KYOCERA

SGS®

Solid Carbide Tools

Conical Barrel Tool

NEW

For revolutionary finishing
and semi-finishing strategies

Create a better way

www.kyocera-sgstool.co.uk

Introducing a new range of conical barrel tools

For revolutionary finishing and semi-finishing strategies on a wide range of components including:

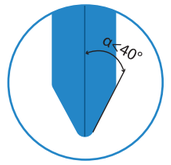
- **Medical** | Femoral knees and trauma plates
- **Aerospace** | Blisks, discs and blades
- **Power generation** | Turbine blades
- **Mould and die** | Deep cavities
- **Motorsport** | Complex shapes

Applications

- Barrel tools are designed to replace inefficient ball-nose scanning
- They are highly efficient at finishing & semi-finishing profiling
- Main application areas are profiling and pocket milling
- They are especially suited to machining deep pockets and hard-to-reach areas without using expensive long-reach tools
- Their versatility also allows them to machine faces and blends with one tool

Barrel tool design

- Barrel tools are a variation of a taper ball-nose tool
- However, the straight taper is replaced with a large tangential radius, (Ø50mm to Ø1500mm)



Barrel tools with a conical angle less than 40° are excellent for machining steep faces

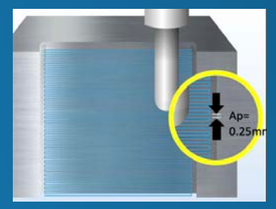
Features and benefits of SGS barrel tools

- Variable geometry for chatter reduction leading to extended tool life
- Patent pending geometry allowing multiple regrinds
- Extreme wear resistance due to hard micro-grain substrates and proprietary coatings developed for optimised tool life
- 3-8 flute design to suit application & material
- Accurate form tolerance for dimensional accuracy
- Standard range from Ø6mm to Ø16mm
- Hard metal and aluminium options available
- Specials available on request

Features and benefits of barrel tools

- Enables a greater ap step-over maintaining the same theoretical scallop height
- Delivers better production efficiency rates from shorter machining times with enhanced surface quality
- Cycle time savings of up to 90%
- Increased tool life while simultaneously reducing the number of tools required
- Spindle growth and machine position tolerance due to thermal properties are compensated with the large tool radius
- Lower set-up costs
- Excellent process reliability
- Reduces / eliminates the need for post-milling processes such as finishing and polishing
- Reduces the effects of heat transfer that can lead to thermal deformation of the component
- Production flexibility with the tool's capability of face machining and ball-nose cutting

Capabilities

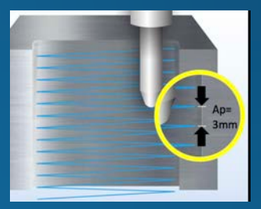


Typical ball nose

Small step-over

- Many cuts
- Long machining time

To achieve the desired cusp height with a ball nose requires a step-over of **0.25mm**



Barrel tooling

Larger step-over

- Fewer cuts
- Shorter machining time

To achieve the desired cusp height with a barrel tool requires a step-over of only **3mm**

Pocket Machining

Ball nose	VS	Barrel
18 mins 40 secs	CYCLE TIME	2 mins 31 secs
0.25mm	STEP DOWN	3mm
18,667mm	CUTTER TRAVEL DISTANCE	4,045mm
1,000mm/min	FEED RATES	1,000mm/min

89% cycle time saving

Cutting Data

- *Steels*
- *Tool Steels*
- *Stainless Steels*
- *Titanium Alloys*
- *High Temp Alloys*
- *Non-Ferrous*

			Ae	0.20	0.45	0.25	0.55	0.30	0.60	0.35	0.65	0.40	0.70
													
Metric	Hardness (HRc)	Vc (m/min)	Diameter	Tip-6	6	Tip-8	8	Tip-10	10	Tip-12	12	Tip-16	16
P Alloy Steels	≤28	194	RPM	14408	10292	10806	7719	8645	6175	7204	5146	5403	3859
		(155-232)	Fz	0.019	0.030	0.025	0.040	0.031	0.050	0.038	0.060	0.057	0.080
			Feed (mm/min)	1621	1853	1621	1853	1621	1853	2161	1853	2470	1853
	≤40	110	RPM	8170	5836	6127	4377	4902	3501	4085	2918	3064	2188
		(88-132)	Fz	0.013	0.020	0.019	0.030	0.025	0.040	0.031	0.050	0.044	0.070
			Feed (mm/min)	613	700	689	788	735	840	766	875	804	919
P Tool Steels	≤35	93	RPM	6907	4934	5180	3700	4144	2960	3454	2467	2590	1850
		(69-118)	Fz	0.019	0.030	0.025	0.040	0.080	0.050	0.038	0.060	0.050	0.080
			Feed (mm/min)	777	888	777	888	1989	888	1036	888	1036	888
	≤45	64	RPM	4753	3395	3565	2546	2852	2037	2377	1698	1782	1273
		(51-77)	Fz	0.013	0.020	0.019	0.030	0.025	0.040	0.031	0.050	0.038	0.060
			Feed (mm/min)	356	407	401	458	428	489	446	509	401	458
M Stainless Steels	≤28	117	RPM	8690	6207	6517	4655	5214	3724	4345	3103	3259	2328
		(94-141)	Fz	0.019	0.030	0.025	0.040	0.031	0.050	0.038	0.060	0.044	0.070
			Feed (mm/min)	978	1117	978	1117	978	1117	978	1117	855	978
	≤35	108	RPM	8021	5729	6016	4297	4813	3438	4011	2865	3008	2149
		(87-130)	Fz	0.013	0.020	0.019	0.030	0.025	0.040	0.031	0.050	0.038	0.060
			Feed (mm/min)	602	688	677	773	722	825	752	859	677	773

- rpm= (Vc x 1000/DC x 3.142)
- Feed= Fz x (#teeth) x rpm
- Adjust speed and feed according to material hardness
- Consider rpm according to cutting area of tool being utilised
- Avoid using tip of the tool where possible due to reduced chip space
- Be aware of max cut Ae, especially on the lower portion of the tool
- Medical applications:
  - Titanium can be cut dry while keeping cut size to a minimum and providing good chip evacuation (air blast)
  - For cobalt chrome applications, a surface speed of 45M/min is a guide (can also be cut dry as per titanium)

Ti-NAMITE-H

This coating demonstrates superior combination of hardness and adhesion in hard machining of moulds and dies and machining high-alloy stainless steels for high temperature applications such as for turbines. The smooth surface ensures optimum surface quality and decreases the temperature in the cutting zone by reducing friction.

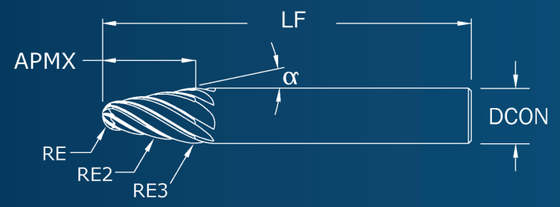
Ti-NAMITE-B

This ceramic-based coating ensures a smooth surface and a low affinity to cold welding or edge build up, which makes it optimal for aluminium and copper applications. It has a high toughness and high hardness.

			Ae	0.20	0.45	0.25	0.55	0.30	0.60	0.35	0.65	0.40	0.70
													
Metric	Hardness (HRc)	Vc (m/min)	Diameter	Tip-6	6	Tip-8	8	Tip-10	10	Tip-12	12	Tip-16	16
S High Temperature Alloys	≤32	32	RPM	2377	1698	1782	1273	1426	1019	1188	849	891	637
		(32-38)	Fz	0.013	0.020	0.019	0.030	0.025	0.040	0.031	0.050	0.038	0.06
			Feed (mm/min)	178	204	201	229	214	244	223	255	201	229
	≤43	26	RPM	1931	1379	1448	1034	1159	828	966	690	724	517
		(21-31)	Fz	0.006	0.010	0.013	0.020	0.019	0.030	0.025	0.040	0.031	0.050
			Feed (mm/min)	72	83	109	124	130	149	145	166	136	155
S Titanium Alloys	≤35	109	RPM	8095	5782	6072	4337	4857	3469	4048	2891	3036	2168
		(85-133)	Fz	0.019	0.030	0.025	0.040	0.031	0.050	0.038	0.060	0.050	0.080
			Feed (mm/min)	911	1041	911	1041	911	1041	911	1041	911	1041
	≤45	53	RPM	3936	2812	2952	2109	2362	1687	1968	1406	1476	1054
		(44-61)	Fz	0.013	0.020	0.019	0.030	0.025	0.040	0.031	0.050	0.044	0.070
			Feed (mm/min)	295	337	332	380	354	405	369	422	387	443
N Aluminium	≤7	610	RPM	37878	27056	28408	20292	22727	16233	18939	13528	14204	10146
		(488-732)	Fz	0.025	0.040	0.031	0.050	0.038	0.060	0.050	0.080	0.063	0.100
			Feed (mm/min)	2841	3247	2663	3044	2557	2922	2841	3247	2663	3044
	≥7	610	RPM	24509	17507	18382	13130	14705	10504	12255	8753	9191	6565
		(488-372)	Fz	0.019	0.030	0.025	0.040	0.031	0.050	0.038	0.060	0.050	0.080
			Feed (mm/min)	1379	1576	1379	1576	1379	1576	1379	1576	1379	1576

Product Range

For patent information visit ***www.ksptpatents.com***



Hard Metals - Range Ø6-Ø16

SHANK (DCON)	LENGTH OF CUT (APMX)	OVERALL LENGTH (LF)	α	RE	RE2	RE3	# TEETH	EDP	COATING
6	9.5	58	17.5	1	250	3	4	45700	TH
6	8	58	17.5	1.5	250	3	4	45701	TH
8	10.5	80	20	1.5	250	4	4	45702	TH
8	9.5	80	20	2	250	4	4	45703	TH
10	12.5	89	20	2	250	5	6	45704	TH
10	11.5	89	20	2.5	250	5	6	45705	TH
12	13.5	100	20	3	250	6	8	45706	TH
12	14.4	100	20	2.5	250	6	8	45707	TH
12	20	100	14	2	60	6	6	45708	TH
16	31	109	12.5	2	1000	5	6	45709	TH
16	27.5	109	12.5	3	1000	5	8	45710	TH
16	24	109	12.5	4	1000	5	8	45711	TH
16	21	109	15	4	1000	5	8	45712	TH
16	18.5	109	20	4	1500	8	8	45713	TH
16	28.5	109	10	4	1000	5	8	45714	TH
16	19	109	20	3	750	5	8	45715	TH
16	15	109	30	2	750	3	6	45716	TH
16	18.5	109	20	3	60	5	8	45717	TH

MULTI Carb
HIGH PERFORMANCE FINISHER - BARREL

Soft Metals - Range Ø6-Ø16

SHANK (DCON)	LENGTH OF CUT (APMX)	OVERALL LENGTH (LF)	α	RE	RE2	RE3	# TEETH	EDP	COATING
6	9.5	58	17.5	1	250	3	3	45718	TB
6	8	58	17.5	1.5	250	3	3	45719	TB
8	10.5	80	20	1.5	250	4	3	45720	TB
8	9.5	80	20	2	250	4	3	45721	TB
10	12.5	89	20	2	250	5	3	45722	TB
10	11.5	89	20	2.5	250	5	3	45723	TB
12	13.5	100	20	3	250	6	4	45724	TB
12	14.4	100	20	2.5	250	6	4	45725	TB
12	20	100	14	2	60	6	4	45726	TB
16	31	109	12.5	2	1000	5	4	45727	TB
16	27.5	109	12.5	3	1000	5	4	45728	TB
16	24	109	12.5	4	1000	5	4	45729	TB
16	21	109	15	4	1000	5	4	45730	TB
16	18.5	109	20	4	1500	8	4	45731	TB
16	28.5	109	10	4	1000	5	4	45732	TB
16	19	109	20	3	750	5	4	45733	TB
16	15	109	30	2	750	3	4	45734	TB
16	18.5	109	20	3	60	5	4	45735	TB

APF-B
ADVANCED PRODUCTIVITY FINISHER - BARREL

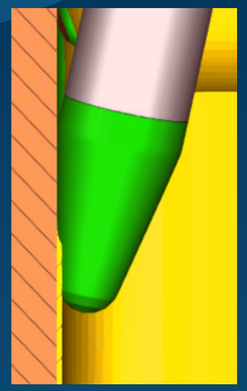
Barrel tool milling strategies

Machining strategies play an important function in the performance of the tool as well as extending tool life.

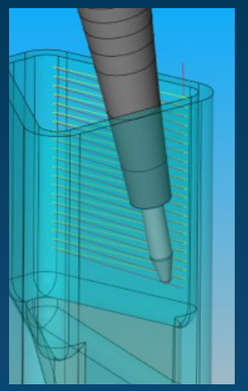
For large surfaces always use the main barrel radius.

Use the largest diameter possible to give the highest surface speed and give the greatest chip space.

Change the contact point along the cutting edge as often as possible to spread wear and prolong tool life.

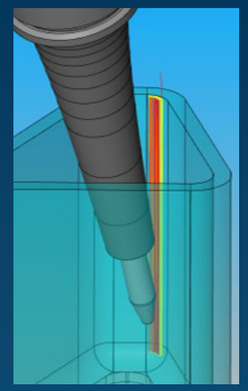


Use a combination of passes to clean ridges.

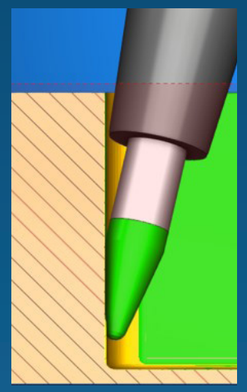


Climb milling is advised to ensure optimal tool life and surface finish.

Small corner features can be finished with the radius tip of the barrel.



For larger corner radii use the barrel radius.



Always consider the tool and tool-holder combination when programming and aim for the shortest possible protrusion.

Try and avoid using the tip of the tool where chip space is smallest, thus limiting size of cut. Consider lowering the surface speed and feed in this area of the tool.

Apply an upward machining strategy where possible instead of feeding the tool nose down a profile.

Barrel tool applications – medical femoral knee solutions

Milling condyle surfaces – barrel tools

The condyle surfaces represent the largest portion of cycle time when machining femoral components. These surfaces have traditionally been milled with ball-nose cutters using a scanning strategy. Whilst this strategy delivers the required surface finish, the small step-overs result in an unsatisfactory cycle time.

The SGS range of barrel tools have achieved step-overs of up to 3.0mm and a feed rate of over 1,500mm/min whilst still delivering surface finishes within tolerance.

Condyle surface machining

Application Details		Cutting Data - Ø12mm / R200mm	
Operation	Finishing condyle surface	Speed	40-50 m/min
Requirement	Cycle time reduction & dimensional accuracy	Feed	800 mm/min
Tool	SGS Barrel Tool - Ø12mm / R200mm	Radial (ae)	2.0 mm
Material	Cobalt chrome	Depth (ap)	0.5 mm
Coolant	Emulsion - Flood	Tool life	60 parts

Result: Cycle time reduction of 40% and dimensional accuracy improvement

Solution Advantages

- ✓ Reduction in the amount of scrap
- ✓ Long tool life (3h recorded)
- ✓ Stable process
- ✓ Reduction in post-milling finishing

Blisk applications – aerospace blade applications

Wall machining – barrel tools

The blade wall surfaces represent the largest portion of cycle time when machining solid blisk components. These surfaces have traditionally been milled with ball-nose cutters using a scanning strategy. Whilst this strategy delivers the required surface finish, the small step-overs result in an unsatisfactory cycle time.

The SGS range of barrel tools have achieved lower cusp height and increased surface quality, whilst increasing the step-over from 0.3mm to 3.0mm. Increasing feed rate reduced the cycle time from 25mins to under 3mins.

Titanium Blade - wall machining

Application Details		Cutting Data - Ø12mm	
Operation	Finishing blade wall	Speed	90 m/min
Requirement	Cycle time reduction & dimensional accuracy	Feed	1000 mm/min
Tool	SGS Barrel Tool - Ø12mm	Radial (ae)	0.2 mm
Material	Titanium	Depth (ap)	3.0 mm
Coolant	Emulsion - Flood	Tool life	+60 blades

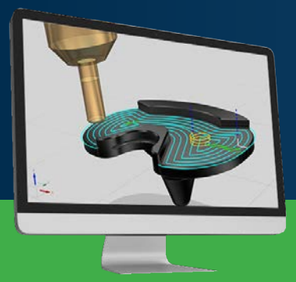
Result: Cycle time reduction of 90% and dimensional accuracy improvement

Solution Advantages

- ✓ Extended tool life
- ✓ Reduced contact time
- ✓ Increased surface finish quality (Ra)
- ✓ Reduction in cusp height

SGS Solid Carbide Tools

OUR SERVICES

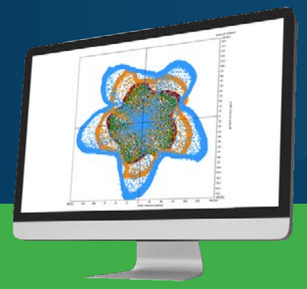


PROCESS DEVELOPMENT

SGS tech hubs can help obtain the best from our high-performance range of tooling by applying the correct tools and optimum strategies.

Using our in-house Multi-Axis CNC milling machines we can perfect a process working in conjunction with our partners.

Whether it be machine tools, tool holding, work holding or software suppliers of the latest CAD-CAM, we are committed to help find the best solution.



BESPOKE TOOLING

SGS R&D can develop specific tooling unique to your requirements, through extensive knowledge and creative thinking.

Using the latest technology in spindle monitoring and high-magnification measuring equipment, we can develop tooling to suit your application and material specification.

REGRIND, RECOAT AND ALTERATION SERVICES

Before

Re-manufactured to original geometry

NEW EASY-TO-USE

ONLINE QUOTE FORM FOR SPECIALS TOOLING

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SGS Solid Carbide Tools **SPECIAL**

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Ask us about our bespoke barrel tools designed to suit specific applications. Our bespoke range includes micro barrel tools.

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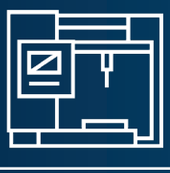
What you can expect from us



Product research and development

Product engineering and tool application support

CAD/CAM software support

Same-day despatch on stock items

On-site customer training

Annual Customer Satisfaction Survey

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