



An ISO 9000 Certified Company

Your Edge in Productivity

Patented



CARB
SOLID CARBIDE END MILLS

Patented Unequal Helix Geometry

Chatter-Resistant Design:

- Improves Surface Finish

Optimum Material Removal:

- Increases Cutting Depth
- Increases Feed Rates

Increased Tool Life:

- Ti-NAMITE-A® (AlTiN Coated)
- Corner Radius
- Special Gash Break Out Grind
- Eccentric Relief

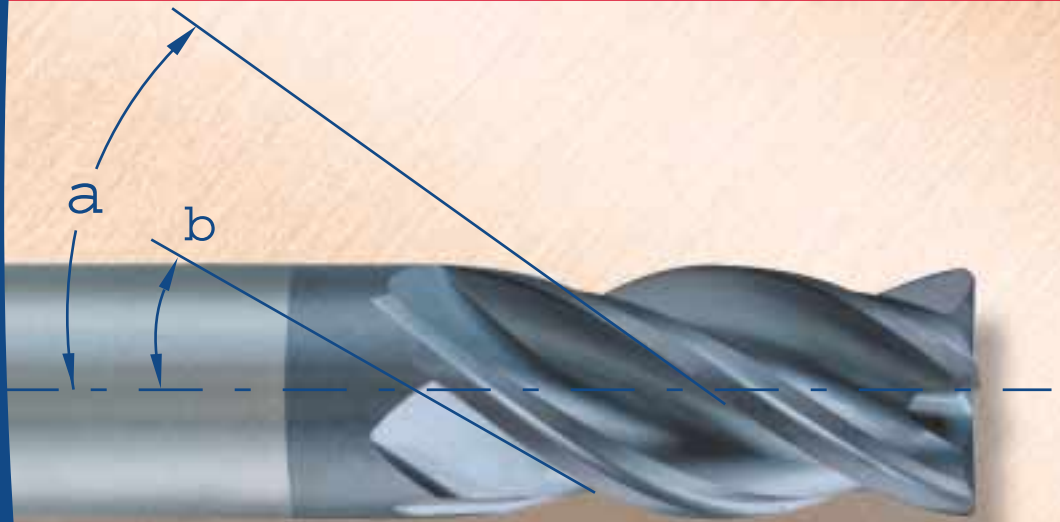
Minimum Tool Deflection:

- Reduces Harmful Machine Vibration
- Improves Dimensional Control

Material Applications Include:

- Low Carbon Steels
- Tool Steels
- Cast Iron
- Stainless Steels
- Titanium/High Temp Alloys

Revolutionizes Milling

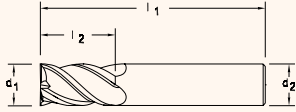


$a \neq b$



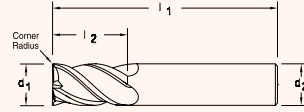
www.sgstool.com

SERIES Z1 - FRACTIONAL SQUARE END



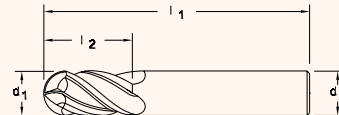
Cutting Diameter d_1	Length of Cut l_2	Overall Length l_1	Shank Diameter d_2	TINAMITE-A (AITIN) EDP Number	TINAMITE-A (AITIN) EDP Number w/ Flat
1/8	3/8	1-1/2	1/8	36404	
5/32	7/16	2	3/16	36406	
3/16	7/16	2	3/16	36408	
7/32	7/16	2-1/2	1/4	36410	
1/4	1/2	2-1/2	1/4	36416	
9/32	5/8	2-1/2	5/16	36418	
5/16	13/16	2-1/2	5/16	36420	
11/32	13/16	2-1/2	3/8	36422	
3/8	7/8	2-1/2	3/8	36424	36530
13/32	15/16	2-3/4	7/16	36426	36531
7/16	1	2-3/4	7/16	36428	36532
15/32	1	3	1/2	36430	36533
1/2	1	3	1/2	36432	36534
9/16	1-1/8	3-1/2	9/16	36436	36535
5/8	1-1/4	3-1/2	5/8	36440	36536
3/4	1-1/2	4	3/4	36442	36537
1	1-1/2	4	1	36444	36538

SERIES Z1CR - FRACTIONAL CORNER RADIUS



Cutting Diameter d_1	Length of Cut l_2	Overall Length l_1	Shank Diameter d_2	Corner Radius	TINAMITE-A (AITIN) EDP Number	TINAMITE-A (AITIN) EDP Number w/ Flat
1/8	3/8	1-1/2	1/8	.010 - .015	36333	
3/16	7/16	2	3/16	.010 - .015	36334	
1/4	1/2	2-1/2	1/4	.015 - .020	36335	
5/16	13/16	2-1/2	5/16	.015 - .020	36336	
3/8	7/8	2-1/2	3/8	.015 - .020	36337	36548
7/16	1	2-3/4	7/16	.015 - .020	36338	36549
1/2	1	3	1/2	.025 - .030	36339	36550
9/16	1-1/8	3-1/2	9/16	.025 - .030	36340	36551
5/8	1-1/4	3-1/2	5/8	.035 - .040	36341	36552
3/4	1-1/2	4	3/4	.035 - .040	36342	36553
1	1-1/2	4	1	.035 - .040	36343	36554

SERIES Z1B - FRACTIONAL BALL END

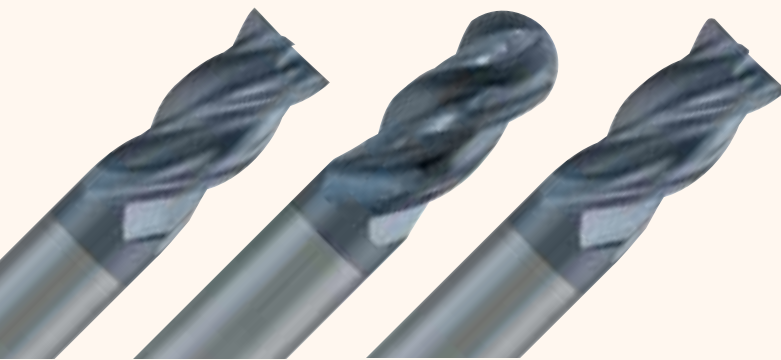


Cutting Diameter d_1	Length of Cut l_2	Overall Length l_1	Shank Diameter d_2	TINAMITE-A (AITIN) EDP Number	TINAMITE-A (AITIN) EDP Number w/ Flat
1/8	3/8	1-1/2	1/8	36358	
5/32	7/16	2	5/32	36357	
3/16	7/16	2	3/16	36359	
7/32	7/16	2-1/2	7/32	36361	
1/4	1/2	2-1/2	1/4	36344	
9/32	5/8	2-1/2	9/32	36353	
5/16	13/16	2-1/2	5/16	36345	
11/32	13/16	2-1/2	11/32	36354	
3/8	7/8	2-1/2	3/8	36346	
13/32	15/16	2-3/4	13/32	36355	36539
7/16	1	2-3/4	7/16	36347	36540
15/32	1	3	15/32	36356	36541
1/2	1	3	1/2	36348	36542
9/16	1-1/8	3-1/2	9/16	36349	36543
5/8	1-1/4	3-1/2	5/8	36350	36544
3/4	1-1/2	4	3/4	36351	36545
1	1-1/2	4	1	36352	36546

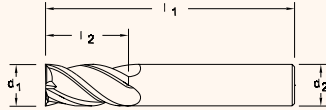
PATENT NUMBERS:
 U.S.: 4,963,059
 Germany: 3,706,282
 Korea: 065,154
 Japan: 1513152

TOLERANCES	
Cutting Diameter d_1	Shank Diameter d_2
1/8 - 1/4 = +.0000/-0.0012	1/8 - 3/8 = -.0001/-0.0003
>1/4 - 3/8 = +.0000/-0.0016	>3/8 - 1 = -.0001/-0.0004
>3/8 - 1 = +.0000/-0.002	

**Outstanding Productivity
& Performance with
Z Carb tools from SGS**

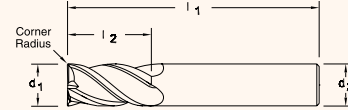


SERIES Z1M - METRIC SQUARE END



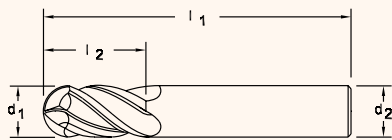
Cutting Diameter d_1 (mm)	Length of Cut l_2 (mm)	Overall Length l_1 (mm)	Shank Diameter d_2 (mm)	TINAMITE-A (AITIN) EDP Number
3	8	57	6	46357
4	11	57	6	46358
5	13	57	6	46359
6	13	57	6	46360
8	19	63	8	46362
10	22	72	10	46364
12	26	83	12	46366
14	26	83	14	46368
16	32	92	16	46370
18	32	92	18	46372
20	38	104	20	46374
25	38	104	25	46376

SERIES Z1MCR - METRIC CORNER RADIUS



Cutting Diameter d_1 (mm)	Length of Cut l_2 (mm)	Overall Length l_1 (mm)	Shank Diameter d_2 (mm)	Corner Radius	TINAMITE-A (AITIN) EDP Number
3	8	57	6	0,25-0,38	46377
4	11	57	6	0,25-0,38	46378
5	13	57	6	0,25-0,38	46379
6	13	57	6	0,38-0,51	46335
7	19	63	8	0,38-0,51	46380
8	19	63	8	0,38-0,51	46336
9	22	72	10	0,38-0,51	46381
10	22	72	10	0,38-0,51	46337
11	26	83	12	0,64-0,76	46382
12	26	83	12	0,64-0,76	46338
13	26	92	16	0,64-0,76	46383
14	26	83	14	0,64-0,76	46339
14	26	92	16	0,64-0,76	46384
15	32	92	16	0,89-1,02	46385
16	32	92	16	0,89-1,02	46340
18	32	92	18	0,89-1,02	46341
18	32	104	20	0,89-1,02	46386
20	38	104	20	0,89-1,02	46342
25	38	104	25	0,89-1,02	46334

SERIES Z1MB - METRIC BALL END



Cutting Diameter d_1 (mm)	Length of Cut l_2 (mm)	Overall Length l_1 (mm)	Shank Diameter d_2 (mm)	TINAMITE-A (AITIN) EDP Number
3	8	57	6	46354
4	11	57	6	46355
5	13	57	6	46356
6	13	57	6	46343
8	19	63	8	46344
10	22	72	10	46345
12	26	83	12	46346
14	26	83	14	46347
16	32	92	16	46348
18	32	92	18	46349
20	38	104	20	46350
25	38	104	25	46351

TOLERANCES	
Cutting Diameter d_1 (mm)	Shank Diameter d_2 (mm)
3 - 6 = +0,0000/-0,030	6 - 10 = -0,0025/-0,0075
> 6 - 10 = +0,0000/-0,040	> 10 - 25 = -0,0025/-0,010
> 10 - 25 = +0,0000/-0,050	



Z CARB SPEED AND FEED RECOMMENDATIONS - METRIC

material	CUTTING DIAMETER (d.)																				
	Bhn	3		5		6		8		10		12		14		16		18		20	
		rpm	mm/min	rpm	mm/min	rpm	mm/min	rpm	mm/min	rpm	mm/min	rpm	mm/min	rpm	mm/min	rpm	mm/min	rpm	mm/min	rpm	mm/min
low carbon steels	~175	16500	335	9894	502	8248	586	6185	754	4948	955	4124	963	3535	890	3093	817	2749	809	2474	804
low carbon steels	~275	13585	276	8148	413	6793	483	5093	620	4075	786	3396	793	2911	733	2547	672	2264	667	2038	662
med alloy steels	~275	11320	230	6790	345	5661	403	4244	517	3396	656	2830	661	2425	592	2123	561	1887	556	1698	552
mold and die steels	~275	5822	118	3492	177	2911	207	2183	266	1747	337	1456	340	1248	314	1092	288	970	285	873	283
cast iron - gray	~200	15364	300	9215	468	7682	546	5760	702	4609	889	3841	897	3292	829	2881	761	2560	754	2304	749
cast iron - ductile	~300	7763	158	4656	236	3882	276	2911	354	2329	449	1941	453	1663	419	1456	384	1294	381	1164	378
cast iron - malleable	~300	4852	98	2911	147	2426	173	1819	221	1455	280	1213	283	1040	262	910	240	809	238	728	236
stainless 300 series	~275	9704	187	5820	295	4852	345	3638	444	2911	561	2426	566	2079	523	1819	480	1617	476	1455	473
stainless 400 series	~185	13585	276	8245	418	6793	483	5093	620	4075	786	3396	793	2911	733	2547	672	2264	667	2038	662
stainless PH series	~325	8086	164	4850	246	4043	287	3032	369	2426	468	2022	472	1733	436	1516	400	1348	397	1213	394
titanium alloys	~295	9704	197	5820	295	4852	345	3638	444	2911	561	2426	566	2079	523	1819	480	1617	476	1455	473
high temp alloys	~300	2588	53	1552	78	1294	92	970	118	776	149	647	151	554	140	485	128	431	126	388	126

Profiling: Radial Width .5 x Diameter (max.)

Profiling: Axial Depth 1.5 x Diameter (max.)

Slotting: Axial Depth 1 x Diameter (max.)

Our customers are saying great things about Z Carb!

From a CNC machining company:

Milling 8620 on a 7HP lathe. –1" diameter Z-Carb pocket was 1" axial depth 1/2" radial depth 1,000 RPM 10 IPM... normally 5 parts w/ a rougher @ 4 IPM & 600 RPM . Z-Carb ran 19 parts!

"That's not carbide, its Kryptonite!" said the machine operator.

From New York State distributor:

"I believe in the Z-Carb"

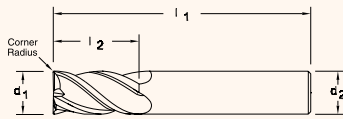
After a Saturday shop visit, his customer cut machining time down 90% and the shop owner told the tool crib attendant to ONLY order Z-Carb.

From a Pennsylvania distributor:

Another hastalloy application was successful with a 1/4" Z-Carb with 3/16" depth of cut. SGS tested against a competitor by running at 1250 RPM and 6 inches per minute. Net result: SGS cycle time was 1:28 seconds lasting for twenty parts. The competitor's tool lasted for six parts with a 4 minute cycle time. The user was 'high-fiving' the distributor as he thanked him for introducing Z-Carb!

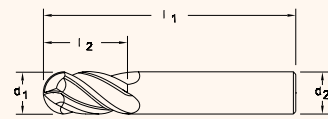


SERIES Z1LC - FRACTIONAL LONG REACH with CORNER RADIUS



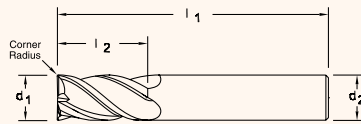
Cutting Diameter d_1	Length of Cut l_2	Overall Length l_1	Shank Diameter d_2	Corner Radius	TINAMITE-A (AlTiN) EDP Number
1/4	1/2	4	1/4	.015 - .020	36450
5/16	13/16	4	5/16	.015 - .020	36452
3/8	7/8	5	3/8	.015 - .020	36456
7/16	1	6	7/16	.015 - .020	36460
1/2	1	6	1/2	.025 - .030	36462
9/16	1-1/8	6	9/16	.025 - .030	36466
5/8	1-1/4	6	5/8	.035 - .040	36470
3/4	1-1/2	6	3/4	.035 - .040	36472
1	1-1/2	6	1	.035 - .040	36474

SERIES Z1LB - FRACTIONAL LONG REACH BALL END



Cutting Diameter d_1	Length of Cut l_2	Overall Length l_1	Shank Diameter d_2	TINAMITE-A (AlTiN) EDP Number
1/4	1/2	4	1/4	36480
5/16	13/16	4	5/16	36482
3/8	7/8	5	3/8	36486
7/16	1	6	7/16	38490
1/2	1	6	1/2	38492
9/16	1-1/8	6	9/16	38496
5/8	1-1/4	6	5/8	36500
3/4	1-1/2	6	3/4	36502
1	1-1/2	6	1	36504

SERIES Z16CR - FRACTIONAL SHORT LENGTH with CORNER RADIUS



TOLERANCES	
Cutting Diameter d_1	Shank Diameter d_2
1/8 - 1/4 = +.0000/-0.0012	1/8 - 3/8 = -.0001/-0.0003
>1/4 - 3/8 = +.0000/-0.0016	>3/8 - 1 = -.0001/-0.0004
>3/8 - 1 = +.0000/-0.002	

Cutting Diameter d_1	Length of Cut l_2	Overall Length l_1	Shank Diameter d_2	Corner Radius	TINAMITE-A (AlTiN) EDP Number
1/8	1/4	1-1/2	1/8	.010 - .015	36505
5/32	5/16	2	3/16	.010 - .015	36506
3/16	3/8	2	3/16	.010 - .015	36507
7/32	3/8	2	1/4	.015 - .020	36508
1/4	7/16	2	1/4	.015 - .020	36509
5/16	1/2	2	5/16	.015 - .020	36511
3/8	5/8	2	3/8	.015 - .020	36513
7/16	5/8	2-1/2	7/16	.015 - .020	36515
1/2	5/8	2-1/2	1/2	.025 - .030	36517
5/8	3/4	3	5/8	.035 - .040	36519
3/4	1	3	3/4	.035 - .040	36520

Z CARB SPEED AND FEED RECOMMENDATIONS - FRACTIONAL

material	CUTTING DIAMETER (d_1)																				
	Bhn	1/8		3/16		1/4		5/16		3/8		7/16		1/2		5/8		3/4		1	
		rpm	in/min	rpm	in/min	rpm	in/min	rpm	in/min	rpm	in/min	rpm	in/min	rpm	in/min	rpm	in/min	rpm	in/min	rpm	in/min
low carbon steels	~175	15,585	10	10,362	15	7793	24	6234	29	5195	39	4453	38	3896	37	3117	33	2598	31	1948	25
low carbon steels	~275	12,835	8	8,534	13	6418	20	5134	24	4278	32	3667	31	3209	30	2567	27	2139	25	1604	21
med alloy steels	~275	10,696	7	7,111	11	5348	17	4278	20	3565	27	3056	26	2674	25	2139	23	1783	21	1337	17
mold and die steels	~275	5,500	3	4,379	5	2750	8	2200	10	1834	13	1572	13	1375	13	1100	11	917	11	688	9
cast iron - gray	~200	14,516	10	9,651	15	7258	23	5806	27	4839	36	4147	35	3629	34	2903	31	2419	29	1815	24
cast iron - ductile	~300	7,334	5	4,876	7	3667	11	2934	14	2445	18	2096	18	1834	17	1467	15	1222	14	917	12
cast iron - malleable	~300	4,584	6	3,047	5	2292	7	1834	8	1528	11	1310	11	1146	11	917	9	764	9	573	7
stainless 300 series	~275	9,168	4	6,095	8	4584	14	3667	17	3056	23	2619	23	2292	22	1834	19	1528	18	1146	15
stainless 400 series	~185	12,835	7	8,534	12	6418	20	5134	24	4278	32	3667	31	3209	30	2567	27	2139	25	1604	21
stainless PH series	~325	7,640	4	5,079	8	3820	12	3056	14	2547	19	2183	19	1910	18	1528	16	1273	15	955	12
titanium alloys	~295	9,168	6	6,095	9	4584	14	3667	17	3056	23	2619	23	2292	22	1834	19	1528	18	1146	15
high temp. alloys	~300	2,444	2	1,625	3	1222	3	978	4	815	6	700	6	611	6	489	5	408	5	306	4

Profiling: Radial Width .5 x Diameter (max.)

Profiling: Axial Depth 1.5 x Diameter (max.)

Slotting: Axial Depth 1 x Diameter (max.)

Reduce cut depth and width appropriately when using Z1LC and Z1LB.



"Outstanding Productivity"



DESIGN BENEFITS

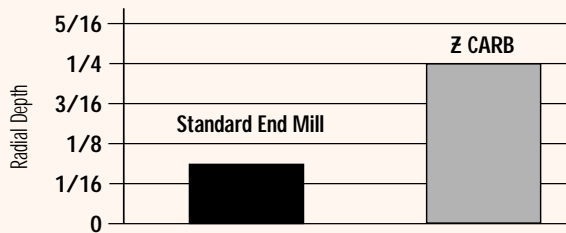
The Z CARB end mill **maximizes stock removal** and **improves productivity** in most milling operations. Chatter is the most common problem associated with aggressive milling. The SGS Z CARB design features reduce chatter, increase tool life and optimize performance. Z CARB tools are coated with SGS Ti-NAMITE-A® coating that resists heat generated in aggressive cutting operations.

CHATTER REDUCTION BY DESIGN

The unique patented design of the SGS Z CARB decreases chatter, which improves work piece finish. Less tuning (manually adjusting speed and feed rates) increases operator confidence and productivity. Increases in axial depth of cut to 275% have been realized without chatter. SGS Z CARB can achieve a 100% increase in radial width of cut over standard geometry end mills.

RADIAL CAPABILITY

Material: 316 SS @ 24Rc, Tool Diameter: 1/2", Axial Depth: 1/2"



APPLICATION TIPS

- Tool holders with adequate gripping pressure are required
- Stub length solid holders are recommended for heavy stock removal
- Avoid remilling chips
- Avoid straight plunging - ramp or spiral plunge into pockets
- Regrind and recondition services are available from SGS
- Set-up rigidity critical during heavy roughing

USA

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