICE786575	ICE786576	ICE786577	\$64.30	ICE786971	ICE786972	ICE786973	\$92.89
17/32	9/16	1-1/4	3-1/2	ICE786578	ICE786579	ICE786580	\$63.84	ICE786974	ICE786975	ICE786976	\$90.91
35/64	9/16	1-1/4	3-1/2	ICE786581	ICE786582	ICE786584	\$60.53	ICE786977	ICE786978	ICE786979	\$85.83
9/16	9/16	1-1/4	3-1/2	ICE786585	ICE786586	ICE786587	\$55.96	ICE786980	ICE786981	ICE786982	\$72.68
37/64	5/8	1-1/4	3-1/2	ICE786589	ICE786590	ICE786591	\$66.47	ICE786984	ICE786985	ICE786986	\$87.39
19/32	5/8	1-1/4	3-1/2	ICE786592	ICE786593	ICE786594	\$63.95	ICE786987	ICE786988	ICE786989	\$85.83
39/64	5/8	1-1/4	3-1/2	ICE786595	ICE786596	ICE786597	\$61.67	ICE786990	ICE786991	ICE786992	\$84.21
5/8	5/8	1-1/4	3-1/2	ICE786598	ICE786599	ICE786600	\$58.24	ICE786993	ICE786994	ICE786995	\$74.96
41/64	3/4	1-1/2	4	ICE786602	ICE786603	ICE786604	\$97.89	ICE786997	ICE786998	ICE786999	\$115.39
21/32	3/4	1-1/2	4	ICE786605	ICE786606	ICE786607	\$97.07	ICE787000	ICE787001	ICE787002	\$113.52
43/64	3/4	1-1/2	4	ICE786608	ICE786609	ICE786610	\$95.93	ICE787003	ICE787004	ICE787005	\$113.29
11/16	3/4	1-1/2	4	ICE786611	ICE786612	ICE786613	\$84.51	ICE787006	ICE787007	ICE787008	\$110.55
45/64	3/4	1-1/2	4	ICE786614	ICE786615	ICE786616	\$90.22	ICE787009	ICE787010	ICE787011	\$112.03
23/32	3/4	1-1/2	4	ICE786617	ICE786618	ICE786619	\$90.22	ICE787012	ICE787013	ICE787014	\$111.23
47/64	3/4	1-1/2	4	ICE786620	ICE786621	ICE786622	\$90.22	ICE787015	ICE787016	ICE787017	\$110.94
3/4	3/4	1-1/2	4	ICE786623	ICE786624	ICE786625	\$81.08	ICE787018	ICE787019	ICE787020	\$100.18
49/64	7/8	1-1/2	4	ICE786627	ICE786628	ICE786629	\$163.31	ICE787022	ICE787023	ICE787024	\$206.02
25/32	7/8	1-1/2	4	ICE786630	ICE786631	ICE786632	\$163.31	ICE787025	ICE787026	ICE787027	\$205.15
51/64	7/8	1-1/2	4	ICE786633	ICE786634	ICE786635	\$163.31	ICE787028	ICE787029	ICE787030	\$204.26
13/16	7/8	1-1/2	4	ICE786636	ICE786637	ICE786638	\$163.31	ICE787031	ICE787032	ICE787033	\$201.00
53/64	7/8	1-1/2	4	ICE786639	ICE786640	ICE786641	\$158.29	ICE787034	ICE787035	ICE787036	\$202.25
27/32	7/8	1-1/2	4	ICE786642	ICE786643	ICE786644	\$158.29	ICE787037	ICE787038	ICE787039	\$201.64
55/64	7/8	1-1/2	4	ICE786645	ICE786646	ICE786647	\$158.29	ICE787040	ICE787041	ICE787042	\$201.00
7/8	7/8	1-1/2	4	ICE786648	ICE786649	ICE786650	\$143.90	ICE787043	ICE787044	ICE787045	\$177.31
57/64	1	1-1/2	4	ICE786652	ICE786653	ICE786654	\$168.11	ICE787047	ICE787048	ICE787049	\$207.80
29/32	1	1-1/2	4	ICE786655	ICE786656	ICE786657	\$168.11	ICE787050	ICE787051	ICE787052	\$206.59
59/64	1	1-1/2	4	ICE786658	ICE786659	ICE786660	\$168.11	ICE787053	ICE787054	ICE787055	\$205.41
15/16	1	1-1/2	4	ICE786661	ICE786662	ICE786663	\$160.80	ICE787056	ICE787057	ICE787058	\$201.00
61/64	1	1-1/2	4	ICE786664	ICE786665	ICE786666	\$160.80	ICE787059	ICE787060	ICE787061	\$199.74
31/32	1	1-1/2	4	ICE786667	ICE786668	ICE786669	\$160.80	ICE787062	ICE787063	ICE787064	\$198.46
63/64	1	1-1/2	4	ICE786670	ICE786671	ICE786672	\$160.80	ICE787065	ICE787066	ICE787067	\$198.26
1	1	1-1/2	4	ICE786486	ICE786487	ICE786488	\$146.18	ICE786882	ICE786883	ICE786884	\$179.60



P	●	Steel
M	◐	Stainless Steel
K	●	Cast Iron
N	○	Non-Ferrous
S		High Temp. Alloys
H		Hardened Steel
● GOOD ◐ OK ○ NOT OPTIMAL		

- 30 deg Helix Carbide with honed edges
- 10% Micrograin Carbide
- Diameter (D) Tolerance: +0.0000"/-0.0020"
- Shank (d) Tolerance: +0.0000"/-0.0004"

ECONOMY



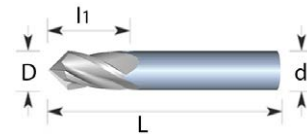
Square End, Standard Carbide, Long Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated				TiALN Coated			
				2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price
1/8	1/8	3/4	2-1/2	ICE787070	--	ICE787071	\$9.48	ICE787114	--	ICE787115	\$12.24
3/16	3/16	3/4	2-1/2	ICE787072	--	ICE787073	\$13.84	ICE787116	--	ICE787117	\$17.50
1/4	1/4	1-1/8	3	ICE787074	--	ICE787075	\$16.56	ICE787118	--	ICE787119	\$21.88
5/16	5/16	1-1/8	3	ICE787076	--	ICE787077	\$20.56	ICE787120	--	ICE787121	\$27.93
3/8	3/8	1-1/8	3	ICE787078	--	ICE787079	\$28.55	ICE787122	--	ICE787123	\$36.04
7/16	7/16	2	4	ICE787080	--	ICE787081	\$45.27	ICE787124	--	ICE787125	\$56.23
1/2	1/2	2	4	ICE787082	--	ICE787083	\$48.92	ICE787126	--	ICE787127	\$62.31
5/8	5/8	2-1/4	5	ICE787086	--	ICE787087	\$89.08	ICE787130	--	ICE787131	\$109.18
3/4	3/4	2-1/4	5	ICE787088	--	ICE787089	\$125.62	ICE787132	--	ICE787133	\$148.51
1	1	2-1/4	5	ICE787068	--	ICE787069	\$194.14	ICE787112	--	ICE787113	\$234.25



Square End, Standard Carbide, Extra Long Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated				TiALN Coated			
				2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price
1/8	1/8	1	3	ICE787139	--	ICE787140	\$14.18	ICE787203	--	ICE787204	\$16.95
3/16	3/16	1-1/8	3	ICE787141	--	ICE787142	\$14.85	ICE787205	--	ICE787206	\$18.50
1/4	1/4	1-1/2	4	ICE787143	--	ICE787144	\$19.41	ICE787207	--	ICE787208	\$26.08
5/16	5/16	1-5/8	4	ICE787147	--	ICE787148	\$23.98	ICE787211	--	ICE787212	\$32.32
3/8	3/8	1-3/4	4	ICE787153	--	ICE787154	\$31.41	ICE787217	--	ICE787218	\$39.74
1/2	1/2	3	6	ICE787157	--	ICE787158	\$76.52	ICE787221	--	ICE787222	\$95.20
5/8	5/8	3	6	ICE787161	--	ICE787162	\$100.50	ICE787225	--	ICE787226	\$123.91
3/4	3/4	3	6	ICE787163	--	ICE787164	\$139.33	ICE787227	--	ICE787228	\$167.10
1	1	3	6	ICE787134	--	ICE787136	\$262.67	ICE787199	--	ICE787200	\$309.42



Drill/Mill 90 Degree, Standard Carbide, Regular Length

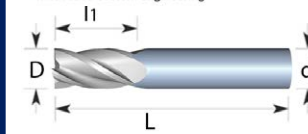
Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated				TiALN Coated			
				2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price
1/8	1/8	1/2	1-1/2	ICE788868	--	ICE788869	\$12.02	ICE788886	--	ICE788887	\$14.54
3/16	3/16	5/8	2	ICE788870	--	ICE788871	\$13.64	ICE788888	--	ICE788889	\$18.19
1/4	1/4	3/4	2-1/2	ICE788872	--	ICE788873	\$16.50	ICE788890	--	ICE788891	\$22.98
5/16	5/16	7/8	2-1/2	ICE788874	--	ICE788875	\$21.37	ICE788892	--	ICE788893	\$29.32
3/8	3/8	1	2-1/2	ICE788876	--	ICE788877	\$25.01	ICE788894	--	ICE788895	\$34.58
7/16	7/16	1	2-3/4	ICE788878	--	ICE788879	\$41.21	ICE788896	--	ICE788897	\$54.52
1/2	1/2	1	3	ICE788880	--	ICE788881	\$44.54	ICE788898	--	ICE788899	\$57.92
5/8	5/8	1-1/4	3-1/2	ICE788882	--	ICE788883	\$77.37	ICE788900	--	ICE788901	\$94.03
3/4	3/4	1-1/2	4	ICE788884	--	ICE788885	\$121.64	ICE788902	--	ICE788903	\$142.03



P	●	Steel
M	◐	Stainless Steel
K	●	Cast Iron
N	○	Non-Ferrous
S		High Temp. Alloys
H		Hardened Steel
● GOOD ◐ OK ○ NOT OPTIMA		

- 30 deg Helix Carbide with honed edges
- 10% Micrograin Carbide
- Diameter (D) Tolerance: +0.0000"/-0.0020"
- Shank (d) Tolerance: +0.0000"/-0.0004"

ECONOMY



METRIC - Square End, Standard Carbide, Regular Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated				TiALN Coated			
				2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price
1	3	3	38	ICE788568	ICE788569	ICE788570	\$9.46	ICE788634	ICE788635	ICE788636	\$11.64
1.5	3	5	38	ICE788571	ICE788572	ICE788573	\$9.36	ICE788637	ICE788638	ICE788639	\$11.64
2	3	6	38	ICE788574	ICE788575	ICE788576	\$7.54	ICE788640	ICE788641	ICE788642	\$9.47
3	3	12	38	ICE788580	ICE788581	ICE788582	\$5.82	ICE788646	ICE788647	ICE788648	\$7.71
3.5	4	12	50	ICE788583	ICE788584	ICE788585	\$10.26	ICE788649	ICE788650	ICE788651	\$12.28
4	4	14	50	ICE788586	ICE788587	ICE788588	\$9.84	ICE788652	ICE788653	ICE788654	\$12.05
4.5	5	14	50	ICE788589	ICE788590	ICE788591	\$10.26	ICE788655	ICE788656	ICE788657	\$12.61
5	5	16	50	ICE788592	ICE788593	ICE788594	\$11.05	ICE788658	ICE788659	ICE788660	\$13.29
6	6	19	63	ICE788595	ICE788596	ICE788597	\$10.85	ICE788661	ICE788662	ICE788663	\$13.37
7	7	19	63	ICE788598	ICE788599	ICE788600	\$15.42	ICE788664	ICE788665	ICE788666	\$17.93
8	8	19	63	ICE788601	ICE788602	ICE788603	\$14.28	ICE788667	ICE788668	ICE788669	\$17.45
9	9	22	70	ICE788604	ICE788605	ICE788606	\$25.63	ICE788670	ICE788671	ICE788672	\$30.08
10	10	22	70	ICE788607	ICE788608	ICE788609	\$22.61	ICE788673	ICE788674	ICE788675	\$27.31
11	11	25	70	ICE788610	ICE788611	ICE788612	\$34.17	ICE788676	ICE788677	ICE788678	\$40.17
12	12	25	75	ICE788613	ICE788614	ICE788615	\$32.16	ICE788679	ICE788680	ICE788681	\$34.93
14	14	30	88	ICE788616	ICE788617	ICE788618	\$52.76	ICE788682	ICE788683	ICE788684	\$60.49
16	16	32	88	ICE788619	ICE788620	ICE788621	\$70.35	ICE788685	ICE788686	ICE788687	\$80.47
18	18	36	100	ICE788622	ICE788623	ICE788624	\$80.40	ICE788688	ICE788689	ICE788690	\$93.08
20	20	38	100	ICE788625	ICE788626	ICE788627	\$96.48	ICE788691	ICE788692	ICE788693	\$110.77
22	22	38	100	ICE788628	ICE788629	ICE788630	\$118.59	ICE788694	ICE788695	ICE788696	\$135.66
25	25	38	100	ICE788631	ICE788632	ICE788633	\$139.33	ICE788697	ICE788698	ICE788699	\$158.75



METRIC - Square End, Standard Carbide, Long Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated				TiALN Coated			
				2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price
3	3	25	75	ICE788788	--	ICE788789	\$10.18	ICE788812	--	ICE788813	\$12.46
4	4	25	75	ICE788790	--	ICE788791	\$14.14	ICE788814	--	ICE788815	\$16.07
5	5	25	75	ICE788792	--	ICE788793	\$14.28	ICE788816	--	ICE788817	\$16.64
6	6	25	75	ICE788794	--	ICE788795	\$17.31	ICE788818	--	ICE788819	\$19.59
8	8	30	100	ICE788796	--	ICE788797	\$20.98	ICE788820	--	ICE788821	\$23.00
10	10	38	100	ICE788798	--	ICE788799	\$36.05	ICE788822	--	ICE788823	\$39.97
12	12	50	100	ICE788800	--	ICE788801	\$50.97	ICE788824	--	ICE788825	\$54.83
14	14	50	125	ICE788802	--	ICE788803	\$81.12	ICE788826	--	ICE788827	\$86.79
16	16	75	150	ICE788804	--	ICE788805	\$105.90	ICE788828	--	ICE788829	\$112.04
18	18	75	150	ICE788806	--	ICE788807	\$135.90	ICE788830	--	ICE788831	\$143.90
20	20	75	150	ICE788808	--	ICE788809	\$186.15	ICE788832	--	ICE788833	\$217.01
25	25	75	150	ICE788810	--	ICE788811	\$263.81	ICE788834	--	ICE788835	\$272.94



METRIC - Square End, Standard Carbide, Extra-Long Length, Single End

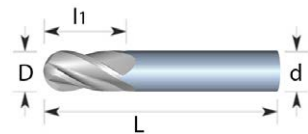
Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated				TiALN Coated			
				2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price
3	3	25	100	ICE788836	--	ICE788837	\$14.77	ICE788852	--	ICE788853	\$17.10
4	4	50	100	ICE788838	--	ICE788839	\$18.31	ICE788854	--	ICE788855	\$21.21
5	5	30	100	ICE788840	--	ICE788841	\$16.09	ICE788856	--	ICE788857	\$18.39
6	6	50	100	ICE788842	--	ICE788843	\$21.76	ICE788858	--	ICE788859	\$24.06
8	8	50	150	ICE788844	--	ICE788845	\$26.16	ICE788860	--	ICE788861	\$29.76
10	10	75	150	ICE788846	--	ICE788847	\$52.53	ICE788862	--	ICE788863	\$56.96
12	12	75	150	ICE788848	--	ICE788849	\$73.02	ICE788864	--	ICE788865	\$77.66
14	14	75	150	ICE788850	--	ICE788851	\$90.69	ICE788866	--	ICE788867	\$96.51



P	●	Steel
M	○	Stainless Steel
K	●	Cast Iron
N	○	Non-Ferrous
S		High Temp. Alloys
H		Hardened Steel
● GOOD ◐ OK ○ NOT OPTIMAL		

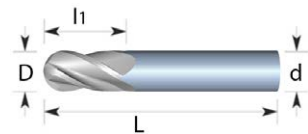
- 30 deg Helix Carbide with honed edges
- 10% Micrograin Carbide
- Diameter (D) Tolerance: +0.0000”/-0.0020”
- Shank (d) Tolerance: +0.0000”/-0.0004”

ECONOMY



Ball Nose, Standard Carbide, Stub Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated				TiAlN Coated			
				2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price
1/32	1/8	1/16	1-1/2	ICE787231	ICE787232	ICE787233	\$9.78	ICE787327	ICE787328	ICE787329	\$11.69
3/64	1/8	3/32	1-1/2	ICE787234	ICE787235	ICE787236	\$9.78	ICE787330	ICE787331	ICE787332	\$11.69
1/16	1/8	1/8	1-1/2	ICE787237	ICE787238	ICE787239	\$8.68	ICE787333	ICE787334	ICE787335	\$10.62
3/32	1/8	3/16	1-1/2	ICE787240	ICE787241	ICE787242	\$8.68	ICE787336	ICE787337	ICE787338	\$10.62
1/8	1/8	1/4	1-1/2	ICE787246	ICE787247	ICE787248	\$6.94	ICE787342	ICE787343	ICE787344	\$8.88
5/32	3/16	5/16	2	ICE787249	ICE787250	ICE787251	\$11.51	ICE787345	ICE787346	ICE787347	\$14.32
3/16	3/16	3/8	2	ICE787252	ICE787253	ICE787254	\$11.51	ICE787348	ICE787349	ICE787350	\$14.32
7/32	1/4	7/16	2	ICE787255	ICE787256	ICE787257	\$14.12	ICE787351	ICE787352	ICE787353	\$19.16
1/4	1/4	1/2	2	ICE787258	ICE787259	ICE787260	\$13.25	ICE787354	ICE787355	ICE787356	\$18.30
5/16	3/8	1/2	2	ICE787261	ICE787262	ICE787263	\$16.92	ICE787357	ICE787358	ICE787359	\$24.05
3/8	3/8	5/8	2	ICE787264	ICE787265	ICE787266	\$20.63	ICE787360	ICE787361	ICE787362	\$27.73
7/16	7/16	5/8	2-1/2	ICE787267	ICE787268	ICE787269	\$31.47	ICE787363	ICE787364	ICE787365	\$41.64
1/2	1/2	5/8	2-1/2	ICE787270	ICE787271	ICE787272	\$34.72	ICE787366	ICE787367	ICE787368	\$45.02
5/8	5/8	3/4	3	ICE787273	ICE787274	ICE787275	\$66.19	ICE787369	ICE787370	ICE787371	\$82.07
3/4	3/4	1	3	ICE787276	ICE787277	ICE787278	\$91.13	ICE787372	ICE787373	ICE787374	\$109.27
1	1	1	3	ICE787243	ICE787244	ICE787245	\$175.53	ICE787339	ICE787340	ICE787341	\$211.85



Ball Nose, Standard Carbide, Regular Length, Single End

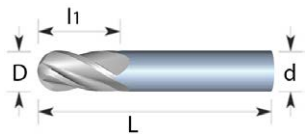
Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated				TiAlN Coated			
				2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price
1/32	1/8	3/32	1-1/2	ICE787378	ICE787379	ICE787380	\$10.28	ICE787761	ICE787762	ICE787763	\$12.31
3/64	1/8	1/8	1-1/2	ICE787381	ICE787382	ICE787383	\$10.28	ICE787764	ICE787765	ICE787766	\$12.31
1/16	1/8	3/16	1-1/2	ICE787384	ICE787385	ICE787386	\$9.14	ICE787767	ICE787768	ICE787769	\$11.17
5/64	1/8	1/4	1-1/2	ICE787387	ICE787388	ICE787389	\$9.14	ICE787770	ICE787771	ICE787772	\$10.42
3/32	1/8	3/8	1-1/2	ICE787390	ICE787391	ICE787392	\$9.14	ICE787773	ICE787774	ICE787775	\$11.17
7/64	1/8	3/8	1-1/2	ICE787396	ICE787397	ICE787398	\$9.14	ICE787779	ICE787780	ICE787781	\$9.59
1/8	1/8	1/2	1-1/2	ICE787399	ICE787400	ICE787401	\$7.31	ICE787782	ICE787783	ICE787784	\$9.34
9/64	3/16	9/16	2	ICE787402	ICE787403	ICE787404	\$12.56	ICE787785	ICE787786	ICE787787	\$16.54
5/32	3/16	9/16	2	ICE787405	ICE787406	ICE787407	\$12.11	ICE787788	ICE787789	ICE787790	\$15.07
11/64	3/16	9/16	2	ICE787408	ICE787409	ICE787410	\$12.56	ICE787791	ICE787792	ICE787793	\$16.19
3/16	3/16	5/8	2	ICE787411	ICE787412	ICE787413	\$12.11	ICE787794	ICE787795	ICE787796	\$15.07
13/64	1/4	5/8	2-1/2	ICE787414	ICE787415	ICE787416	\$15.87	ICE787797	ICE787798	ICE787799	\$21.61
7/32	1/4	5/8	2-1/2	ICE787417	ICE787418	ICE787419	\$14.85	ICE787800	ICE787801	ICE787802	\$20.17
15/64	1/4	3/4	2-1/2	ICE787420	ICE787421	ICE787422	\$15.87	ICE787803	ICE787804	ICE787805	\$20.97
1/4	1/4	3/4	2-1/2	ICE787423	ICE787424	ICE787425	\$13.93	ICE787806	ICE787807	ICE787808	\$19.25



P	●	Steel
M	○	Stainless Steel
K	●	Cast Iron
N	○	Non-Ferrous
S		High Temp. Alloys
H		Hardened Steel
● GOOD ◐ OK ○ NOT OPTIMAL		

- 30 deg Helix Carbide with honed edges
- 10% Micrograin Carbide
- Diameter (D) Tolerance: +0.0000”/-0.0020”
- Shank (d) Tolerance: +0.0000”/-0.0004”

ECONOMY



Ball Nose, Standard Carbide, Regular Length, Single End

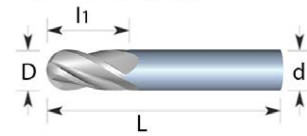
Cutter Diam.	Shank Diam.	Length Of Cut	O.A.L.	Uncoated				TiAlN Coated			
				2 Flute 	3 Flute 	4 Flute 	Price	2 Flute 	3 Flute 	4 Flute 	Price
				Part#	Part#	Part#		Part#	Part#	Part#	
D	d	l ₁	L	Part#	Part#	Part#		Part#	Part#	Part#	
17/64	5/16	7/8	2-1/2	ICE787426	ICE787427	ICE787428	\$20.78	ICE787809	ICE787810	ICE787811	\$27.25
9/32	5/16	7/8	2-1/2	ICE787429	ICE787430	ICE787431	\$19.41	ICE787812	ICE787813	ICE787814	\$25.76
19/64	5/16	7/8	2-1/2	ICE787432	ICE787433	ICE787434	\$20.78	ICE787815	ICE787816	ICE787817	\$26.29
5/16	5/16	7/8	2-1/2	ICE787435	ICE787436	ICE787437	\$17.82	ICE787818	ICE787819	ICE787820	\$25.31
21/64	3/8	7/8	2-1/2	ICE787438	ICE787439	ICE787440	\$23.41	ICE787821	ICE787822	ICE787823	\$31.93
11/32	3/8	7/8	2-1/2	ICE787441	ICE787442	ICE787443	\$21.70	ICE787824	ICE787825	ICE787826	\$29.19
23/64	3/8	7/8	2-1/2	ICE787444	ICE787445	ICE787446	\$23.41	ICE787827	ICE787828	ICE787829	\$29.90
3/8	3/8	1	2-1/2	ICE787447	ICE787448	ICE787449	\$21.70	ICE787830	ICE787831	ICE787832	\$29.19
25/64	7/16	1	2-1/2	ICE787450	ICE787451	ICE787452	\$36.09	ICE787833	ICE787834	ICE787835	\$47.35
13/32	7/16	1	2-1/2	ICE787453	ICE787454	ICE787455	\$35.40	ICE787836	ICE787837	ICE787838	\$45.32
27/64	7/16	1	2-1/2	ICE787456	ICE787457	ICE787458	\$35.17	ICE787839	ICE787840	ICE787841	\$44.27
7/16	7/16	1	2-1/2	ICE787459	ICE787460	ICE787461	\$34.26	ICE787842	ICE787843	ICE787844	\$44.97
29/64	1/2	1	3	ICE787462	ICE787463	ICE787464	\$39.06	ICE787845	ICE787846	ICE787847	\$52.53
15/32	1/2	1	3	ICE787465	ICE787466	ICE787467	\$38.71	ICE787848	ICE787849	ICE787850	\$50.25
31/64	1/2	1	3	ICE787468	ICE787469	ICE787470	\$38.37	ICE787851	ICE787852	ICE787853	\$49.11
1/2	1/2	1	3	ICE787471	ICE787472	ICE787473	\$36.54	ICE787854	ICE787855	ICE787856	\$47.26
33/64	9/16	1-1/4	3-1/2	ICE787474	ICE787475	ICE787476	\$84.51	ICE787857	ICE787858	ICE787859	\$105.55
17/32	9/16	1-1/4	3-1/2	ICE787477	ICE787478	ICE787479	\$79.94	ICE787860	ICE787861	ICE787862	\$104.08
35/64	9/16	1-1/4	3-1/2	ICE787480	ICE787481	ICE787482	\$77.66	ICE787863	ICE787864	ICE787865	\$100.06
9/16	9/16	1-1/4	3-1/2	ICE787483	ICE787484	ICE787485	\$69.66	ICE787866	ICE787867	ICE787868	\$86.38
37/64	5/8	1-1/4	3-1/2	ICE787486	ICE787487	ICE787488	\$85.65	ICE787869	ICE787870	ICE787871	\$99.20
19/32	5/8	1-1/4	3-1/2	ICE787489	ICE787490	ICE787491	\$81.08	ICE787872	ICE787873	ICE787874	\$98.42
39/64	5/8	1-1/4	3-1/2	ICE787492	ICE787493	ICE787494	\$78.80	ICE787875	ICE787876	ICE787877	\$97.83
5/8	5/8	1-1/4	3-1/2	ICE787495	ICE787496	ICE787497	\$69.66	ICE787878	ICE787879	ICE787880	\$86.38
41/64	3/4	1-1/2	4	ICE787498	ICE787499	ICE787500	\$117.63	ICE787881	ICE787882	ICE787883	\$131.63
21/32	3/4	1-1/2	4	ICE787501	ICE787502	ICE787503	\$117.63	ICE787884	ICE787885	ICE787886	\$129.89
43/64	3/4	1-1/2	4	ICE787504	ICE787505	ICE787506	\$116.49	ICE787887	ICE787888	ICE787889	\$128.14
11/16	3/4	1-1/2	4	ICE787507	ICE787508	ICE787509	\$109.63	ICE787890	ICE787891	ICE787892	\$126.88
45/64	3/4	1-1/2	4	ICE787510	ICE787511	ICE786090	\$107.35	ICE787893	ICE787894	ICE787895	\$128.68
23/32	3/4	1-1/2	4	ICE787512	ICE787513	ICE787514	\$107.35	ICE787896	ICE787897	ICE787898	\$128.20
47/64	3/4	1-1/2	4	ICE787515	ICE787516	ICE787517	\$107.35	ICE787899	ICE787900	ICE787901	\$127.59
3/4	3/4	1-1/2	4	ICE787518	ICE787519	ICE787520	\$95.93	ICE787902	ICE787903	ICE787904	\$115.03
49/64	7/8	1-1/2	4	ICE787521	ICE787522	ICE787523	\$212.30	ICE787905	ICE787906	ICE787907	\$247.25
25/32	7/8	1-1/2	4	ICE787524	ICE787525	ICE787526	\$212.30	ICE787908	ICE787909	ICE787910	\$246.72
51/64	7/8	1-1/2	4	ICE787527	ICE787528	ICE787529	\$212.30	ICE787911	ICE787912	ICE787913	\$246.22
13/16	7/8	1-1/2	4	ICE787530	ICE787531	ICE787532	\$212.30	ICE787914	ICE787915	ICE787916	\$243.71
53/64	7/8	1-1/2	4	ICE787533	ICE787534	ICE787535	\$206.25	ICE787917	ICE787918	ICE787919	\$244.85
27/32	7/8	1-1/2	4	ICE787536	ICE787537	ICE787538	\$206.25	ICE787920	ICE787921	ICE787922	\$244.35
55/64	7/8	1-1/2	4	ICE787539	ICE787540	ICE787541	\$206.25	ICE787923	ICE787924	ICE787925	\$243.71
7/8	7/8	1-1/2	4	ICE787542	ICE787543	ICE787544	\$187.29	ICE787926	ICE787927	ICE787928	\$220.71
57/64	1	1-1/2	4	ICE787545	ICE787546	ICE787547	\$216.64	ICE787929	ICE787930	ICE787931	\$258.78
29/32	1	1-1/2	4	ICE787548	ICE787549	ICE787550	\$216.64	ICE787932	ICE787933	ICE787934	\$255.70
59/64	1	1-1/2	4	ICE787551	ICE787552	ICE787553	\$216.64	ICE787935	ICE787936	ICE787937	\$251.25
15/16	1	1-1/2	4	ICE787554	ICE787555	ICE787556	\$208.42	ICE787938	ICE787939	ICE787940	\$246.22
61/64	1	1-1/2	4	ICE787557	ICE787558	ICE787559	\$208.42	ICE787941	ICE787942	ICE787943	\$247.50
31/32	1	1-1/2	4	ICE787560	ICE787561	ICE787562	\$208.42	ICE787944	ICE787945	ICE787946	\$246.79
63/64	1	1-1/2	4	ICE787563	ICE787564	ICE787565	\$208.42	ICE787947	ICE787948	ICE787949	\$246.22
1	1	1-1/2	4	ICE787393	ICE787394	ICE787395	\$189.58	ICE787776	ICE787777	ICE787778	\$222.99



P	●	Steel
M	○	Stainless Steel
K	●	Cast Iron
N	○	Non-Ferrous
S	○	High Temp. Alloys
H	○	Hardened Steel
● GOOD ○ OK ○ NOT OPTIMAL		

- 30 deg Helix Carbide with honed edges
- 10% Micrograin Carbide
- Diameter (D) Tolerance: +0.0000"/-0.0020"
- Shank (d) Tolerance: +0.0000"/-0.0004"

ECONOMY



Ball Nose, Standard Carbide, Long Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated				TiAlN Coated			
				2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price
1/8	1/8	3/4	2-1/2	ICE787952	--	ICE787953	\$15.53	ICE787996	--	ICE787997	\$18.30
3/16	3/16	3/4	2-1/2	ICE787954	--	ICE787955	\$18.55	ICE787998	--	ICE787999	\$22.20
1/4	1/4	1-1/8	3	ICE787956	--	ICE787957	\$24.05	ICE788000	--	ICE788001	\$28.96
5/16	5/16	1-1/8	3	ICE787958	--	ICE787959	\$29.12	ICE788002	--	ICE788003	\$36.50
3/8	3/8	1-1/8	3	ICE787960	--	ICE787961	\$37.69	ICE788004	--	ICE788005	\$45.18
7/16	7/16	2	4	ICE787962	--	ICE787963	\$55.01	ICE788006	--	ICE788007	\$64.34
1/2	1/2	2	4	ICE787964	--	ICE787965	\$60.23	ICE788008	--	ICE788009	\$73.62
5/8	5/8	2-1/4	5	ICE787968	--	ICE787969	\$112.90	ICE788012	--	ICE788013	\$133.00
3/4	3/4	2-1/4	5	ICE787970	--	ICE787971	\$158.74	ICE788014	--	ICE788015	\$181.63
1	1	2-1/4	5	ICE787950	--	ICE787951	\$246.68	ICE787994	--	ICE787995	\$286.79



Ball Nose, Standard Carbide, Extra Long Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated				TiAlN Coated			
				2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price
1/8	1/8	1	3	ICE788020	--	ICE788021	\$18.41	ICE788084	--	ICE788085	\$21.17
3/16	3/16	1-1/8	3	ICE788022	--	ICE788023	\$20.42	ICE788086	--	ICE788087	\$24.07
1/4	1/4	1-1/2	4	ICE788024	--	ICE788025	\$26.84	ICE788088	--	ICE788089	\$33.51
5/16	5/16	1-5/8	4	ICE788028	--	ICE788029	\$32.78	ICE788092	--	ICE788093	\$41.46
3/8	3/8	1-3/4	4	ICE788034	--	ICE788035	\$43.40	ICE788098	--	ICE788099	\$63.15
1/2	1/2	3	6	ICE788038	--	ICE788039	\$94.79	ICE788102	--	ICE788103	\$108.90
5/8	5/8	3	6	ICE788042	--	ICE788043	\$132.48	ICE788106	--	ICE788107	\$154.74
3/4	3/4	3	6	ICE788044	--	ICE788045	\$178.16	ICE788108	--	ICE788109	\$204.90
1	1	3	6	ICE788016	--	ICE788017	\$308.35	ICE788080	--	ICE788081	\$355.10



METRIC - Ball End, Standard Carbide, Regular Length, Single End

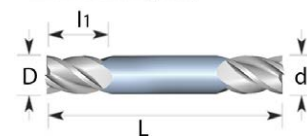
Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated				TiAlN Coated			
				2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price
1	3	3	38	ICE788700	--	ICE788701	\$10.96	ICE788744	--	ICE788745	\$12.06
1.5	3	5	38	ICE788702	--	ICE788703	\$10.96	ICE788746	--	ICE788747	\$12.06
2	3	6	38	ICE788704	--	ICE788705	\$9.04	ICE788748	--	ICE788749	\$9.96
3	3	12	38	ICE788708	--	ICE788709	\$9.04	ICE788752	--	ICE788753	\$9.96
3.5	4	12	50	ICE788710	--	ICE788711	\$12.47	ICE788754	--	ICE788755	\$13.74
4	4	14	50	ICE788712	--	ICE788713	\$12.06	ICE788756	--	ICE788757	\$13.29
4.5	5	14	50	ICE788714	--	ICE788715	\$12.47	ICE788758	--	ICE788759	\$13.75
5	5	16	50	ICE788716	--	ICE788717	\$13.27	ICE788760	--	ICE788761	\$14.61
6	6	19	63	ICE788718	--	ICE788719	\$15.49	ICE788762	--	ICE788763	\$17.08
7	7	19	63	ICE788720	--	ICE788721	\$24.21	ICE788764	--	ICE788765	\$26.63
8	8	19	63	ICE788722	--	ICE788723	\$19.04	ICE788766	--	ICE788767	\$21.09
9	9	22	70	ICE788724	--	ICE788725	\$31.45	ICE788768	--	ICE788769	\$34.59
10	10	22	70	ICE788726	--	ICE788727	\$28.44	ICE788770	--	ICE788771	\$31.27
11	11	25	70	ICE788728	--	ICE788729	\$37.69	ICE788772	--	ICE788773	\$41.46
12	12	25	75	ICE788730	--	ICE788731	\$36.54	ICE788774	--	ICE788775	\$40.20
14	14	30	88	ICE788732	--	ICE788733	\$53.68	ICE788776	--	ICE788777	\$59.04
16	16	32	88	ICE788734	--	ICE788735	\$71.79	ICE788778	--	ICE788779	\$77.82
18	18	36	100	ICE788736	--	ICE788737	\$95.38	ICE788780	--	ICE788781	\$102.63
20	20	38	100	ICE788738	--	ICE788739	\$118.59	ICE788782	--	ICE788783	\$124.73
22	22	38	100	ICE788740	--	ICE788741	\$140.70	ICE788784	--	ICE788785	\$150.20
25	25	38	100	ICE788742	--	ICE788743	\$172.86	ICE788786	--	ICE788787	\$183.28



P	●	Steel
M	○	Stainless Steel
K	●	Cast Iron
N	○	Non-Ferrous
S	○	High Temp. Alloys
H	○	Hardened Steel
● GOOD ○ OK ○ NOT OPTIMAL		

- 30 deg Helix Carbide with honed edges
- 10% Micrograin Carbide
- Diameter (D) Tolerance: +0.0000"/-0.0020"
- Shank (d) Tolerance: +0.0000"/-0.0004"

ECONOMY



Square End, Standard Carbide, Stub Length, Double End

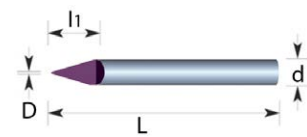
Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated				TiAlN Coated			
				2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price
1/32	1/8*	1/16	1-1/2	ICE788112	--	ICE788113	\$10.28	ICE788184	--	ICE788185	\$11.42
3/64	1/8*	3/32	1-1/2	ICE788114	--	ICE788115	\$10.28	ICE788186	--	ICE788187	\$11.42
1/16	1/8*	1/8	1-1/2	ICE788116	--	ICE788117	\$9.14	ICE788188	--	ICE788189	\$10.28
3/32	1/8*	3/16	1-1/2	ICE788118	--	ICE788119	\$8.68	ICE788190	--	ICE788191	\$9.82
7/64	1/8*	7/32	1-1/2	ICE788120	--	ICE788121	\$8.45	ICE788192	--	ICE788193	\$9.59
1/8	1/8*	1/4	1-1/2	ICE788122	--	ICE788123	\$8.22	ICE788194	--	ICE788195	\$9.36
5/32	3/16*	5/16	2	ICE788124	--	ICE788125	\$12.56	ICE788196	--	ICE788197	\$15.53
3/16	3/16*	5/16	2	ICE788126	--	ICE788127	\$11.99	ICE788198	--	ICE788199	\$14.85
7/32	1/4	3/8	2-1/2	ICE788128	--	ICE788129	\$14.16	ICE788200	--	ICE788201	\$19.41
1/4	1/4	1/2	2-1/2	ICE788130	--	ICE788131	\$13.93	ICE788202	--	ICE788203	\$18.73
9/32	5/16	1/2	2-1/2	ICE788132	--	ICE788133	\$17.13	ICE788204	--	ICE788205	\$23.98
5/16	5/16	1/2	2-1/2	ICE788134	--	ICE788135	\$16.67	ICE788206	--	ICE788207	\$23.30
3/8	3/8	9/16	2-1/2	ICE788136	--	ICE788137	\$21.70	ICE788208	--	ICE788209	\$28.55
7/16	1/2	9/16	2-3/4	ICE788138	--	ICE788139	\$33.12	ICE788210	--	ICE788211	\$42.26
1/2	1/2	5/8	3	ICE788140	--	ICE788141	\$36.54	ICE788212	--	ICE788213	\$43.40
9/16	5/8	11/16	3-1/2	ICE788142	--	ICE788143	\$79.94	ICE788214	--	ICE788215	\$91.36
5/8	5/8	11/16	3-1/2	ICE788144	--	ICE788145	\$77.66	ICE788216	--	ICE788217	\$86.79
3/4	3/4	7/8	4	ICE788146	--	ICE788147	\$98.21	ICE788218	--	ICE788219	\$116.49



Square End, Standard Carbide, Regular Length, Double End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated				TiAlN Coated			
				2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price
5/32	3/16*	7/16	3	ICE788332	--	ICE788333	\$31.52	ICE788360	--	ICE788361	\$36.66
3/16	3/16*	1/2	3	ICE788334	--	ICE788335	\$30.83	ICE788362	--	ICE788363	\$35.97
7/32	1/4	9/16	4	ICE788336	--	ICE788337	\$30.83	ICE788364	--	ICE788365	\$35.97
1/4	1/4	5/8	4	ICE788338	--	ICE788339	\$30.83	ICE788366	--	ICE788367	\$35.97
5/16	5/16	3/4	4	ICE788340	--	ICE788341	\$32.43	ICE788368	--	ICE788369	\$37.80
3/8	3/8	3/4	4	ICE788344	--	ICE788345	\$34.26	ICE788372	--	ICE788373	\$39.63
7/16	1/2	7/8	4	ICE788346	--	ICE788347	\$52.53	ICE788374	--	ICE788375	\$58.47
1/2	1/2	1	4	ICE788348	--	ICE788349	\$47.97	ICE788376	--	ICE788377	\$55.96
5/8	5/8	1-1/2	6	ICE788352	--	ICE788353	\$95.93	ICE788380	--	ICE788381	\$106.21
3/4	3/4	1-1/2	6	ICE788354	--	ICE788355	\$139.33	ICE788382	--	ICE788383	\$150.75

* Double Ended tools under 1/4" Diameter have Round Shanks. 1/4" diameter & larger have Weldon Shanks.



NEW

- Engraving Tools with 30 Degree angle
- 3 tip sizes to choose from
- 10% Micrograin Carbide
- Diameter Tolerance: +0.0000"/-0.0020"



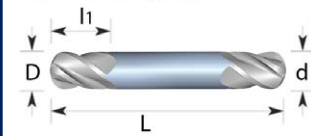
Engraving Tools 30 Degree Tip

Tip Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	TiAlN Coated	
				Part#	Price
.005	1/4	1/2	2-1/2	ICE789544	\$15.04
.010	1/4	1/2	2-1/2	ICE789545	\$15.04
.020	1/4	1/2	2-1/2	ICE789546	\$15.04

P	Steel
M	Stainless Steel
K	Cast Iron
N	Non-Ferrous
S	High Temp. Alloys
H	Hardened Steel
●	GOOD
◐	OK
○	NOT OPTIMAL

- 30 deg Helix Carbide with honed edges
- 10% Micrograin Carbide
- Diameter (D) Tolerance: +0.0000"/-0.0020"
- Shank (d) Tolerance: +0.0000"/-0.0004"

ECONOMY



Ball Nose, Standard Carbide, Stub Length, Double End

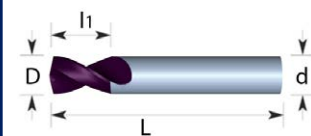
Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated				TiALN Coated			
				2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price
1/32	1/8*	1/16	1-1/2	ICE788220	--	ICE788221	\$18.27	ICE788292	--	ICE788293	\$19.41
3/64	1/8*	3/32	1-1/2	ICE788222	--	ICE788223	\$18.27	ICE788294	--	ICE788295	\$19.41
1/16	1/8*	1/8	1-1/2	ICE788224	--	ICE788225	\$16.45	ICE788296	--	ICE788297	\$18.27
3/32	1/8*	3/16	1-1/2	ICE788226	--	ICE788227	\$15.99	ICE788298	--	ICE788299	\$18.27
7/64	1/8*	7/32	1-1/2	ICE788228	--	ICE788229	\$15.99	ICE788300	--	ICE788301	\$17.82
1/8	1/8*	1/4	1-1/2	ICE788230	--	ICE788231	\$15.53	ICE788302	--	ICE788303	\$17.82
5/32	3/16*	5/16	2	ICE788232	--	ICE788233	\$18.27	ICE788304	--	ICE788305	\$21.24
3/16	3/16*	5/16	2	ICE788234	--	ICE788235	\$17.82	ICE788306	--	ICE788307	\$20.56
7/32	1/4	3/8	2-1/2	ICE788236	--	ICE788237	\$18.96	ICE788308	--	ICE788309	\$23.98
1/4	1/4	1/2	2-1/2	ICE788238	--	ICE788239	\$18.50	ICE788310	--	ICE788311	\$22.84
9/32	5/16	1/2	2-1/2	ICE788240	--	ICE788241	\$21.70	ICE788312	--	ICE788313	\$28.55
5/16	5/16	1/2	2-1/2	ICE788242	--	ICE788243	\$20.56	ICE788314	--	ICE788315	\$27.41
3/8	3/8	9/16	2-1/2	ICE788244	--	ICE788245	\$31.98	ICE788316	--	ICE788317	\$38.83
7/16	1/2	9/16	2-3/4	ICE788246	--	ICE788247	\$41.11	ICE788318	--	ICE788319	\$50.25
1/2	1/2	5/8	3	ICE788248	--	ICE788249	\$47.97	ICE788320	--	ICE788321	\$57.10
9/16	5/8	11/16	3-1/2	ICE788250	--	ICE788251	\$107.35	ICE788322	--	ICE788323	\$123.34
5/8	5/8	11/16	3-1/2	ICE788252	--	ICE788253	\$100.50	ICE788324	--	ICE788325	\$117.63
3/4	3/4	7/8	4	ICE788254	--	ICE788255	\$127.91	ICE788326	--	ICE788327	\$150.75



Ball Nose, Standard Carbide, Regular Length, Double End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated				TiALN Coated			
				2 Flute Part#	3 Flute Part#	4 Flute Part#	Price	2 Flute Part#	3 Flute Part#	4 Flute Part#	Price
5/32	3/16*	7/16	3	ICE788388	--	ICE788389	\$38.83	ICE788416	--	ICE788417	\$43.97
3/16	3/16*	1/2	3	ICE788390	--	ICE788391	\$37.69	ICE788418	--	ICE788419	\$42.83
7/32	1/4	9/16	4	ICE788392	--	ICE788393	\$37.69	ICE788420	--	ICE788421	\$42.83
1/4	1/4	5/8	4	ICE788394	--	ICE788395	\$37.69	ICE788422	--	ICE788423	\$42.83
5/16	5/16	3/4	4	ICE788396	--	ICE788397	\$43.40	ICE788424	--	ICE788425	\$48.76
3/8	3/8	3/4	4	ICE788400	--	ICE788401	\$43.40	ICE788428	--	ICE788429	\$48.76
7/16	1/2	7/8	4	ICE788402	--	ICE788403	\$63.95	ICE788430	--	ICE788431	\$69.89
1/2	1/2	1	4	ICE788404	--	ICE788405	\$61.67	ICE788432	--	ICE788433	\$69.66
5/8	5/8	1-1/2	6	ICE788408	--	ICE788409	\$132.48	ICE788436	--	ICE788437	\$142.75
3/4	3/4	1-1/2	6	ICE788410	--	ICE788411	\$178.16	ICE788438	--	ICE788439	\$189.58

* Double Ended tools under 1/4" Diameter have Round Shanks. 1/4" diameter & larger have Weldon Shanks.



NEW

- Allows High Performance drills to center properly without damaging their outside edge
- 145 Degree Point Carbide with honed edges
- 10% Micrograin Carbide
- Diameter Tolerance: +0.0000"/-0.0004"



Spot Drills 145 Degree Point

Drill Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	TiALN Coated	
				Part#	Price
1/4	1/4	1/2	3	ICE789547	\$28.00
3/8	3/8	3/4	3	ICE789548	\$30.08
1/2	1/2	1	4	ICE789549	\$52.80
5/8	5/8	1	4	ICE789550	\$86.40
3/4	3/4	1-1/8	4	ICE789551	\$115.19

SPEED & FEED RECOMMENDATIONS

ECONOMY

Material	Speed (SFM)		Feed Per Tooth By End Mill Diameter							
	Uncoated	TiALN Coated	1/4"	5/16"	3/8"	7/16"	1/2"	5/8"	3/4"	1"
Aluminum & Aluminum Alloys	600-1200	900-1800	.0020	.0025	.0030	.0035	.0040	.0050	.0060	.0080
Copper & Copper Alloys	350-850	525-1275	.0020	.0025	.0025	.0030	.0030	.0035	.0040	.0060
Brass & Bronze	250-400	375-600	.0020	.0025	.0025	.0030	.0030	.0035	.0040	.0050
Graphite	500-800	500-1200	.0030	.0035	.0025	.0030	.0030	.0040	.0050	.0070
Plastics	600-1100	600-1650	.0030	.0035	.0040	.0050	.0060	.0080	.0100	.0150
Iron, Cast (soft)	250-450	375-650	.0020	.0022	.0025	.0027	.0030	.0045	.0060	.0080
Iron, Cast (hard)	100-250	100-375	.0008	.0010	.0015	.0017	.0020	.0025	.0030	.0040
Iron, Ductile	80-400	100-600	.0010	.0012	.0015	.0017	.0020	.0030	.0040	.0060
Iron, Malleable	150-500	225-650	.0010	.0015	.0020	.0025	.0030	.0040	.0050	.0070
Carbon Steels, Low	200-400	300-600	.0010	.0015	.0020	.0025	.0030	.0040	.0050	.0070
Carbon Steels, Medium	100-250	150-375	.0015	.0016	.0017	.0018	.0020	.0030	.0040	.0050
Carbon Steels Hardened to 35 Rc	130-230	130-345	.0010	.0011	.0012	.0013	.0015	.0017	.0020	.0030
Carbon Steels Hardened to 50 Rc	70-130	70-160	.0007	.0007	.0008	.0009	.0010	.0015	.0020	.0030
Carbon Steels Hardened to 60 Rc	30-70	30-90	.0005	.0006	.0007	.0009	.0010	.0012	.0015	.0020
Steels, Mold	200-350	300-525	.0010	.0012	.0015	.0017	.0020	.0025	.0030	.0040
Steels, Tool	100-250	150-375	.0010	.0012	.0015	.0017	.0020	.0025	.0030	.0040
Stainless Steels, Soft	200-350	300-450	.0010	.0012	.0015	.0012	.0020	.0030	.0040	.0060
Stainless Steels, Hard	100-200	150-300	.0005	.0006	.0007	.0008	.0010	.0020	.0030	.0050
Monel & High Nickel Steel	75-175	75-200	.0010	.0012	.0015	.0017	.0020	.0025	.0030	.0040
Titanium, Soft	125-300	125-375	.0010	.0012	.0015	.0017	.0020	.0030	.0040	.0060
Titanium, Hard	50-150	50-175	.0005	.0006	.0007	.0008	.0010	.0015	.0020	.0020
Nickel Based High Temp Alloys	50-100	50-125	.0008	.0008	.0009	.0009	.0010	.0012	.0015	.0020

- Higher Feed Per Tooth should be used to start for radial depths of cut less than 25% of the tool diameter. Lower Feed Per Tooth should be used to start for radial depths of cut greater than 25% of the tool diameter.

$$RPM = \frac{SFM}{(3.146 * Cutter Diam.) / 12}$$

- The above recommendations are for axial lengths of cut not to exceed 1 times the tool diameter for profiling and .5 times the diameter for full slotting.

$$IPM = RPM * Feed Per Tooth * \# of Teeth$$

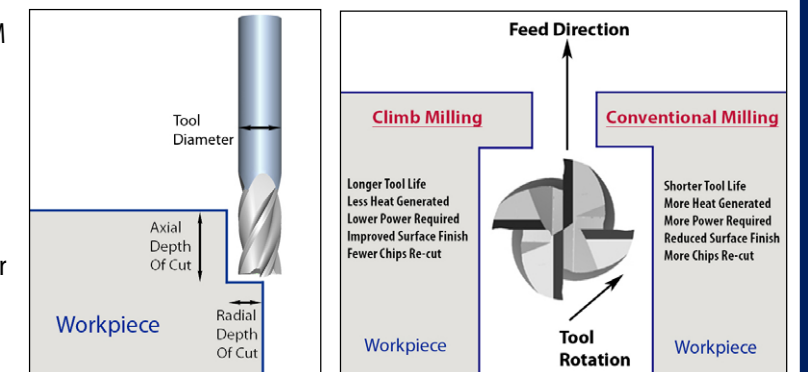
(Inches Per Minute)

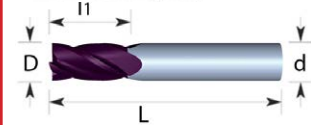
- The above parameters are recommended starting points only. If the tool is working well, without vibrations or significant noise, increase the SFM and/or Feed Per Tooth in 5-10% increments.

- Optimum speeds & feeds will depend upon material, setup, machine conditions & tool deflection. Higher or lower parameters may be required to achieve optimum machining conditions.

- For Light Radial Depths of cut, make certain to increase the feed rate to compensate for Radial Chip Thinning Factor (RCTF). Consult a formula or app to calculate.

- Climb Milling is preferred to Conventional Milling





P	Steel
M	Stainless Steel
K	Cast Iron
N	Non-Ferrous
S	High Temp. Alloys
H	Hardened Steel
● BETTER ◐ OK ○ NOT OPTIMAL	

- Special Helix Design with honed edges
- 10% Micrograin Carbide
- Variable Pitch to reduce chatter with special core design

PERFORMANCE

- Diameter (D) Tolerance: +0.0000"/-0.0020"
- Shank (d) Tolerance: +0.0000"/-0.0004"



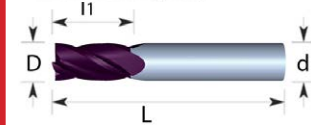
PERFORMANCE Variable Pitch Carbide, Stub Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Corner Radius	TiAlN Coated		
					4 Flute - ROUND Shank Part#	4 Flute - WELDON Shank Part#	Price
3/16	3/16	3/8	2	SQ	ICE789482	--	\$13.57
3/16	3/16	3/8	2	.015CR	ICE789483	--	\$13.57
1/4	1/4	3/8	2	SQ	ICE789484	--	\$17.18
1/4	1/4	3/8	2	.015CR	ICE789485	--	\$17.18
5/16	5/16	3/8	2	SQ	ICE789486	--	\$23.72
5/16	5/16	3/8	2	.020CR	ICE789487	--	\$23.72
3/8	3/8	1/2	2	SQ	ICE789488	--	\$28.34
3/8	3/8	1/2	2	.020CR	ICE789489	--	\$28.34
1/2	1/2	5/8	2-1/2	SQ	ICE789490	ICE789496	\$41.69
1/2	1/2	5/8	2-1/2	.030CR	ICE789491	ICE789497	\$41.69
5/8	5/8	3/4	3	SQ	ICE789492	ICE789498	\$74.01
5/8	5/8	3/4	3	.030CR	ICE789493	ICE789499	\$74.01
3/4	3/4	1	3	SQ	ICE789494	ICE789500	\$104.57
3/4	3/4	1	3	.030CR	ICE789495	ICE789501	\$104.57



PERFORMANCE Variable Pitch Carbide, Regular Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Corner Radius	TiAlN Coated			Price
					4 Flute - ROUND Shank Part#	4 Flute - WELDON Shank Part#	5 Flute - ROUND Shank Part#	
1/8	1/8	1/2	1-1/2	SQ	ICE790002	--	--	\$12.88
1/8	1/8	1/2	1-1/2	.010CR	ICE790003	--	--	\$12.88
3/16	3/16	5/8	2	SQ	ICE789339	--	--	\$15.08
3/16	3/16	5/8	2	.015CR	ICE789340	--	--	\$15.08
1/4	1/4	3/4	2-1/2	SQ	ICE789341	ICE789365	ICE790022	\$19.09
1/4	1/4	3/4	2-1/2	.020CR	ICE789342	ICE789366	ICE790023	\$19.09
5/16	5/16	13/16	2-1/2	SQ	ICE789343	ICE789367	ICE790024	\$26.34
5/16	5/16	13/16	2-1/2	.020CR	ICE789344	ICE789368	ICE790025	\$26.34
3/8	3/8	7/8	2-1/2	SQ	ICE789345	ICE789369	ICE790026	\$30.80
3/8	3/8	7/8	2-1/2	.020CR	ICE789346	ICE789370	ICE790027	\$30.80
7/16	7/16	1	2-3/4	SQ	ICE789348	ICE789371	--	\$40.47
1/2	1/2	1-1/4	3	SQ	ICE789349	ICE789372	ICE790028	\$46.33
1/2	1/2	1-1/4	3	.015CR	ICE789350	ICE789373	--	\$46.33
1/2	1/2	1-1/4	3	.030CR	ICE789351	ICE789374	ICE790029	\$46.33
1/2	1/2	1-1/4	3	.060CR	ICE789352	ICE789375	--	\$46.33
5/8	5/8	1-1/4	3-1/2	SQ	ICE789353	ICE789376	ICE790030	\$76.29
5/8	5/8	1-1/4	3-1/2	.030CR	ICE789354	ICE789377	ICE790031	\$76.29
5/8	5/8	1-1/4	3-1/2	.060CR	ICE789355	ICE789378	--	\$76.29
5/8	5/8	1-1/4	3-1/2	.125CR	ICE789356	ICE789379	--	\$76.29
3/4	3/4	1-1/2	4	SQ	ICE789357	ICE789380	ICE790032	\$111.03
3/4	3/4	1-1/2	4	.030CR	ICE789358	ICE789381	ICE790033	\$111.03
3/4	3/4	1-1/2	4	.060CR	ICE789359	ICE789382	--	\$111.03
3/4	3/4	1-1/2	4	.125CR	ICE789360	ICE789383	--	\$111.03
1	1	1-1/2	4	SQ	ICE789335	ICE789361	ICE790020	\$180.69
1	1	1-1/2	4	.030CR	ICE789336	ICE789362	ICE790021	\$180.69
1	1	1-1/2	4	.060CR	ICE789337	ICE789363	--	\$180.69
1	1	1-1/2	4	.125CR	ICE789338	ICE789364	--	\$180.69



P	Steel
M	Stainless Steel
K	Cast Iron
N	Non-Ferrous
S	High Temp. Alloys
H	Hardened Steel
● BETTER ◐ OK ○ NOT OPTIMAL	

- Special Helix Design with honed edges
- 10% Micrograin Carbide
- Variable Pitch to reduce chatter with special core design

PERFORMANCE

- Diameter (D) Tolerance: +0.0000"/-0.0020"
- Shank (d) Tolerance: +0.0000"/-0.0004"



PERFORMANCE Variable Pitch Carbide, Long Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Corner Radius	TiAlN Coated			
					4 Flute - ROUND Shank Part#	4 Flute - WELDON Shank Part#	5 Flute - ROUND Shank Part#	Price
3/16	3/16	3/4	2-1/2	SQ	ICE789388	--	--	\$30.80
3/16	3/16	3/4	2-1/2	.015CR	ICE789389	--	--	\$30.80
1/4	1/4	1-1/8	3	SQ	ICE789390	ICE789413	ICE790036	\$32.47
1/4	1/4	1-1/8	3	.020CR	ICE789391	ICE789414	ICE790037	\$32.47
5/16	5/16	1-1/8	3	SQ	ICE789392	ICE789415	ICE790038	\$44.79
5/16	5/16	1-1/8	3	.020CR	ICE789393	ICE789416	ICE790039	\$44.79
3/8	3/8	1-1/8	3	SQ	ICE789394	ICE789417	ICE790040	\$52.35
3/8	3/8	1-1/8	3	.020CR	ICE789395	ICE789418	ICE790041	\$52.35
7/16	7/16	2	4	SQ	ICE789396	ICE789419	--	\$68.80
1/2	1/2	2	4	SQ	ICE789397	ICE789420	ICE790042	\$78.78
1/2	1/2	2	4	.015CR	ICE789398	ICE789421	--	\$78.78
1/2	1/2	2	4	.030CR	ICE789399	ICE789422	ICE790043	\$78.78
1/2	1/2	2	4	.060CR	ICE789400	ICE789423	--	\$78.78
5/8	5/8	2-1/4	5	SQ	ICE789401	ICE789424	ICE790044	\$114.45
5/8	5/8	2-1/4	5	.030CR	ICE789402	ICE789425	ICE790045	\$114.45
5/8	5/8	2-1/4	5	.060CR	ICE789403	ICE789426	--	\$114.45
5/8	5/8	2-1/4	5	.125CR	ICE789404	ICE789427	--	\$114.45
3/4	3/4	2-1/4	5	SQ	ICE789405	ICE789428	ICE790046	\$161.73
3/4	3/4	2-1/4	5	.030CR	ICE789406	ICE789429	ICE790047	\$161.73
3/4	3/4	2-1/4	5	.060CR	ICE789407	ICE789430	--	\$161.73
3/4	3/4	2-1/4	5	.125CR	ICE789408	ICE789431	--	\$161.73
1	1	2-1/4	5	SQ	ICE789384	ICE789409	ICE790034	\$234.88
1	1	2-1/4	5	.030CR	ICE789385	ICE789410	ICE790035	\$234.88
1	1	2-1/4	5	.060CR	ICE789386	ICE789411	--	\$234.88
1	1	2-1/4	5	.125CR	ICE789387	ICE789412	--	\$234.88



PERFORMANCE Variable Pitch Carbide, Extra Long Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Corner Radius	TiAlN Coated		
					4 Flute - ROUND Shank Part#	5 Flute - ROUND Shank Part#	Price
3/16	3/16	1-1/8	3	SQ	ICE789467	--	\$33.88
3/16	3/16	1-1/8	3	.015CR	ICE790005	--	\$33.87
1/4	1/4	1-1/2	4	SQ	ICE789468	ICE790050	\$38.62
1/4	1/4	1-1/2	4	.020CR	ICE790006	ICE790051	\$38.61
5/16	5/16	1-5/8	4	SQ	ICE789469	ICE790052	\$51.51
5/16	5/16	1-5/8	4	.020CR	ICE790007	ICE790053	\$51.50
3/8	3/8	1-3/4	4	SQ	ICE789470	ICE790054	\$57.59
3/8	3/8	1-3/4	4	.020CR	ICE790008	ICE790055	\$57.59
1/2	1/2	3	6	SQ	ICE789471	ICE790056	\$119.74
1/2	1/2	3	6	.030CR	ICE790009	ICE790057	\$119.73
5/8	5/8	3	6	SQ	ICE789472	ICE790058	\$132.76
5/8	5/8	3	6	.030CR	ICE790010	ICE790059	\$132.75
3/4	3/4	3	6	SQ	ICE789473	ICE790060	\$184.38
3/4	3/4	3	6	.030CR	ICE790011	ICE790061	\$184.37
1	1	3	6	SQ	ICE789466	ICE790048	\$314.02
1	1	3	6	.030CR	ICE790004	ICE790049	\$314.00



P	Steel
M	Stainless Steel
K	Cast Iron
N	Non-Ferrous
S	High Temp. Alloys
H	Hardened Steel
●	BETTER
○	OK
○	NOT OPTIMAL

- Special Helix Design with honed edges
- 10% Micrograin Carbide
- Variable Pitch to reduce chatter with special core design

PERFORMANCE

- Diameter (D) Tolerance: +0.0000"/-0.0020"
- Shank (d) Tolerance: +0.0000"/-0.0004"



PERFORMANCE Variable Pitch Carbide, Ball Nose, Regular Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l ₁	O.A.L. L	TiAlN Coated		
				4 Flute - ROUND Shank Part#	4 Flute - WELDON Shank Part#	Price
3/16	3/16	5/8	2	ICE789433	--	\$21.75
1/4	1/4	3/4	2-1/2	ICE789434	ICE789442	\$22.91
5/16	5/16	13/16	2-1/2	ICE789435	ICE789443	\$31.61
3/8	3/8	7/8	2-1/2	ICE789436	ICE789444	\$36.96
7/16	7/16	1	2-3/4	ICE789437	ICE789445	\$48.56
1/2	1/2	1	3	ICE789438	ICE789446	\$55.61
5/8	5/8	1-1/4	3-1/2	ICE789439	ICE789447	\$91.57
3/4	3/4	1-1/2	4	ICE789440	ICE789448	\$129.38
1	1	1-1/2	4	ICE789432	ICE789441	\$216.82



PERFORMANCE Variable Pitch Carbide, Ball Nose, Long Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l ₁	O.A.L. L	TiAlN Coated		
				4 Flute - ROUND Shank Part#	4 Flute - WELDON Shank Part#	Price
3/16	3/16	3/4	2-1/2	ICE789450	--	\$36.96
1/4	1/4	1-1/8	3	ICE789451	ICE789459	\$38.95
5/16	5/16	1-1/8	3	ICE789452	ICE789460	\$53.73
3/8	3/8	1-1/8	3	ICE789453	ICE789461	\$62.82
7/16	7/16	2	4	ICE789454	ICE789462	\$82.55
1/2	1/2	2	4	ICE789455	ICE789463	\$94.55
5/8	5/8	2-1/4	5	ICE789456	ICE789464	\$137.33
3/4	3/4	2-1/4	5	ICE789457	ICE789465	\$194.07
1	1	2-1/4	5	ICE789449	ICE789458	\$281.87



PERFORMANCE Variable Pitch Carbide, Ball Nose, Extra Long Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l ₁	O.A.L. L	TiAlN Coated		
				4 Flute - ROUND Shank Part#	4 Flute - WELDON Shank Part#	Price
3/16	3/16	1-1/8	3	ICE789475	--	\$42.49
1/4	1/4	1-1/2	4	ICE789476	--	\$44.79
5/16	5/16	1-5/8	4	ICE789477	--	\$61.25
3/8	3/8	1-3/4	4	ICE789478	--	\$87.96
1/2	1/2	3	6	ICE789479	--	\$143.71
5/8	5/8	3	6	ICE789480	--	\$153.78
3/4	3/4	3	6	ICE789481	--	\$221.25
1	1	3	6	ICE789474	--	\$374.87

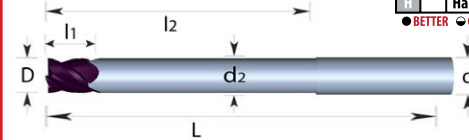


P	Steel
M	Stainless Steel
K	Cast Iron
N	Non-Ferrous
S	High Temp. Alloys
H	Hardened Steel
●	BETTER
○	OK
○	NOT OPTIMAL

- Special Helix Design with honed edges
- 10% Micrograin Carbide
- Variable Pitch to reduce chatter with special core design

PERFORMANCE

- Diameter (D) Tolerance: +0.0000"/-0.0020"
- Shank (d) Tolerance: +0.0000"/-0.0004"



PERFORMANCE Variable Pitch Carbide, Long Reach Neck Relief, Single End

Cutter Diam. D	Shank Diam. d	Necked Diam. d ₂	Length Of Cut l ₁	Length Below Shk. l ₂	O.A.L. L	Corner Radius	TiAlN Coated	
							4 Flute - ROUND Shank Part#	Price
3/16	3/16	.1775	3/8	2-1/2	4	SQ	ICE789508	\$56.16
3/16	3/16	.1775	3/8	2-1/2	4	.015CR	ICE789509	\$56.16
1/4	1/4	.2400	3/8	2-1/2	4	SQ	ICE789510	\$61.94
1/4	1/4	.2400	3/8	2-1/2	4	.015CR	ICE789511	\$61.94
5/16	5/16	.3025	7/16	2-1/2	4	SQ	ICE789512	\$73.17
5/16	5/16	.3025	7/16	2-1/2	4	.015CR	ICE789513	\$73.17
3/8	3/8	.3650	1/2	2-1/2	4	SQ	ICE789514	\$77.60
3/8	3/8	.3650	1/2	2-1/2	4	.015CR	ICE789515	\$77.60
1/2	1/2	.4800	5/8	3	5	SQ	ICE789516	\$114.82
1/2	1/2	.4800	5/8	3	5	.020CR	ICE789517	\$114.82
1/2	1/2	.4800	5/8	4	6	SQ	ICE789519	\$124.46
1/2	1/2	.4800	5/8	4	6	.020CR	ICE789518	\$124.46
5/8	5/8	.6050	3/4	3	5	SQ	ICE789520	\$142.11
5/8	5/8	.6050	3/4	3	5	.020CR	ICE789521	\$142.11
5/8	5/8	.6050	3/4	4	6	SQ	ICE789523	\$148.77
5/8	5/8	.6050	3/4	4	6	.020CR	ICE789522	\$148.77
3/4	3/4	.7300	1	3	5	SQ	ICE789524	\$191.14
3/4	3/4	.7300	1	3	5	.020CR	ICE789525	\$191.14
3/4	3/4	.7300	1	4	6	SQ	ICE789528	\$201.12
3/4	3/4	.7300	1	4	6	.020CR	ICE789526	\$201.12
3/4	3/4	.7300	1	5	7	SQ	ICE789529	\$229.41
3/4	3/4	.7300	1	5	7	.020CR	ICE789527	\$229.41
1	1	.9800	1-1/4	3	5	SQ	ICE789502	\$309.20
1	1	.9800	1-1/4	3	5	.020CR	ICE789503	\$309.20
1	1	.9800	1-1/4	4	6	SQ	ICE789506	\$330.83
1	1	.9800	1-1/4	4	6	.020CR	ICE789504	\$330.83
1	1	.9800	1-1/4	5	7	SQ	ICE789507	\$382.42
1	1	.9800	1-1/4	5	7	.020CR	ICE789505	\$382.42



PERFORMANCE Variable Pitch Carbide, Ball Long Reach Neck Relief, Single End

Cutter Diam. D	Shank Diam. d	Necked Diam. d ₂	Length Of Cut l ₁	Length Below Shk. l ₂	O.A.L. L	TiAlN Coated	
						4 Flute - ROUND Shank Part#	Price
3/16	3/16	.1775	3/8	2-1/2	4	ICE789533	\$63.95
1/4	1/4	.2400	3/8	2-1/2	4	ICE789534	\$72.27
5/16	5/16	.3025	7/16	2-1/2	4	ICE789535	\$81.25
3/8	3/8	.3650	1/2	2-1/2	4	ICE789536	\$87.90
1/2	1/2	.4800	5/8	3	5	ICE789537	\$126.13
1/2	1/2	.4800	5/8	4	6	ICE789538	\$132.78
5/8	5/8	.6050	3/4	3	5	ICE789539	\$168.02
5/8	5/8	.6050	3/4	4	6	ICE789540	\$173.84
3/4	3/4	.7300	1	3	5	ICE789541	\$231.36
3/4	3/4	.7300	1	4	6	ICE789542	\$241.34
3/4	3/4	.7300	1	5	7	ICE789543	\$266.30
1	1	.9800	1-1/4	3	5	ICE789530	\$373.42
1	1	.9800	1-1/4	4	6	ICE789531	\$395.06
1	1	.9800	1-1/4	5	7	ICE789532	\$439.98

SPEED & FEED RECOMMENDATIONS

PERFORMANCE

Material		Speed (SFM)	Feed Per Tooth By End Mill Diameter							
		TiAlN Coated	1/4"	5/16"	3/8"	7/16"	1/2"	5/8"	3/4"	1"
Aluminum & Aluminum Alloys	N	900-1800	.0025	.0030	.0035	.0040	.0045	.0055	.0065	.0085
Copper & Copper Alloys		525-1275	.0025	.0030	.0030	.0035	.0035	.0040	.0045	.0065
Brass & Bronze		375-600	.0025	.0030	.0030	.0035	.0035	.0040	.0045	.0055
Graphite		--	--	--	--	--	--	--	--	--
Plastics		--	--	--	--	--	--	--	--	--
Iron, Cast (soft)	K	375-650	.0025	.0027	.0030	.0032	.0035	.0040	.0065	.0085
Iron, Cast (hard)		100-375	.0013	.0015	.0020	.0022	.0025	.0030	.0035	.0045
Iron, Ductile		100-600	.0015	.0017	.0020	.0022	.0025	.0035	.0045	.0065
Iron, Malleable		225-650	.0015	.0020	.0025	.0030	.0035	.0045	.0055	.0075
Carbon Steels, Low	P	300-600	.0015	.0020	.0025	.0030	.0035	.0045	.0055	.0075
Carbon Steels, Medium		150-375	.0020	.0021	.0022	.0023	.0025	.0035	.0045	.0055
Carbon Steels Hardened to 35 Rc		130-345	.0015	.0016	.0017	.0018	.0020	.0022	.0025	.0035
Carbon Steels Hardened to 50 Rc		70-160	.0012	.0012	.0013	.0014	.0015	.0020	.0025	.0035
Carbon Steels Hardened to 60 Rc		--	--	--	--	--	--	--	--	--
Steels, Mold		300-525	.0015	.0017	.0020	.0022	.0025	.0030	.0035	.0045
Steels, Tool		150-375	.0015	.0017	.0020	.0022	.0025	.0030	.0035	.0045
Stainless Steels, Soft	M	300-450	.0015	.0017	.0020	.0017	.0025	.0035	.0045	.0065
Stainless Steels, Hard		150-300	.0010	.0011	.0012	.0013	.0015	.0025	.0035	.0055
Monel & High Nickel Steel	S	75-200	.0015	.0017	.0020	.0021	.0025	.0030	.0035	.0045
Titanium, Soft		125-375	.0015	.0017	.0020	.0021	.0025	.0035	.0045	.0065
Titanium, Hard		50-175	.0010	.0011	.0012	.0012	.0014	.0017	.0022	.0023
Nickel Based High Temp Alloys		50-125	.0013	.0012	.0011	.0011	.0014	.0015	.0017	.0023

• Higher Feed Per Tooth should be used to start for radial depths of cut less than 25% of the tool diameter. Lower Feed Per Tooth should be used to start for radial depths of cut greater than 25% of the tool diameter.

• The above recommendations are for axial lengths of cut not to exceed 1.25 times the tool diameter for profiling and .75 times the diameter for full slotting.

• The above parameters are recommended starting points only. If the tool is working well, without vibrations or significant noise, increase the SFM and/or Feed Per Tooth in 5-10% increments.

• Optimum speeds & feeds will depend upon material, setup, machine conditions & tool deflection. Higher or lower parameters may be required to achieve optimum machining conditions.

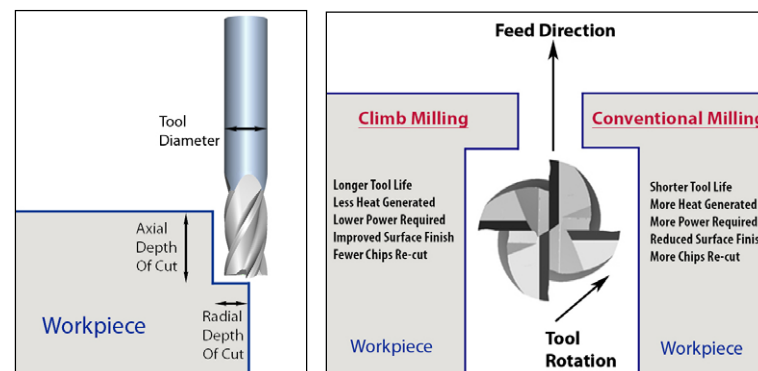
• For Light Radial Depths of cut, make certain to increase the feed rate to compensate for Radial Chip Thinning Factor (RCTF). Consult a formula or app to calculate.

• Climb Milling is preferred to Conventional Milling

$$RPM = \frac{SFM}{(3.146 * \text{Cutter Diam.}) / 12}$$

$$IPM = RPM * \text{Feed Per Tooth} * \# \text{ of Teeth}$$

(Inches Per Minute)



WHAT'S NEW IN THE 2023 CATALOG... ABOUT 300 NEW ITEMS!

ECONOMY

- **ECO Series** - 1/2" 4 Flute Regular Length end mills in Coated and Uncoated are now available in a 1-1/4" LOC in addition to the standard 1" LOC



PERFORMANCE

- **PER Series** - Extra Long Length series now have corner radius options (*previously only square were available*)
- **PER Series** - 1/8" square & corner radius now available
- **PER Series** - 5 Flute Square & Corner Radius in Regular, Long & Extra Long series are now available



PROFESSIONAL

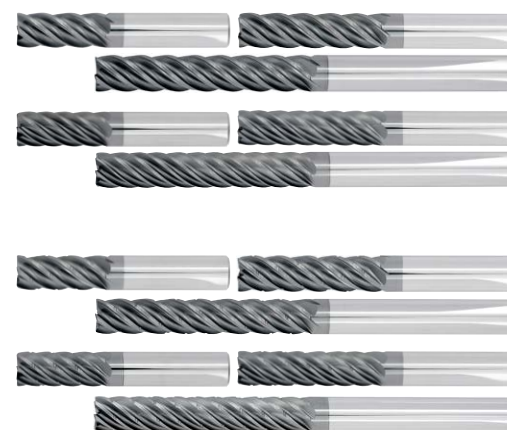
- **PRO Series** - Extra Long Length series now have corner radius options (*previously only square were available*)
- **PRO Series** - 5 Flute Square & Corner Radius in Regular, Long & Extra Long series are now available



PROFESSIONAL HEM

New Series specially designed for High Efficiency Machining (HEM), Dynamic & Trochoidal Milling

- **PRO Series** - 5 Flute & 7 Flute Regular, Long & Extra Long Series Square & Corner Radius
- **PRO Series** - 5 Flute & 7 Flute Regular, Long & Extra Long Series Square & Corner Radius With Chip Breakers



NON-FERROUS

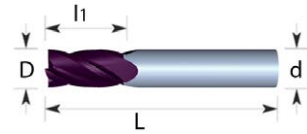
NEW Improved design for all tools to increase performance... for the same price!

- All tools now have a special high polished, mirror like finish to prevent built up edge. This dramatically increases tool life & performance.





P	●	Steel
M	☹	Stainless Steel
K	●	Cast Iron
N	○	Non-Ferrous
S	☹	High Temp. Alloys
H		Hardened Steel
● BEST ☹ OK ○ NOT OPTIMAL		



PROFESSIONAL

- Special Helix Design with honed edges
- Variable Pitch to reduce chatter with special core design

- 10% Ultra High Performance Micrograin Carbide
- Diameter (D) Tolerances: +0.0000"/-0.0015"
- Shank (d) Tolerance: +0.0000"/-0.0004"



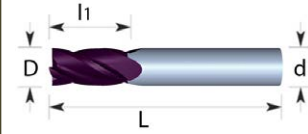
PROFESSIONAL Variable Pitch Carbide, Stub Length, Single End							
Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Corner Radius	TiAlN Coated		
					4 Flute - ROUND Shank Part#	4 Flute - WELDON Shank Part#	Price
3/16	3/16	3/8	2	SQ	ICE786277	--	\$16.31
3/16	3/16	3/8	2	.015CR	ICE786278	--	\$16.31
1/4	1/4	3/8	2	SQ	ICE786279	--	\$20.21
1/4	1/4	3/8	2	.015CR	ICE786280	--	\$20.21
5/16	5/16	3/8	2	SQ	ICE786281	--	\$27.92
5/16	5/16	3/8	2	.020CR	ICE786282	--	\$27.92
3/8	3/8	1/2	2	SQ	ICE786283	--	\$34.89
3/8	3/8	1/2	2	.020CR	ICE786284	--	\$34.89
1/2	1/2	5/8	2-1/2	SQ	ICE786285	ICE786291	\$56.88
1/2	1/2	5/8	2-1/2	.030CR	ICE786286	ICE786292	\$56.88
5/8	5/8	3/4	3	SQ	ICE786287	ICE786293	\$104.86
5/8	5/8	3/4	3	.030CR	ICE786288	ICE786294	\$104.86
3/4	3/4	1	3	SQ	ICE786289	ICE786295	\$153.25
3/4	3/4	1	3	.030CR	ICE786290	ICE786296	\$153.25



PROFESSIONAL Variable Pitch Carbide, Regular Length, Single End							
Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Corner Radius	TiAlN Coated		
					4 Flute - ROUND Shank Part#	4 Flute - WELDON Shank Part#	5 Flute - ROUND Shank Part#
1/8	1/8	1/2	1-1/2	SQ	ICE786106		
1/8	1/8	1/2	1-1/2	.010CR	ICE786107	--	--
3/16	3/16	5/8	2	SQ	ICE786109	--	--
3/16	3/16	5/8	2	.015CR	ICE786110	--	--
1/4	1/4	3/4	2-1/2	SQ	ICE786112	ICE786153	ICE786115
1/4	1/4	3/4	2-1/2	.020CR	ICE786114	ICE786155	ICE786116
5/16	5/16	13/16	2-1/2	SQ	ICE786117	ICE786156	ICE786119
5/16	5/16	13/16	2-1/2	.020CR	ICE786118	ICE786157	ICE786120
3/8	3/8	7/8	2-1/2	SQ	ICE786121	ICE786158	ICE786125
3/8	3/8	7/8	2-1/2	.020CR	ICE786123	ICE786160	ICE786126
3/8	3/8	7/8	2-1/2	.030CR	ICE786124	ICE786161	ICE786127
7/16	7/16	1	2-3/4	SQ	ICE786128	ICE786162	--
1/2	1/2	1-1/4	3	SQ	ICE786129	ICE786163	ICE786133
1/2	1/2	1-1/4	3	.015CR	ICE786130	ICE786164	--
1/2	1/2	1-1/4	3	.030CR	ICE786131	ICE786165	ICE786134
1/2	1/2	1-1/4	3	.060CR	ICE786132	ICE786166	--
5/8	5/8	1-1/4	3-1/2	SQ	ICE786135	ICE786167	ICE786139
5/8	5/8	1-1/4	3-1/2	.030CR	ICE786136	ICE786168	ICE786140
5/8	5/8	1-1/4	3-1/2	.060CR	ICE786137	ICE786169	--
5/8	5/8	1-1/4	3-1/2	.125CR	ICE786138	ICE786170	--
3/4	3/4	1-1/2	4	SQ	ICE786141	ICE786171	ICE786145
3/4	3/4	1-1/2	4	.030CR	ICE786142	ICE786173	ICE786146
3/4	3/4	1-1/2	4	.060CR	ICE786143	ICE786174	--
3/4	3/4	1-1/2	4	.125CR	ICE786144	ICE786175	--
1	1	1-1/2	4	SQ	ICE786100	ICE786147	ICE786104
1	1	1-1/2	4	.030CR	ICE786101	ICE786148	ICE786105
1	1	1-1/2	4	.060CR	ICE786102	ICE786149	--
1	1	1-1/2	4	.125CR	ICE786103	ICE786150	--



P	●	Steel
M	☉	Stainless Steel
K	●	Cast Iron
N	○	Non-Ferrous
S	☉	High Temp. Alloys
H		Hardened Steel
● BEST ☉ OK ○ NOT OPTIMAL		



PROFESSIONAL

- Special Helix Design with honed edges
- Variable Pitch to reduce chatter with special core design

- 10% Ultra High Performance Micrograin Carbide
- Diameter (D) Tolerances: +0.0000"/-0.0015"
- Shank (d) Tolerance: +0.0000"/-0.0004"



PROFESSIONAL Variable Pitch Carbide, Long Length, Single End							
Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Corner Radius	TiAlN Coated		
					4 Flute - ROUND Shank Part#	4 Flute - WELDON Shank Part#	5 Flute - ROUND Shank Part#
3/16	3/16	3/4	2-1/2	SQ	ICE786181	--	--
3/16	3/16	3/4	2-1/2	.015CR	ICE786182	--	--
1/4	1/4	1-1/8	3	SQ	ICE786183	ICE786206	ICE790064
1/4	1/4	1-1/8	3	.020CR	ICE786184	ICE786207	ICE790065
5/16	5/16	1-1/8	3	SQ	ICE786185	ICE786208	ICE790066
5/16	5/16	1-1/8	3	.020CR	ICE786186	ICE786209	ICE790067
3/8	3/8	1-1/8	3	SQ	ICE786187	ICE786210	ICE790068
3/8	3/8	1-1/8	3	.020CR	ICE786188	ICE786211	ICE790069
7/16	7/16	2	4	SQ	ICE786189	ICE786212	--
1/2	1/2	2	4	SQ	ICE786190	ICE786213	ICE790070
1/2	1/2	2	4	.015CR	ICE786191	ICE786214	--
1/2	1/2	2	4	.030CR	ICE786192	ICE786215	ICE790071
1/2	1/2	2	4	.060CR	ICE786193	ICE786216	--
5/8	5/8	2-1/4	5	SQ	ICE786194	ICE786217	ICE790072
5/8	5/8	2-1/4	5	.030CR	ICE786195	ICE786218	ICE790073
5/8	5/8	2-1/4	5	.060CR	ICE786196	ICE786219	--
5/8	5/8	2-1/4	5	.125CR	ICE786197	ICE786220	--
3/4	3/4	2-1/4	5	SQ	ICE786198	ICE786221	ICE790074
3/4	3/4	2-1/4	5	.030CR	ICE786199	ICE786222	ICE790075
3/4	3/4	2-1/4	5	.060CR	ICE786200	ICE786223	--
3/4	3/4	2-1/4	5	.125CR	ICE786201	ICE786224	--
1	1	2-1/4	5	SQ	ICE786176	ICE786202	ICE790062
1	1	2-1/4	5	.030CR	ICE786177	ICE786203	ICE790063
1	1	2-1/4	5	.060CR	ICE786178	ICE786204	--
1	1	2-1/4	5	.125CR	ICE786179	ICE786205	--



PROFESSIONAL Variable Pitch Carbide, Extra Long Length, Single End							
Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Corner Radius	TiAlN Coated		
					4 Flute - ROUND Shank Part#	5 Flute - ROUND Shank Part#	Price
3/16	3/16	1-1/8	3	SQ	ICE786261	--	\$39.64
3/16	3/16	1-1/8	3	.015CR	ICE790013	--	\$39.64
1/4	1/4	1-1/2	4	SQ	ICE786262	ICE790078	\$45.20
1/4	1/4	1-1/2	4	.020CR	ICE790014	ICE790079	\$45.19
5/16	5/16	1-5/8	4	SQ	ICE786263	ICE790080	\$60.78
5/16	5/16	1-5/8	4	.020CR	ICE790015	ICE790081	\$60.77
3/8	3/8	1-3/4	4	SQ	ICE786264	ICE790082	\$70.26
3/8	3/8	1-3/4	4	.020CR	ICE790016	ICE790083	\$70.25
1/2	1/2	3	6	SQ	ICE786265	ICE790084	\$146.61
1/2	1/2	3	6	.030CR	ICE790017	ICE790085	\$146.60
5/8	5/8	3	6	SQ	ICE786266	ICE790086	\$172.06
5/8	5/8	3	6	.030CR	ICE790018	ICE790087	\$172.05
3/4	3/4	3	6	SQ	ICE786267	ICE790088	\$228.98
3/4	3/4	3	6	.030CR	ICE790019	ICE790089	\$228.97
1	1	3	6	SQ	ICE786260	ICE790076	\$433.66
1	1	3	6	.030CR	ICE790012	ICE790077	\$433.63

P	Steel
M	Stainless Steel
K	Cast Iron
N	Non-Ferrous
S	High Temp. Alloys
H	Hardened Steel

- Special Helix Design with honed edges
- Variable Pitch to reduce chatter with special core design

PROFESSIONAL

- 10% Ultra High Performance Micrograin Carbide
- Diameter (D) Tolerances: +0.0000"/-0.0015"
- Shank (d) Tolerance: +0.0000"/-0.0004"



PROFESSIONAL Variable Pitch Carbide, Ball Nose, Regular Length, Single End						
Cutter Diam. D	Shank Diam. d	Length Of Cut L ₁	O.A.L. L	TiALN Coated		
				4 Flute - ROUND Shank Part#	4 Flute - WELDON Shank Part#	Price
3/16	3/16	5/8	2	ICE786227	--	\$21.75
1/4	1/4	3/4	2-1/2	ICE786228	ICE786236	\$26.94
5/16	5/16	13/16	2-1/2	ICE786229	ICE786237	\$37.21
3/8	3/8	7/8	2-1/2	ICE786230	ICE786238	\$45.50
7/16	7/16	1	2-3/4	ICE786231	ICE786239	\$65.85
1/2	1/2	1	3	ICE786232	ICE786240	\$75.83
5/8	5/8	1-1/4	3-1/2	ICE786233	ICE786241	\$129.71
3/4	3/4	1-1/2	4	ICE786234	ICE786242	\$189.58
1	1	1-1/2	4	ICE786225	ICE786235	\$309.32



PROFESSIONAL Variable Pitch Carbide, Ball Nose, Long Length, Single End						
Cutter Diam. D	Shank Diam. d	Length Of Cut L ₁	O.A.L. L	TiALN Coated		
				4 Flute - ROUND Shank Part#	4 Flute - WELDON Shank Part#	Price
3/16	3/16	3/4	2-1/2	ICE786244	--	\$43.25
1/4	1/4	1-1/8	3	ICE786245	ICE786253	\$45.58
5/16	5/16	1-1/8	3	ICE786246	ICE786254	\$63.41
3/8	3/8	1-1/8	3	ICE786247	ICE786255	\$76.64
7/16	7/16	2	4	ICE786248	ICE786256	\$99.35
1/2	1/2	2	4	ICE786249	ICE786257	\$115.74
5/8	5/8	2-1/4	5	ICE786250	ICE786258	\$177.61
3/4	3/4	2-1/4	5	ICE786251	ICE786259	\$241.47
1	1	2-1/4	5	ICE786243	ICE786252	\$389.14



PROFESSIONAL Variable Pitch Carbide, Ball Nose, Extra Long Length, Single End						
Cutter Diam. D	Shank Diam. d	Length Of Cut L ₁	O.A.L. L	TiALN Coated		
				4 Flute - ROUND Shank Part#	4 Flute - WELDON Shank Part#	Price
3/16	3/16	1-1/8	3	ICE786270	--	\$49.63
1/4	1/4	1-1/2	4	ICE786271	--	\$52.87
5/16	5/16	1-5/8	4	ICE786272	--	\$72.29
3/8	3/8	1-3/4	4	ICE786273	--	\$107.16
1/2	1/2	3	6	ICE786274	--	\$175.93
5/8	5/8	3	6	ICE786275	--	\$197.87
3/4	3/4	3	6	ICE786276	--	\$274.78
1	1	3	6	ICE786268	--	\$520.39

SPEED & FEED RECOMMENDATIONS

PROFESSIONAL										
Material		Speed (SFM)	Feed Per Tooth By End Mill Diameter							
		TiALN Coated	1/4"	5/16"	3/8"	7/16"	1/2"	5/8"	3/4"	1"
Aluminum & Aluminum Alloys	N	900-1800	.0025	.0030	.0035	.0040	.0045	.0055	.0065	.0085
Copper & Copper Alloys		525-1275	.0025	.0030	.0030	.0035	.0035	.0040	.0045	.0065
Brass & Bronze		375-600	.0025	.0030	.0030	.0035	.0035	.0040	.0045	.0055
Graphite		--	--	--	--	--	--	--	--	--
Plastics		--	--	--	--	--	--	--	--	--
Iron, Cast (soft)	K	375-650	.0030	.0032	.0035	.0037	.0040	.0045	.0070	.0090
Iron, Cast (hard)		100-375	.0018	.0020	.0025	.0027	.0030	.0035	.0040	.0050
Iron, Ductile		100-600	.0020	.0022	.0025	.0027	.0030	.0040	.0050	.0070
Iron, Malleable		225-650	.0020	.0025	.0030	.0035	.0040	.0050	.0060	.0080
Carbon Steels, Low	P	300-600	.0020	.0025	.0030	.0035	.0040	.0050	.0060	.0080
Carbon Steels, Medium		150-375	.0025	.0026	.0027	.0028	.0030	.0040	.0050	.0060
Carbon Steels Hardened to 35 Rc		130-345	.0020	.0021	.0022	.0023	.0025	.0027	.0030	.0040
Carbon Steels Hardened to 50 Rc		70-160	.0012	.0012	.0013	.0014	.0015	.0026	.0030	.0035
Carbon Steels Hardened to 60 Rc		--	--	--	--	--	--	--	--	--
Steels, Mold		300-525	.0020	.0022	.0025	.0027	.0030	.0035	.0040	.0050
Steels, Tool		150-375	.0020	.0022	.0025	.0027	.0030	.0035	.0040	.0050
Stainless Steels, Soft	M	300-450	.0020	.0022	.0025	.0022	.0030	.0040	.0050	.0070
Stainless Steels, Hard		150-300	.0015	.0016	.0017	.0018	.0020	.0030	.0040	.0060
Monel & High Nickel Steel	S	75-200	.0015	.0022	.0025	.0027	.0030	.0035	.0040	.0050
Titanium, Soft		125-375	.0015	.0022	.0025	.0027	.0030	.0040	.0050	.0070
Titanium, Hard		50-175	.0010	.0016	.0017	.0018	.0020	.0022	.0026	.0030
Nickel Based High Temp Alloys		50-125	.0014	.0014	.0015	.0016	.0017	.0018	.0020	.0023

- Higher Feed Per Tooth should be used to start for radial depths of cut less than 25% of the tool diameter. Lower Feed Per Tooth should be used to start for radial depths of cut greater than 25% of the tool diameter.

$$RPM = \frac{SFM}{(3.146 * \text{Cutter Diam.}) / 12}$$

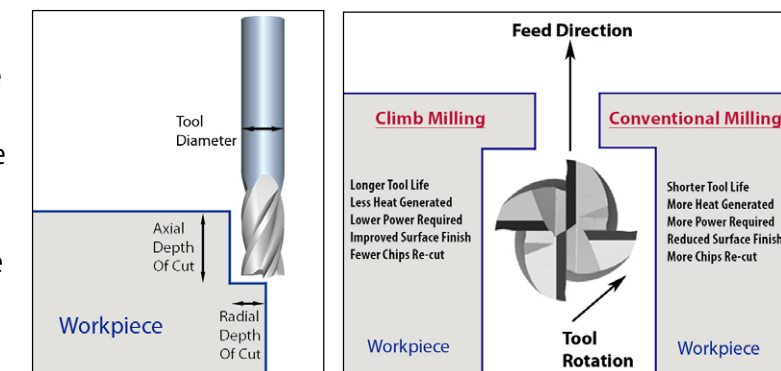
- The above recommendations are for axial lengths of cut not to exceed 1.5 times the tool diameter for profiling and 1 times the diameter for full slotting.

$$IPM = \frac{RPM * \text{Feed Per Tooth} * \# \text{ of Teeth}}{(\text{Inches Per Minute})}$$

- The above parameters are recommended starting points only. If the tool is working well, without vibrations or significant noise, increase the SFM and/or Feed Per Tooth in 5-10% increments.
- Optimum speeds & feeds will depend upon material, setup, machine conditions & tool deflection. Higher or lower parameters may be required to achieve optimum machining conditions.

- For Light Radial Depths of cut, make certain to increase the feed rate to compensate for Radial Chip Thinning Factor (RCTF). Consult a formula or app to calculate.

- Climb Milling is preferred to Conventional Milling



P	Steel
M	Stainless Steel
K	Cast Iron
N	Non-Ferrous
S	High Temp. Alloys
H	Hardened Steel
●	BEST
○	OK
○	NOT OPTIMAL

- Special Helix Design with honed edges
- Variable Pitch to reduce chatter with special core design
- With & Without Chip Breakers

PROFESSIONAL HEM

- 10% Ultra High Performance Micrograin Carbide
- Diameter (D) Tolerances: +0.0000"/-0.0015"
- Shank (d) Tolerance: +0.0000"/-0.0004"



5, 6 & 7 Flute

Specially for HEM (High Efficiency Machining)

- For long axial with low radial engagement at high speeds & feeds
- For Dynamic Milling, Trochoidal Milling, HEM (High Efficiency Milling)
- Take advantage of Radial Chip Thinning Factor compensation (RCTF) to move at high velocities to maximize cubic inches removed

Unique
Chipbreakers



PROFESSIONAL Variable Pitch Carbide, Regular Length, Single End - HEM

Cutter Diam. D	Shank Diam. d	Length Of Cut l ₁	O.A.L. L	Corner Radius	ALL4 Coated				ALL4 Coated		
					5 Flute Part#	5 Flute Chipbreaker Part#	6 Flute Part#	Price	7 Flute Part#	7 Flute Chipbreaker Part#	Price
1/4	1/4	3/4	2-1/2	SQ	ICE790090	--	ICE786300	\$22.45	--	--	
1/4	1/4	3/4	2-1/2	.015CR	ICE790091	--	--	\$22.45	--	--	
1/4	1/4	3/4	2-1/2	.030CR	ICE790092	--	ICE786301	\$22.45	--	--	
5/16	5/16	13/16	2-1/2	SQ	ICE790096	--	--	\$31.02	--	--	
5/16	5/16	13/16	2-1/2	.015CR	ICE790097	--	--	\$31.02	--	--	
5/16	5/16	13/16	2-1/2	.030CR	ICE790098	--	--	\$31.02	--	--	
3/8	3/8	1	2-1/2	SQ	ICE790105	ICE790120	ICE786302	\$37.91	ICE790114	ICE790129	\$41.71
3/8	3/8	1	2-1/2	.015CR	ICE790106	ICE790121	--	\$37.91	ICE790115	ICE790130	\$41.71
3/8	3/8	1	2-1/2	.030CR	ICE790107	ICE790122	ICE786303	\$37.91	ICE790116	ICE790131	\$41.71
1/2	1/2	1-1/4	3	SQ	ICE790135	ICE790167	ICE786304	\$63.19	ICE790151	ICE790183	\$69.51
1/2	1/2	1-1/4	3	.015CR	ICE790136	ICE790168	--	\$63.19	ICE790152	ICE790184	\$69.51
1/2	1/2	1-1/4	3	.030CR	ICE790137	ICE790169	ICE786305	\$63.19	ICE786306	ICE790185	\$69.51
1/2	1/2	1-1/4	3	.060CR	ICE790138	ICE790170	--	\$63.19	ICE790154	--	\$69.51
5/8	5/8	1-1/2	3-1/2	SQ	ICE790195	ICE790213	ICE786307	\$108.09	ICE790204	ICE790222	\$118.90
5/8	5/8	1-1/2	3-1/2	.030CR	ICE790196	ICE790214	ICE786308	\$108.09	ICE786309	ICE790223	\$118.90
5/8	5/8	1-1/2	3-1/2	.060CR	ICE790197	ICE790215	--	\$108.09	ICE790206	--	\$118.90
3/4	3/4	1-1/2	4	SQ	ICE790228	ICE790246	ICE786310	\$157.97	ICE790237	ICE790252	\$173.77
3/4	3/4	1-1/2	4	.030CR	ICE790229	ICE790247	ICE786311	\$157.97	ICE786312	ICE790253	\$173.77
3/4	3/4	1-1/2	4	.060CR	ICE790230	--	--	\$157.97	ICE790239	--	\$173.77
1	1	1-1/2	4	SQ	ICE790258	ICE790276	ICE786297	\$270.55	ICE790267	ICE790282	\$297.61
1	1	1-1/2	4	.030CR	ICE790259	ICE790277	ICE786298	\$270.55	ICE786299	ICE790283	\$297.61
1	1	1-1/2	4	.060CR	ICE790260	--	--	\$270.55	ICE790269	--	\$297.61

P	Steel
M	Stainless Steel
K	Cast Iron
N	Non-Ferrous
S	High Temp. Alloys
H	Hardened Steel
●	BEST
○	OK
○	NOT OPTIMAL

- Special Helix Design with honed edges
- Variable Pitch to reduce chatter with special core design
- With & Without Chip Breakers

PROFESSIONAL HEM

- 10% Ultra High Performance Micrograin Carbide
- Diameter (D) Tolerances: +0.0000"/-0.0015"
- Shank (d) Tolerance: +0.0000"/-0.0004"



PROFESSIONAL Variable Pitch Carbide, Long Length, Single End - HEM

Cutter Diam. D	Shank Diam. d	Length Of Cut l ₁	O.A.L. L	Corner Radius	ALL4 Coated				ALL4 Coated		
					5 Flute Part#	5 Flute Chipbreaker Part#	6 Flute Part#	Price	7 Flute Part#	7 Flute Chipbreaker Part#	Price
1/4	1/4	1-1/8	3	SQ	ICE790093	--	--	\$37.98	--	--	
1/4	1/4	1-1/8	3	.015CR	ICE790094	--	--	\$37.98	--	--	
1/4	1/4	1-1/8	3	.030CR	ICE790095	--	--	\$37.98	--	--	
5/16	5/16	1-1/4	3	SQ	ICE790099	--	--	\$52.84	--	--	
5/16	5/16	1-1/4	3	.015CR	ICE790100	--	--	\$52.84	--	--	
5/16	5/16	1-1/4	3	.030CR	ICE790101	--	--	\$52.84	--	--	
3/8	3/8	1-1/4	3	SQ	ICE790108	ICE790123	--	\$63.87	ICE790117	ICE790132	\$70.25
3/8	3/8	1-1/4	3	.015CR	ICE790109	ICE790124	--	\$63.87	ICE790118	ICE790133	\$70.25
3/8	3/8	1-1/4	3	.030CR	ICE790110	ICE790125	--	\$63.87	ICE790119	ICE790134	\$70.25
1/2	1/2	2-1/8	4	SQ	ICE790139	ICE790171	--	\$96.45	ICE790155	ICE790186	\$106.09
1/2	1/2	2-1/8	4	.015CR	ICE790140	ICE790172	--	\$96.45	ICE790156	ICE790187	\$106.09
1/2	1/2	2-1/8	4	.030CR	ICE790141	ICE790173	--	\$96.45	ICE790157	ICE790188	\$106.09
1/2	1/2	2-1/8	4	.060CR	ICE790142	ICE790174	--	\$96.45	ICE790158	--	\$106.09
1/2	1/2	2-5/8	5	SQ	ICE790143	ICE790175	--	\$119.99	ICE790159	ICE790189	\$131.99
1/2	1/2	2-5/8	5	.015CR	ICE790144	ICE790176	--	\$119.99	ICE790160	ICE790190	\$131.99
1/2	1/2	2-5/8	5	.030CR	ICE790145	ICE790177	--	\$119.99	ICE790161	ICE790191	\$131.99
1/2	1/2	2-5/8	5	.060CR	ICE790146	ICE790178	--	\$119.99	ICE790162	--	\$131.99
5/8	5/8	2-1/2	5	SQ	ICE790198	ICE790216	--	\$148.00	ICE790207	ICE790224	\$162.80
5/8	5/8	2-1/2	5	.030CR	ICE790199	ICE790217	--	\$148.00	ICE790208	ICE790225	\$162.80
5/8	5/8	2-1/2	5	.060CR	ICE790200	ICE790218	--	\$148.00	ICE790209	--	\$162.80
3/4	3/4	2-1/2	5	SQ	ICE790231	ICE790248	--	\$201.21	ICE790240	ICE790254	\$221.33
3/4	3/4	2-1/2	5	.030CR	ICE790232	ICE790249	--	\$201.21	ICE790241	ICE790255	\$221.33
3/4	3/4	2-1/2	5	.060CR	ICE790233	--	--	\$201.21	ICE790242	--	\$221.33
1	1	2-5/8	5	SQ	ICE790261	ICE790278	--	\$324.26	ICE790270	ICE790284	\$356.69
1	1	2-5/8	5	.030CR	ICE790262	ICE790279	--	\$324.26	ICE790271	ICE790285	\$356.69
1	1	2-5/8	5	.060CR	ICE790263	--	--	\$324.26	ICE790272	--	\$356.69



PROFESSIONAL Variable Pitch Carbide, Extra Long Length, Single End - HEM

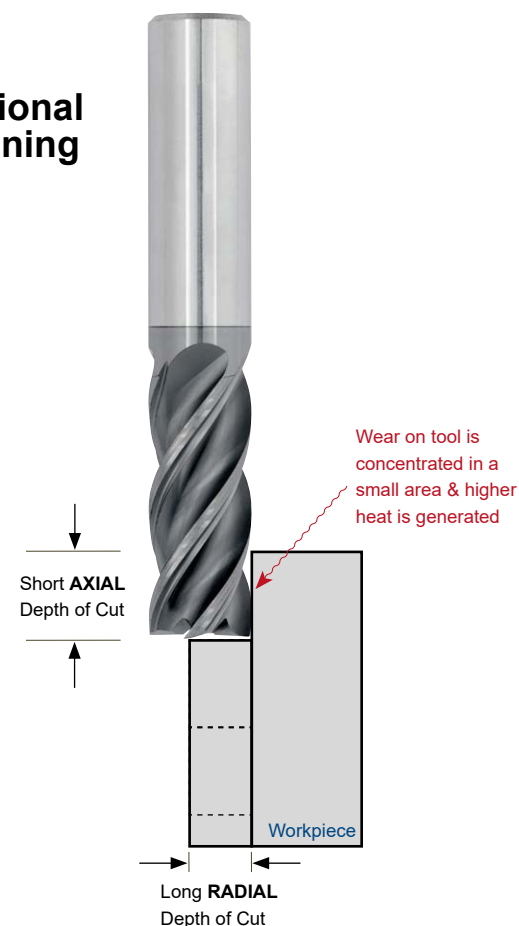
Cutter Diam. D	Shank Diam. d	Length Of Cut l ₁	O.A.L. L	Corner Radius	ALL4 Coated				ALL4 Coated		
					5 Flute Part#	5 Flute Chipbreaker Part#	6 Flute Part#	Price	7 Flute Part#	7 Flute Chipbreaker Part#	Price
5/16	5/16	2-1/8	4	SQ	ICE790102	--	--	\$60.77	--	--	
5/16	5/16	2-1/8	4	.015CR	ICE790103	--	--	\$60.77	--	--	
5/16	5/16	2-1/8	4	.030CR	ICE790104	--	--	\$60.77	--	--	
3/8	3/8	2-1/8	4	SQ	ICE790111	ICE790126	--	\$70.25	--	--	
3/8	3/8	2-1/8	4	.015CR	ICE790112	ICE790127	--	\$70.25	--	--	
3/8	3/8	2-1/8	4	.030CR	ICE790113	ICE790128	--	\$70.25	--	--	
1/2	1/2	3-1/4	6	SQ	ICE790147	ICE790179	--	\$146.60	ICE790163	ICE790192	\$161.26
1/2	1/2	3-1/4	6	.015CR	ICE790148	ICE790180	--	\$146.60	ICE790164	ICE790193	\$161.26
1/2	1/2	3-1/4	6	.030CR	ICE790149	ICE790181	--	\$146.60	ICE790165	ICE790194	\$161.26
1/2	1/2	3-1/4	6	.060CR	ICE790150	ICE790182	--	\$146.60	ICE790166	--	\$161.26
5/8	5/8	3-1/4	6	SQ	ICE790201	ICE790219	--	\$172.05	ICE790210	ICE790226	\$189.25
5/8	5/8	3-1/4	6	.030CR	ICE790202	ICE790220	--	\$172.05	ICE790211	ICE790227	\$189.25
5/8	5/8	3-1/4	6	.060CR	ICE790203	ICE790221	--	\$172.05	ICE790212	--	\$189.25
3/4	3/4	3-1/4	6	SQ	ICE790234	ICE790250	--	\$228.97	ICE790243	ICE790256	\$251.86
3/4	3/4	3-1/4	6	.030CR	ICE790235	ICE790251	--	\$228.97	ICE790244	ICE790257	\$251.86
3/4	3/4	3-1/4	6	.060CR	ICE790236	--	--	\$228.97	ICE790245	--	\$251.86
1	1	3-1/4	6	SQ	ICE790264	ICE790280	--	\$433.63	ICE790273	ICE790286	\$476.99
1	1	3-1/4	6	.030CR	ICE790265	ICE790281	--	\$433.63	ICE790274	ICE790287	\$476.99
1	1	3-1/4	6	.060CR	ICE790266	--	--	\$433.63	ICE790275	--	\$476.99

PROFESSIONAL **HEM** FEATURES:

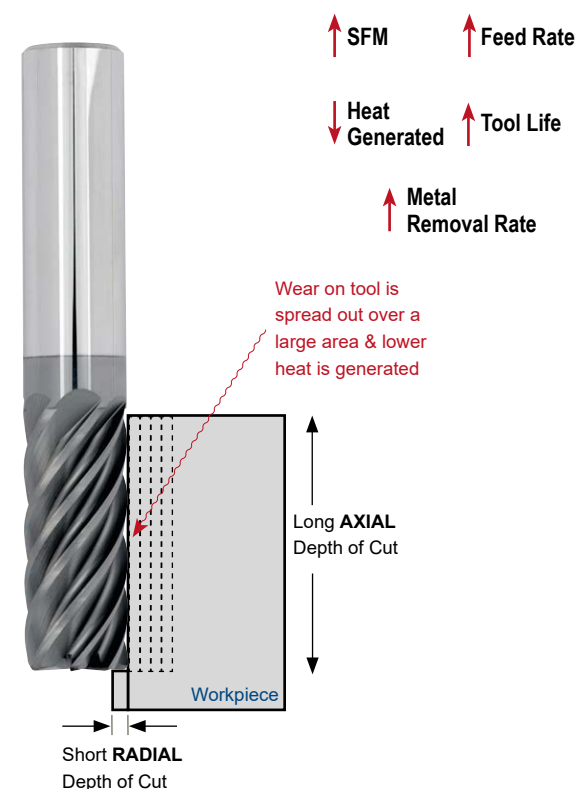
- 1 Special Tapered Core** - Increases tool stiffness
- 2 Ultra High Performance Micrograin Carbide** - Exceptional tool life
- 3 Variable Pitch** - Reduces harmonic vibration & increases tool life & surface finish
- 4 Finishers** - When exceptional finishes are required and chip lengths aren't an issue
- 5 Unique Chipbreakers** - A must in slotting & pocketing applications to clear chips. Keeps chip augers & conveyors from getting clogged too
- 6 ALL4 Coating** - Premium coating provides extremely high tool life
- 7 Proprietary Edge Honing** - Provides quiet cutting & long tool life



Traditional Machining



High Efficiency Machining (HEM)



SPEED & FEED RECOMMENDATIONS

PROFESSIONAL **HEM**

Material		Speed (SFM)	Feed Per Tooth By End Mill Diameter*							
		ALL4 Coated	1/4"	5/16"	3/8"	7/16"	1/2"	5/8"	3/4"	1"
Iron, Cast (soft)	K	375-950	.0030	.0032	.0035	.0037	.0040	.0045	.0070	.0090
Iron, Cast (hard)		150-475	.0018	.0020	.0025	.0027	.0030	.0035	.0040	.0050
Iron, Ductile		200-900	.0020	.0022	.0025	.0027	.0030	.0040	.0050	.0070
Iron, Malleable		275-850	.0020	.0025	.0030	.0035	.0040	.0050	.0060	.0080
Carbon Steels, Low	P	350-900	.0020	.0025	.0030	.0035	.0040	.0050	.0060	.0080
Carbon Steels, Medium		200-675	.0025	.0026	.0027	.0028	.0030	.0040	.0050	.0060
Carbon Steels Hardened to 35 Rc		190-545	.0020	.0021	.0022	.0023	.0025	.0027	.0030	.0040
Carbon Steels Hardened to 50 Rc		90-275	.0012	.0012	.0013	.0014	.0015	.0026	.0030	.0035
Carbon Steels Hardened to 60 Rc		--	--	--	--	--	--	--	--	--
Steels, Mold		300-725	.0020	.0022	.0025	.0027	.0030	.0035	.0040	.0050
Steels, Tool		175-525	.0020	.0022	.0025	.0027	.0030	.0035	.0040	.0050
Stainless Steels, Soft	M	300-525	.0020	.0022	.0025	.0022	.0030	.0040	.0050	.0070
Stainless Steels, Hard		150-475	.0015	.0016	.0017	.0018	.0020	.0030	.0040	.0060
Monel & High Nickel Steel	S	75-250	.0015	.0022	.0025	.0027	.0030	.0035	.0040	.0050
Titanium, Soft		125-425	.0015	.0022	.0025	.0027	.0030	.0040	.0050	.0070
Titanium, Hard		50-195	.0010	.0016	.0017	.0018	.0020	.0022	.0026	.0030
Nickel Based High Temp Alloys		50-175	.0014	.0014	.0015	.0016	.0017	.0018	.0020	.0023

* When using **HEM** techniques, the above feed per tooth must be used in a Radial Chip Thinning Factor (RCTF), formula to assure the proper programmed feed is calculated. Most machinist apps available online will have this.

Example below demonstrates the importance of RCTF calculations:

1/2" Diameter 5 Flute Machining Low Carbon Steel using 500 SFM & .0040" feed per tooth from the chart above with Traditional & HEM techniques. The HEM application will use .025" Radial Depths of Cut

Traditional Machining

Result = 76.4 IPM

High Efficiency Machining (HEM)

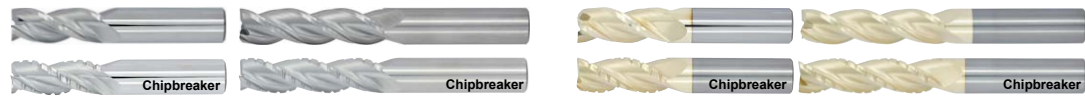
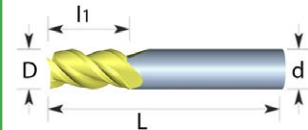
Result = 175.3 IPM



P	Steel
M	Stainless Steel
K	Cast Iron
N	Non-Ferrous
S	High Temp. Alloys
H	Hardened Steel
● BEST	

NON-FERROUS Medium/Rougher

- Special **36 Degree Helix** Design with Cylindrical Margin
- Ultra High Performance Micrograin Carbide
- 3 Flute Variable Pitch & Special Core Design with Chipbreaker
- Diameter (D) Tolerance: +0.0000"/-0.0004"
- Flute Geometries, with High Polished finish
- Shank (d) Tolerance: +0.0000"/-0.0004"



NON-FERROUS 3Flute Medium/Roughing - ALUMINUM

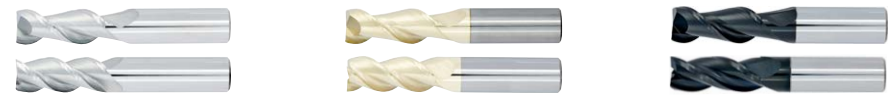
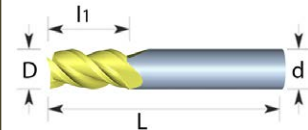
Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Corner Radius	Uncoated			ZrN Coated		
					3 Flute Part#	3 Flute Chipbreaker Part#	Price	3 Flute Part#	3 Flute Chipbreaker Part#	Price
1/4	1/4	3/4	2-1/2	SQ	ICE789248	--	\$16.98	ICE789299	--	\$22.46
1/4	1/4	3/4	2-1/2	.015CR	ICE789249	--	\$16.98	ICE789300	--	\$22.46
1/4	1/4	3/4	2-1/2	.030CR	ICE789251	--	\$16.98	--	--	
1/4	1/4	3/4	2-1/2	.060CR	ICE789252	--	\$16.98	--	--	
5/16	5/16	13/16	2-1/2	SQ	ICE789254	--	\$22.46	ICE789303	--	\$31.04
5/16	5/16	13/16	2-1/2	.030CR	ICE789255	--	\$22.46	ICE789304	--	\$31.04
5/16	5/16	13/16	2-1/2	.060CR	ICE789256	--	\$22.46	--	--	
3/8	3/8	1	2-1/2	SQ	ICE789257	--	\$29.62	ICE789305	--	\$37.94
3/8	3/8	1	2-1/2	.030CR	ICE789258	ICE789260	\$29.62	ICE789306	ICE789307	\$37.94
3/8	3/8	1	2-1/2	.060CR	ICE789259	--	\$29.62	--	--	
3/8	3/8	1-1/8	3	SQ	ICE789261	--	\$53.90	ICE789308	--	\$63.90
3/8	3/8	1-1/8	3	.030CR	ICE789262	ICE789263	\$53.90	ICE789309	ICE789310	\$63.90
1/2	1/2	1-1/4	3	SQ	ICE789264	--	\$48.91	ICE789311	--	\$63.23
1/2	1/2	1-1/4	3	.030CR	ICE789265	ICE789269	\$48.91	ICE789312	ICE789313	\$63.23
1/2	1/2	1-1/4	3	.060CR	ICE789266	--	\$48.91	--	--	
1/2	1/2	1-1/4	3	.090CR	ICE789267	--	\$48.91	--	--	
1/2	1/2	1-1/4	3	.120CR	ICE789268	--	\$48.91	--	--	
1/2	1/2	2	4	SQ	ICE789270	--	\$84.03	ICE789314	--	\$96.51
1/2	1/2	2	4	.030CR	ICE789271	ICE789272	\$84.03	ICE789315	ICE789316	\$96.51
5/8	5/8	1-1/4	3-1/2	SQ	ICE789273	--	\$97.17	ICE789317	--	\$108.16
5/8	5/8	1-1/4	3-1/2	.030CR	ICE789274	ICE789278	\$97.17	ICE789318	ICE789319	\$108.16
5/8	5/8	1-1/4	3-1/2	.060CR	ICE789275	--	\$97.17	--	--	
5/8	5/8	1-1/4	3-1/2	.090CR	ICE789276	--	\$97.17	--	--	
5/8	5/8	1-1/4	3-1/2	.120CR	ICE789277	--	\$97.17	--	--	
5/8	5/8	2-1/4	5	SQ	ICE789279	--	\$134.78	ICE789320	--	\$148.10
5/8	5/8	2-1/4	5	.030CR	ICE789280	ICE789281	\$134.78	ICE789321	ICE789322	\$148.10
3/4	3/4	1-5/8	4	SQ	ICE789282	--	\$134.78	ICE789323	--	\$158.08
3/4	3/4	1-5/8	4	.030CR	ICE789283	ICE789287	\$134.78	ICE789324	ICE789325	\$158.08
3/4	3/4	1-5/8	4	.060CR	ICE789284	--	\$134.78	--	--	
3/4	3/4	1-5/8	4	.090CR	ICE789285	--	\$134.78	--	--	
3/4	3/4	1-5/8	4	.120CR	ICE789286	--	\$134.78	--	--	
3/4	3/4	2-1/4	5	SQ	ICE789288	--	\$187.70	ICE789326	--	\$201.33
3/4	3/4	2-1/4	5	.030CR	ICE789289	ICE789290	\$187.70	ICE789327	ICE789328	\$201.33
1	1	1-1/2	4	SQ	ICE789291	--	\$231.98	ICE789329	--	\$257.90
1	1	1-1/2	4	.030CR	ICE789292	ICE789295	\$231.98	ICE789330	ICE789331	\$257.90
1	1	1-1/2	4	.060CR	ICE789293	--	\$231.98	--	--	
1	1	1-1/2	4	.120CR	ICE789294	--	\$231.98	--	--	
1	1	2-1/4	5	SQ	ICE789296	--	\$292.21	ICE789332	--	\$324.46
1	1	2-1/4	5	.030CR	ICE789297	ICE789298	\$292.21	ICE789333	ICE789334	\$324.46



P	Steel
M	Stainless Steel
K	Cast Iron
N	Non-Ferrous
S	High Temp. Alloys
H	Hardened Steel
● BEST	

NON-FERROUS Medium/Finisher

- Special **45 Degree Helix** Design with Cylindrical Margin
- Ultra High Performance Micrograin Carbide
- Variable Pitch & Special Core Design with Chipbreaker Flute
- Diameter (D) Tolerance: +0.0000"/-0.0004"
- Geometries, with High Polished finish
- Shank (d) Tolerance: +0.0000"/-0.0004"



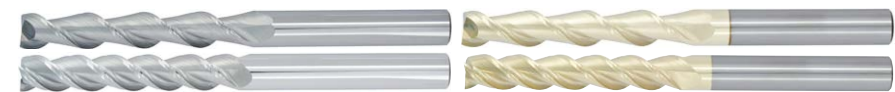
NON-FERROUS Medium/Finishing, Regular Length, Single End - ALUMINUM

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Corner Radius	Uncoated			ZrN Coated			DLC Coated		
					2 Flute Part#	3 Flute Part#	Price	2 Flute Part#	3 Flute Part#	Price	2 Flute Part#	3 Flute Part#	Price
1/8	1/8	1/2	1-1/2	SQ	ICE789022	ICE789023	\$11.72	--	--		--	--	
3/16	3/16	5/8	2	SQ	ICE789024	ICE789026	\$15.56	ICE788908	ICE788910	\$18.13	ICE789138	ICE789140	\$30.82
1/4	1/4	3/4	2-1/2	SQ	ICE789027	ICE789029	\$16.96	ICE788911	ICE788913	\$22.45	ICE789141	ICE789143	\$38.17
1/4	1/4	3/4	2-1/2	.020CR	ICE789028	ICE789030	\$16.96	ICE788912	ICE788914	\$22.45	ICE789142	ICE789144	\$38.17
5/16	5/16	13/16	2-1/2	SQ	ICE789032	ICE789034	\$22.45	ICE788916	ICE788918	\$31.02	ICE789146	ICE789148	\$52.73
5/16	5/16	13/16	2-1/2	.020CR	ICE789033	ICE789036	\$22.45	ICE788917	ICE788920	\$31.02	ICE789147	ICE789150	\$52.73
3/8	3/8	1	2-1/2	SQ	ICE789038	ICE789040	\$29.60	ICE788922	ICE788924	\$37.92	ICE789152	ICE789154	\$64.46
3/8	3/8	1	2-1/2	.020CR	ICE789039	ICE789041	\$29.60	ICE788923	ICE788925	\$37.92	ICE789153	ICE789155	\$64.46
1/2	1/2	1-1/4	3	SQ	ICE789042	ICE789044	\$48.89	ICE788926	ICE788928	\$63.19	ICE789156	ICE789158	\$107.43
1/2	1/2	1-1/4	3	.030CR	ICE789043	ICE789045	\$48.89	ICE788927	ICE788929	\$63.19	ICE789157	ICE789159	\$107.43
5/8	5/8	1-1/4	3-1/2	SQ	ICE789046	ICE789048	\$97.12	ICE788930	ICE788932	\$108.10	ICE789160	ICE789162	\$183.76
5/8	5/8	1-1/4	3-1/2	.030CR	ICE789047	ICE789049	\$97.12	ICE788931	ICE788933	\$108.10	ICE789161	ICE789163	\$183.76
3/4	3/4	1-1/2	4	SQ	ICE789050	ICE789052	\$134.70	ICE788934	ICE788936	\$157.99	ICE789164	ICE789166	\$268.57
3/4	3/4	1-1/2	4	.030CR	ICE789051	ICE789053	\$134.70	ICE788935	ICE788937	\$157.99	ICE789165	ICE789167	\$268.57
1	1	1-1/2	4	SQ	ICE789018	ICE789020	\$231.86	ICE788904	ICE788906	\$257.77	ICE789134	ICE789136	\$438.20
1	1	1-1/2	4	.030CR	ICE789019	ICE789021	\$231.86	ICE788905	ICE788907	\$257.77	ICE789135	ICE789137	\$438.20



NON-FERROUS Medium/Finishing, Long Length, Single End - ALUMINUM

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Corner Radius	Uncoated			ZrN Coated		
					2 Flute Part#	3 Flute Part#	Price	2 Flute Part#	3 Flute Part#	Price
3/16	3/16	3/4	2-1/2	SQ	ICE789056	ICE789057	\$25.61	ICE788940	ICE788941	\$36.04
1/4	1/4	1-1/8	3	SQ	ICE789058	ICE789059	\$32.02	ICE788942	ICE788943	\$37.98
5/16	5/16	1-1/8	3	SQ	ICE789060	ICE789061	\$47.73	ICE788944	ICE788945	\$52.85
3/8	3/8	1-1/8	3	SQ	ICE789062	ICE789063	\$53.88	ICE788946	ICE788947	\$63.87
1/2	1/2	2	4	SQ	ICE789064	ICE789065	\$83.98	ICE788948	ICE788949	\$96.45
5/8	5/8	2-1/4	5	SQ	ICE789066	ICE789067	\$134.70	ICE788950	ICE788951	\$148.01
3/4	3/4	2-1/4	5	SQ	ICE789068	ICE789069	\$187.59	ICE788952	ICE788953	\$201.22
1	1	2-1/4	5	SQ	ICE789054	ICE789055	\$292.05	ICE788938	ICE788939	\$324.29



NON-FERROUS Medium/Finishing, Extra Long Length, Single End - ALUMINUM

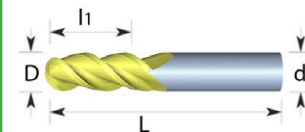
Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Corner Radius	Uncoated			ZrN Coated		
					2 Flute Part#	3 Flute Part#	Price	2 Flute Part#	3 Flute Part#	Price
3/16	3/16	1-1/8	3	SQ	ICE789104	ICE789105	\$30.87	ICE788988	ICE788989	\$39.64
1/4	1/4	1-1/2	4	SQ	ICE789106	ICE789107	\$41.91	ICE788990	ICE788991	\$45.20
5/16	5/16	1-5/8	4	SQ	ICE789108	ICE789109	\$55.37	ICE788992	ICE788993	\$60.78
3/8	3/8	1-3/4	4	SQ	ICE789110	ICE789111	\$59.27	ICE788994	ICE788995	\$70.26
1/2	1/2	3	6	SQ	ICE789112	ICE789113	\$125.39	ICE788996	ICE788997	\$146.61
5/8	5/8	3	6	SQ	ICE789114	ICE789115	\$166.63	ICE788998	ICE788999	\$172.06
3/4	3/4	3	6	SQ	ICE789116	ICE789117	\$205.29	ICE789000	ICE789001	\$228.98
1	1	3	6	SQ	ICE789102	ICE789103	\$399.76	ICE788986	ICE788987	\$433.66

P	Steel
M	Stainless Steel
K	Cast Iron
N	Non-Ferrous
S	High Temp. Alloys
H	Hardened Steel

- Special 45 Degree Helix Design with Cylindrical Margin
- Variable Pitch & Special Core Design with Chipbreaker Flute Geometries, with High Polished finish

NON-FERROUS

- Ultra High Performance Micrograin Carbide
- Diameter (D) Tolerance: +0.0000"/-0.0004"
- Shank (d) Tolerance: +0.0000"/-0.0004"



NON-FERROUS Medium/Finishing, Ball Regular Length, Single End - ALUMINUM

Cutter Diam. D	Shank Diam. d	Length Of Cut L1	O.A.L. L	Corner Radius	Uncoated			ZrN Coated		
					2 Flute Part#	3 Flute Part#	Price	2 Flute Part#	3 Flute Part#	Price
3/16	3/16	5/8	2	BN	ICE789072	ICE789073	\$18.66	ICE788956	ICE788957	\$21.75
1/4	1/4	3/4	2-1/2	BN	ICE789074	ICE789075	\$20.35	ICE788958	ICE788959	\$26.94
5/16	5/16	13/16	2-1/2	BN	ICE789076	ICE789077	\$26.94	ICE788960	ICE788961	\$37.21
3/8	3/8	1	2-1/2	BN	ICE789078	ICE789079	\$35.52	ICE788962	ICE788963	\$45.50
1/2	1/2	1-1/4	3	BN	ICE789080	ICE789081	\$58.67	ICE788964	ICE788965	\$75.83
5/8	5/8	1-1/4	3-1/2	BN	ICE789082	ICE789083	\$116.54	ICE788966	ICE788967	\$129.71
3/4	3/4	1-1/2	4	BN	ICE789084	ICE789085	\$161.64	ICE788968	ICE788969	\$189.58
1	1	1-1/2	4	BN	ICE789070	ICE789071	\$278.23	ICE788954	ICE788955	\$309.32



NON-FERROUS Medium/Finishing, Ball Long Length, Single End - ALUMINUM

Cutter Diam. D	Shank Diam. d	Length Of Cut L1	O.A.L. L	Corner Radius	Uncoated			ZrN Coated		
					2 Flute Part#	3 Flute Part#	Price	2 Flute Part#	3 Flute Part#	Price
3/16	3/16	3/4	2-1/2	BN	ICE789088	ICE789089	\$30.73	ICE788972	ICE788973	\$43.25
1/4	1/4	1-1/8	3	BN	ICE789090	ICE789091	\$38.42	ICE788974	ICE788975	\$45.58
5/16	5/16	1-1/8	3	BN	ICE789092	ICE789093	\$57.27	ICE788976	ICE788977	\$63.41
3/8	3/8	1-1/8	3	BN	ICE789094	ICE789095	\$64.65	ICE788978	ICE788979	\$76.64
1/2	1/2	2	4	BN	ICE789096	ICE789097	\$100.78	ICE788980	ICE788981	\$115.74
5/8	5/8	2-1/4	5	BN	ICE789098	ICE789099	\$161.64	ICE788982	ICE788983	\$177.61
3/4	3/4	2-1/4	5	BN	ICE789100	ICE789101	\$225.11	ICE788984	ICE788985	\$241.47
1	1	2-1/4	5	BN	ICE789086	ICE789087	\$350.46	ICE788970	ICE788971	\$389.14



NON-FERROUS Medium/Finishing, Ball Extra Long Length, Single End - ALUMINUM

Cutter Diam. D	Shank Diam. d	Length Of Cut L1	O.A.L. L	Corner Radius	Uncoated			ZrN Coated		
					2 Flute Part#	3 Flute Part#	Price	2 Flute Part#	3 Flute Part#	Price
3/16	3/16	1-1/8	3	BN	ICE789120	ICE789121	\$37.03	ICE789004	ICE789005	\$47.57
1/4	1/4	1-1/2	4	BN	ICE789122	ICE789123	\$50.29	ICE789006	ICE789007	\$54.24
5/16	5/16	1-5/8	4	BN	ICE789124	ICE789125	\$66.44	ICE789008	ICE789009	\$72.93
3/8	3/8	1-3/4	4	BN	ICE789126	ICE789127	\$71.13	ICE789010	ICE789011	\$84.30
1/2	1/2	3	6	BN	ICE789128	ICE789129	\$150.46	ICE789012	ICE789013	\$175.93
5/8	5/8	3	6	BN	ICE789130	ICE789131	\$199.96	ICE789014	ICE789015	\$206.47
3/4	3/4	3	6	BN	ICE789132	ICE789133	\$246.35	ICE789016	ICE789017	\$274.78
1	1	3	6	BN	ICE789118	ICE789119	\$479.71	ICE789002	ICE789003	\$520.39

SPEED & FEED RECOMMENDATIONS

NON-FERROUS										
Material		Speed (SFM)	Feed Per Tooth By End Mill Diameter							
		ZrN Coated	1/4"	5/16"	3/8"	7/16"	1/2"	5/8"	3/4"	1"
Aluminum & Aluminum Alloys	N	900-1800	.0030	.0035	.0040	.0045	.0050	.0060	.0070	.0090
Copper & Copper Alloys		525-1275	.0030	.0035	.0035	.0040	.0040	.0045	.0050	.0070
Brass & Bronze		375-600	.0030	.0035	.0035	.0040	.0040	.0045	.0050	.0060
Graphite		500-1200	.0040	.0045	.0045	.0045	.0045	.0050	.0060	.0080
Plastics		600-1650	.0040	.0045	.0050	.0060	.0070	.0090	.0110	.0160
Iron, Cast (soft)	K	--								
Iron, Cast (hard)		--								
Iron, Ductile		--								
Iron, Malleable		--								
Carbon Steels, Low	P	--								
Carbon Steels, Medium		--								
Carbon Steels Hardened to 35 Rc		--								
Carbon Steels Hardened to 50 Rc		--								
Carbon Steels Hardened to 60 Rc		--								
Steels, Mold	P	--								
Steels, Tool		--								
Stainless Steels, Soft	M	--								
Stainless Steels, Hard		--								
Monel & High Nickel Steel	S	--								
Titanium, Soft		--								
Titanium, Hard		--								
Nickel Based High Temp Alloys		--								



- Higher Feed Per Tooth should be used to start for radial depths of cut less than 25% of the tool diameter. Lower Feed Per Tooth should be used to start for radial depths of cut greater than 25% of the tool diameter.

$$RPM = \frac{SFM}{(3.146 * \text{Cutter Diam.}) / 12}$$

- The above recommendations are for axial lengths of cut not to exceed 1.5 times the tool diameter for profiling and 1 times the diameter for full slotting.

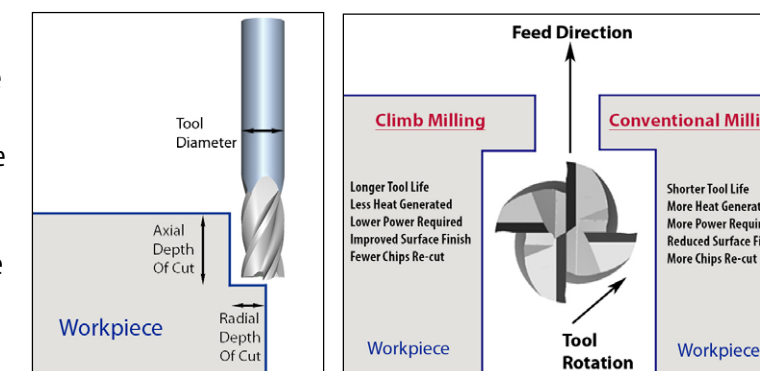
$$IPM = RPM * \text{Feed Per Tooth} * \# \text{ of Teeth}$$

- The above parameters are recommended starting points only. If the tool is working well, without vibrations or significant noise, increase the SFM and/or Feed Per Tooth in 5-10% increments.

- Optimum speeds & feeds will depend upon material, setup, machine conditions & tool deflection. Higher or lower parameters may be required to achieve optimum machining conditions.

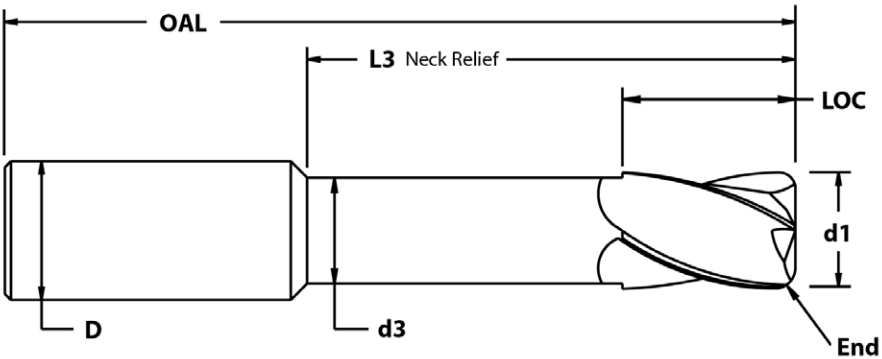
- For Light Radial Depths of cut, make certain to increase the feed rate to compensate for Radial Chip Thinning Factor (RCTF). Consult a formula or app to calculate.

- Climb Milling is preferred to Conventional Milling





CUSTOM CARBIDE END MILL FORM



- End:
- ☐ Square
 - ☐ Ball Nose
 - ☐ Corner Radius (Size: _____)
 - ☐ Chamfer (Size: _____)

Dimensions:

- OAL (Overall Length): _____
- D (Shank Diameter): _____
- LOC (Length of Cut): _____
- d1 (Tool Diameter): _____
- Number of Flutes: _____

Series:

- ☐ **ECONOMY**
- ☐ **PERFORMANCE**
- ☐ **PROFESSIONAL**
- ☐ **NON-FERROUS**

Special Minimum Order Quantities	
Tool Diameter Range	Minimum Order Qty.
Under 3/16" (4mm)	Not Available
3/16"-1/4" (4mm-6mm)	20
5/16"-3/8" (7mm-10mm)	15
7/16"-1/2" (11mm-12mm)	10
9/16"-3/4" (13mm-20mm)	5
7/8"-1" (25mm)	3

OPTIONAL:

Neck Relief:

- ☐ No
 - ☐ Yes
- d3 (Neck Relief Diameter): _____
- L3 (Length from Tip): _____

Tapered:

- ☐ No
 - ☐ Yes
- Taper Angle (Indicate if angle is per side or included): _____
- d1 (Tip Diameter): _____

Shank Type:

- ☐ Cylindrical
- ☐ Weldon Flat

Coating:

- ☐ Uncoated
- ☐ ALL4 (Aluminum Chromium Titanium Nitride)
- ☐ ZrN (Zirconium Nitride)
- ☐ DLC (Diamond Like Carbon)

OTHER INFORMATION:

- Material(s) being machined: _____
- Current Speed: _____ Radial DOC.: _____
- Current Feed: _____ Axial DOC.: _____

- End User Company Name: _____
- End User Contact: _____

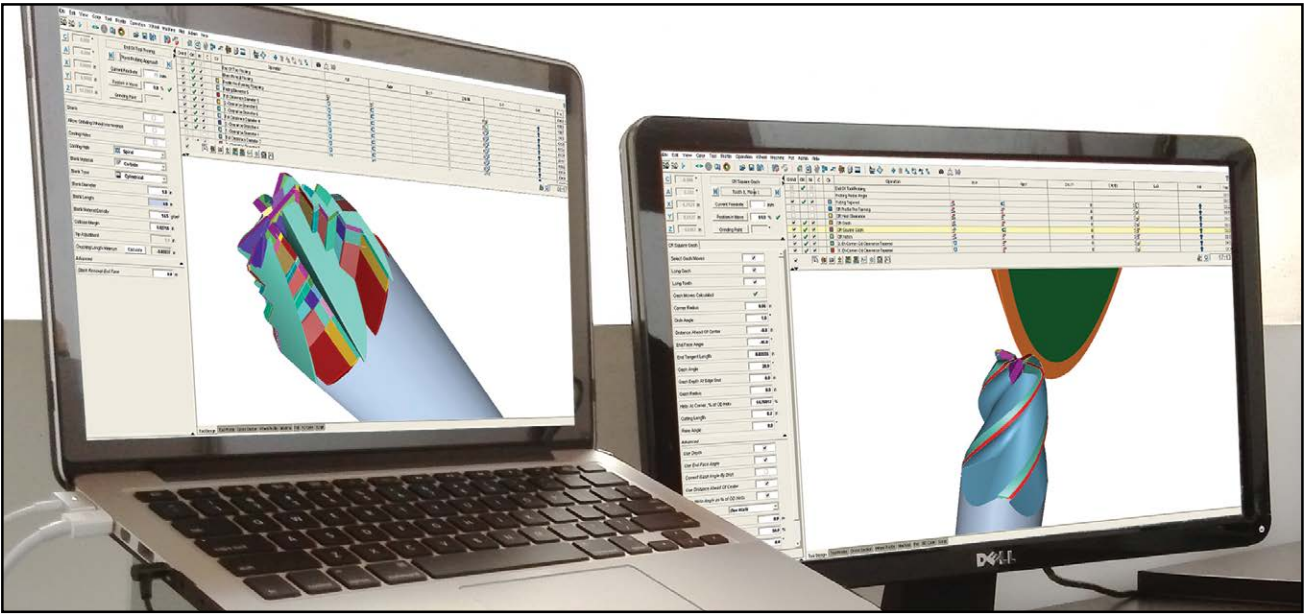
Other Information: _____



ADDITIONAL SERVICES

SPECIALS & ENGINEERED SOLUTIONS

- Don't see what you need? Let us know what you would like and we would be happy to quote on it!
- Engineered solutions based on your applications. Allow our technical experience to design the tool that works best for your unique application.
- Quick turnaround time from concept to your spindle.



REGRINDING SERVICES:

- Extremely high precision work on 5 Axis CNC Tool & Cutter Grinders, allowing your used tools to be brought back to better-than-new condition in many cases.
- Quick turnaround times.
- Tools are measured, labelled with new size, and repackaged in new plastic tubes.
- Tools reground include HSS & Carbide:
 - Endmills
 - HSS Drills
 - Reamers
 - Countersinks
 - Counterbores
 - High Performance Carbide Drills
 - Annular Cutters
 - Spot Drills



Bring Them Back To Life At A Fraction Of The Price!

COMPLETE COATING SERVICES:

- The most state of the art PVD coatings on the World's Leading Equipment
- Ultra High Performance Coatings on new tools & regrinds
- Extremely quick turn around times



