



Precision Sapphire & Ruby Components



Quality. Precision. Reliability.

The components of our components.



Swiss Jewel offers a wide range of components for Optical and Mechanical markets from R&D to full scale volume production.

Precision, quality, competitive pricing coupled with a commitment to on time delivery runs through our breadth of services and offerings.

We specialize in creating custom optical and mechanical components including a variety of options – from internal holes and tapers to outer flanges, angles and surface finishes.

Product Offerings

- Windows
- Balls & Hemispheres
- Jewel Bearings
- Orifice Jewels
- Rods & Tubes
- Metal Pivots & Shafts
- Aperture Wafers
- Ball (valve) Seats
- Washers
- Nozzles
- Stylus

Materials

- Sapphire
- Ruby
- Fused Silica
- Glass
- Ceramic
- Alloys
 - Stainless Steel
 - Corepoint
 - Tungsten Carbide

Products



Sapphire's attributes include high mechanical strength, temperature stability, wear resistance and chemical inertness. A Sapphire Window will exceed other optical materials in harsh environments, providing a barrier between elements.

We offer a wide range of stock sizes for immediate delivery in round, square and rectangular shapes. Additionally, we can supply custom sizes and designs based on your specification.

Typical Applications:

Medical Imaging Devices, Air & Gas Analyzers/Monitors, Cryogenic View Ports, UV & IR Windows and Lenses, Detector & Pressure Cells, Photodiodes



Sapphire Rods and Tubes are well suited as optical light pipes and mechanically suited to act as wear surfaces and insulators, unaffected by extreme temperatures in harsh & high-pressure environments. Sapphire's ability to accept a high polish and tight tolerances make it ideal for use as tubes for flow control, guides and sleeves.

Stock Sapphire Rods start at diameter .0175", Sapphire Tubes start with an inner diameter of .015". Custom sizes for rods and tubes are feasible as well, with feasibility over 2.0".

Typical Applications:

Lightpipes/guides, Insulators, Lift Pins, Feedthroughs, Wear Applications



Balls and Hemispheres are ground and polished for precision applications. They can be customized with drilled holes, ground into hemispheres and drum lenses. Diameter tolerances down to 2.5um and sphericity down to 0.125um make the balls ideal for precision applications. Tighter tolerances upon request.

Materials include Sapphire, Ruby, Fused Silica, Optical & Technical Glass, Ceramic, Silicon Nitride, Tungsten Carbide, Stainless Steel and more. Diameters starting at 0.2mm from stock. Smaller upon request.

Typical Applications:

Fiber Optics, Detectors & Imaging Systems, Flow Meters, Rotameters, Metrology (CMM), Check Valves (ball and seat), Wear Surfaces



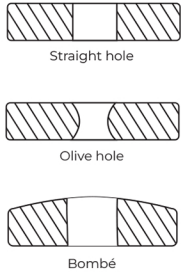

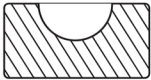
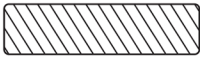
Sapphire and Ruby are excellent orifice jewel materials because of their resistance to wear, heat, corrosion and offer low friction. With zero porosity and controlled drilling sapphire orifice jewels can have hole tolerances within 0.0002".

Sapphire Orifices can be used for UHP water jet applications (up to 40,000-50,000 PSI), gas and air restrictors and the handling of air, hot gasses and practically all liquids and acids.

Typical Applications:

Ultra-High Pressure Waterjet, Gas/Liquid Control Units, Inkjet Printing, 3-D Printing

Jewel Bearing Design Aids

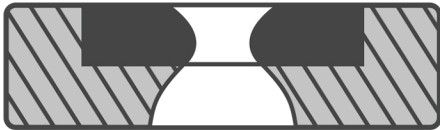
	Attributes	Design Notes	Typical Applications
<p>Ring Jewels</p>  <p style="text-align: center;">Straight hole</p> <p style="text-align: center;">Olive hole</p> <p style="text-align: center;">Bombé</p>	<p>Serving as radial/sleeve jewel bearings, Ring Jewels are used with straight cylindrical shafts.</p> <p>Ring jewels offer flexibility due to their many combinations with endstones showing little to no wear.</p>	<p>Straight Hole: Restrict lateral movement to a minimum, but require accurate alignment between the bearings.</p> <p>Olive Hole (radiused): Offers lower friction with pivot and permits adjustment in the assembly.</p> <p>Bombé Surface: Provides minimum contact with the shoulder of a pivot for light, intermittent end thrust.</p>	<ul style="list-style-type: none"> • General Instrumentation • Medical Equipment • Gauges • Flow Meters • Indicators • Watches & Clocks • Gyros • Aircraft Instrumentation
<p>Vee Jewels</p> 	<p>Well suited to sensitive instruments where the moving element is light (<500g).</p> <p>Offers minimum friction and low starting torque when used with conical pivots. Low friction coefficient of about 0.12 against steel.</p> <p>Permits slight lateral movement.</p>	<p>Jewel radius should be 2x-3x larger than the pivot radius for low starting torque, sensitivity and resistance to deformation.</p> <p>Contact area of the mating pivot should be highly polished with a micro-inch finish of 2 or better on the pivot radius is recommended.</p> <p>Will exhibit little to no wear.</p>	<ul style="list-style-type: none"> • Gauges • Indicating Meters • Turbine Flow Meters • Timers • Compasses • Wind Speed Indicators
<p>Cup Jewels</p> 	<p>Spherical design with high polish provides for low starting torque and will exhibit little to no wear.</p>	<p>Used with semi-spherical pivot or in a design that fits a ball bearing between two cup jewels.</p> <p>Low friction coefficient of about 0.12 against steel</p> <p>Widely used for vertical shaft application</p>	<ul style="list-style-type: none"> • Watt-Hour Meters • Compasses • Heat Motors
<p>Endstones</p> 	<p>Polished flats to a high finish provide for low friction and widely used as a thrust bearing in combination with a ring jewel which serves as the annular bearing.</p>	<p>The endstone may be mounted in the same housing with the ring jewel or mounted separately in an adjusting screw, especially when the end of the pivot extends beyond the radial bearing. Pivot ends in both cases should be radiused and polished.</p> <p>Also can be utilized as spacers, insulators and windows.</p>	<ul style="list-style-type: none"> • Instrumentation • Medical Devices • Insulating Spacers • Wear Surfaces • Time-Keeping Movements

Mounting Configurations

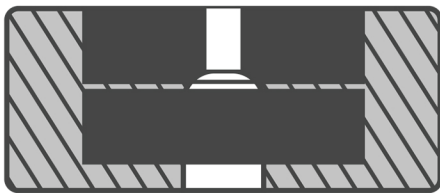
Jewel Bearings can be set into a housing made from brass, stainless steel, aluminum or plastic.

- **Spin-setting:** the most common style to set a jewel bearing, whereas the jewel is mounted with minimum interference and the housing material is spun over the jewel to hold it.
- **Interference-setting:** this method has more friction between jewel and housing so spinning may not be required, however, more pressure is put on the jewel.
- **Spring-loaded:** the use of a spring allows for fine tuning when installing the assembly so it's not over tightened, which can impede operation and will absorb shock.

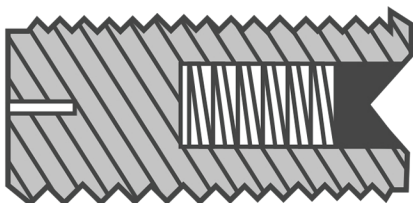
Ring Jewel
Instrument Mount



Ring Jewel
Endstone Mount



Vee Jewel
Spring Load Mount



Pivots

The shape and type of the pivot used are determined by the operating conditions, the type of jewel, and other jewel bearing design factors involved in suspending the moving element in the system.

Cylindrical pivots can be supported by any of the ring jewel bearing designs and combinations.

Design Notes

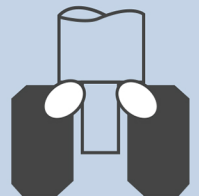
Since the working area of a jewel bearing is lapped to a mirror finish, the contact area of the pivot should also be highly polished for best performance. A finish of 2 microinch or better on the pivot radius is recommended.

Through our affiliate, HERMAN D. STEEL COMPANY, we can furnish miniature pivots of most materials turned with extreme accuracy. Especially recommended is "Corepoint", a patented, non-corrosive, non-magnetic material with excellent tensile strength and hardness.

Shouldered Pivot

with Olive/Bombé jewel

End thrust may be taken by having a shoulder on the pivot ride on the polished face of the jewel (bombé) or by using an endstone with the ring jewel to take the thrust from a pivot with a rounded end.



Conical Pivot

with vee jewel

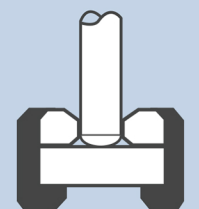
Pivots with radiused conical ends are generally used with vee jewels.



Rounded Pivot

with olive jewel and endstone

Rounded or semi-spherical pivots are used with single cup jewels and flat endstones.





Swiss Jewel Company, a fourth generation family run business, is the leading supplier of precision Synthetic Sapphire & Ruby components for industrial markets worldwide. The company was launched in 1920 when sapphire bearings were used primarily in timing and measuring devices.

Over the past several decades the world has evolved and so has the demand for synthetic sapphire, ruby and emerging materials. During this time Swiss Jewel has increased efficiencies and continually developed processes to serve an ever-growing list of applications.

We look forward to working together.



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