ICE

Innovative Custom Engineering

SOLID CARBIDE END MILLS

2021/2022

ICE

Innovative Custom Engineering

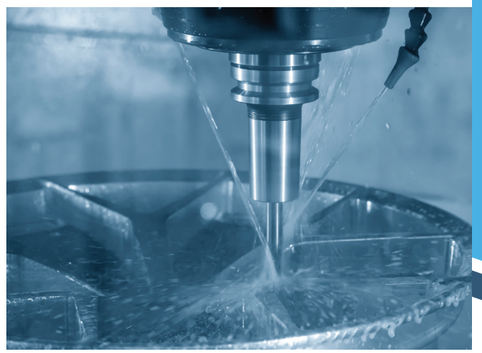
Carbide End Mills engineered to the highest quality with the best raw material & coatings for demanding applications. High tech geometries manufactured on the most state of the art 5 Axis CNC Grinders in the world. Extremely rigid quality control to assure the tightest tolerances & consistency.

ECO — *ECONOMY*

- General Purpose
- 30 deg Helix Carbide with honed edges
- 10% Micro Grain 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% Micro Grain 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 Micro Grain 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 Micro Grain Carbide with extremely high Transverse Rupture strength
- 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

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END MILL SERIES LISTING

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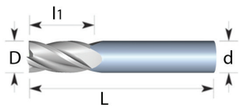
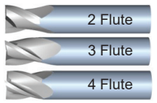
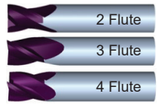
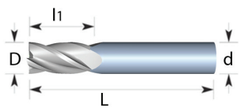


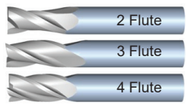


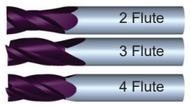


Square End, Standard Carbide, Stub Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated 2 Flute Part#	Uncoated 3 Flute Part#	Uncoated 4 Flute Part#	Uncoated Price	TiALN Coated 2 Flute Part#	TiALN Coated 3 Flute Part#	TiALN Coated 4 Flute Part#	TiALN Coated Price
1/32	1/8	1/16	1-1/2	ICE786324	ICE786325	ICE786326	$6.26	ICE786420	ICE786421	ICE786422	$8.13
3/64	1/8	3/32	1-1/2	ICE786327	ICE786328	ICE786329	$6.26	ICE786423	ICE786424	ICE786425	$8.13
1/16	1/8	1/8	1-1/2	ICE786330	ICE786331	ICE786332	$5.01	ICE786426	ICE786427	ICE786428	$6.87
3/32	1/8	3/16	1-1/2	ICE786333	ICE786334	ICE786335	$4.39	ICE786429	ICE786430	ICE786431	$6.24
1/8	1/8	1/4	1-1/2	ICE786339	ICE786340	ICE786341	$4.17	ICE786435	ICE786436	ICE786437	$6.04
5/32	3/16	5/16	2	ICE786342	ICE786343	ICE786344	$9.29	ICE786438	ICE786439	ICE786440	$12.01
3/16	3/16	3/8	2	ICE786345	ICE786346	ICE786347	$8.98	ICE786441	ICE786442	ICE786443	$11.68
7/32	1/4	7/16	2	ICE786348	ICE786349	ICE786350	$10.85	ICE786444	ICE786445	ICE786446	$15.70
1/4	1/4	1/2	2	ICE786351	ICE786352	ICE786353	$8.87	ICE786447	ICE786448	ICE786449	$13.73
5/16	3/8	1/2	2	ICE786354	ICE786355	ICE786356	$11.99	ICE786450	ICE786451	ICE786452	$18.84
3/8	3/8	5/8	2	ICE786357	ICE786358	ICE786359	$15.24	ICE786453	ICE786454	ICE786455	$22.07
7/16	7/16	5/8	2-1/2	ICE786360	ICE786361	ICE786362	$20.86	ICE786456	ICE786457	ICE786458	$30.66
1/2	1/2	5/8	2-1/2	ICE786363	ICE786364	ICE786365	$26.09	ICE786459	ICE786460	ICE786461	$35.86
5/8	5/8	3/4	3	ICE786366	ICE786367	ICE786368	$53.21	ICE786462	ICE786463	ICE786464	$68.48
3/4	3/4	1	3	ICE786369	ICE786370	ICE786371	$74.08	ICE786465	ICE786466	ICE786467	$91.52
1	1	1	3	ICE786336	ICE786337	ICE786338	$131.33	ICE786432	ICE786433	ICE786434	$164.06







Square End, Standard Carbide, Regular Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated 2 Flute Part#	Uncoated 3 Flute Part#	Uncoated 4 Flute Part#	Uncoated Price	TiALN Coated 2 Flute Part#	TiALN Coated 3 Flute Part#	TiALN Coated 4 Flute Part#	TiALN Coated Price
1/64	1/8	1/16	1-1/2	ICE786468	ICE786469	ICE786470	$7.14	ICE786864	ICE786865	ICE786866	$8.89
1/32	1/8	3/32	1-1/2	ICE786471	ICE786472	ICE786473	$6.59	ICE786867	ICE786868	ICE786869	$8.54
3/64	1/8	1/8	1-1/2	ICE786474	ICE786475	ICE786476	$6.59	ICE786870	ICE786871	ICE786872	$8.54
1/16	1/8	3/16	1-1/2	ICE786477	ICE786478	ICE786479	$5.27	ICE786873	ICE786874	ICE786875	$7.23
5/64	1/8	1/4	1-1/2	ICE786480	ICE786481	ICE786482	$4.94	ICE786876	ICE786877	ICE786878	$7.03
3/32	1/8	3/8	1-1/2	ICE786483	ICE786484	ICE786485	$4.61	ICE786879	ICE786880	ICE786881	$6.57
7/64	1/8	3/8	1-1/2	ICE786490	ICE786491	ICE786492	$4.61	ICE786886	ICE786887	ICE786888	$6.59
1/8	1/8	1/2	1-1/2	ICE786493	ICE786494	ICE786495	$4.39	ICE786889	ICE786890	ICE786891	$6.35
9/64	3/16	9/16	2	ICE786497	ICE786498	ICE786499	$10.21	ICE786893	ICE786894	ICE786895	$13.59
5/32	3/16	9/16	2	ICE786500	ICE786501	ICE786502	$9.77	ICE786896	ICE786897	ICE786898	$12.63
11/64	3/16	9/16	2	ICE786503	ICE786504	ICE786505	$10.21	ICE786899	ICE786900	ICE786901	$13.13
3/16	3/16	5/8	2	ICE786506	ICE786507	ICE786508	$9.44	ICE786902	ICE786903	ICE786904	$12.30
13/64	1/4	5/8	2-1/2	ICE786510	ICE786511	ICE786512	$12.94	ICE786906	ICE786907	ICE786908	$18.16
7/32	1/4	5/8	2-1/2	ICE786513	ICE786514	ICE786515	$11.42	ICE786909	ICE786910	ICE786911	$16.54
15/64	1/4	3/4	2-1/2	ICE786516	ICE786517	ICE786518	$12.94	ICE786912	ICE786913	ICE786914	$17.92
1/4	1/4	3/4	2-1/2	ICE786519	ICE786520	ICE786521	$9.33	ICE786915	ICE786916	ICE786917	$14.45

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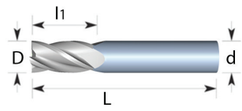

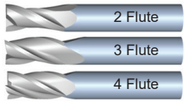

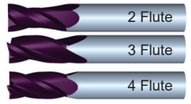

Square End, Standard Carbide, Regular Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated 2 Flute Part#	Uncoated 3 Flute Part#	Uncoated 4 Flute Part#	Uncoated Price	TiALN Coated 2 Flute Part#	TiALN Coated 3 Flute Part#	TiALN Coated 4 Flute Part#	TiALN Coated Price
17/64	5/16	7/8	2-1/2	ICE786523	ICE786524	ICE786525	$15.48	ICE786919	ICE786920	ICE786921	$21.90
9/32	5/16	7/8	2-1/2	ICE786526	ICE786527	ICE786528	$14.17	ICE786922	ICE786923	ICE786924	$20.38
19/64	5/16	7/8	2-1/2	ICE786529	ICE786530	ICE786531	$15.48	ICE786925	ICE786926	ICE786927	$21.17
5/16	5/16	7/8	2-1/2	ICE786532	ICE786533	ICE786534	$12.63	ICE786928	ICE786929	ICE786930	$19.83
21/64	3/8	7/8	2-1/2	ICE786536	ICE786537	ICE786538	$17.90	ICE786932	ICE786933	ICE786934	$26.18
11/32	3/8	7/8	2-1/2	ICE786539	ICE786540	ICE786541	$16.47	ICE786935	ICE786936	ICE786937	$23.68
23/64	3/8	7/8	2-1/2	ICE786542	ICE786543	ICE786544	$17.90	ICE786938	ICE786939	ICE786940	$23.87
3/8	3/8	1	2-1/2	ICE786545	ICE786546	ICE786547	$16.03	ICE786941	ICE786942	ICE786943	$23.24
25/64	7/16	1	2-1/2	ICE786549	ICE786550	ICE786551	$28.00	ICE786945	ICE786946	ICE786947	$35.14
13/32	7/16	1	2-1/2	ICE786552	ICE786553	ICE786554	$27.45	ICE786948	ICE786949	ICE786950	$34.59
27/64	7/16	1	2-1/2	ICE786555	ICE786556	ICE786557	$26.35	ICE786951	ICE786952	ICE786953	$33.16
7/16	7/16	1	2-1/2	ICE786558	ICE786559	ICE786560	$23.06	ICE786954	ICE786955	ICE786956	$33.36
29/64	1/2	1	3	ICE786562	ICE786563	ICE786564	$30.97	ICE786958	ICE786959	ICE786960	$41.62
15/32	1/2	1	3	ICE786565	ICE786566	ICE786567	$30.20	ICE786961	ICE786962	ICE786963	$41.18
31/64	1/2	1	3	ICE786568	ICE786569	ICE786570	$29.10	ICE786964	ICE786965	ICE786966	$40.63
1/2	1/2	1	3	ICE786571	ICE786572	ICE786573	$27.45	ICE786967	ICE786968	ICE786969	$37.75
33/64	9/16	1-1/4	3-1/2	ICE786575	ICE786576	ICE786577	$61.82	ICE786971	ICE786972	ICE786973	$89.32
17/32	9/16	1-1/4	3-1/2	ICE786578	ICE786579	ICE786580	$61.38	ICE786974	ICE786975	ICE786976	$87.41
35/64	9/16	1-1/4	3-1/2	ICE786581	ICE786582	ICE786584	$58.20	ICE786977	ICE786978	ICE786979	$82.53
9/16	9/16	1-1/4	3-1/2	ICE786585	ICE786586	ICE786587	$53.81	ICE786980	ICE786981	ICE786982	$69.88
37/64	5/8	1-1/4	3-1/2	ICE786589	ICE786590	ICE786591	$63.91	ICE786984	ICE786985	ICE786986	$84.03
19/32	5/8	1-1/4	3-1/2	ICE786592	ICE786593	ICE786594	$61.49	ICE786987	ICE786988	ICE786989	$82.53
39/64	5/8	1-1/4	3-1/2	ICE786595	ICE786596	ICE786597	$59.30	ICE786990	ICE786991	ICE786992	$80.97
5/8	5/8	1-1/4	3-1/2	ICE786598	ICE786599	ICE786600	$56.00	ICE786993	ICE786994	ICE786995	$72.08
41/64	3/4	1-1/2	4	ICE786602	ICE786603	ICE786604	$94.13	ICE786997	ICE786998	ICE786999	$110.95
21/32	3/4	1-1/2	4	ICE786605	ICE786606	ICE786607	$93.34	ICE787000	ICE787001	ICE787002	$109.15
43/64	3/4	1-1/2	4	ICE786608	ICE786609	ICE786610	$92.24	ICE787003	ICE787004	ICE787005	$108.93
11/16	3/4	1-1/2	4	ICE786611	ICE786612	ICE786613	$81.26	ICE787006	ICE787007	ICE787008	$106.30
45/64	3/4	1-1/2	4	ICE786614	ICE786615	ICE786616	$86.75	ICE787009	ICE787010	ICE787011	$107.72
23/32	3/4	1-1/2	4	ICE786617	ICE786618	ICE786619	$86.75	ICE787012	ICE787013	ICE787014	$106.96
47/64	3/4	1-1/2	4	ICE786620	ICE786621	ICE786622	$86.75	ICE787015	ICE787016	ICE787017	$106.67
3/4	3/4	1-1/2	4	ICE786623	ICE786624	ICE786625	$77.97	ICE787018	ICE787019	ICE787020	$96.33
49/64	7/8	1-1/2	4	ICE786627	ICE786628	ICE786629	$157.03	ICE787022	ICE787023	ICE787024	$198.10
25/32	7/8	1-1/2	4	ICE786630	ICE786631	ICE786632	$157.03	ICE787025	ICE787026	ICE787027	$197.26
51/64	7/8	1-1/2	4	ICE786633	ICE786634	ICE786635	$157.03	ICE787028	ICE787029	ICE787030	$196.41
13/16	7/8	1-1/2	4	ICE786636	ICE786637	ICE786638	$157.03	ICE787031	ICE787032	ICE787033	$193.27
53/64	7/8	1-1/2	4	ICE786639	ICE786640	ICE786641	$152.20	ICE787034	ICE787035	ICE787036	$194.47
27/32	7/8	1-1/2	4	ICE786642	ICE786643	ICE786644	$152.20	ICE787037	ICE787038	ICE787039	$193.88
55/64	7/8	1-1/2	4	ICE786645	ICE786646	ICE786647	$152.20	ICE787040	ICE787041	ICE787042	$193.27
7/8	7/8	1-1/2	4	ICE786648	ICE786649	ICE786650	$138.36	ICE787043	ICE787044	ICE787045	$170.49
57/64	1	1-1/2	4	ICE786652	ICE786653	ICE786654	$161.64	ICE787047	ICE787048	ICE787049	$199.81
29/32	1	1-1/2	4	ICE786655	ICE786656	ICE786657	$161.64	ICE787050	ICE787051	ICE787052	$198.65
59/64	1	1-1/2	4	ICE786658	ICE786659	ICE786660	$161.64	ICE787053	ICE787054	ICE787055	$197.51
15/16	1	1-1/2	4	ICE786661	ICE786662	ICE786663	$154.61	ICE787056	ICE787057	ICE787058	$193.27
61/64	1	1-1/2	4	ICE786664	ICE786665	ICE786666	$154.61	ICE787059	ICE787060	ICE787061	$192.06
31/32	1	1-1/2	4	ICE786667	ICE786668	ICE786669	$154.61	ICE787062	ICE787063	ICE787064	$190.83
63/64	1	1-1/2	4	ICE786670	ICE786671	ICE786672	$154.61	ICE787065	ICE787066	ICE787067	$190.82
1	1	1-1/2	4	ICE786486	ICE786487	ICE786488	$140.56	ICE786882	ICE786883	ICE786884	$172.69

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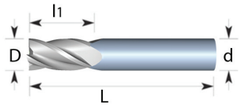

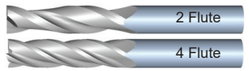

Square End, Standard Carbide, Long Length, Single End

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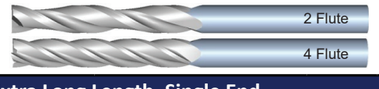
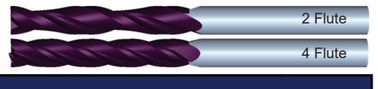
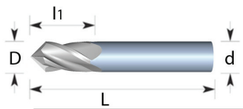
1/8	1/8	3/4	2-1/2	ICE787070	--	ICE787071	$9.11	ICE787114	--	ICE787115	$11.77
3/16	3/16	3/4	2-1/2	ICE787072	--	ICE787073	$13.31	ICE787116	--	ICE787117	$16.82
1/4	1/4	1-1/8	3	ICE787074	--	ICE787075	$15.92	ICE787118	--	ICE787119	$21.04
5/16	5/16	1-1/8	3	ICE787076	--	ICE787077	$19.77	ICE787120	--	ICE787121	$26.86
3/8	3/8	1-1/8	3	ICE787078	--	ICE787079	$27.45	ICE787122	--	ICE787123	$34.66
7/16	7/16	2	4	ICE787080	--	ICE787081	$43.53	ICE787124	--	ICE787125	$54.07
1/2	1/2	2	4	ICE787082	--	ICE787083	$47.04	ICE787126	--	ICE787127	$59.91
5/8	5/8	2-1/4	5	ICE787086	--	ICE787087	$85.65	ICE787130	--	ICE787131	$104.98
3/4	3/4	2-1/4	5	ICE787088	--	ICE787089	$120.79	ICE787132	--	ICE787133	$142.80
1	1	2-1/4	5	ICE787068	--	ICE787069	$186.68	ICE787112	--	ICE787113	$225.24

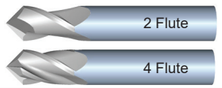


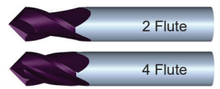


Square End, Standard Carbide, Extra Long Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated 2 Flute Part#	Uncoated 3 Flute Part#	Uncoated 4 Flute Part#	Uncoated Price	TiALN Coated 2 Flute Part#	TiALN Coated 3 Flute Part#	TiALN Coated 4 Flute Part#	TiALN Coated Price
1/8	1/8	1	3	ICE787140	--	ICE787142	$13.64	ICE787203	--	ICE787204	$16.30
3/16	3/16	1-1/8	3	ICE787141	--	ICE787142	$14.28	ICE787205	--	ICE787206	$17.79
1/4	1/4	1-1/2	4	ICE787143	--	ICE787144	$18.67	ICE787207	--	ICE787208	$25.08
5/16	5/16	1-5/8	4	ICE787147	--	ICE787148	$23.06	ICE787211	--	ICE787212	$31.08
3/8	3/8	1-3/4	4	ICE787153	--	ICE787154	$30.20	ICE787217	--	ICE787218	$38.21
1/2	1/2	3	6	ICE787157	--	ICE787158	$73.57	ICE787221	--	ICE787222	$91.54
5/8	5/8	3	6	ICE787161	--	ICE787162	$96.63	ICE787225	--	ICE787226	$119.14
3/4	3/4	3	6	ICE787163	--	ICE787164	$133.97	ICE787227	--	ICE787228	$160.67
1	1	3	6	ICE787134	--	ICE787136	$252.56	ICE787199	--	ICE787200	$297.52







Drill/Mill 90 Degree, Standard Carbide, Regular Length

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated 2 Flute Part#	Uncoated 3 Flute Part#	Uncoated 4 Flute Part#	Uncoated Price	TiALN Coated 2 Flute Part#	TiALN Coated 3 Flute Part#	TiALN Coated 4 Flute Part#	TiALN Coated Price
1/8	1/8	1/2	1-1/2	ICE788868	--	ICE788869	$11.56	ICE788886	--	ICE788887	$13.98
3/16	3/16	5/8	2	ICE788870	--	ICE788871	$13.12	ICE788888	--	ICE788889	$17.50
1/4	1/4	3/4	2-1/2	ICE788872	--	ICE788873	$15.86	ICE788890	--	ICE788891	$22.10
5/16	5/16	7/8	2-1/2	ICE788874	--	ICE788875	$20.54	ICE788892	--	ICE788893	$28.20
3/8	3/8	1	2-1/2	ICE788876	--	ICE788877	$24.06	ICE788894	--	ICE788895	$33.24
7/16	7/16	1	2-3/4	ICE788878	--	ICE788879	$39.62	ICE788896	--	ICE788897	$52.42
1/2	1/2	1	3	ICE788880	--	ICE788881	$42.82	ICE788898	--	ICE788899	$55.70
5/8	5/8	1-1/4	3-1/2	ICE788882	--	ICE788883	$74.40	ICE788900	--	ICE788901	$90.42
3/4	3/4	1-1/2	4	ICE788884	--	ICE788885	$116.96	ICE788902	--	ICE788903	$136.56

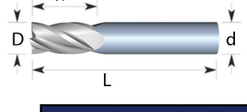
Innovative Custom Engineering

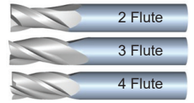
P	●	Steel
M	◒	Stainless Steel
K	●	Cast Iron
N	○	Non-Ferrous
S		High Temp. Alloys
H		Hardened Steel

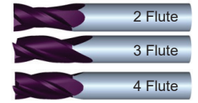
● GOOD ◒ OK ○ NOT OPTIMAL

ECONOMY

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







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

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated 2 Flute Part#	Uncoated 3 Flute Part#	Uncoated 4 Flute Part#	Uncoated Price	TiALN Coated 2 Flute Part#	TiALN Coated 3 Flute Part#	TiALN Coated 4 Flute Part#	TiALN Coated Price
1	1	3	38	ICE788568	ICE788569	ICE788570	$9.09	ICE788634	ICE788635	ICE788636	$11.19
1.5	2	5	38	ICE788571	ICE788572	ICE788573	$9.00	ICE788637	ICE788638	ICE788639	$11.19
2	2	6	38	ICE788574	ICE788575	ICE788576	$7.25	ICE788640	ICE788641	ICE788642	$9.10
3	3	12	38	ICE788580	ICE788581	ICE788582	$5.60	ICE788646	ICE788647	ICE788648	$7.41
3.5	4	12	50	ICE788583	ICE788584	ICE788585	$9.86	ICE788649	ICE788650	ICE788651	$11.80
4	4	14	50	ICE788586	ICE788587	ICE788588	$9.47	ICE788652	ICE788653	ICE788654	$11.59
4.5	5	14	50	ICE788589	ICE788590	ICE788591	$9.86	ICE788655	ICE788656	ICE788657	$12.12
5	5	16	50	ICE788592	ICE788593	ICE788594	$10.63	ICE788658	ICE788659	ICE788660	$12.78
6	6	19	63	ICE788595	ICE788596	ICE788597	$10.43	ICE788661	ICE788662	ICE788663	$12.86
7	7	19	63	ICE788598	ICE788599	ICE788600	$14.82	ICE788664	ICE788665	ICE788666	$17.24
8	8	19	63	ICE788601	ICE788602	ICE788603	$13.73	ICE788667	ICE788668	ICE788669	$16.78
9	9	22	70	ICE788604	ICE788605	ICE788606	$24.64	ICE788670	ICE788671	ICE788672	$28.92
10	10	22	70	ICE788607	ICE788608	ICE788609	$21.74	ICE788673	ICE788674	ICE788675	$26.26
11	11	25	70	ICE788610	ICE788611	ICE788612	$32.86	ICE788676	ICE788677	ICE788678	$38.62
12	12	25	75	ICE788613	ICE788614	ICE788615	$30.92	ICE788679	ICE788680	ICE788681	$33.59
14	14	30	88	ICE788616	ICE788617	ICE788618	$50.73	ICE788682	ICE788683	ICE788684	$58.17
16	16	32	88	ICE788619	ICE788620	ICE788621	$67.64	ICE788685	ICE788686	ICE788687	$77.37
18	18	36	100	ICE788622	ICE788623	ICE788624	$77.31	ICE788688	ICE788689	ICE788690	$89.50
20	20	38	100	ICE788625	ICE788626	ICE788627	$92.77	ICE788691	ICE788692	ICE788693	$106.51
22	22	38	100	ICE788628	ICE788629	ICE788630	$114.03	ICE788694	ICE788695	ICE788696	$130.44
25	25	38	100	ICE788631	ICE788632	ICE788633	$133.97	ICE788697	ICE788698	ICE788699	$152.65

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

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated 2 Flute Part#	Uncoated 3 Flute Part#	Uncoated 4 Flute Part#	Uncoated Price	TiALN Coated 2 Flute Part#	TiALN Coated 3 Flute Part#	TiALN Coated 4 Flute Part#	TiALN Coated Price
3	3	25	75	ICE788788	--	ICE788789	$9.78	ICE788812	--	ICE788813	$11.98
4	4	25	75	ICE788790	--	ICE788791	$13.59	ICE788814	--	ICE788815	$15.45
5	5	25	75	ICE788792	--	ICE788793	$13.73	ICE788816	--	ICE788817	$16.00
6	6	25	75	ICE788794	--	ICE788795	$16.65	ICE788818	--	ICE788819	$18.83
8	8	30	100	ICE788796	--	ICE788797	$20.17	ICE788820	--	ICE788821	$22.12
10	10	38	100	ICE788798	--	ICE788799	$34.67	ICE788822	--	ICE788823	$38.43
12	12	50	100	ICE788800	--	ICE788801	$49.01	ICE788824	--	ICE788825	$52.72
14	14	50	125	ICE788802	--	ICE788803	$78.00	ICE788826	--	ICE788827	$83.46
16	16	75	150	ICE788804	--	ICE788805	$101.83	ICE788828	--	ICE788829	$107.74
18	18	75	150	ICE788806	--	ICE788807	$130.67	ICE788830	--	ICE788831	$138.36
20	20	75	150	ICE788808	--	ICE788809	$178.99	ICE788832	--	ICE788833	$208.66
25	25	75	150	ICE788810	--	ICE788811	$253.66	ICE788834	--	ICE788835	$262.45

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 2 Flute Part#	Uncoated 3 Flute Part#	Uncoated 4 Flute Part#	Uncoated Price	TiALN Coated 2 Flute Part#	TiALN Coated 3 Flute Part#	TiALN Coated 4 Flute Part#	TiALN Coated Price
3	3	25	100	ICE788836	--	ICE788837	$14.20	ICE788852	--	ICE788853	$16.44
4	4	50	100	ICE788838	--	ICE788839	$17.60	ICE788854	--	ICE788855	$20.39
5	5	30	100	ICE788840	--	ICE788841	$15.47	ICE788856	--	ICE788857	$17.68
6	6	50	100	ICE788842	--	ICE788843	$20.92	ICE788858	--	ICE788859	$23.14
8	8	50	150	ICE788844	--	ICE788845	$25.16	ICE788860	--	ICE788861	$28.62
10	10	75	150	ICE788846	--	ICE788847	$50.51	ICE788862	--	ICE788863	$54.77
12	12	75	150	ICE788848	--	ICE788849	$70.21	ICE788864	--	ICE788865	$74.67
14	14	75	150	ICE788850	--	ICE788851	$87.20	ICE788866	--	ICE788867	$92.80

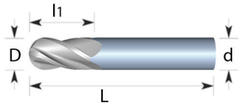
Innovative Custom Engineering

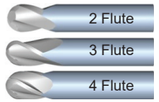
P	●	Steel
M	◒	Stainless Steel
K	●	Cast Iron
N	○	Non-Ferrous
S		High Temp. Alloys
H		Hardened Steel

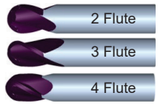
● GOOD ◒ OK ○ NOT OPTIMAL

ECONOMY

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

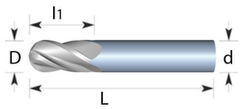


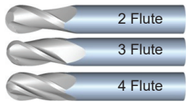


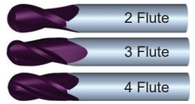


Ball Nose, Standard Carbide, Stub Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated 2 Flute Part#	Uncoated 3 Flute Part#	Uncoated 4 Flute Part#	Uncoated Price	TiALN Coated 2 Flute Part#	TiALN Coated 3 Flute Part#	TiALN Coated 4 Flute Part#	TiALN Coated Price
1/32	1/8	1/16	1-1/2	ICE787231	ICE787232	ICE787233	$9.40	ICE787327	ICE787328	ICE787329	$11.24
3/64	1/8	3/32	1-1/2	ICE787234	ICE787235	ICE787236	$9.40	ICE787330	ICE787331	ICE787332	$11.24
1/16	1/8	1/8	1-1/2	ICE787237	ICE787238	ICE787239	$8.35	ICE787333	ICE787334	ICE787335	$10.21
3/32	1/8	3/16	1-1/2	ICE787240	ICE787241	ICE787242	$8.35	ICE787336	ICE787337	ICE787338	$10.21
1/8	1/8	1/4	1-1/2	ICE787246	ICE787247	ICE787248	$6.68	ICE787342	ICE787343	ICE787344	$8.54
5/32	3/16	5/16	2	ICE787249	ICE787250	ICE787251	$11.07	ICE787345	ICE787346	ICE787347	$13.77
3/16	3/16	3/8	2	ICE787252	ICE787253	ICE787254	$11.07	ICE787348	ICE787349	ICE787350	$13.77
7/32	1/4	7/16	2	ICE787255	ICE787256	ICE787257	$13.57	ICE787351	ICE787352	ICE787353	$18.43
1/4	1/4	1/2	2	ICE787258	ICE787259	ICE787260	$12.74	ICE787354	ICE787355	ICE787356	$17.59
5/16	3/8	1/2	2	ICE787261	ICE787262	ICE787263	$16.27	ICE787357	ICE787358	ICE787359	$23.13
3/8	3/8	5/8	2	ICE787264	ICE787265	ICE787266	$19.83	ICE787360	ICE787361	ICE787362	$26.66
7/16	7/16	5/8	2-1/2	ICE787267	ICE787268	ICE787269	$30.26	ICE787363	ICE787364	ICE787365	$40.04
1/2	1/2	5/8	2-1/2	ICE787270	ICE787271	ICE787272	$33.38	ICE787366	ICE787367	ICE787368	$43.29
5/8	5/8	3/4	3	ICE787273	ICE787274	ICE787275	$63.65	ICE787369	ICE787370	ICE787371	$78.91
3/4	3/4	1	3	ICE787276	ICE787277	ICE787278	$87.63	ICE787372	ICE787373	ICE787374	$105.07
1	1	1	3	ICE787243	ICE787244	ICE787245	$168.78	ICE787339	ICE787340	ICE787341	$203.70







Ball Nose, Standard Carbide, Regular Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated 2 Flute Part#	Uncoated 3 Flute Part#	Uncoated 4 Flute Part#	Uncoated Price	TiALN Coated 2 Flute Part#	TiALN Coated 3 Flute Part#	TiALN Coated 4 Flute Part#	TiALN Coated Price
1/64	1/8	1/16	1-1/2	ICE787375	ICE787376	ICE787377	$13.41	ICE787758	ICE787759	ICE787760	$13.07
1/32	1/8	3/32	1-1/2	ICE787378	ICE787379	ICE787380	$9.88	ICE787761	ICE787762	ICE787763	$11.84
3/64	1/8	1/8	1-1/2	ICE787381	ICE787382	ICE787383	$9.88	ICE787764	ICE787765	ICE787766	$11.84
1/16	1/8	3/16	1-1/2	ICE787384	ICE787385	ICE787386	$8.78	ICE787767	ICE787768	ICE787769	$10.74
5/64	1/8	1/4	1-1/2	ICE787387	ICE787388	ICE787389	$8.78	ICE787770	ICE787771	ICE787772	$10.01
3/32	1/8	3/8	1-1/2	ICE787390	ICE787391	ICE787392	$8.78	ICE787773	ICE787774	ICE787775	$10.74
7/64	1/8	3/8	1-1/2	ICE787396	ICE787397	ICE787398	$8.78	ICE787779	ICE787780	ICE787781	$9.22
1/8	1/8	1/2	1-1/2	ICE787399	ICE787400	ICE787401	$7.03	ICE787782	ICE787783	ICE787784	$8.98
9/64	3/16	9/16	2	ICE787402	ICE787403	ICE787404	$12.08	ICE787785	ICE787786	ICE787787	$15.90
5/32	3/16	9/16	2	ICE787405	ICE787406	ICE787407	$11.64	ICE787788	ICE787789	ICE787790	$14.49
11/64	3/16	9/16	2	ICE787408	ICE787409	ICE787410	$12.08	ICE787791	ICE787792	ICE787793	$15.57
3/16	3/16	5/8	2	ICE787411	ICE787412	ICE787413	$11.64	ICE787794	ICE787795	ICE787796	$14.49
13/64	1/4	5/8	2-1/2	ICE787414	ICE787415	ICE787416	$15.26	ICE787797	ICE787798	ICE787799	$20.78
7/32	1/4	5/8	2-1/2	ICE787417	ICE787418	ICE787419	$14.28	ICE787800	ICE787801	ICE787802	$19.39
15/64	1/4	3/4	2-1/2	ICE787420	ICE787421	ICE787422	$15.26	ICE787803	ICE787804	ICE787805	$20.16
1/4	1/4	3/4	2-1/2	ICE787423	ICE787424	ICE787425	$13.40	ICE787806	ICE787807	ICE787808	$18.51

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ECONOMY

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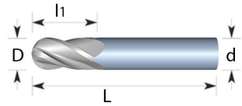
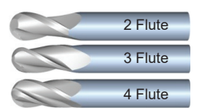
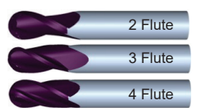
- Diameter Tolerances: +0.0000"/-0.0020"







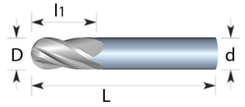
Ball Nose, Standard Carbide, Regular Length, Single End

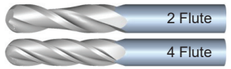
Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated 2 Flute Part#	Uncoated 3 Flute Part#	Uncoated 4 Flute Part#	Uncoated Price	TiALN Coated 2 Flute Part#	TiALN Coated 3 Flute Part#	TiALN Coated 4 Flute Part#	TiALN Coated Price
17/64	5/16	7/8	2-1/2	ICE787426	ICE787427	ICE787428	$19.99	ICE787809	ICE787810	ICE787811	$26.20
9/32	5/16	7/8	2-1/2	ICE787429	ICE787430	ICE787431	$18.67	ICE787812	ICE787813	ICE787814	$24.77
19/64	5/16	7/8	2-1/2	ICE787432	ICE787433	ICE787434	$19.99	ICE787815	ICE787816	ICE787817	$25.28
5/16	5/16	7/8	2-1/2	ICE787435	ICE787436	ICE787437	$17.13	ICE787818	ICE787819	ICE787820	$24.33
21/64	3/8	7/8	2-1/2	ICE787438	ICE787439	ICE787440	$22.51	ICE787821	ICE787822	ICE787823	$30.70
11/32	3/8	7/8	2-1/2	ICE787441	ICE787442	ICE787443	$20.86	ICE787824	ICE787825	ICE787826	$28.07
23/64	3/8	7/8	2-1/2	ICE787444	ICE787445	ICE787446	$22.51	ICE787827	ICE787828	ICE787829	$28.75
3/8	3/8	1	2-1/2	ICE787447	ICE787448	ICE787449	$20.86	ICE787830	ICE787831	ICE787832	$28.07
25/64	7/16	1	2-1/2	ICE787450	ICE787451	ICE787452	$34.70	ICE787833	ICE787834	ICE787835	$45.53
13/32	7/16	1	2-1/2	ICE787453	ICE787454	ICE787455	$34.04	ICE787836	ICE787837	ICE787838	$43.57
27/64	7/16	1	2-1/2	ICE787456	ICE787457	ICE787458	$33.82	ICE787839	ICE787840	ICE787841	$42.56
7/16	7/16	1	2-1/2	ICE787459	ICE787460	ICE787461	$32.94	ICE787842	ICE787843	ICE787844	$43.24
29/64	1/2	1	3	ICE787462	ICE787463	ICE787464	$37.56	ICE787845	ICE787846	ICE787847	$50.51
15/32	1/2	1	3	ICE787465	ICE787466	ICE787467	$37.23	ICE787848	ICE787849	ICE787850	$48.32
31/64	1/2	1	3	ICE787468	ICE787469	ICE787470	$36.90	ICE787851	ICE787852	ICE787853	$47.22
1/2	1/2	1	3	ICE787471	ICE787472	ICE787473	$35.14	ICE787854	ICE787855	ICE787856	$45.44
33/64	9/16	1-1/4	3-1/2	ICE787474	ICE787475	ICE787476	$81.26	ICE787857	ICE787858	ICE787859	$101.49
17/32	9/16	1-1/4	3-1/2	ICE787477	ICE787478	ICE787479	$76.87	ICE787860	ICE787861	ICE787862	$100.08
35/64	9/16	1-1/4	3-1/2	ICE787480	ICE787481	ICE787482	$74.67	ICE787863	ICE787864	ICE787865	$96.22
9/16	9/16	1-1/4	3-1/2	ICE787483	ICE787484	ICE787485	$66.98	ICE787866	ICE787867	ICE787868	$83.06
37/64	5/8	1-1/4	3-1/2	ICE787486	ICE787487	ICE787488	$82.36	ICE787869	ICE787870	ICE787871	$95.38
19/32	5/8	1-1/4	3-1/2	ICE787489	ICE787490	ICE787491	$77.97	ICE787872	ICE787873	ICE787874	$94.63
39/64	5/8	1-1/4	3-1/2	ICE787492	ICE787493	ICE787494	$75.77	ICE787875	ICE787876	ICE787877	$94.06
5/8	5/8	1-1/4	3-1/2	ICE787495	ICE787496	ICE787497	$66.98	ICE787878	ICE787879	ICE787880	$83.06
41/64	3/4	1-1/2	4	ICE787498	ICE787499	ICE787500	$113.10	ICE787881	ICE787882	ICE787883	$126.57
21/32	3/4	1-1/2	4	ICE787501	ICE787502	ICE787503	$113.10	ICE787884	ICE787885	ICE787886	$124.90
43/64	3/4	1-1/2	4	ICE787504	ICE787505	ICE787506	$112.01	ICE787887	ICE787888	ICE787889	$123.21
11/16	3/4	1-1/2	4	ICE787507	ICE787508	ICE787509	$105.42	ICE787890	ICE787891	ICE787892	$122.00
45/64	3/4	1-1/2	4	ICE787510	ICE787511	#N/A	$103.22	ICE787893	ICE787894	ICE787895	$123.73
23/32	3/4	1-1/2	4	ICE787512	ICE787513	ICE787514	$103.22	ICE787896	ICE787897	ICE787898	$123.27
47/64	3/4	1-1/2	4	ICE787515	ICE787516	ICE787517	$103.22	ICE787899	ICE787900	ICE787901	$122.68
3/4	3/4	1-1/2	4	ICE787518	ICE787519	ICE787520	$92.24	ICE787902	ICE787903	ICE787904	$110.60
49/64	7/8	1-1/2	4	ICE787521	ICE787522	ICE787523	$204.14	ICE787905	ICE787906	ICE787907	$237.74
25/32	7/8	1-1/2	4	ICE787524	ICE787525	ICE787526	$204.14	ICE787908	ICE787909	ICE787910	$237.23
51/64	7/8	1-1/2	4	ICE787527	ICE787528	ICE787529	$204.14	ICE787911	ICE787912	ICE787913	$236.75
13/16	7/8	1-1/2	4	ICE787530	ICE787531	ICE787532	$204.14	ICE787914	ICE787915	ICE787916	$234.34
53/64	7/8	1-1/2	4	ICE787533	ICE787534	ICE787535	$198.32	ICE787917	ICE787918	ICE787919	$235.43
27/32	7/8	1-1/2	4	ICE787536	ICE787537	ICE787538	$198.32	ICE787920	ICE787921	ICE787922	$234.95
55/64	7/8	1-1/2	4	ICE787539	ICE787540	ICE787541	$198.32	ICE787923	ICE787924	ICE787925	$234.34
7/8	7/8	1-1/2	4	ICE787542	ICE787543	ICE787544	$180.09	ICE787926	ICE787927	ICE787928	$212.22
57/64	1	1-1/2	4	ICE787545	ICE787546	ICE787547	$208.31	ICE787929	ICE787930	ICE787931	$248.83
29/32	1	1-1/2	4	ICE787548	ICE787549	ICE787550	$208.31	ICE787932	ICE787933	ICE787934	$245.87
59/64	1	1-1/2	4	ICE787551	ICE787552	ICE787553	$208.31	ICE787935	ICE787936	ICE787937	$241.58
15/16	1	1-1/2	4	ICE787554	ICE787555	ICE787556	$200.40	ICE787938	ICE787939	ICE787940	$236.75
61/64	1	1-1/2	4	ICE787557	ICE787558	ICE787559	$200.40	ICE787941	ICE787942	ICE787943	$237.98
31/32	1	1-1/2	4	ICE787560	ICE787561	ICE787562	$200.40	ICE787944	ICE787945	ICE787946	$237.30
63/64	1	1-1/2	4	ICE787563	ICE787564	ICE787565	$200.40	ICE787947	ICE787948	ICE787949	$236.75
1	1	1-1/2	4	ICE787393	ICE787394	ICE787395	$182.29	ICE787776	ICE787777	ICE787778	$214.42

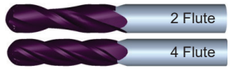
P	●	Steel
M	◒	Stainless Steel
K	●	Cast Iron
N	○	Non-Ferrous
S		High Temp. Alloys
H		Hardened Steel

● GOOD ◒ OK ○ NOT OPTIMAL

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

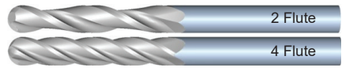






Ball Nose, Standard Carbide, Long Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated 2 Flute Part#	Uncoated 3 Flute Part#	Uncoated 4 Flute Part#	Uncoated Price	TiALN Coated 2 Flute Part#	TiALN Coated 3 Flute Part#	TiALN Coated 4 Flute Part#	TiALN Coated Price
1/8	1/8	3/4	2-1/2	ICE787952	--	ICE787953	$14.93	ICE787996	--	ICE787997	$17.59
3/16	3/16	3/4	2-1/2	ICE787954	--	ICE787955	$17.83	ICE787998	--	ICE787999	$21.35
1/4	1/4	1-1/8	3	ICE787956	--	ICE787957	$23.13	ICE788000	--	ICE788001	$27.85
5/16	5/16	1-1/8	3	ICE787958	--	ICE787959	$28.00	ICE788002	--	ICE788003	$35.10
3/8	3/8	1-1/8	3	ICE787960	--	ICE787961	$36.24	ICE788004	--	ICE788005	$43.44
7/16	7/16	2	4	ICE787962	--	ICE787963	$52.90	ICE788006	--	ICE788007	$61.87
1/2	1/2	2	4	ICE787964	--	ICE787965	$57.91	ICE788008	--	ICE788009	$70.78
5/8	5/8	2-1/4	5	ICE787968	--	ICE787969	$108.56	ICE788012	--	ICE788013	$127.89
3/4	3/4	2-1/4	5	ICE787970	--	ICE787971	$152.64	ICE788014	--	ICE788015	$174.64
1	1	2-1/4	5	ICE787950	--	ICE787951	$237.19	ICE787994	--	ICE787995	$275.76



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

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated 2 Flute Part#	Uncoated 3 Flute Part#	Uncoated 4 Flute Part#	Uncoated Price	TiALN Coated 2 Flute Part#	TiALN Coated 3 Flute Part#	TiALN Coated 4 Flute Part#	TiALN Coated Price
1/8	1/8	1	3	ICE788020	--	ICE788021	$17.70	ICE788084	--	ICE788085	$20.36
3/16	3/16	1-1/8	3	ICE788022	--	ICE788023	$19.63	ICE788086	--	ICE788087	$23.15
1/4	1/4	1-1/2	4	ICE788024	--	ICE788025	$25.81	ICE788088	--	ICE788089	$32.22
5/16	5/16	1-5/8	4	ICE788028	--	ICE788029	$31.52	ICE788092	--	ICE788093	$39.86
3/8	3/8	1-3/4	4	ICE788034	--	ICE788035	$41.73	ICE788098	--	ICE788099	$60.73
1/2	1/2	3	6	ICE788038	--	ICE788039	$91.14	ICE788102	--	ICE788103	$104.72
5/8	5/8	3	6	ICE788042	--	ICE788043	$127.38	ICE788106	--	ICE788107	$148.79
3/4	3/4	3	6	ICE788044	--	ICE788045	$171.30	ICE788108	--	ICE788109	$197.02
1	1	3	6	ICE788016	--	ICE788017	$296.49	ICE788080	--	ICE788081	$341.44

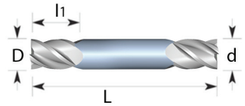
METRIC - Ball End, Standard Carbide, Regular Length, Single End

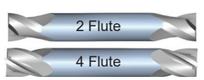
Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated 2 Flute Part#	Uncoated 3 Flute Part#	Uncoated 4 Flute Part#	Uncoated Price	TiALN Coated 2 Flute Part#	TiALN Coated 3 Flute Part#	TiALN Coated 4 Flute Part#	TiALN Coated Price
1	1	3	38	ICE788700	--	ICE788701	$10.54	ICE788744	--	ICE788745	$11.60
1.5	2	5	38	ICE788702	--	ICE788703	$10.54	ICE788746	--	ICE788747	$11.60
2	2	6	38	ICE788704	--	ICE788705	$8.70	ICE788748	--	ICE788749	$9.58
3	3	12	38	ICE788708	--	ICE788709	$8.70	ICE788752	--	ICE788753	$9.58
3.5	4	12	50	ICE788710	--	ICE788711	$11.99	ICE788754	--	ICE788755	$13.21
4	4	14	50	ICE788712	--	ICE788713	$11.60	ICE788756	--	ICE788757	$12.78
4.5	5	14	50	ICE788714	--	ICE788715	$11.99	ICE788758	--	ICE788759	$13.22
5	5	16	50	ICE788716	--	ICE788717	$12.76	ICE788760	--	ICE788761	$14.04
6	6	19	63	ICE788718	--	ICE788719	$14.89	ICE788762	--	ICE788763	$16.43
7	7	19	63	ICE788720	--	ICE788721	$23.28	ICE788764	--	ICE788765	$25.61
8	8	19	63	ICE788722	--	ICE788723	$18.31	ICE788766	--	ICE788767	$20.28
9	9	22	70	ICE788724	--	ICE788725	$30.24	ICE788768	--	ICE788769	$33.26
10	10	22	70	ICE788726	--	ICE788727	$27.34	ICE788770	--	ICE788771	$30.07
11	11	25	70	ICE788728	--	ICE788729	$36.24	ICE788772	--	ICE788773	$39.86
12	12	25	75	ICE788730	--	ICE788731	$35.14	ICE788774	--	ICE788775	$38.65
14	14	30	88	ICE788732	--	ICE788733	$51.61	ICE788776	--	ICE788777	$56.77
16	16	32	88	ICE788734	--	ICE788735	$69.03	ICE788778	--	ICE788779	$74.82
18	18	36	100	ICE788736	--	ICE788737	$91.71	ICE788780	--	ICE788781	$98.69
20	20	38	100	ICE788738	--	ICE788739	$114.03	ICE788782	--	ICE788783	$119.93
22	22	38	100	ICE788740	--	ICE788741	$135.29	ICE788784	--	ICE788785	$144.42
25	25	38	100	ICE788742	--	ICE788743	$166.21	ICE788786	--	ICE788787	$176.23

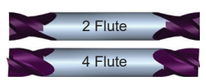
P	●	Steel
M	◒	Stainless Steel
K	●	Cast Iron
N	○	Non-Ferrous
S		High Temp. Alloys
H		Hardened Steel

● GOOD ◒ OK ○ NOT OPTIMAL

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

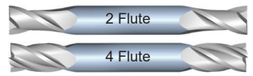


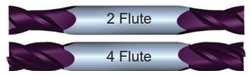




Square End, Standard Carbide, Stub Length, Double End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated 2 Flute Part#	Uncoated 3 Flute Part#	Uncoated 4 Flute Part#	Uncoated Price	TiALN Coated 2 Flute Part#	TiALN Coated 3 Flute Part#	TiALN Coated 4 Flute Part#	TiALN Coated Price
1/32	1/8	1/16	1-1/2	ICE788112	--	ICE788113	$9.88	ICE788184	--	ICE788185	$10.98
3/64	1/8	3/32	1-1/2	ICE788114	--	ICE788115	$9.88	ICE788186	--	ICE788187	$10.98
1/16	1/8	1/8	1-1/2	ICE788116	--	ICE788117	$8.78	ICE788188	--	ICE788189	$9.88
3/32	1/8	3/16	1-1/2	ICE788118	--	ICE788119	$8.35	ICE788190	--	ICE788191	$9.44
7/64	1/8	7/32	1-1/2	ICE788120	--	ICE788121	$8.13	ICE788192	--	ICE788193	$9.22
1/8	1/8	1/4	1-1/2	ICE788122	--	ICE788123	$7.91	ICE788194	--	ICE788195	$9.00
5/32	3/16	5/16	2	ICE788124	--	ICE788125	$12.08	ICE788196	--	ICE788197	$14.93
3/16	3/16	5/16	2	ICE788126	--	ICE788127	$11.53	ICE788198	--	ICE788199	$14.28
7/32	1/4	3/8	2-1/2	ICE788128	--	ICE788129	$13.62	ICE788200	--	ICE788201	$18.67
1/4	1/4	1/2	2-1/2	ICE788130	--	ICE788131	$13.40	ICE788202	--	ICE788203	$18.01
9/32	5/16	1/2	2-1/2	ICE788132	--	ICE788133	$16.47	ICE788204	--	ICE788205	$23.06
5/16	5/16	1/2	2-1/2	ICE788134	--	ICE788135	$16.03	ICE788206	--	ICE788207	$22.40
3/8	3/8	9/16	2-1/2	ICE788136	--	ICE788137	$20.86	ICE788208	--	ICE788209	$27.45
7/16	1/2	9/16	2-3/4	ICE788138	--	ICE788139	$31.85	ICE788210	--	ICE788211	$40.63
1/2	1/2	5/8	3	ICE788140	--	ICE788141	$35.14	ICE788212	--	ICE788213	$41.73
9/16	5/8	11/16	3-1/2	ICE788142	--	ICE788143	$76.87	ICE788214	--	ICE788215	$87.85
5/8	5/8	11/16	3-1/2	ICE788144	--	ICE788145	$74.67	ICE788216	--	ICE788217	$83.46
3/4	3/4	7/8	4	ICE788146	--	ICE788147	$94.44	ICE788218	--	ICE788219	$112.01

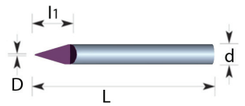




Square End, Standard Carbide, Regular Length, Double End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated 2 Flute Part#	Uncoated 3 Flute Part#	Uncoated 4 Flute Part#	Uncoated Price	TiALN Coated 2 Flute Part#	TiALN Coated 3 Flute Part#	TiALN Coated 4 Flute Part#	TiALN Coated Price
3/32	1/8	5/16	3	ICE788328	--	ICE788329	$31.19	ICE788356	--	ICE788357	$35.58
1/8	1/8	3/8	3-1/16	ICE788330	--	ICE788331	$30.75	ICE788358	--	ICE788359	$35.14
5/32	3/16	7/16	3-1/8	ICE788332	--	ICE788333	$30.31	ICE788360	--	ICE788361	$35.25
3/16	3/16	1/2	3-1/4	ICE788334	--	ICE788335	$29.65	ICE788362	--	ICE788363	$34.59
7/32	1/4	9/16	3-1/2	ICE788336	--	ICE788337	$29.65	ICE788364	--	ICE788365	$34.59
1/4	1/4	5/8	3-1/2	ICE788338	--	ICE788339	$29.65	ICE788366	--	ICE788367	$34.59
5/16	5/16	3/4	3-1/2	ICE788340	--	ICE788341	$31.19	ICE788368	--	ICE788369	$36.35
3/8	3/8	3/4	3-1/2	ICE788344	--	ICE788345	$32.94	ICE788372	--	ICE788373	$38.10
7/16	1/2	7/8	4	ICE788346	--	ICE788347	$50.51	ICE788374	--	ICE788375	$56.22
1/2	1/2	1	4	ICE788348	--	ICE788349	$46.12	ICE788376	--	ICE788377	$53.81
5/8	5/8	1-1/2	6	ICE788352	--	ICE788353	$92.24	ICE788380	--	ICE788381	$102.12
3/4	3/4	1-1/2	6	ICE788354	--	ICE788355	$133.97	ICE788382	--	ICE788383	$144.95

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



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

NEW

Engraving Tools 30 Degree Tip

Tip Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	TiALN Coated Part#	TiALN Coated Price
.005	1/4	1/2	2-1/2	ICE789544	$14.45
.010	1/4	1/2	2-1/2	ICE789545	$14.45
.020	1/4	1/2	2-1/2	ICE789546	$14.45

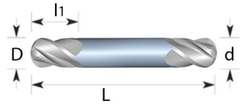
Innovative Custom Engineering

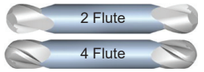
P	●	Steel
M	◒	Stainless Steel
K	●	Cast Iron
N	○	Non-Ferrous
S		High Temp. Alloys
H		Hardened Steel

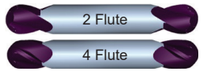
● GOOD ◒ OK ○ NOT OPTIMAL

ECONOMY

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

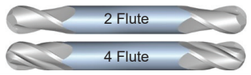


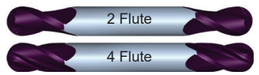




Ball Nose, Standard Carbide, Stub Length, Double End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated 2 Flute Part#	Uncoated 3 Flute Part#	Uncoated 4 Flute Part#	Uncoated Price	TiALN Coated 2 Flute Part#	TiALN Coated 3 Flute Part#	TiALN Coated 4 Flute Part#	TiALN Coated Price
1/32	1/8	1/16	1-1/2	ICE788220	--	ICE788221	$17.57	ICE788292	--	ICE788293	$18.67
3/64	1/8	3/32	1-1/2	ICE788222	--	ICE788223	$17.57	ICE788294	--	ICE788295	$18.67
1/16	1/8	1/8	1-1/2	ICE788224	--	ICE788225	$15.81	ICE788296	--	ICE788297	$17.57
3/32	1/8	3/16	1-1/2	ICE788226	--	ICE788227	$15.37	ICE788298	--	ICE788299	$17.57
7/64	1/8	7/32	1-1/2	ICE788228	--	ICE788229	$15.37	ICE788300	--	ICE788301	$17.13
1/8	1/8	1/4	1-1/2	ICE788230	--	ICE788231	$14.93	ICE788302	--	ICE788303	$17.13
5/32	3/16	5/16	2	ICE788232	--	ICE788233	$17.57	ICE788304	--	ICE788305	$20.42
3/16	3/16	5/16	2	ICE788234	--	ICE788235	$17.13	ICE788306	--	ICE788307	$19.77
7/32	1/4	3/8	2-1/2	ICE788236	--	ICE788237	$18.23	ICE788308	--	ICE788309	$23.06
1/4	1/4	1/2	2-1/2	ICE788238	--	ICE788239	$17.79	ICE788310	--	ICE788311	$21.96
9/32	5/16	1/2	2-1/2	ICE788240	--	ICE788241	$20.86	ICE788312	--	ICE788313	$27.45
5/16	5/16	1/2	2-1/2	ICE788242	--	ICE788243	$19.77	ICE788314	--	ICE788315	$26.35
3/8	3/8	9/16	2-1/2	ICE788244	--	ICE788245	$30.75	ICE788316	--	ICE788317	$37.34
7/16	1/2	9/16	2-3/4	ICE788246	--	ICE788247	$39.53	ICE788318	--	ICE788319	$48.32
1/2	1/2	5/8	3	ICE788248	--	ICE788249	$46.12	ICE788320	--	ICE788321	$54.91
9/16	5/8	11/16	3-1/2	ICE788250	--	ICE788251	$103.22	ICE788322	--	ICE788323	$118.60
5/8	5/8	11/16	3-1/2	ICE788252	--	ICE788253	$96.63	ICE788324	--	ICE788325	$113.10
3/4	3/4	7/8	4	ICE788254	--	ICE788255	$122.99	ICE788326	--	ICE788327	$144.95

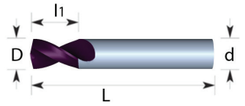




Ball Nose, Standard Carbide, Regular Length, Double End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Uncoated 2 Flute Part#	Uncoated 3 Flute Part#	Uncoated 4 Flute Part#	Uncoated Price	TiALN Coated 2 Flute Part#	TiALN Coated 3 Flute Part#	TiALN Coated 4 Flute Part#	TiALN Coated Price
3/32	1/8	5/16	3	ICE788384	--	ICE788385	$39.53	ICE788412	--	ICE788413	$43.92
1/8	1/8	3/8	3-1/16	ICE788386	--	ICE788387	$37.34	ICE788414	--	ICE788415	$41.73
5/32	3/16	7/16	3-1/8	ICE788388	--	ICE788389	$37.34	ICE788416	--	ICE788417	$42.28
3/16	3/16	1/2	3-1/4	ICE788390	--	ICE788391	$36.24	ICE788418	--	ICE788419	$41.18
7/32	1/4	9/16	3-1/2	ICE788392	--	ICE788393	$36.24	ICE788420	--	ICE788421	$41.18
1/4	1/4	5/8	3-1/2	ICE788394	--	ICE788395	$36.24	ICE788422	--	ICE788423	$41.18
5/16	5/16	3/4	3-1/2	ICE788396	--	ICE788397	$41.73	ICE788424	--	ICE788425	$46.89
3/8	3/8	3/4	3-1/2	ICE788400	--	ICE788401	$41.73	ICE788428	--	ICE788429	$46.89
7/16	1/2	7/8	4	ICE788402	--	ICE788403	$61.49	ICE788430	--	ICE788431	$67.20
1/2	1/2	1	4	ICE788404	--	ICE788405	$59.30	ICE788432	--	ICE788433	$66.98
5/8	5/8	1-1/2	6	ICE788408	--	ICE788409	$127.38	ICE788436	--	ICE788437	$137.26
3/4	3/4	1-1/2	6	ICE788410	--	ICE788411	$171.30	ICE788438	--	ICE788439	$182.29

* 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% Micro Grain Carbide
- Diameter Tolerances: +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#	TiALN Coated Price
1/4	1/4	1/2	3	ICE789547	$26.91
3/8	3/8	3/4	3	ICE789548	$28.91
1/2	1/2	1	4	ICE789549	$50.74
5/8	5/8	1	4	ICE789550	$83.03
3/4	3/4	1-1/8	4	ICE789551	$110.71

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SPEED & FEED RECOMMENDATIONS

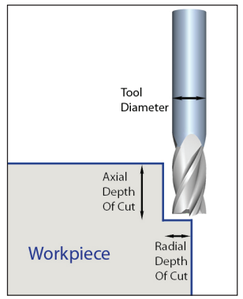
ECONOMY

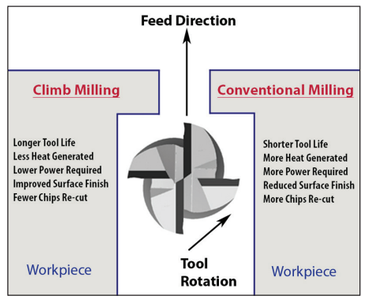
Material		Speed (SFM) Uncoated	Speed (SFM) TiALN Coated	Feed Per Tooth By End Mill Diameter 1/4"	5/16"	3/8"	7/16"	1/2"	5/8"	3/4"	1"
Aluminum & Aluminum Alloys	N	600-1200	900-1800	.0020	.0025	.0030	.0035	.0040	.0050	.0060	.0080
Copper & Copper Alloys	N	350-850	525-1275	.0020	.0025	.0025	.0030	.0030	.0035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

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

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





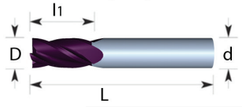
Innovative Custom Engineering

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

● BETTER ◒ OK ○ NOT OPTIMAL

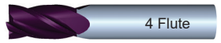
PERFORMANCE

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



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#	Price	TiALN Coated 4 Flute - WELDON Shank Part#	Price
3/16	3/16	3/8	2	SQ	ICE789482	$13.05	--	
3/16	3/16	3/8	2	.015CR	ICE789483	$13.05	--	
1/4	1/4	3/8	2	SQ	ICE789484	$16.52	--	
1/4	1/4	3/8	2	.015CR	ICE789485	$16.52	--	
5/16	5/16	3/8	2	SQ	ICE789486	$22.80	--	
5/16	5/16	3/8	2	.020CR	ICE789487	$22.80	--	
3/8	3/8	1/2	2	SQ	ICE789488	$27.25	--	
3/8	3/8	1/2	2	.020CR	ICE789489	$27.25	--	
1/2	1/2	5/8	2-1/2	SQ	ICE789490	$40.09	ICE789496	$40.09
1/2	1/2	5/8	2-1/2	.030CR	ICE789491	$40.09	ICE789497	$40.09
5/8	5/8	3/4	3	SQ	ICE789492	$71.16	ICE789498	$71.16
5/8	5/8	3/4	3	.030CR	ICE789493	$71.16	ICE789499	$71.16
3/4	3/4	1	3	SQ	ICE789494	$100.55	ICE789500	$100.55
3/4	3/4	1	3	.030CR	ICE789495	$100.55	ICE789501	$100.55



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 4 Flute - ROUND Shank Part#	Price	TiALN Coated 4 Flute - WELDON Shank Part#	Price
3/16	3/16	5/8	2	SQ	ICE789339	$14.50	--	
3/16	3/16	5/8	2	.015CR	ICE789340	$14.50	--	
1/4	1/4	3/4	2-1/2	SQ	ICE789341	$18.35	ICE789365	$18.35
1/4	1/4	3/4	2-1/2	.020CR	ICE789342	$18.35	ICE789366	$18.35
5/16	5/16	13/16	2-1/2	SQ	ICE789343	$25.33	ICE789367	$25.33
5/16	5/16	13/16	2-1/2	.020CR	ICE789344	$25.33	ICE789368	$25.33
3/8	3/8	7/8	2-1/2	SQ	ICE789345	$29.62	ICE789369	$29.62
3/8	3/8	7/8	2-1/2	.020CR	ICE789346	$29.62	ICE789370	$29.62
7/16	7/16	1	2-3/4	SQ	ICE789348	$38.92	ICE789371	$38.92
1/2	1/2	1-1/4	3	SQ	ICE789349	$44.55	ICE789372	$44.55
1/2	1/2	1-1/4	3	.015CR	ICE789350	$44.55	ICE789373	$44.55
1/2	1/2	1-1/4	3	.030CR	ICE789351	$44.55	ICE789374	$44.55
1/2	1/2	1-1/4	3	.060CR	ICE789352	$44.55	ICE789375	$44.55
5/8	5/8	1-1/4	3-1/2	SQ	ICE789353	$73.36	ICE789376	$73.36
5/8	5/8	1-1/4	3-1/2	.030CR	ICE789354	$73.36	ICE789377	$73.36
5/8	5/8	1-1/4	3-1/2	.060CR	ICE789355	$73.36	ICE789378	$73.36
5/8	5/8	1-1/4	3-1/2	.125CR	ICE789356	$73.36	ICE789379	$73.36
3/4	3/4	1-1/2	4	SQ	ICE789357	$106.71	ICE789380	$106.71
3/4	3/4	1-1/2	4	.030CR	ICE789358	$106.71	ICE789381	$106.71
3/4	3/4	1-1/2	4	.060CR	ICE789359	$106.71	ICE789382	$106.71
3/4	3/4	1-1/2	4	.125CR	ICE789360	$106.71	ICE789383	$106.71
1	1	1-1/2	4	SQ	ICE789335	$173.74	ICE789361	$173.74
1	1	1-1/2	4	.030CR	ICE789336	$173.74	ICE789362	$173.74
1	1	1-1/2	4	.060CR	ICE789337	$173.74	ICE789363	$173.74
1	1	1-1/2	4	.125CR	ICE789338	$173.74	ICE789364	$173.74

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K	●	Cast Iron
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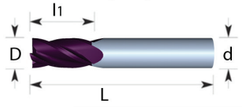
S	○	High Temp. Alloys
H		Hardened Steel

● BETTER ◒ OK ○ NOT OPTIMAL

PERFORMANCE

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



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#	Price	TiALN Coated 4 Flute - WELDON Shank Part#	Price
3/16	3/16	3/4	2-1/2	SQ	ICE789388	$29.62	--	
3/16	3/16	3/4	2-1/2	.015CR	ICE789389	$29.62	--	
1/4	1/4	1-1/8	3	SQ	ICE789390	$31.22	ICE789413	$31.22
1/4	1/4	1-1/8	3	.020CR	ICE789391	$31.22	ICE789414	$31.22
5/16	5/16	1-1/8	3	SQ	ICE789392	$43.06	ICE789415	$43.06
5/16	5/16	1-1/8	3	.020CR	ICE789393	$43.06	ICE789416	$43.06
3/8	3/8	1-1/8	3	SQ	ICE789394	$50.33	ICE789417	$50.33
3/8	3/8	1-1/8	3	.020CR	ICE789395	$50.33	ICE789418	$50.33
7/16	7/16	2	4	SQ	ICE789396	$66.15	ICE789419	$66.15
1/2	1/2	2	4	SQ	ICE789397	$75.75	ICE789420	$75.75
1/2	1/2	2	4	.015CR	ICE789398	$75.75	ICE789421	$75.75
1/2	1/2	2	4	.030CR	ICE789399	$75.75	ICE789422	$75.75
1/2	1/2	2	4	.060CR	ICE789400	$75.75	ICE789423	$75.75
5/8	5/8	2-1/4	5	SQ	ICE789401	$110.05	ICE789424	$110.05
5/8	5/8	2-1/4	5	.030CR	ICE789402	$110.05	ICE789425	$110.05
5/8	5/8	2-1/4	5	.060CR	ICE789403	$110.05	ICE789426	$110.05
5/8	5/8	2-1/4	5	.125CR	ICE789404	$110.05	ICE789427	$110.05
3/4	3/4	2-1/4	5	SQ	ICE789405	$155.51	ICE789428	$155.51
3/4	3/4	2-1/4	5	.030CR	ICE789406	$155.51	ICE789429	$155.51
3/4	3/4	2-1/4	5	.060CR	ICE789407	$155.51	ICE789430	$155.51
3/4	3/4	2-1/4	5	.125CR	ICE789408	$155.51	ICE789431	$155.51
1	1	2-1/4	5	SQ	ICE789384	$225.85	ICE789409	$225.85
1	1	2-1/4	5	.030CR	ICE789385	$225.85	ICE789410	$225.85
1	1	2-1/4	5	.060CR	ICE789386	$225.85	ICE789411	$225.85
1	1	2-1/4	5	.125CR	ICE789387	$225.85	ICE789412	$225.85

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#	Price	TiALN Coated 4 Flute - WELDON Shank Part#	Price
3/16	3/16	1-1/8	3	SQ	ICE789467	$32.57	--	
1/4	1/4	1-1/2	4	SQ	ICE789468	$37.13	--	
5/16	5/16	1-5/8	4	SQ	ICE789469	$49.52	--	
3/8	3/8	1-3/4	4	SQ	ICE789470	$55.38	--	
1/2	1/2	3	6	SQ	ICE789471	$115.14	--	
5/8	5/8	3	6	SQ	ICE789472	$127.66	--	
3/4	3/4	3	6	SQ	ICE789473	$177.29	--	
1	1	3	6	SQ	ICE789466	$301.94	--	

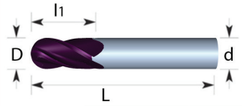
Innovative Custom Engineering

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

● BETTER ◒ OK ○ NOT OPTIMAL

PERFORMANCE

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



PERFORMANCE Variable Pitch Carbide, Ball 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#	Price	TiALN Coated 4 Flute - WELDON Shank Part#	Price
3/16	3/16	5/8	2	ICE789433	$20.91	--	
1/4	1/4	3/4	2-1/2	ICE789434	$22.03	ICE789442	$22.03
5/16	5/16	13/16	2-1/2	ICE789435	$30.39	ICE789443	$30.39
3/8	3/8	7/8	2-1/2	ICE789436	$35.54	ICE789444	$35.54
7/16	7/16	1	2-3/4	ICE789437	$46.69	ICE789445	$46.69
1/2	1/2	1	3	ICE789438	$53.47	ICE789446	$53.47
5/8	5/8	1-1/4	3-1/2	ICE789439	$88.05	ICE789447	$88.05
3/4	3/4	1-1/2	4	ICE789440	$124.41	ICE789448	$124.41
1	1	1-1/2	4	ICE789432	$208.48	ICE789441	$208.48

PERFORMANCE Variable Pitch Carbide, Ball 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#	Price	TiALN Coated 4 Flute - WELDON Shank Part#	Price
3/16	3/16	3/4	2-1/2	ICE789433	$20.91	--	
1/4	1/4	1-1/8	3	ICE789434	$22.03	ICE789442	$22.03
5/16	5/16	1-1/8	3	ICE789435	$30.39	ICE789443	$30.39
3/8	3/8	1-1/8	3	ICE789436	$35.54	ICE789444	$35.54
7/16	7/16	2	4	ICE789437	$46.69	ICE789445	$46.69
1/2	1/2	2	4	ICE789438	$53.47	ICE789446	$53.47
5/8	5/8	2-1/4	5	ICE789439	$88.05	ICE789447	$88.05
3/4	3/4	2-1/4	5	ICE789440	$124.41	ICE789448	$124.41
1	1	2-1/4	5	ICE789432	$208.48	ICE789441	$208.48

PERFORMANCE Variable Pitch Carbide, Ball 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#	Price	TiALN Coated 4 Flute - WELDON Shank Part#	Price
3/16	3/16	1-1/8	3	ICE789475	$40.86	--	
1/4	1/4	1-1/2	4	ICE789476	$43.06	--	
5/16	5/16	1-5/8	4	ICE789477	$58.90	--	
3/8	3/8	1-3/4	4	ICE789478	$84.58	--	
1/2	1/2	3	6	ICE789479	$138.18	--	
5/8	5/8	3	6	ICE789480	$147.87	--	
3/4	3/4	3	6	ICE789481	$212.74	--	
1	1	3	6	ICE789474	$360.45	--	

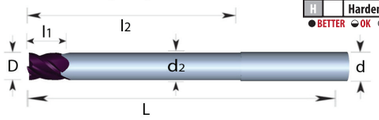
Innovative Custom Engineering

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

● BETTER ◒ OK ○ NOT OPTIMAL

PERFORMANCE

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



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

Cutter Diam. D	Shank Diam. d	Necked Diam. d_1	Length Of Cut l_1	Length Below Shk. l_2	O.A.L. L	Corner Radius	TiALN Coated 4 Flute - ROUND Shank Part#	Price	TiALN Coated 4 Flute - WELDON Shank Part#	Price
3/16	3/16	.1775	3/8	2-1/2	4	SQ	ICE789508	$53.97	--	
3/16	3/16	.1775	3/8	2-1/2	4	.015CR	ICE789509	$53.97	--	
1/4	1/4	.2400	3/8	2-1/2	4	SQ	ICE789510	$59.52	--	
1/4	1/4	.2400	3/8	2-1/2	4	.015CR	ICE789511	$59.52	--	
5/16	5/16	.3025	7/16	2-1/2	4	SQ	ICE789512	$70.31	--	
5/16	5/16	.3025	7/16	2-1/2	4	.015CR	ICE789513	$70.31	--	
3/8	3/8	.3650	1/2	2-1/2	4	SQ	ICE789514	$74.57	--	
3/8	3/8	.3650	1/2	2-1/2	4	.015CR	ICE789515	$74.57	--	
1/2	1/2	.4800	5/8	3	5	SQ	ICE789516	$110.34	--	
1/2	1/2	.4800	5/8	3	5	.020CR	ICE789517	$110.34	--	
1/2	1/2	.4800	5/8	4	6	SQ	ICE789519	$119.61	--	
1/2	1/2	.4800	5/8	4	6	.020CR	ICE789518	$119.61	--	
5/8	5/8	.6050	3/4	3	5	SQ	ICE789520	$136.56	--	
5/8	5/8	.6050	3/4	3	5	.020CR	ICE789521	$136.56	--	
5/8	5/8	.6050	3/4	4	6	SQ	ICE789523	$142.96	--	
5/8	5/8	.6050	3/4	4	6	.020CR	ICE789522	$142.96	--	
3/4	3/4	.7300	1	3	5	SQ	ICE789524	$183.69	--	
3/4	3/4	.7300	1	3	5	.020CR	ICE789525	$183.69	--	
3/4	3/4	.7300	1	4	6	SQ	ICE789528	$193.28	--	
3/4	3/4	.7300	1	4	6	.020CR	ICE789526	$193.28	--	
3/4	3/4	.7300	1	5	7	SQ	ICE789529	$220.47	--	
3/4	3/4	.7300	1	5	7	.020CR	ICE789527	$220.47	--	
1	1	.9800	1-1/4	3	5	SQ	ICE789502	$297.15	--	
1	1	.9800	1-1/4	3	5	.020CR	ICE789503	$297.15	--	
1	1	.9800	1-1/4	4	6	SQ	ICE789506	$317.93	--	
1	1	.9800	1-1/4	4	6	.020CR	ICE789504	$317.93	--	
1	1	.9800	1-1/4	5	7	SQ	ICE789507	$367.51	--	
1	1	.9800	1-1/4	5	7	.020CR	ICE789505	$367.51	--	

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

Cutter Diam. D	Shank Diam. d	Necked Diam. d_1	Length Of Cut l_1	Length Below Shk. l_2	O.A.L. L	TiALN Coated 4 Flute - ROUND Shank Part#	Price	TiALN Coated 4 Flute - WELDON Shank Part#	Price
3/16	3/16	.1775	3/8	2-1/2	4	ICE789533	$61.45	--	
1/4	1/4	.2400	3/8	2-1/2	4	ICE789534	$69.45	--	
5/16	5/16	.3025	7/16	2-1/2	4	ICE789535	$78.08	--	
3/8	3/8	.3650	1/2	2-1/2	4	ICE789536	$84.48	--	
1/2	1/2	.4800	5/8	3	5	ICE789537	$121.21	--	
1/2	1/2	.4800	5/8	4	6	ICE789538	$127.61	--	
5/8	5/8	.6050	3/4	3	5	ICE789539	$161.46	--	
5/8	5/8	.6050	3/4	4	6	ICE789540	$167.06	--	
3/4	3/4	.7300	1	3	5	ICE789541	$222.34	--	
3/4	3/4	.7300	1	4	6	ICE789542	$231.93	--	
3/4	3/4	.7300	1	5	7	ICE789543	$255.92	--	
1	1	.9800	1-1/4	3	5	ICE789530	$358.85	--	
1	1	.9800	1-1/4	4	6	ICE789531	$379.64	--	
1	1	.9800	1-1/4	5	7	ICE789532	$422.82	--	

Innovative Custom Engineering

SPEED & FEED RECOMMENDATIONS

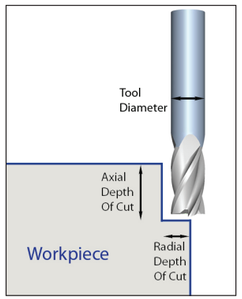
PERFORMANCE

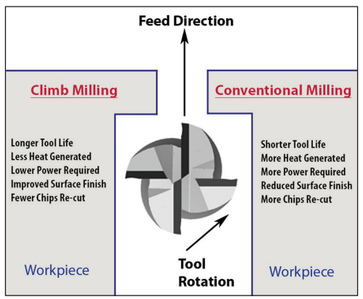
Material		Speed (SFM)	Feed Per Tooth By End Mill Diameter							
		TiALN Coated	1/4"	5/16"	3/8"	7/16"	1/2"	5/8"	3/4"	1"
Aluminum & Aluminum Alloys	N	900-1800	.0025	.0030	.0035	.0040	.0045	.0055	.0065	.0085
Copper & Copper Alloys	N	525-1275	.0025	.0030	.0030	.0035	.0035	.0040	.0045	.0065
Brass & Bronze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

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

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

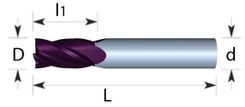




Innovative Custom Engineering

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

● BEST ◒ OK ○ NOT OPTIMAL

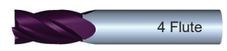


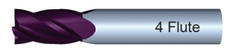
PROFESSIONAL

- Special Helix Design with honed edges
- Variable Pitch to reduce chatter with special core design
- 10% Ultra High Performance Micro Grain Carbide
- Diameter Tolerances: +0.0000"/-0.0015"

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#	Price	TiALN Coated 4 Flute - WELDON Shank Part#	Price
3/16	3/16	3/8	2	SQ	ICE786277	$15.69	--	
3/16	3/16	3/8	2	.015CR	ICE786278	$15.69	--	
1/4	1/4	3/8	2	SQ	ICE786279	$19.43	--	
1/4	1/4	3/8	2	.015CR	ICE786280	$19.43	--	
5/16	5/16	3/8	2	SQ	ICE786281	$26.85	--	
5/16	5/16	3/8	2	.020CR	ICE786282	$26.85	--	
3/8	3/8	1/2	2	SQ	ICE786283	$33.55	--	
3/8	3/8	1/2	2	.020CR	ICE786284	$33.55	--	
1/2	1/2	5/8	2-1/2	SQ	ICE786285	$54.69	ICE786291	$54.69
1/2	1/2	5/8	2-1/2	.030CR	ICE786286	$54.69	ICE786292	$54.69
5/8	5/8	3/4	3	SQ	ICE786287	$100.82	ICE786293	$100.82
5/8	5/8	3/4	3	.030CR	ICE786288	$100.82	ICE786294	$100.82
3/4	3/4	1	3	SQ	ICE786289	$147.36	ICE786295	$147.36
3/4	3/4	1	3	.030CR	ICE786290	$147.36	ICE786296	$147.36





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#	Price	TiALN Coated 4 Flute - WELDON Shank Part#	Price	TiALN Coated 5 Flute - ROUND Shank Part#	Price
1/8	1/8	1/2	1-1/2	.010CR	ICE786107	$14.87	--		--	
3/16	3/16	5/8	2	SQ	ICE786109	$17.43	--		--	
3/16	3/16	5/8	2	.015CR	ICE786110	$17.43	--		--	
1/4	1/4	3/4	2-1/2	SQ	ICE786112	$21.59	ICE786153	$21.59	ICE786115	$21.59
1/4	1/4	3/4	2-1/2	.020CR	ICE786114	$21.59	ICE786155	$21.59	ICE786116	$21.59
5/16	5/16	13/16	2-1/2	SQ	ICE786117	$29.83	ICE786156	$29.83	ICE786119	$29.83
5/16	5/16	13/16	2-1/2	.020CR	ICE786118	$29.83	ICE786157	$29.83	ICE786120	$29.83
3/8	3/8	7/8	2-1/2	SQ	ICE786121	$36.46	ICE786158	$36.46	ICE786125	$36.46
3/8	3/8	7/8	2-1/2	.020CR	ICE786123	$36.46	ICE786160	$36.46	ICE786126	$36.46
3/8	3/8	7/8	2-1/2	.030CR	ICE786124	$36.46	ICE786161	$36.46	ICE786127	$36.46
7/16	7/16	1	2-3/4	SQ	ICE786128	$52.77	ICE786162	$52.77	--	
1/2	1/2	1-1/4	3	SQ	ICE786129	$60.76	ICE786163	$60.76	ICE786133	$60.76
1/2	1/2	1-1/4	3	.015CR	ICE786130	$60.76	ICE786164	$60.76	--	
1/2	1/2	1-1/4	3	.030CR	ICE786131	$60.76	ICE786165	$60.76	ICE786134	$60.76
1/2	1/2	1-1/4	3	.060CR	ICE786132	$60.76	ICE786166	$60.76	--	
5/8	5/8	1-1/4	3-1/2	SQ	ICE786135	$103.94	ICE786167	$103.94	ICE786139	$103.94
5/8	5/8	1-1/4	3-1/2	.030CR	ICE786136	$103.94	ICE786168	$103.94	ICE786140	$103.94
5/8	5/8	1-1/4	3-1/2	.060CR	ICE786137	$103.94	ICE786169	$103.94	--	
5/8	5/8	1-1/4	3-1/2	.125CR	ICE786138	$103.94	ICE786170	$103.94	--	
3/4	3/4	1-1/2	4	SQ	ICE786141	$151.91	ICE786171	$151.91	ICE786145	$151.91
3/4	3/4	1-1/2	4	.030CR	ICE786142	$151.91	ICE786173	$151.91	ICE786146	$151.91
3/4	3/4	1-1/2	4	.060CR	ICE786143	$151.91	ICE786174	$151.91	--	
3/4	3/4	1-1/2	4	.125CR	ICE786144	$151.91	ICE786175	$151.91	--	
1	1	1-1/2	4	SQ	ICE786100	$260.16	ICE786147	$260.16	ICE786104	$260.16
1	1	1-1/2	4	.030CR	ICE786101	$260.16	ICE786148	$260.16	ICE786105	$260.16
1	1	1-1/2	4	.060CR	ICE786102	$260.16	ICE786149	$260.16	--	
1	1	1-1/2	4	.125CR	ICE786103	$260.16	ICE786150	$260.16	--	

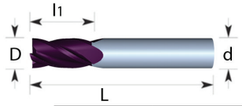
Innovative Custom Engineering

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 Micro Grain Carbide
- Diameter Tolerances: +0.0000"/-0.0015"



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#	Price	TiALN Coated 4 Flute - WELDON Shank Part#	Price
3/16	3/16	3/4	2-1/2	SQ	ICE786181	$34.65	--	
3/16	3/16	3/4	2-1/2	.015CR	ICE786182	$34.65	--	
1/4	1/4	1-1/8	3	SQ	ICE786183	$36.52	ICE786206	$36.52
1/4	1/4	1-1/8	3	.020CR	ICE786184	$36.52	ICE786207	$36.52
5/16	5/16	1-1/8	3	SQ	ICE786185	$50.81	ICE786208	$50.81
5/16	5/16	1-1/8	3	.020CR	ICE786186	$50.81	ICE786209	$50.81
3/8	3/8	1-1/8	3	SQ	ICE786187	$61.42	ICE786210	$61.42
3/8	3/8	1-1/8	3	.020CR	ICE786188	$61.42	ICE786211	$61.42
7/16	7/16	2	4	SQ	ICE786189	$79.61	ICE786212	$79.61
1/2	1/2	2	4	SQ	ICE786190	$92.74	ICE786213	$92.74
1/2	1/2	2	4	.015CR	ICE786191	$92.74	ICE786214	$92.74
1/2	1/2	2	4	.030CR	ICE786192	$92.74	ICE786215	$92.74
1/2	1/2	2	4	.060CR	ICE786193	$92.74	ICE786216	$92.74
5/8	5/8	2-1/4	5	SQ	ICE786194	$142.31	ICE786217	$142.31
5/8	5/8	2-1/4	5	.030CR	ICE786195	$142.31	ICE786218	$142.31
5/8	5/8	2-1/4	5	.060CR	ICE786196	$142.31	ICE786219	$142.31
5/8	5/8	2-1/4	5	.125CR	ICE786197	$142.31	ICE786220	$142.31
3/4	3/4	2-1/4	5	SQ	ICE786198	$193.48	ICE786221	$193.48
3/4	3/4	2-1/4	5	.030CR	ICE786199	$193.48	ICE786222	$193.48
3/4	3/4	2-1/4	5	.060CR	ICE786200	$193.48	ICE786223	$193.48
3/4	3/4	2-1/4	5	.125CR	ICE786201	$193.48	ICE786224	$193.48
1	1	2-1/4	5	SQ	ICE786176	$311.81	ICE786202	$311.81
1	1	2-1/4	5	.030CR	ICE786177	$311.81	ICE786203	$311.81
1	1	2-1/4	5	.060CR	ICE786178	$311.81	ICE786204	$311.81
1	1	2-1/4	5	.125CR	ICE786179	$311.81	ICE786205	$311.81

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#	Price	TiALN Coated 4 Flute - WELDON Shank Part#	Price
3/16	3/16	1-1/8	3	SQ	ICE786261	$38.12	--	
1/4	1/4	1-1/2	4	SQ	ICE786262	$43.46	--	
5/16	5/16	1-5/8	4	SQ	ICE786263	$58.44	--	
3/8	3/8	1-3/4	4	SQ	ICE786264	$67.55	--	
1/2	1/2	3	6	SQ	ICE786265	$140.97	--	
5/8	5/8	3	6	SQ	ICE786266	$165.44	--	
3/4	3/4	3	6	SQ	ICE786267	$220.18	--	
1	1	3	6	SQ	ICE786260	$416.98	--	

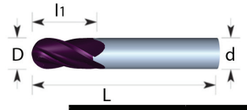
Innovative Custom Engineering

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 Micro Grain Carbide
- Diameter Tolerances: +0.0000"/-0.0015"



PROFESSIONAL Variable Pitch Carbide, Ball Regular Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	TiALN Coated 4 Flute - ROUND Shank Part#	Price	TiALN Coated 4 Flute - WELDON Shank Part#	Price
3/16	3/16	5/8	2	ICE786227	$20.91	--	
1/4	1/4	3/4	2-1/2	ICE786228	$25.90	ICE786236	$25.90
5/16	5/16	13/16	2-1/2	ICE786229	$35.78	ICE786237	$35.78
3/8	3/8	7/8	2-1/2	ICE786230	$43.75	ICE786238	$43.75
7/16	7/16	1	2-3/4	ICE786231	$63.32	ICE786239	$63.32
1/2	1/2	1	3	ICE786232	$72.92	ICE786240	$72.92
5/8	5/8	1-1/4	3-1/2	ICE786233	$124.73	ICE786241	$124.73
3/4	3/4	1-1/2	4	ICE786234	$182.29	ICE786242	$182.29
1	1	1-1/2	4	ICE786225	$297.42	ICE786235	$297.42

PROFESSIONAL Variable Pitch Carbide, Ball Long Length, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	TiALN Coated 4 Flute - ROUND Shank Part#	Price	TiALN Coated 4 Flute - WELDON Shank Part#	Price
3/16	3/16	3/4	2-1/2	ICE786244	$41.59	--	
1/4	1/4	1-1/8	3	ICE786245	$43.83	ICE786253	$43.83
5/16	5/16	1-1/8	3	ICE786246	$60.97	ICE786254	$60.97
3/8	3/8	1-1/8	3	ICE786247	$73.69	ICE786255	$73.69
7/16	7/16	2	4	ICE786248	$95.52	ICE786256	$95.52
1/2	1/2	2	4	ICE786249	$111.29	ICE786257	$112.52
5/8	5/8	2-1/4	5	ICE786250	$170.78	ICE786258	$170.78
3/4	3/4	2-1/4	5	ICE786251	$232.18	ICE786259	$232.18
1	1	2-1/4	5	ICE786243	$374.18	ICE786252	$374.18

PROFESSIONAL Variable Pitch Carbide, Ball Extra Long Length, Single End

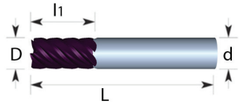
Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	TiALN Coated 4 Flute - ROUND Shank Part#	Price	TiALN Coated 4 Flute - WELDON Shank Part#	Price
3/16	3/16	1-1/8	3	ICE786270	$47.73	--	
1/4	1/4	1-1/2	4	ICE786271	$50.84	--	
5/16	5/16	1-5/8	4	ICE786272	$69.51	--	
3/8	3/8	1-3/4	4	ICE786273	$103.04	--	
1/2	1/2	3	6	ICE786274	$169.17	--	
5/8	5/8	3	6	ICE786275	$190.26	--	
3/4	3/4	3	6	ICE786276	$264.21	--	
1	1	3	6	ICE786268	$500.38	--	

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 Micro Grain Carbide
- Diameter Tolerances: +0.0000"/-0.0015"

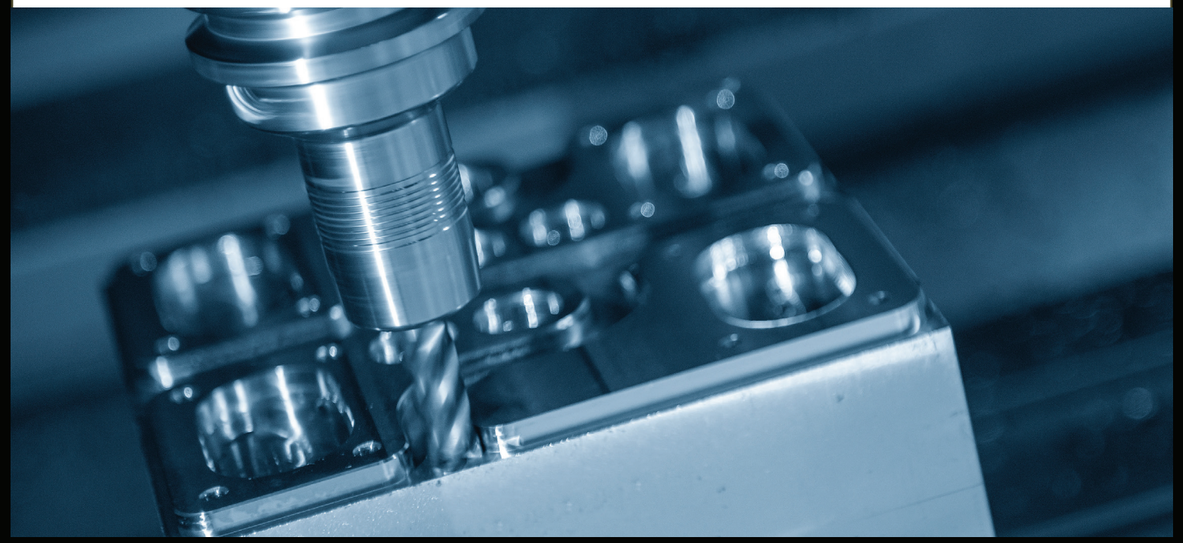


6 & 7 Flute High Performance End Mills

- Full edge finishing with low radial engagement at high speeds & feeds
- Excellent for Trochoidal Milling
- Take advantage of Radial Chip Thinning Factor compensation (RCTF), to move at high velocities

PROFESSIONAL Variable Pitch Carbide, Finishers, Single End

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Corner Radius	TiALN Coated 6 Flute - ROUND Shank Part#	Price	TiALN Coated 7 Flute - ROUND Shank Part#	Price
1/4	1/4	3/4	2-1/2	SQ	ICE786300	$21.59	--	
1/4	1/4	3/4	2-1/2	.030CR	ICE786301	$21.59	--	
3/8	3/8	7/8	2-1/2	SQ	ICE786302	$36.46	--	
3/8	3/8	7/8	2-1/2	.030CR	ICE786303	$36.46	--	
1/2	1/2	1-1/4	3	SQ	ICE786304	$60.77	--	
1/2	1/2	1-1/4	3	.030CR	ICE786305	$60.77	ICE786306	$66.84
5/8	5/8	1-1/4	3-1/2	SQ	ICE786307	$103.94	--	
5/8	5/8	1-1/4	3-1/2	.030CR	ICE786308	$103.94	ICE786309	$114.34
3/4	3/4	1-1/2	4	SQ	ICE786310	$151.91	--	
3/4	3/4	1-1/2	4	.030CR	ICE786311	$151.91	ICE786312	$167.11
1	1	1-1/2	4	SQ	ICE786297	$247.86	--	
1	1	1-1/2	4	.030CR	ICE786298	$247.86	ICE786299	$272.65



SPEED & FEED RECOMMENDATIONS

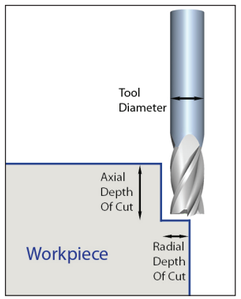
PROFESSIONAL

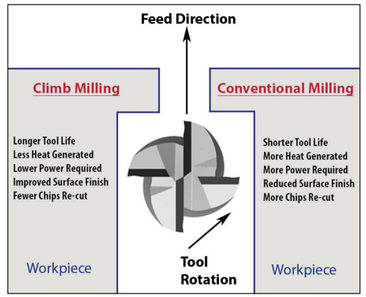
Material		Speed (SFM) TiALN Coated	Feed Per Tooth By End Mill Diameter 1/4"	5/16"	3/8"	7/16"	1/2"	5/8"	3/4"	1"
Aluminum & Aluminum Alloys	N	900-1800	.0025	.0030	.0035	.0040	.0045	.0055	.0065	.0085
Copper & Copper Alloys	N	525-1275	.0025	.0030	.0030	.0035	.0035	.0040	.0045	.0065
Brass & Bronze	N	375-600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

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

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





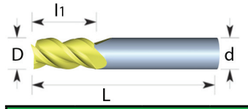
Innovative Custom Engineering

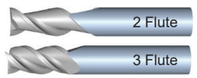
P		Steel
M		Stainless Steel
K		Cast Iron
N	●	Non-Ferrous
S		High Temp. Alloys
H		Hardened Steel

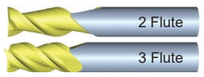
● BEST

NON-FERROUS

- Special 45 Degree Helix Design with Cylindrical Margin
- Variable Pitch & Special Core Design with Chipbreaker Flute Geometries
- Diameter Tolerances: +0.0000"/-0.0004"
- Ultra High Performance Micro Grain Carbide with extremely high Transverse Rupture strength

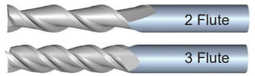


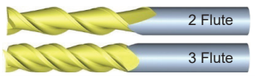




NON-FERROUS Medium/Finishing, Regular Length, Single End - ALUMINUM

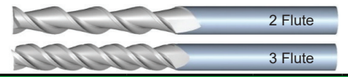
Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Corner Radius	Uncoated 2 Flute Part#	Uncoated 3 Flute Part#	Uncoated Price	ZrN Coated 2 Flute Part#	ZrN Coated 3 Flute Part#	ZrN Coated Price	DLC Coated 2 Flute Part#	DLC Coated 3 Flute Part#	DLC Coated Price
1/8	1/8	1/2	1-1/2	SQ	ICE789022	ICE789023	$11.27	--	--		--	--	
3/16	3/16	5/8	2	SQ	ICE789024	ICE789026	$14.96	ICE788908	ICE788910	$17.43	ICE789138	ICE789140	$29.63
1/4	1/4	3/4	2-1/2	SQ	ICE789027	ICE789029	$16.31	ICE788911	ICE788913	$21.59	ICE789141	ICE789143	$36.70
1/4	1/4	3/4	2-1/2	.020CR	ICE789028	ICE789030	$16.31	ICE788912	ICE788914	$21.59	ICE789142	ICE789144	$36.70
5/16	5/16	13/16	2-1/2	SQ	ICE789032	ICE789034	$21.59	ICE788916	ICE788918	$29.83	ICE789146	ICE789148	$50.70
5/16	5/16	13/16	2-1/2	.020CR	ICE789033	ICE789036	$21.59	ICE788917	ICE788920	$29.83	ICE789147	ICE789150	$50.70
3/8	3/8	1	2-1/2	SQ	ICE789038	ICE789040	$28.46	ICE788922	ICE788924	$36.46	ICE789152	ICE789154	$61.98
3/8	3/8	1	2-1/2	.020CR	ICE789039	ICE789041	$28.46	ICE788923	ICE788925	$36.46	ICE789153	ICE789155	$61.98
1/2	1/2	1-1/4	3	SQ	ICE789042	ICE789044	$47.01	ICE788926	ICE788928	$60.76	ICE789156	ICE789158	$103.30
1/2	1/2	1-1/4	3	.030CR	ICE789043	ICE789045	$47.01	ICE788927	ICE788929	$60.76	ICE789157	ICE789159	$103.30
5/8	5/8	1-1/4	3-1/2	SQ	ICE789046	ICE789048	$93.38	ICE788930	ICE788932	$103.94	ICE789160	ICE789162	$176.69
5/8	5/8	1-1/4	3-1/2	.030CR	ICE789047	ICE789049	$93.38	ICE788931	ICE788933	$103.94	ICE789161	ICE789163	$176.69
3/4	3/4	1-1/2	4	SQ	ICE789050	ICE789052	$129.52	ICE788934	ICE788936	$151.91	ICE789164	ICE789166	$258.24
3/4	3/4	1-1/2	4	.030CR	ICE789051	ICE789053	$129.52	ICE788935	ICE788937	$151.91	ICE789165	ICE789167	$258.24
1	1	1-1/2	4	SQ	ICE789018	ICE789020	$222.94	ICE788904	ICE788906	$247.85	ICE789134	ICE789136	$421.35
1	1	1-1/2	4	.030CR	ICE789019	ICE789021	$222.94	ICE788905	ICE788907	$247.85	ICE789135	ICE789137	$421.35

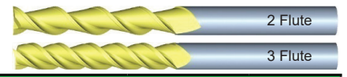




NON-FERROUS Medium/Finishing, Long Length, Single End - ALUMINUM

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Corner Radius	Uncoated 2 Flute Part#	Uncoated 3 Flute Part#	Uncoated Price	ZrN Coated 2 Flute Part#	ZrN Coated 3 Flute Part#	ZrN Coated Price
3/16	3/16	3/4	2-1/2	SQ	ICE789056	ICE789057	$24.63	ICE788940	ICE788941	$34.65
1/4	1/4	1-1/8	3	SQ	ICE789058	ICE789059	$30.79	ICE788942	ICE788943	$36.52
5/16	5/16	1-1/8	3	SQ	ICE789060	ICE789061	$45.89	ICE788944	ICE788945	$50.81
3/8	3/8	1-1/8	3	SQ	ICE789062	ICE789063	$51.81	ICE788946	ICE788947	$61.42
1/2	1/2	2	4	SQ	ICE789064	ICE789065	$80.75	ICE788948	ICE788949	$92.74
5/8	5/8	2-1/4	5	SQ	ICE789066	ICE789067	$129.52	ICE788950	ICE788951	$142.31
3/4	3/4	2-1/4	5	SQ	ICE789068	ICE789069	$180.37	ICE788952	ICE788953	$193.48
1	1	2-1/4	5	SQ	ICE789054	ICE789055	$280.82	ICE788938	ICE788939	$311.81





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 2 Flute Part#	Uncoated 3 Flute Part#	Uncoated Price	ZrN Coated 2 Flute Part#	ZrN Coated 3 Flute Part#	ZrN Coated Price
3/16	3/16	1-1/8	3	SQ	ICE789104	ICE789105	$29.68	ICE788988	ICE788989	$38.12
1/4	1/4	1-1/2	4	SQ	ICE789106	ICE789107	$40.30	ICE788990	ICE788991	$43.46
5/16	5/16	1-5/8	4	SQ	ICE789108	ICE789109	$53.24	ICE788992	ICE788993	$58.44
3/8	3/8	1-3/4	4	SQ	ICE789110	ICE789111	$56.99	ICE788994	ICE788995	$67.55
1/2	1/2	3	6	SQ	ICE789112	ICE789113	$120.57	ICE788996	ICE788997	$140.97
5/8	5/8	3	6	SQ	ICE789114	ICE789115	$160.22	ICE788998	ICE788999	$165.44
3/4	3/4	3	6	SQ	ICE789116	ICE789117	$197.40	ICE789000	ICE789001	$220.18
1	1	3	6	SQ	ICE789102	ICE789103	$384.38	ICE788986	ICE788987	$416.98

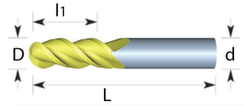
Innovative Custom Engineering

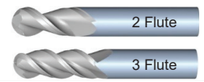
P		Steel
M		Stainless Steel
K		Cast Iron
N	●	Non-Ferrous
S		High Temp. Alloys
H		Hardened Steel

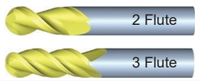
● BEST

NON-FERROUS

- Special 45 Degree Helix Design with Cylindrical Margin
- Variable Pitch & Special Core Design with Chipbreaker Flute Geometries
- Diameter Tolerances: +0.0000"/-0.0004"
- Ultra High Performance Micro Grain Carbide with extremely high Transverse Rupture strength

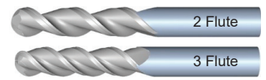


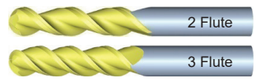




NON-FERROUS Medium/Finishing, Ball Regular Length, Single End - ALUMINUM

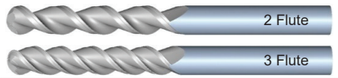
Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Corner Radius	Uncoated 2 Flute Part#	Uncoated 3 Flute Part#	Uncoated Price	ZrN Coated 2 Flute Part#	ZrN Coated 3 Flute Part#	ZrN Coated Price
3/16	3/16	5/8	2	BN	ICE789072	ICE789073	$17.95	ICE788956	ICE788957	$20.91
1/4	1/4	3/4	2-1/2	BN	ICE789074	ICE789075	$19.57	ICE788958	ICE788959	$25.90
5/16	5/16	13/16	2-1/2	BN	ICE789076	ICE789077	$25.90	ICE788960	ICE788961	$35.78
3/8	3/8	1	2-1/2	BN	ICE789078	ICE789079	$34.16	ICE788962	ICE788963	$43.75
1/2	1/2	1-1/4	3	BN	ICE789080	ICE789081	$56.41	ICE788964	ICE788965	$72.92
5/8	5/8	1-1/4	3-1/2	BN	ICE789082	ICE789083	$112.06	ICE788966	ICE788967	$124.73
3/4	3/4	1-1/2	4	BN	ICE789084	ICE789085	$155.43	ICE788968	ICE788969	$182.29
1	1	1-1/2	4	BN	ICE789070	ICE789071	$267.53	ICE788954	ICE788955	$297.42

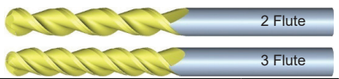




NON-FERROUS Medium/Finishing, Ball Long Length, Single End - ALUMINUM

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Corner Radius	Uncoated 2 Flute Part#	Uncoated 3 Flute Part#	Uncoated Price	ZrN Coated 2 Flute Part#	ZrN Coated 3 Flute Part#	ZrN Coated Price
3/16	3/16	3/4	2-1/2	BN	ICE789088	ICE789089	$29.55	ICE788972	ICE788973	$41.59
1/4	1/4	1-1/8	3	BN	ICE789090	ICE789091	$36.94	ICE788974	ICE788975	$43.83
5/16	5/16	1-1/8	3	BN	ICE789092	ICE789093	$55.07	ICE788976	ICE788977	$60.97
3/8	3/8	1-1/8	3	BN	ICE789094	ICE789095	$62.17	ICE788978	ICE788979	$73.69
1/2	1/2	2	4	BN	ICE789096	ICE789097	$96.90	ICE788980	ICE788981	$111.29
5/8	5/8	2-1/4	5	BN	ICE789098	ICE789099	$155.43	ICE788982	ICE788983	$170.78
3/4	3/4	2-1/4	5	BN	ICE789100	ICE789101	$216.45	ICE788984	ICE788985	$232.18
1	1	2-1/4	5	BN	ICE789086	ICE789087	$336.98	ICE788970	ICE788971	$374.18





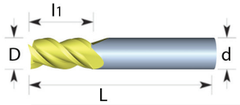
NON-FERROUS Medium/Finishing, Ball Extra Long Length, Single End - ALUMINUM

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Corner Radius	Uncoated 2 Flute Part#	Uncoated 3 Flute Part#	Uncoated Price	ZrN Coated 2 Flute Part#	ZrN Coated 3 Flute Part#	ZrN Coated Price
3/16	3/16	1-1/8	3	BN	ICE789120	ICE789121	$35.61	ICE789004	ICE789005	$45.74
1/4	1/4	1-1/2	4	BN	ICE789122	ICE789123	$48.35	ICE789006	ICE789007	$52.15
5/16	5/16	1-5/8	4	BN	ICE789124	ICE789125	$63.89	ICE789008	ICE789009	$70.12
3/8	3/8	1-3/4	4	BN	ICE789126	ICE789127	$68.39	ICE789010	ICE789011	$81.06
1/2	1/2	3	6	BN	ICE789128	ICE789129	$144.68	ICE789012	ICE789013	$169.17
5/8	5/8	3	6	BN	ICE789130	ICE789131	$192.27	ICE789014	ICE789015	$198.53
3/4	3/4	3	6	BN	ICE789132	ICE789133	$236.88	ICE789016	ICE789017	$264.21
1	1	3	6	BN	ICE789118	ICE789119	$461.26	ICE789002	ICE789003	$500.38

Innovative Custom Engineering

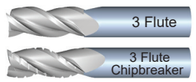
P	Steel
M	Stainless Steel
K	Cast Iron
N ●	Non-Ferrous
S	High Temp. Alloys
H	Hardened Steel

● BEST



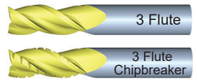
NEW

- Special 36 Degree Helix Design with Cylindrical Margin
- Variable Pitch & Special Core Design with Chipbreaker Flute Geometries
- Diameter Tolerances: +0.0000"/-0.0004"



NON-FERROUS

- Ultra High Performance Micro Grain Carbide with extremely high Transverse Rupture strength



NON-FERROUS 3Flute Medium/Roughing - ALUMINUM

Cutter Diam. D	Shank Diam. d	Length Of Cut l1	O.A.L. L	Corner Radius	Uncoated Part#	Uncoated Chipbreaker Part#	Uncoated Price	ZrN Coated Part#	ZrN Coated Chipbreaker Part#	ZrN Coated Price
1/4	1/4	3/4	2-1/2	SQ	ICE789248	--	$16.31	ICE789299	--	$21.59
1/4	1/4	3/4	2-1/2	.015CR	ICE789249	--	$16.31	ICE789300	--	$21.59
1/4	1/4	3/4	2-1/2	.030CR	ICE789251	--	$16.31	--	--	
1/4	1/4	3/4	2-1/2	.060CR	ICE789252	--	$16.31	--	--	
5/16	5/16	13/16	2-1/2	SQ	ICE789254	--	$21.59	ICE789303	--	$29.83
5/16	5/16	13/16	2-1/2	.030CR	ICE789255	--	$21.59	ICE789304	--	$29.83
5/16	5/16	13/16	2-1/2	.060CR	ICE789256	--	$21.59	--	--	
3/8	3/8	1	2-1/2	SQ	ICE789257	--	$28.46	ICE789305	--	$36.46
3/8	3/8	1	2-1/2	.030CR	ICE789258	ICE789260	$28.46	ICE789306	ICE789307	$36.46
3/8	3/8	1	2-1/2	.060CR	ICE789259	--	$28.46	--	--	
3/8	3/8	1-1/8	3	SQ	ICE789261	--	$51.80	ICE789308	--	$61.41
3/8	3/8	1-1/8	3	.030CR	ICE789262	ICE789263	$51.80	ICE789309	ICE789310	$61.41
1/2	1/2	1-1/4	3	SQ	ICE789264	--	$47.00	ICE789311	--	$60.77
1/2	1/2	1-1/4	3	.030CR	ICE789265	ICE789269	$47.00	ICE789312	ICE789313	$60.77
1/2	1/2	1-1/4	3	.060CR	ICE789266	--	$47.00	--	--	
1/2	1/2	1-1/4	3	.090CR	ICE789267	--	$47.00	--	--	
1/2	1/2	1-1/4	3	.120CR	ICE789268	--	$47.00	--	--	
1/2	1/2	2	4	SQ	ICE789270	--	$80.75	ICE789314	--	$92.75
1/2	1/2	2	4	.030CR	ICE789271	ICE789272	$80.75	ICE789315	ICE789316	$92.75
5/8	5/8	1-1/4	3-1/2	SQ	ICE789273	--	$93.38	ICE789317	--	$103.94
5/8	5/8	1-1/4	3-1/2	.030CR	ICE789274	ICE789278	$93.38	ICE789318	ICE789319	$103.94
5/8	5/8	1-1/4	3-1/2	.060CR	ICE789275	--	$93.38	--	--	
5/8	5/8	1-1/4	3-1/2	.090CR	ICE789276	--	$93.38	--	--	
5/8	5/8	1-1/4	3-1/2	.120CR	ICE789277	--	$93.38	--	--	
5/8	5/8	2-1/4	5	SQ	ICE789279	--	$129.53	ICE789320	--	$142.32
5/8	5/8	2-1/4	5	.030CR	ICE789280	ICE789281	$129.53	ICE789321	ICE789322	$142.32
3/4	3/4	1-5/8	4	SQ	ICE789282	--	$129.53	ICE789323	--	$151.91
3/4	3/4	1-5/8	4	.030CR	ICE789283	ICE789287	$129.53	ICE789324	ICE789325	$151.91
3/4	3/4	1-5/8	4	.060CR	ICE789284	--	$129.53	--	--	
3/4	3/4	1-5/8	4	.090CR	ICE789285	--	$129.53	--	--	
3/4	3/4	1-5/8	4	.120CR	ICE789286	--	$129.53	--	--	
3/4	3/4	2-1/4	5	SQ	ICE789288	--	$180.38	ICE789326	--	$193.48
3/4	3/4	2-1/4	5	.030CR	ICE789289	ICE789290	$180.38	ICE789327	ICE789328	$193.48
1	1	1-1/2	4	SQ	ICE789291	--	$222.94	ICE789329	--	$247.85
1	1	1-1/2	4	.030CR	ICE789292	ICE789295	$222.94	ICE789330	ICE789331	$247.85
1	1	1-1/2	4	.060CR	ICE789293	--	$222.94	--	--	
1	1	1-1/2	4	.120CR	ICE789294	--	$222.94	--	--	
1	1	2-1/4	5	SQ	ICE789296	--	$280.81	ICE789332	--	$311.81
1	1	2-1/4	5	.030CR	ICE789297	ICE789298	$280.81	ICE789333	ICE789334	$311.81

Innovative Custom Engineering

SPEED & FEED RECOMMENDATIONS

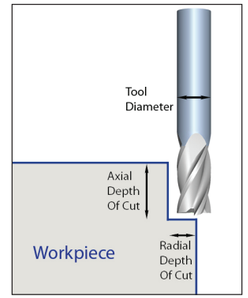
NON-FERROUS

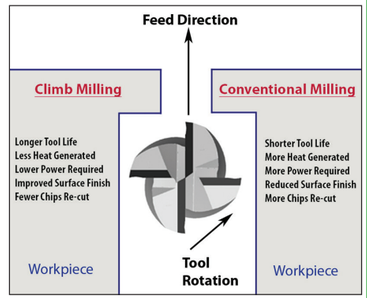
Material		Speed (SFM) ZrN Coated	Feed Per Tooth By End Mill Diameter 1/4"	5/16"	3/8"	7/16"	1/2"	5/8"	3/4"	1"
Aluminum & Aluminum Alloys	N	900-1800	.0030	.0035	.0040	.0045	.0050	.0060	.0070	.0090
Copper & Copper Alloys	N	525-1275	.0030	.0035	.0035	.0040	.0040	.0045	.0050	.0070
Brass & Bronze	N	375-600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

- 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 1.5 times the tool diameter for profiling and 1 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

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

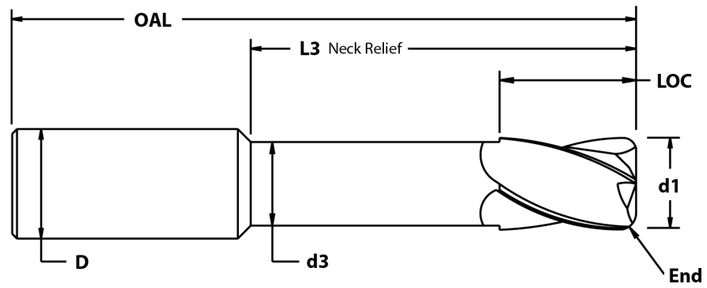
$$IPM = RPM * Feed\ Per\ Tooth * \#\ of\ Teeth$$





Innovative Custom Engineering

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 (ECO)
- ☐ Performance (PER)
- ☐ Professional (PRO)
- ☐ Non-Ferrous (NFE)

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

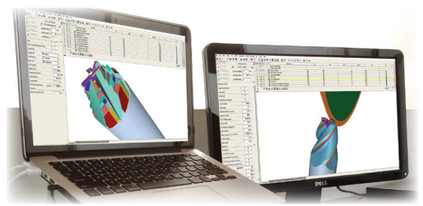
OPTIONAL:

Neck Relief:

- ☐ No
- ☐ Yes

d3 (Neck Relief Diameter): _____

L3 (Length from Tip): _____



Shank Type:

- ☐ Cylindrical
- ☐ Weldon Flat
- ☐ Other:_____

Tapered:

- ☐ No
- ☐ Yes

Taper Angle (Indicate if angle is per side or included): _____

d1 (Tip Diameter): _____

Coating:

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

OTHER INFORMATION:

Material(s) being machined: _____

End User Company Name: _____

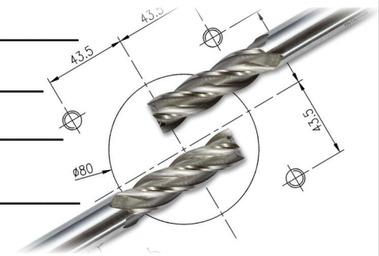
End User Contact: _____

Sales Representative: _____

Other Information:_____

_____

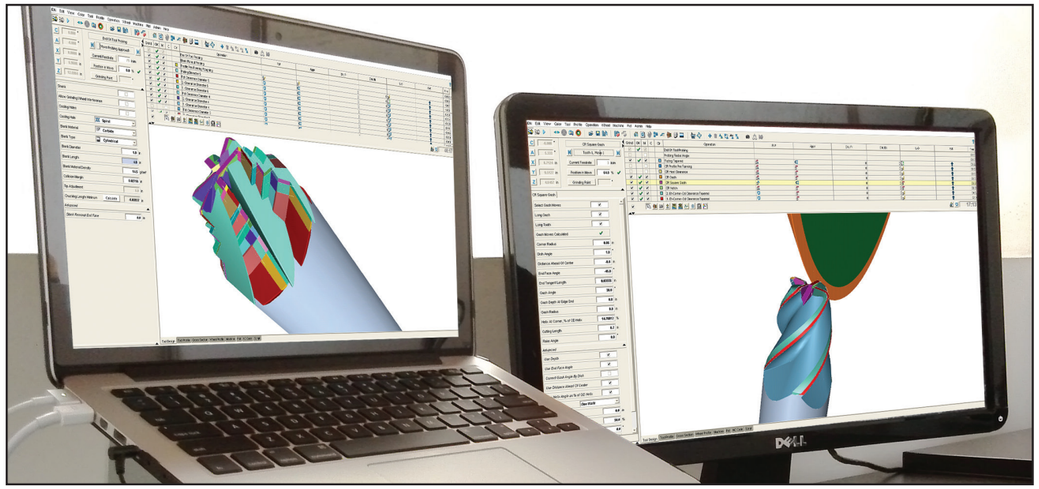
_____



ADDITIONAL SERVICES

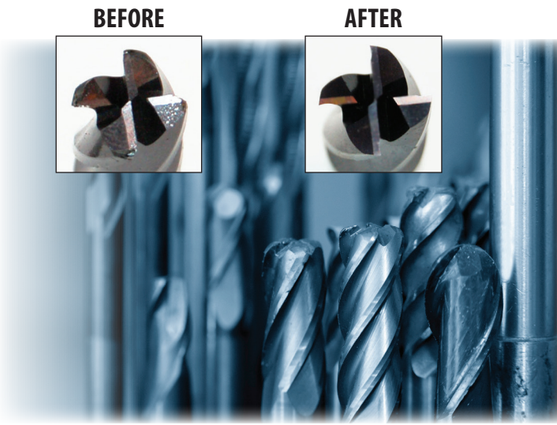
SPECIALS & ENGINEERED SOLUTIONS

- 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.
- From concept to your spindle with quick turnaround times.



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


ICE
Innovative Custom Engineering