HIGH PRECISION MACHINING
AND POLISHING
OF HARD MATERIALS
CMM precisely documents dimensions and profiles of complex machined parts.

Non-contact measurement of multiple features.

“Precision tolerances can have different meaning to different people. At Insaco, the only acceptable definition is the one required by the customer.”

Example of interferometer reading which allows us to measure flatness of a part.
Since 1947, Insaco has been synonymous with excellence in the development and production of high precision machined parts.

As a custom fabricator of ceramic, glass, sapphire, and other hard materials, we specialize in machining parts that often require tolerances measured in millionths of an inch, and wear properties that satisfy even the most demanding applications.

Here is an example of ceramic on ceramic wear applications where we can maintain tolerances capable of holding back air or fluid for metering applications. Sets can be held to clearance <0.0005".

This is our largest machining center. It can accommodate parts of up to 32” x 62” x 18”.

These sapphire tubes are highly polished to less than one microinch Ra on all surfaces including the convoluted outside diameter.
The Zygo Mark IV XP is used to measure spherical and flat elements. It is capable of resolving to 1/20 wave.

Total Traceability Assures Quality Parts

We maintain raw material identification and traceability throughout the entire manufacturing process, and comply to ISO 9001 requirements in order to ensure the highest quality standards in the industry.

“Quality is never an accident; it is always the result of high intention, sincere effort, intelligent direction and skillful execution; it represents the wise choice of many alternatives.”
A commitment to quality...

If you cannot measure it, you cannot make it.

Each completed product undergoes an extensive array of final checks for specific tolerances and accuracy. Using a series of statistical process controls, each step is monitored and checked against the required specifications. If a non-conforming situation arises, it is resolved immediately, thus preventing a defective product from reaching the customer. It is through these controls that Insaco is able to work under a “defect prevention” versus a “defect detection” environment. This is why our products are used in many applications where stringent tolerances are the norm rather than the exception.

Jig grinder illustrating quick change fixturing designed to enhance productivity while still providing highest accuracy.

Non-contact measurements capable to 0.1 Micron.
Precision Machinery...

With over hundreds of drilling, grinding and CNC machines, Insaco produces everything from a single prototype to thousands of custom machined parts, all to specification, and all backed by quality levels unsurpassed in the industry...

“The end products are only as good as the people and machines that make them.”
Shown are a variety of parts employing contour grinding, drilling and polishing.

Insaco routinely machines both large and small ceramic parts, including thread grinding, and drilling with tolerances to .00005" and angular accuracy to five seconds of arc.

Sapphire wafer carriers offer superior chip resistance and are chemically resistant to all reagents commonly used in processing GaAs wafers.

Silicon nitride rings and bars, used in the bearing industry, with roundness tolerances of .00001".

Wafer chucks to hold semiconductor and compound semiconductor wafers for deposition, etching or other requirements are possible with a variety of materials.
Large ceramic cylinders with precision O.D.s and precision ring cuts. Tight outside diameter tolerances and slot milling are Insaco specialties with ceramic and steel assemblies. Holes and features which are square, circular, or elliptical are possible in any ultra-hard material.

Quadrupole holders used for mass spectrometers. Both applications require flatnesses of less than one wavelength with positional tolerances of .00005".

Typical sapphire, quartz and glass components used in laser applications. Surfaces can be polished from 1 microinch Ra to low angstroms.

Holes and features which are square, circular, or elliptical are possible in any ultra-hard material.
...However, the real key to meeting our customers’ needs rests with Insaco’s working knowledge of both hard materials and the machines required to make precise parts from these materials. It's this unique combination of people and machines that makes the difference with our customers.
Customer Service...Not Lip Service

At Insaco, we do more than machine hard materials. We listen. We pride ourselves on listening to our customers and working with them to help solve problems as well as developing new material applications when needed. Our vast experience in material selection and engineering enables our customers to tap into a resource that, many times, is unavailable elsewhere.

Our Designer’s Guide (available on insaco.com) is an internet access, user-friendly first-step resource for materials selection and specs. Since we don’t produce these raw materials in house we have the distinct advantage of providing unbiased recommendations based on your budgets and your specialized needs. The Designer’s Guide is backed by a team of highly trained engineers capable of addressing all of your specifications needs as well as a willingness to discuss options for application performance, many times saving our customers time and money.

Insaco has built a solid reputation in providing expertise in the precision machining of ultra-hard materials for all our customers. We recognize that our most important asset is YOU, the customer, which is why we make it a point to keep our customers first in everything we do. Next time you need a quality, high precision machined part from hard materials, we hope you will consider Insaco.
Fabrication Operations
- 80,000 square foot facility
- Zygo Mark IV XP interferometer for radius and figure checks
- Advanced polishing techniques for low scatter surfaces
- Laser marking for material traceability
- Hole diameters from 0.010”; diameter tolerances to 0.00002”
- Location tolerances to 0.00005” and angular accuracy to five seconds of arc
- Surface finishes from fine ground to highly polished are available
- Flatness tolerance to fractional wave depending on part thickness and configuration
- Interferometer measurement capability to 1/20 wave
- Optical materials, including sapphire, are polishing in accordance with MIL-0-13830B, MIL-G-174
- Advanced polishing techniques are used, when required, to produce surfaces which are free of damage, have no subsurface damage and which have a typical surface roughness of 1 Angstrom (Å). 1 Å is equal to 1/250th of a microinch
- Climate-controlled facility with Class 100 cleanroom and cleanroom packaging available
- 13,000 sq. ft. lapping and polishing facility
- Helped to develop the ASTM standard guide for measuring sapphire wafers using interferometry methods

Typical Applications for Ultra-Hard Components
- Guidance Systems
- Microwave Tubes
- Spectrometer Systems
- LVAD Pump Components
- Vacuum Instrumentation Devices
- Infrared Optical Systems
- Ceramic Components for an Oil Field Fracking System
- Sapphire Detector Tubes for High Pressure Liquid Chromatography
- Titanium Carbide Disks for Ultrasonic Transducers
- Missile Cones
- Laser Gyro Systems
- Tape Transfer Systems
- Infrared Detectors
- Photomultiplier Windows
- Fiber Optic Devices
- Mass Spectrometer Quad Holders
- Fluid Meters
- Check Valves
- Sapphire Wafer Carriers

For more information on our products and applications, e-mail us at: sales@insaco.com

For help in a hurry, call 215-536-3500 or send us your dimensioned and tolerance drawings to sales@insaco.com