



VALUE AT THE SPINDLE®

Medical Solutions



www.kyocera-sgstool.com

ISO 9001:2015 Certified

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MEDICAL MANUFACTURING THE CHALLENGES WE FACE

The Medical sector continues to grow as new biocompatible materials are found and the life expectancy of people in the developed world extends further. Health issues such as disease, trauma, arthritis, and obesity also increase demand for medical devices.

With this ever-increasing demand and the challenges presented by new materials results in a drive for more efficient, stable and cost-effective manufacturing processes.

CNC machining or micromachining of surgical devices present many challenges. Medical devices often have very tiny components made of titanium, cobalt chrome, and stainless steel materials due to their non-reactivity within the human body.

Working closely with medical manufacturers, SGS has developed many new and innovative milling and drilling solutions designed specifically to overcome the challenges faced by the Medical market.

SGS CUSTOM SOLUTIONS

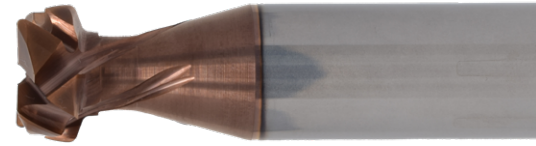
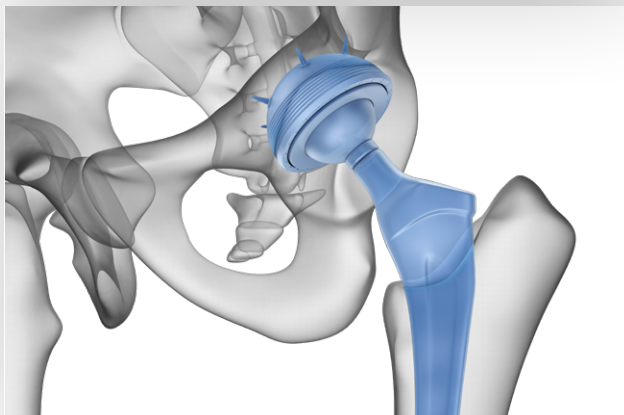


The KYOCERA SGS Tech Hub (KSTH) is a division of KYOCERA SGS Precision Tools Inc. created to focus on custom high-performance cutting tool solutions, while exploring emerging technologies. The state-of-the-art custom facility is designed with the purpose and resources to provide MORE than a cutting tool. KSTH provides a complete scope of services and works with customers to tailor solutions from conception to application and beyond.

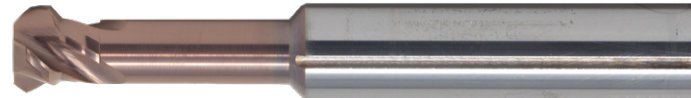
KSTH works closely with the medical device manufacturers through developing many new and innovative milling and drilling solutions, carbide grades, edge preparations, and coatings specifically to overcome the challenges faced by the medical market.

Our technicians develop specific special solutions on customer supplied components and testing requirements using the latest technology in testing applications.

KSTH provides quotation requests within a 24-hour period with aggressive deliveries.



Undercutting Tool | Suitable for Titanium, Cobalt Chrome and Stainless Steel



De-Burring Tool | Suitable for Titanium, Cobalt Chrome and Stainless Steel



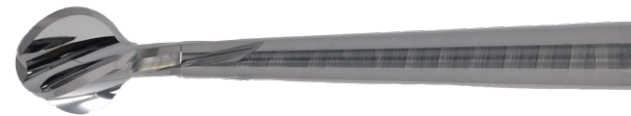
Drillmill | Suitable for Titanium, Cobalt Chrome and Stainless Steel



Taper Ball Nose Tool | Suitable for Titanium, Cobalt Chrome and Stainless Steel



Form Cutter | Suitable for Polyethylene



Lollipop Cutter | Suitable for Polyethylene



Step Drill | Suitable for Titanium



Step Drill | Suitable for Polyethylene

MEDICAL SOLUTIONS TOOL MATRIX

| Name | Series | Type | Page No. | Material | | | |
|--|-----------|--------------|----------|----------|---|---|---|
| Tapered Circle Segment Barrel Endmills | APFB, 67B | Mill | 8 | ● | ● | ● | ● |
| Tapered Ball End Tools | Special | Mill | 8 | ● | ● | ● | ● |
| Ski-Carb | 44 | Mill | 7 | ● | ● | ● | ● |
| Condyle Form Tool | Special | Mill | 7 | ● | ● | ● | ● |
| H-Carb | 77 | Mill | 6 | ● | ● | ● | ● |
| High-Feed | Special | Mill | 6 | ● | ● | ● | ● |
| Z-Carb HPR | Z5 | Mill | 9, 11 | ● | ● | ● | ● |
| Combi-Drill | Special | Drill | 9 | ● | ● | ● | ● |
| Drill-Mill | Special | Mill / Drill | 9 | ● | ● | ● | ● |
| V-Carb | 55 | Mill | 10 | ● | ● | ● | ● |
| Hi-PerCarb® | 135 | Drill | 9, 10 | ● | ● | ● | ● |
| Hi-PerCarb® M-S | 143 | Drill | 9, 10 | ● | ● | ● | ● |
| Z-Carb-AP | Z1P | Mill | 11 | ● | ● | ● | ● |
| Micro Tools | M | Mill / Drill | 11 | ● | ● | ● | ● |

| Main Key | |
|--------------------|---|
| Primary Function | ● |
| Secondary Function | ○ |
| Coolant Required | ● |

| Material Key | | |
|----------------------|-----------------------------|---|
| Stainless Steel | 17-4 PH forged / cast & 316 | ● |
| Titanium Alloys | Titanium | ● |
| Plastics, Composites | Polyethylene | ● |
| Cobalt Chrome | CoCrMo / CoNiCrMo | ● |

| Flute Count | Flute Index | Coating | Finishing | HSM | HFM | Profiling | Slotting | Drilling |
|-------------|-------------|--|-----------|-----|-----|-----------|----------|----------|
| 3, 4, 6 & 8 | Unequal | Ti-NAMITE [®] -B Ti-NAMITE [®] -H | ● | | | ● | | |
| 4 & 5 | Unequal | Ti-NAMITE [®] -M Ti-NAMITE [®] -X | ● | | | ● | | |
| 2 | Equal | Ti-NAMITE [®] -B | ● | ● | | ● | ● | |
| 5 | Unequal | Uncoated | ● | ● | | ● | | |
| 7 | Unequal | Ti-NAMITE [®] -M Ti-NAMITE [®] -X | ● | ● | | ● | | |
| 2, 3, 4 & 6 | Unequal | Ti-NAMITE [®] -X | | | ● | | | |
| 5 | Unequal | Ti-NAMITE [®] -M Ti-NAMITE [®] -A | ○ | ● | | ● | ● | |
| 2 | Equal | Ti-NAMITE [®] -M Ti-NAMITE [®] -X | ● | | | | | ● |
| 2 & 4 | Equal | Ti-NAMITE [®] -M Ti-NAMITE [®] -X | ● | | | ● | | ● |
| 5 | Unequal | Ti-NAMITE [®] -A | ● | ○ | | ○ | ○ | |
| 2 | Equal | Ti-NAMITE [®] -X | | | | | | ● |
| 2 | Equal | Ti-NAMITE [®] -A | | | | | | ● |
| 4 | Unequal | Ti-NAMITE [®] -X | ○ | ○ | | ● | ● | |
| 2, 3 & 4 | Unequal | Ti-NAMITE [®] -A | ● | | | ● | ○ | ● |

| Coating Key |
|--|
| Ti-NAMITE [®] -A = AlTiN |
| Ti-NAMITE [®] -X = Proprietary |
| Ti-NAMITE [®] -M = Proprietary |
| Ti-NAMITE [®] -B = TiB ₂ |
| Ti-NAMITE [®] -H = Proprietary |

SGS TIBIAL TRAY SOLUTIONS

H-Carb Milling

The H-Carb product range is ideally suited for high-speed roughing (profiling, trochoidal, dynamic) machining of titanium and cobalt chrome. The lower cutting forces generated by the H-Carb is ideal for lower-powered machines or challenging work-holding.

HIGH TEMP ALLOYS

STAINLESS STEELS



Solution Advantages

- ✓ Cycle time reduction
- ✓ Reduced tooling costs
- ✓ Extended tool life (3h recorded)
- ✓ Improved productivity



High Feed Milling (*Special*)

Using the same geometries and quality substrates as in our high-performance range, SGS has developed a high feed milling solution that combines small depths of cut with high feed rates resulting in increased metal removal when compared to conventional milling. The increased feed rates can significantly reduce cycle times when machining tibia tray components, while the tool stability helps maximize surface quality and tool life.

HIGH TEMP ALLOYS

STAINLESS STEELS



Solution Advantages

- ✓ Increased metal removal rates
- ✓ Improved cycle times
- ✓ Multiple regrinds available



SGS BEARING INSERT SOLUTIONS

Ski-Carb Milling

SGS's Ski-Carb solution has a high helix angle of 45° for exceptional shearing while the ski-land flute construction consisting of a primary secondary rake efficiently forms and evacuates the chips. This geometry combination helps eliminate burrs and produces unparalleled surface finishes.

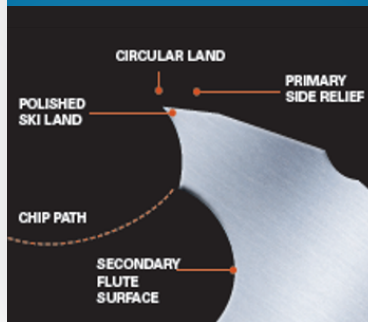
NON-FERROUS



SkiCarb

Solution Advantages

- ✓ Improved component quality
- ✓ Enhanced productivity
- ✓ Maximized profitability
- ✓ Lower processing costs



Form Tools – Condyle Surface Milling (Special)

Form tools can also be produced with the Ski-Carb geometry to the precise tolerances demanded by this type of component. The solution shown is for machining the condyle surface of the bearing insert where the upper convex-shaped femoral component is located. Quality of the cutting edge is key.

NON-FERROUS



Solution Advantages

- ✓ Dimensional accuracy
- ✓ Elimination of post milling de-burring
- ✓ Tool regrind available



SGS FEMORAL KNEE SOLUTIONS

Tapered Circle Segment Barrel Endmills

The condyle surfaces represent the largest portion of cycle time when machining femoral components. These surfaces are milled with ball end tools using a scanning strategy.

The SGS range of tapered circle segment barrel endmills achieve step overs up to 0.120" and feed rate over 30 IPM while still delivering surface finishes within tolerance.

Tapered circle segment barrel endmills are coated with Ti-NAMITE®-B for manufacturing non-ferrous aluminum medical devices while the Ti-NAMITE®-H coating is used for high performance operations for difficult to machine materials such as titanium.



Solution Advantages

- ✓ Reduction of scrap
- ✓ Extended tool life (3h recorded)
- ✓ Reduction in post milling finishing



Tapered Ball End Milling (*Special*)

Femoral components present challenges when milling due to deep walls, small corners, and high surface finish requirements that minimize manual polishing.

SGS's tapered ball end tool solutions benefit from patented vibration-reducing geometries which deliver the required component surface finishes and maximize tool life.



Solution Advantages

- ✓ Improved surface finishes
- ✓ Lower cost per part
- ✓ Reduction in post milling polishing



SGS HIP STEM SOLUTIONS

Hi-PerCarb® Drilling

The Hi-PerCarb® Series 135 drill features a double margin design removing the need for reamers. Other design features are engineered to maximize chip control, drill strength, penetration rates, and productivity.

The Hi-PerCarb® 143M-S High-Performance drill under the industry leading Hi-PerCarb® drill family demonstrates unparalleled performance in High Temp Alloys and Stainless Steel applications with crossover into other material groups. Available in two lengths of cut, the single margin design is uniquely engineered as a solution towards addressing the issues commonly encountered during high production drilling.

Combination Drill / Mill (Special)

SGS's drill solutions reduce the number of tools required for each hole. Drilling stepped holes and chamfers can be combined into one tool delivering an accurate process reducing cycle times and tooling costs.

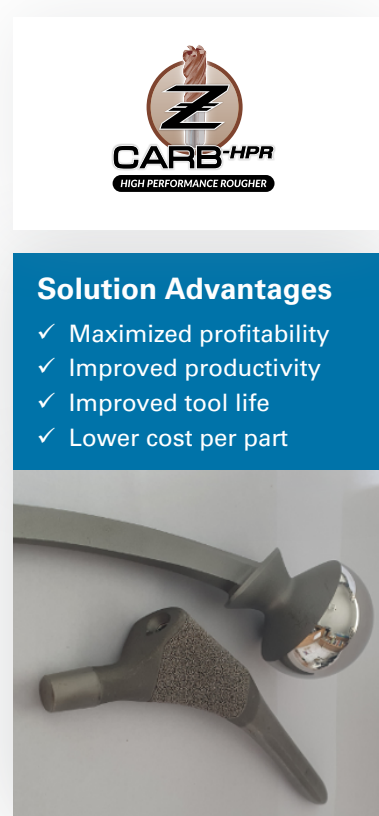


Solution Advantages

- ✓ One hit solution
- ✓ Reduction in number of tools
- ✓ Lower tooling costs
- ✓ Increased tool carousel capacity

Z-Carb-HPR Series Milling

SGS's Z-Carb-HPR tool series is ideal for achieving high material removal rates (MRR) and a finish of 20Ra or better in most materials. The specialized 5-flute design increases productivity over 3- and 4-flute end mills. The variable geometry design improves chatter suppression to enhance tool life. Tool life is further improved with a through coolant option and coatings suited to machine titanium.



Solution Advantages

- ✓ Maximized profitability
- ✓ Improved productivity
- ✓ Improved tool life
- ✓ Lower cost per part

SGS TRAUMA AND SPINAL SOLUTIONS

V-Carb Milling

SGS's high-performance V-Carb solution will profile and finish difficult medical materials.

The 5-flute design is suitable for trochoidal / dynamic machining. The SGS V-Carb range has a variable geometry design for vibration reduction and is available in stub, regular and long flute lengths as well as a ball end configuration.

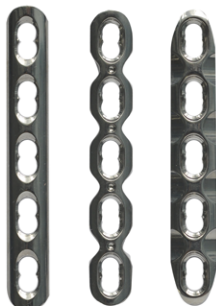
HIGH TEMP ALLOYS

STAINLESS STEELS



Solution Advantages

- ✓ Maximized profitability
- ✓ Multiple regrinds available
- ✓ Superior surface finish
- ✓ High feed rates



Hi-PerCarb® Drilling

Features such as a double margin, secondary flute, and a specialized 145° notched point give the SGS Hi-PerCarb® 135 drill maximized chip control and penetration rates. A self-centering point geometry eliminates the need for spot drilling. The Hi-PerCarb® 135 drill is available in 3xD and 5xD versions. Cutting diameters range in fractional, metric, letter and number sizes from 1/64" to 59/64".

The Hi-PerCarb® 143M-S High-Performance drill under the industry leading Hi-PerCarb® drill family demonstrates unparalleled performance in High Temp Alloys and Stainless Steel applications with crossover into other material groups. Available in two lengths of cut, the single margin design is uniquely engineered as a solution towards addressing the issues commonly encountered during high production drilling.

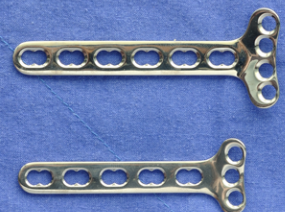
HIGH TEMP ALLOYS

STAINLESS STEELS



Solution Advantages

- ✓ Superior hole quality
- ✓ Improved tool life
- ✓ Improved productivity
- ✓ Removal of reaming process



SGS DENTAL DEVICE SOLUTIONS

Micro Tool Milling

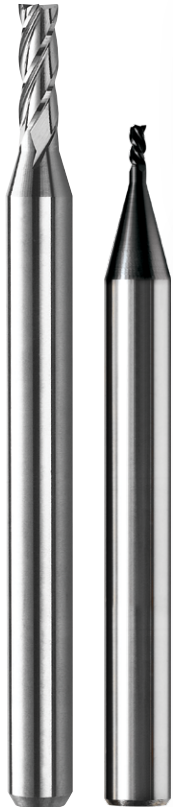
In recent years, SGS has further committed to the micro tool market and introduced a comprehensive range of superior quality tools.

During the testing and development process, we have identified advanced geometries extending tool life, reducing chatter and cycle times, and improving part quality. Lab testing also identified a coating resulting in improved chip flow, even in low RPM applications, and a 250% tool life increase over the competition.

The micro tool offering is available in square, radius, or ball end configurations in fractional and metric cutting diameters ranging from 0.004" to 0.120" and up to 12xD in cut length and 25xD in overall reach.

HIGH TEMP ALLOYS

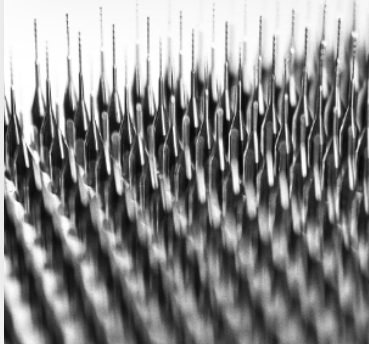
STAINLESS STEELS



MICRO
SGS[®]
Solid Carbide Tools

Solution Advantages

- ✓ Improved component quality
- ✓ Superior surface finish
- ✓ Lower process costs



Z-Carb Milling

SGS launched the first variable geometry tooling to the market in 2000 with the introduction of the legendary Z-Carb series.

With its patented variable rake geometry, SGS launched the Z-Carb-AP series further enhancing the portfolio with the ability to maximize metal removal rates, reduce cycle times, and improve productivity. SGS has added several variants to the Z-Carb family creating one of the most comprehensive tooling offering including the HPR. The Z-Carb-HPR is a 5-flute version of the Z-Carb available in two coatings to cover a broad range of materials.

HIGH TEMP ALLOYS

STAINLESS STEELS



Z-CARB-AP
Patented Variable Rake End Mills

Z-CARB-HPR
HIGH PERFORMANCE ROUGHER

Solution Advantages

- ✓ High metal removal rates
- ✓ Improved productivity
- ✓ Lower tooling costs

SOLUTIONS AROUND THE GLOBE

KYOCERA SGS Precision Tools is an ISO 9001:2015 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 on our Northeast Ohio manufacturing campus. KSPT high performance end mills, drills and routers are increasing productivity and reducing cost around the world.

EXCEEDING CUSTOMER EXPECTATIONS

As the world's manufacturing needs change, so does KSPT. It's all about the science, starting with our lab inspected substrate materials to our tool designs and coatings. Our exceptional team of researchers, engineers, and machinists are dedicated to developing the absolute best and delivering the ultimate Value at the Spindle®.

- Incredible batch-to-batch consistency
- Metallurgical lab dedicated to testing and rigorous quality control
- ISO 9001:2015 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
- Comprehensive tooling services
- Experienced Field Sales Engineers who work to optimize a tool for your particular application
- Dedicated multi-lingual customer service representatives

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VALUE AT THE SPINDLE®

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