SGS®
Solid Carbide Tools

S-CARB APR S-CARB APF

High Performance | *VALUE AT THE SPINDLE*

ISO 9001 Certified Company

www.sgstool.com

NEW

HIGH PERFORMANCE ALUMINUM MACHINING

ADVANCED PRODUCTIVITY ROUGHING AND FINISHING

APR

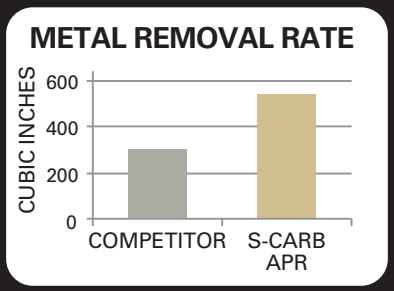
S-CARB APR

Developed and engineered for high power, high efficiency machining of aluminum aerospace structural parts. Material removal rates of 550 cubic inches achievable, dependent on machine.

- 3 flute design for high feed power roughing
- High feed direct plunge ability
- Through coolant design
- Polished flute design to maximize chip evacuation

VALUE AT THE SPINDLE

Design and engineering ensure outstanding performance in a variety of aluminum applications.



Superior metal removal rate achievement over competition.

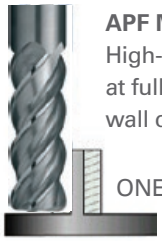
Please contact your SGS representative for more information.

Developed and engineered for high-feed finishing of thin wall aluminum applications. Significant reduction in machining times, with straighter walls and superior finishes compared to waterlining.

S-CARB APF

- 4 flute unique variable geometry reduces vibration and allows finishing of thin walls in one pass
- Through coolant design
- Polished flutes for superior finishes
- Significant reduction in cycle times

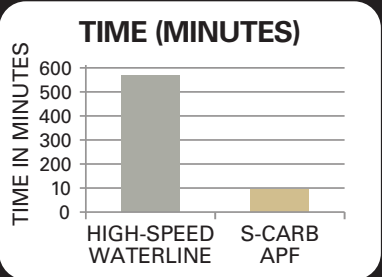
TYPICAL METHOD
High-speed waterline finishing, multiple passes at numerous levels to produce acceptable thin walls



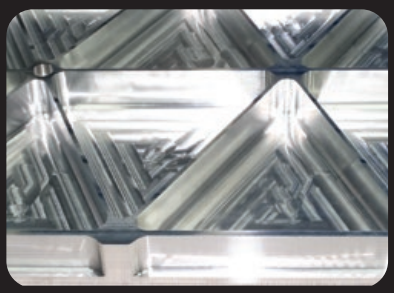
APF METHOD
High-speed finishing at full depth without wall distortion

ONE HIT

ENGINEERED **FLUTE DESIGN**



Dramatic increase in productivity versus the high speed waterline finishing method, which requires multiple passes to produce acceptable thin walls.

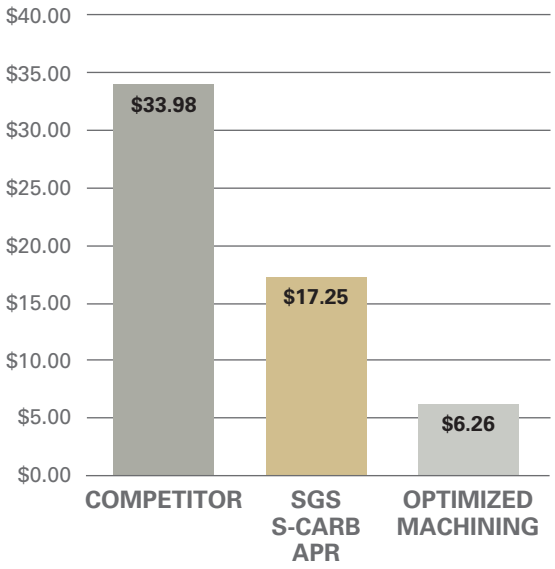


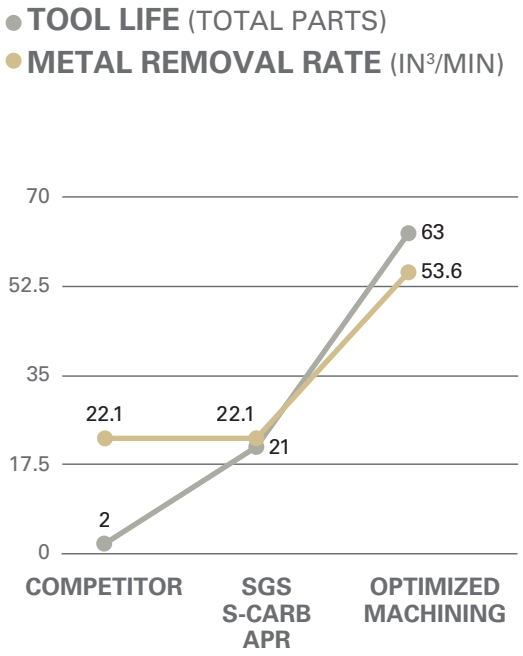
RIB MACHINING

TOOLING	COMPETITOR TOOL	SGS S-CARB APR 5/8"	SGS OPTIMIZED MACHINING **SGS S-CARB APR 5/8"**
Speed (RPM)	18002	18002	18002
Feed (in/min)	276.4	276.4	223.3
Radial (Ae) (in)	0.63	0.63	0.63
Depth (Ap) (in)	0.2	0.2	0.6
Tool Life (parts)	2	**21**	**63**
Metal Removal Rate (in^3/min)	22.1	22.1	**53.6**
Comments	Tool experienced excessive edge build up and had a catastrophic failure after two parts.	Tool was worn on last .2 inches.	Even tool wear over flute length

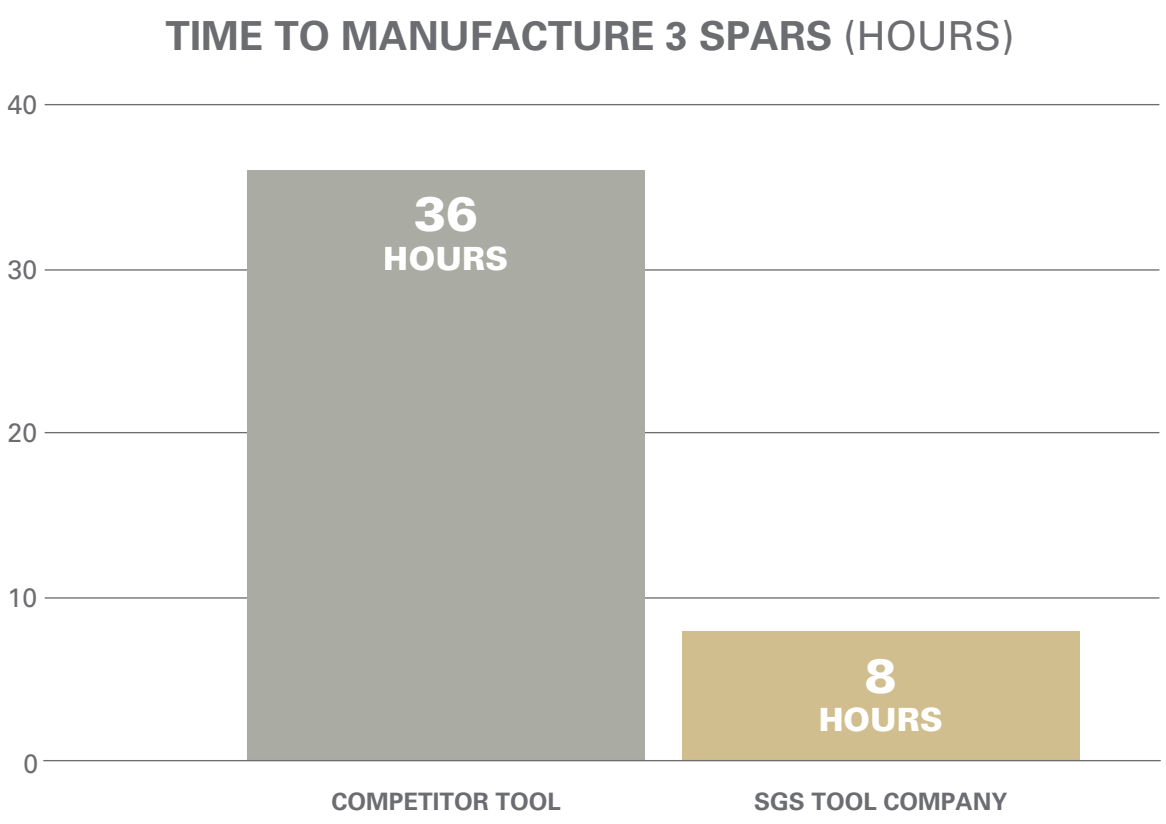
PART COST

$110,010 SAVED ANNUALLY





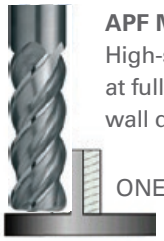
SPAR MACHINING



TIME IS MONEY

Spend it wisely with SGS Tools like the APR and APF

TYPICAL METHOD
High-speed waterline finishing, multiple passes at numerous levels to produce acceptable thin walls



APF METHOD
High-speed finishing at full depth without wall distortion

ONE HIT

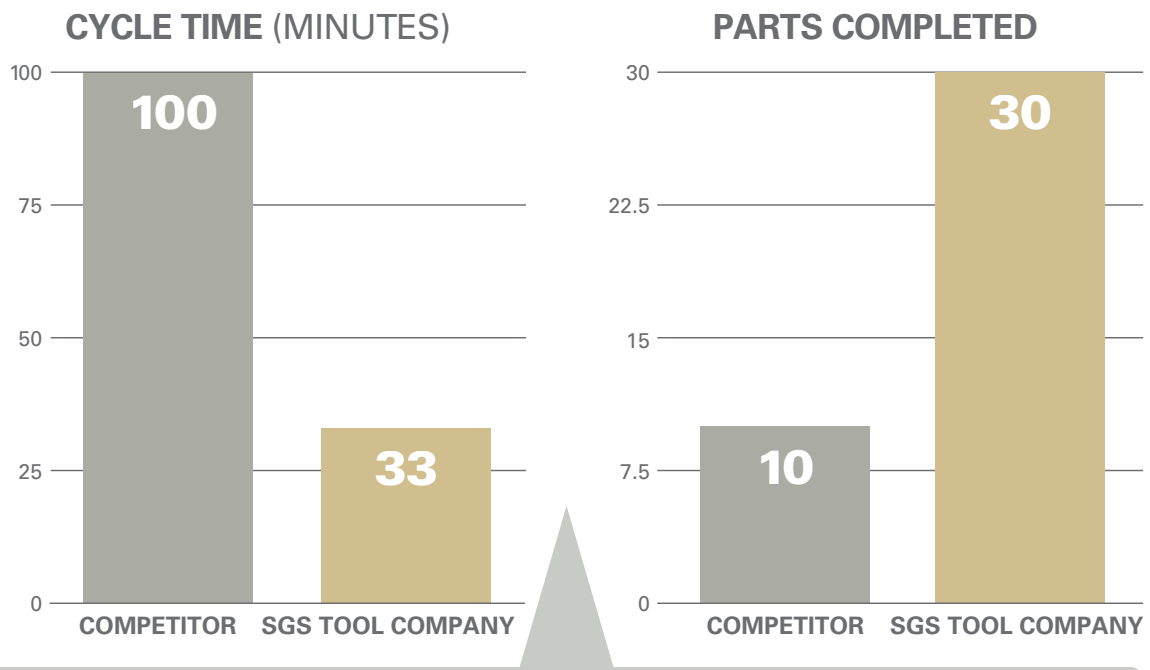
- **Single pass finishing**
- **Superior surface finish**
- **Eliminates the need for manual polishing**

SKIN MACHINING

“After the results obtained today, [we] have entered a new era in manufacturing.”

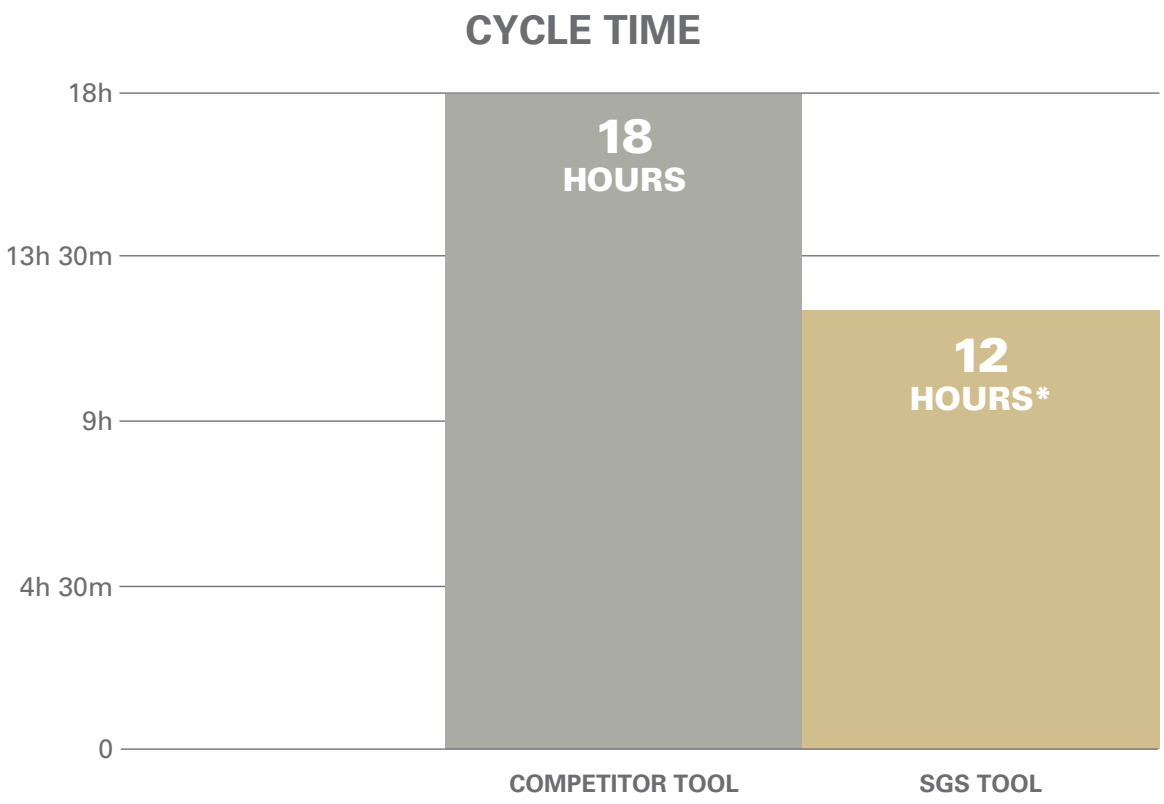
–Aerospace manufacturer
following a SGS APF test

SIGNIFICANT CYCLE TIME REDUCTION
SIGNIFICANT UPGRADE IN PART QUALITY



OVER 60% CYCLE TIME REDUCTION
$485,830 ANNUAL COST SAVINGS

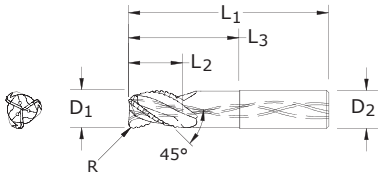
LOWER BEAM MACHINING



*SGS optimized machining using the Series 43 S-Carb, APR and APF tools

	COMPETITOR TOOL	SGS TOOL COMPANY
Cycle Time Per Part (hour)	18 hours	12 hours
Total Machining Cost Per Part	$ 2,452.00	$ 1,634.00
Time Savings Per Part (min)	–	360 minutes
Annual Time Savings (hour)	–	216 hours
Cost Savings Per Part	–	$ 818.00
Annual Cost Savings	–	$ 29,428.00

CARB
Solid Carbide End Mills for Aluminum



TOLERANCES (inch)		
DIAMETER	D_1	D_2
3/4 - 1	–0.00040/–0.00200	h6

CORNER RADIUS TOLERANCES (inch)
R= +/– 0.0018

TOLERANCES (mm)		
DIAMETER	D_1	D_2
12 - 25	–0,010/–0,050	h6

CORNER RADIUS TOLERANCES (mm)
R = +/– 0,03

FRACTIONAL

Cutting Diameter D_1	Length of Cut L_2	Overall Length L_1	Shank Diameter D_2	Reach L_3	Corner Radius R	Ti-NAMITE-B (TiB_2) EDP No.
3/4	1-3/8	4-1/4	3/4	2-3/8	.030	34000
3/4	1-3/8	4-1/4	3/4	2-3/8	.060	34001
3/4	1-3/8	4-1/4	3/4	2-3/8	.090	34002
3/4	1-3/8	4-1/4	3/4	2-3/8	.120	34003
3/4	1-1/4	4-7/8	3/4	3	.030	34004
3/4	1-1/4	4-7/8	3/4	3	.060	34005
3/4	1-1/4	4-7/8	3/4	3	.090	34006
3/4	1-1/4	4-7/8	3/4	3	.120	34007
1	1-3/4	4-1/2	1	2-1/2	.030	34008
1	1-3/4	4-1/2	1	2-1/2	.060	34009
1	1-3/4	4-1/2	1	2-1/2	.090	34010
1	1-3/4	4-1/2	1	2-1/2	.120	34011
1	1-1/2	5-1/4	1	3-1/4	.030	34012
1	1-1/2	5-1/4	1	3-1/4	.060	34013
1	1-1/2	5-1/4	1	3-1/4	.090	34014
1	1-1/2	5-1/4	1	3-1/4	.120	34015

METRIC

Cutting Diameter D_1	Length of Cut L_2	Overall Length L_1	Shank Diameter D_2	Reach L_3	Corner Radius R	Ti-NAMITE-B (TiB_2) EDP No.
12,0	18,0	83,0	12,0	38,0	–	44650
12,0	18,0	83,0	12,0	38,0	2,0	44685
12,0	18,0	83,0	12,0	38,0	3,0	44686
12,0	18,0	83,0	12,0	38,0	4,0	44687
16,0	24,0	92,0	16,0	51,0	–	44652
16,0	24,0	92,0	16,0	51,0	2,0	44688
16,0	24,0	92,0	16,0	51,0	3,0	44689
16,0	24,0	92,0	16,0	51,0	4,0	44690
20,0	30,0	86,0	20,0	45,0	–	44646
20,0	30,0	86,0	20,0	45,0	3,0	44647
20,0	30,0	86,0	20,0	45,0	4,0	44648
20,0	30,0	86,0	20,0	45,0	5,0	44649
20,0	35,0	104,0	20,0	64,0	–	44653
20,0	35,0	104,0	20,0	64,0	3,0	44691
20,0	35,0	104,0	20,0	64,0	4,0	44692
20,0	35,0	104,0	20,0	64,0	5,0	44693
25,0	35,0	108,0	25,0	55,0	3,0	44809
25,0	35,0	108,0	25,0	55,0	4,0	44810
25,0	35,0	108,0	25,0	55,0	5,0	44811
25,0	35,0	140,0	25,0	80,0	–	44654
25,0	35,0	140,0	25,0	80,0	3,0	44694
25,0	35,0	140,0	25,0	80,0	4,0	44695
25,0	35,0	140,0	25,0	80,0	5,0	44696
25,0	35,0	140,0	25,0	90,0	3,0	44645

Available on request: • JetStream Technology • Side exits for MQL applications • HAIMER Safe-Lock

Corner
Straight
HAIMER Safe-Lock
Extended Reach – Long
Right Spiral
POS
Positive Rake Angle
Internal Coolant
3
Flutes

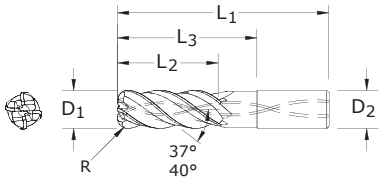
Series 43 | APR

TOLERANCES (inch)		
DIAMETER	D_1	D_2
1/2 - 3/4	–0.00040/–0.00200	h6

CORNER RADIUS TOLERANCES (inch)
R= +/– 0.0018

TOLERANCES (mm)		
DIAMETER	D_1	D_2
6 - 25	–0,010/–0,050	h6

CORNER RADIUS TOLERANCES (mm)
R = +/– 0,03



CARB
Solid Carbide End Mills for Aluminum

Corner

Straight

HAIMER Safe-Lock

Extended Reach – Long

Variable Right Spiral

Positive Rake Angle

Internal Coolant

4 Flutes

FRACTIONAL

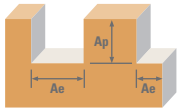
Cutting Diameter D_1	Length of Cut L_2	Overall Length L_1	Shank Diameter D_2	Reach L_3	Corner Radius R	Ti-NAMITE-B (TiB_2) EDP No.
1/2	1-1/4	3-1/4	1/2	1-5/8	.030	34016
1/2	1-1/4	3-1/4	1/2	1-5/8	.060	34017
1/2	1-1/4	3-1/4	1/2	1-5/8	.090	34018
1/2	1-1/4	3-1/4	1/2	1-5/8	.120	34019
1/2	2	4	1/2	2-3/8	.030	34020
1/2	2	4	1/2	2-3/8	.060	34021
1/2	2	4	1/2	2-3/8	.090	34022
1/2	2	4	1/2	2-3/8	.120	34023
3/4	1-7/8	4-1/4	3/4	2-3/8	.030	34024
3/4	1-7/8	4-1/4	3/4	2-3/8	.060	34025
3/4	1-7/8	4-1/4	3/4	2-3/8	.090	34026
3/4	1-7/8	4-1/4	3/4	2-3/8	.120	34027
3/4	3	5-3/8	3/4	3-1/2	.030	34028
3/4	3	5-3/8	3/4	3-1/2	.060	34029
3/4	3	5-3/8	3/4	3-1/2	.090	34030
3/4	3	5-3/8	3/4	3-1/2	.120	34031

METRIC

Cutting Diameter D_1	Length of Cut L_2	Overall Length L_1	Shank Diameter D_2	Reach L_3	Corner Radius R	Ti-NAMITE-B (TiB_2) EDP No.
6,0	24,0	58,0	6,0	30,0	–	44627
8,0	32,0	64,0	8,0	40,0	–	44628
10,0	40,0	80,0	10,0	50,0	–	44629
12,0	30,0	83,0	12,0	40,0	–	44630
12,0	30,0	83,0	12,0	40,0	2,0	44745
12,0	30,0	83,0	12,0	40,0	3,0	44746
12,0	30,0	83,0	12,0	40,0	4,0	44747
12,0	30,0	83,0	12,0	50,0	0,5	44641
12,0	30,0	83,0	12,0	50,0	5,0	44642
12,0	48,0	100,0	12,0	62,0	–	44631
12,0	48,0	100,0	12,0	62,0	2,0	44748
12,0	48,0	100,0	12,0	62,0	3,0	44749
12,0	48,0	100,0	12,0	62,0	4,0	44750
16,0	42,0	93,0	16,0	51,0	5,0	44643
16,0	40,0	92,0	16,0	51,0	–	44634
16,0	40,0	92,0	16,0	51,0	2,0	44751
16,0	40,0	92,0	16,0	51,0	3,0	44752
16,0	40,0	92,0	16,0	51,0	4,0	44753
16,0	64,0	125,0	16,0	82,0	–	44635
16,0	64,0	125,0	16,0	82,0	2,0	44754
16,0	64,0	125,0	16,0	82,0	3,0	44755
16,0	64,0	125,0	16,0	82,0	4,0	44756
20,0	50,0	108,0	20,0	63,0	–	44636
20,0	50,0	108,0	20,0	63,0	3,0	44757
20,0	50,0	108,0	20,0	63,0	4,0	44758
20,0	50,0	108,0	20,0	63,0	5,0	44759
20,0	80,0	150,0	20,0	102,0	–	44637
20,0	80,0	150,0	20,0	102,0	3,0	44760
20,0	80,0	150,0	20,0	102,0	4,0	44761
20,0	80,0	150,0	20,0	102,0	5,0	44762
25,0	63,0	130,0	25,0	79,0	–	44638
25,0	63,0	130,0	25,0	79,0	3,0	44763
25,0	63,0	130,0	25,0	79,0	4,0	44764
25,0	63,0	130,0	25,0	79,0	5,0	44765
25,0	100,0	175,0	25,0	120,0	–	44639
25,0	100,0	175,0	25,0	120,0	3,0	44766
25,0	100,0	175,0	25,0	120,0	4,0	44767
25,0	100,0	175,0	25,0	120,0	5,0	44768

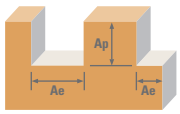
Available on request: • JetStream Technology • HAIMER Safe-Lock

CARB
Solid Carbide End Mills for Aluminum



	Series S-Carb APR Fractional		Ae x D_1	Ap x D_1	Vc (sfm)		Diameter (D_1) (inch) 3/4	1
N	ALUMINUM ALLOYS 2024, 5052, 5086, 6061, 6063, 7075	Slot <40hp	1	≤ 1	3280 (2624-3936)	RPM	16706	12530
						Fz	0.0060	0.0070
						Feed (IPM)	301	263
		Slot >67hp	1	≤ 1	4920 (3936-5904)	RPM	25059	18794
						Fz	0.0090	0.0110
						Feed (IPM)	677	620
		Profile	≤ 0.5	≤ 1.5	6560 (5248-7872)	RPM	33412	25059
						Fz	0.0090	0.0110
						Feed (IPM)	902	827
N	ALUMINUM ALLOYS (LITHIUM)* 2090, 2091, 2099, 2195, 2199, 2297, 8090	Slot <40hp	1	≤ 1	2620 (2096-3144)	RPM	13345	10008
						Fz	0.0060	0.0070
						Feed (IPM)	240	210
		Slot >67hp	1	≤ 1	3940 (3152-4728)	RPM	20068	15051
						Fz	0.0090	0.0110
						Feed (IPM)	542	497
		Profile	≤ 0.5	≤ 1.5	4920 (3936-5904)	RPM	25059	18794
						Fz	0.0090	0.0110
						Feed (IPM)	677	620

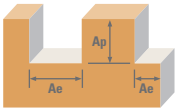
Note:
- surface speed is dependent on machine spindle & fixturing*
- balancing is recommended at ultra high surface speeds
- tool life may be reduced when machining Lithium Alloys
- rpm = sfm x 3.82 / D_1
- ipm = (inch / flute) x number of flutes x rpm
- maximum recommended depths shown
- reduce speed and feed for materials harder than listed
- ramp angle = 15˚ (feed rate = 30%)
- maximum ramp depth = 1 x D_1
- plunge depth = 1 x D_1 (feed rate = 30%)
- refer to the SGS Tool Wizard for complete technical information (www.sgstool.com)



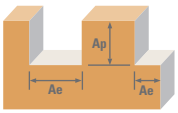
	Series S-Carb APR Metric		Ae x D_1	Ap x D_1	Vc (m/min)		Diameter (D_1) (mm) 12	16	20	25
N	ALUMINUM ALLOYS 2024, 5052, 5086, 6061, 6063, 7075	Slot <30 kW	1	1	1000 (800-1200)	RPM	26525	19894	15915	12732
						Fz	0.080	0.110	0.150	0.180
						Feed (mm/min)	6366	6565	7162	6875
		Slot >50kW	1	≤ 1	1500 (1200-1800)	RPM	39788	29841	23873	19098
						Fz	0.120	0.160	0.220	0.270
						Feed (mm/min)	14324	14324	15756	15469
		Profile	≤ 0.5	≤ 1.5	2000 (1600-2400)	RPM	53050	39788	31830	25464
						Fz	0.120	0.160	0.220	0.270
						Feed (mm/min)	19098	19098	21008	20626
N	ALUMINUM ALLOYS (LITHIUM)* 2090, 2091, 2099, 2195, 2199, 2297, 8090	Slot <30 kW	1	≤ 1	800 (640-960)	RPM	21220	15915	12732	10186
						Fz	0.080	0.110	0.150	0.180
						Feed (mm/min)	5093	5252	5729	5500
		Slot >50kW	1	≤ 1	1200 (960-1440)	RPM	31830	23873	19098	15278
						Fz	0.120	0.160	0.220	0.270
						Feed (mm/min)	11459	11459	12605	12375
		Profile	≤ 0.5	≤ 1.5	1500 (1200-1800)	RPM	39788	29841	23873	19098
						Fz	0.120	0.160	0.220	0.270
						Feed (mm/min)	14324	14324	15756	15469

Note:
- surface speed is dependent on machine spindle & fixturing*
- balancing is recommended at ultra high surface speeds
- tool life may be reduced when machining Lithium Alloys
- rpm = (1000 x m/min) / (3.14 x D_1)
- mm/min = (mm / flute) x rpm
- maximum recommended depths shown
- reduce speed and feed for materials harder than listed
- ramp angle = 15˚ (feed rate = 30%)
- maximum ramp depth = 1 x D_1
- plunge depth = 1 x D_1 (feed rate = 30%)
- refer to the SGS Tool Wizard for complete technical information (www.sgstool.com)

CARB
Solid Carbide End Mills for Aluminum

	Series S-Carb APF Fractional		 Ae x D_1	Ap x D_1	Vc (sfm)		Diameter (D_1) (inch) 1/2	3/4
N	ALUMINUM ALLOYS 2024, 5052, 5086, 6061, 6063, 7075	Profile	≤ 0.1	≤ 2.5	2625 (2100-3150)	RPM	20055	13370
						Fz	0.0030	0.0050
						Feed (IPM)	241	267
		Profile	≤ 0.1	≤ 4	2625 (2100-3150)	RPM	20055	13370
						Fz	0.0020	0.0040
						Feed (IPM)	160	214
N	ALUMINUM ALLOYS (LITHIUM)* 2090, 2091, 2099, 2195, 2199, 2297, 8090	Profile	≤ 0.1	≤ 2.5	1970 (1576-2364)	RPM	15051	10034
						Fz	0.0030	0.0050
						Feed (IPM)	181	201
		Profile	≤ 0.1	≤ 4	1970 (1576-2364)	RPM	15051	10034
						Fz	0.0020	0.0040
						Feed (IPM)	120	161

Note:
- surface speed is dependent on machine spindle & fixturing*
- balancing is recommended at ultra high surface speeds
- tool life may be reduced when machining Lithium Alloys
- rpm = sfm x 3.82 / D_1
- ipm = (inch / flute) x number of flutes x rpm
- maximum recommended depths shown
- reduce speed and feed for materials harder than listed
- finish cuts typically require reduced feed and cutting depths of 0.02 x D_1 maximum
- ramp angle = 6° (feed rate = 30%)
- maximum ramp depth = .25 x D_1
- plunging not recommended
- refer to the SGS Tool Wizard for complete technical information (www.sgstool.com)

	Series S-Carb APF Metric		 Ae x D_1	Ap x D_1	Vc (m/min)		Diameter (D_1) (mm) 6	8	10	12	16	20	25
N	ALUMINUM ALLOYS 2024, 5052, 5086, 6061, 6063, 7075	Profile	≤ 0.1	≤ 2.5	800 (640-960)	RPM	42440	31830	25464	21220	15915	12732	10186
						Fz	0.050	0.055	0.060	0.070	0.100	0.140	0.170
						Feed (mm/min)	8488	7003	6111	5942	6366	7130	6926
		Profile	≤ 0.1	≤ 4	800 (640-960)	RPM	42440	31830	25464	21220	15915	12732	10186
						Fz	0.040	0.045	0.050	0.050	0.070	0.100	0.120
						Feed (mm/min)	6790	5729	5093	4244	4456	5093	4889
N	ALUMINUM ALLOYS (LITHIUM)* 2090, 2091, 2099, 2195, 2199, 2297, 8090	Profile	≤ 0.1	≤ 2.5	600 (480-720)	RPM	31830	23873	19098	15915	11936	9549	7639
						Fz	0.050	0.055	0.060	0.070	0.100	0.140	0.170
						Feed (mm/min)	6366	5252	4584	4456	4774	5347	5195
		Profile	≤ 0.1	≤ 4	600 (480-720)	RPM	31830	23873	19098	15915	11936	9549	7639
						Fz	0.040	0.045	0.050	0.050	0.070	0.100	0.120
						Feed (mm/min)	5093	4297	3820	3183	3342	3820	3667

Note:
- surface speed is dependent on machine spindle & fixturing*
- balancing is recommended at ultra high surface speeds
- tool life may be reduced when machining Lithium Alloys
- rpm = (1000 x m/min) / (3.14 x D_1)
- mm/min = (mm / flute) x rpm
- maximum recommended depths shown
- reduce speed and feed for materials harder than listed
- finish cuts typically require reduced feed and cutting depths of 0.02 x D_1 maximum
- ramp angle = 6° (feed rate = 30%)
- maximum ramp depth = .25 x D_1
- plunging not recommended
- refer to the SGS Tool Wizard for complete technical information (www.sgstool.com)

Tool Wizard
CALCULATE APPLICATION PARAMETERS
www.sgstool.com

SGS
Solid Carbide Tools

Solutions Around The Globe
SGS Tool Company is a privately-held, ISO-certified leader of round solid carbide cutting tool technology for the aerospace, metalworking, and automotive industries with manufacturing sites in the United States and United Kingdom. Our global network of Sales Representatives, Industrial Distributors, and Agents blanket the world selling into more than 60 countries.

Leaders in Solid Carbide Tool Technology
Brand names such as Z-Carb, S-Carb, V-Carb, Hi-PerCarb, Multi-Carb have become synonymous with high performance tooling in the machining and metalworking industry.

We're proud to have pioneered some of the world's most advanced cutting technology right here in our Northeast Ohio manufacturing campus. SGS high performance end mills, drills and routers are increasing productivity and reducing cost around the world.

Exceeding Customer Expectations
In addition to our substantial R&D facilities, we offer a portfolio of products and services that have an unparalleled track record in manufacture, supply and value at the spindle.

- Incredible batch-to-batch consistency
- Metallurgical lab dedicated to testing and rigorous quality control
- ISO-certified quality procedures
- Patented geometries that extend tool life, reduce chatter, cut cycle times, and improve part quality—even at extreme parameters
- Specialists in extreme and demanding product applications
- Specialty Group tooling services
- Experienced Field Sales Engineers who work to optimize a tool for your particular application
- Dedicated multi-lingual customer service representatives

SGS Products are distributed by:

VALUE AT THE SPINDLE

UNITED STATES OF AMERICA
SGS TOOL COMPANY
World Headquarters
P.O. Box 187
55 South Main Street
Munroe Falls, Ohio 44262 U.S.A.
customer service -
US and Canada: (330) 686-5700
fax - US & Canada: (800) 447-4017
international fax: (330) 686-2146
e-mail: webmaster@sgstool.com

UNITED KINGDOM
SGS TOOL EUROPE LTD.
10 Ashville Way
Wokingham, Berkshire
RG41 2PL England
phone: (44) 1189-795-200
fax: (44) 1189-795-295
e-mail: sales@sgstool.eu

FRANCE
DOGA-SGS FRANCE
8, Avenue Gutenburg
78310 Maurepas
France
phone: +33 (0) 1 82 88 49 14
fax: +33 (0) 1 82 88 49 39
e-mail: sgsfrance@sgstool.eu

GERMANY
SGS TOOL GmbH
Am Sägebach 6
D- 88356 Ostrach-Einhart
Germany
phone: +49 (0) 7585 427 980
fax: +49 (0) 7585 4279819
e-mail: info@sgstool.eu

POLAND
SGS TOOL POLAND
phone: +48 530 432 002
e-mail: infopolska@sgstool.pl

SPAIN
SGS TOOL IBERICA
e-mail: sgsiberica@sgstool.es

EASTERN EUROPE
SINTCOM
Sintcom Tools
95 Arsenalski Blvd.
1421 Sofia, Bulgaria
phone: (359) 283-64421
fax: (359) 286-52493
e-mail: sintcom@sintcomtools.com

RUSSIA
HALTEC
phone: (7) 495-252-05-00
e-mail: info@haltec.ru
web: www.haltec.ru

CHINA
SGS TOOL DIVISION
Unit 301, Building A, No.200,
Jin Su Road
Jinqiao Export Processing Zone,
Pudong New Area
Shanghai 201206
China
phone: (86) 21-50589822
fax: (86) 21-50817160
e-mail: china@sgstool.com
web: www.sgstool.com/china

sgstool.com

EDP 00049 Rev 0216