



# ITT

## Precision Optics

### High-Performance Optical Components For Your Most Demanding Projects

Leveraging 50 years of innovation and experience in large optical component fabrication, ITT has the in-depth knowledge to create precision optics for applications ranging from aerospace to microlithography to laser communications. We develop components separately and as part of complete systems. Our designers and fabricators deliver reliable optical solutions that cost-effectively meet and exceed our clients' specific requirements on earth...and in outer space.

At ITT's world-class Precision Optics facilities we develop a full range of mirrors, mounts and metering structures for ground, sea, air and space-based platforms and systems. From design and engineering, to precision optics fabrication, to complete systems integration and testing, we can produce all types of optical surfaces, including planos, spheres, aspheres, and off-axis aspheres.

ITT has the expertise to identify and implement precision optical solutions that precisely meet your requirements. We can integrate these solutions into your existing imaging systems. And we can provide consulting services to help you achieve total mission success.



### Key Features

- **Meeting exacting specifications.** ITT fabricates optics ranging in size from 0.2 (8") to 2.5 (100") meters in diameter.
- **Precision testing and figuring.** We can mount a mirror in an in-use configuration, test in the mount and even final figure the optical surface in the mount. Mount induced errors and gravity effects may be accounted for in the final figuring stages and as a result our mirrors perform optimally in designated applications.
- **Accurate finishing.** We produce plano surface quality levels of 0.005 waves rms and aspheric surfaces of 0.01 waves rms. Typical surface finish for planos ranges from 3 to 7 Å rms, while aspheric components range from 10 to 20 Å.
- **Lightweight design.** New technologies allow ITT to create ultra-lightweight optical components, as proven by high-quality demonstration mirrors that yield an aerial density of 12 kg/m<sup>2</sup>.

*Engineered for life*

## ITT's Precision Optics design/build teams are committed to the success of your projects.

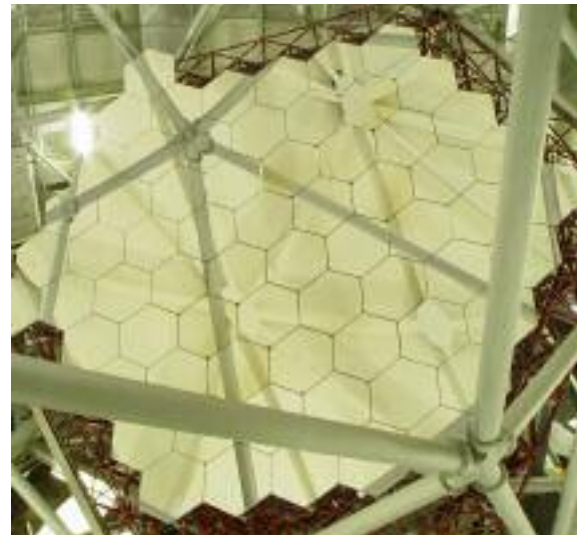
We can provide end-to-end capabilities, including design consultation and fabrication. We are experts in the development of high-performance, ultra-light, space-capable optics for payload systems. We also provide rigorous metrology and testing of components and systems to help assure optical performance.

### ITT Technologies and Processes include:

- **Ion figuring** – Removes material at the atomic level to converge the optical figure to its specifications. Permits fast and competitively-priced production and exceptional edge-of-aperture control for segmented systems.
- **Off-axis generation** – Advanced computer systems and high-precision laser interferometers control the grinding process with extreme accuracy producing figures within five microns of the final requirements.
- **Small tool polishing** – Smooths surfaces to correct optical figure within a few wavelengths using the latest deterministic control algorithms.
- **Low-temperature fusion** – Bonds plates with cores to deliver the performance of solid optics at a fraction of the weight.
- **Abrasive water-jet technology** – Computer controlled cutting creates thin-sectioned and honeycombed cores to minimize weight.
- **Advanced CNC manufacturing techniques**
- **Specialized coatings** – Various coating solutions including low-stress, high-reflectance silver coatings.
- **Testing and metrology** of optics as large as 3 meters and weighing up to 2 tons with ISO 9001 certified, MIL 38830, accuracy to less than  $.01\mu\text{m}$  (better than a millionth of an inch). Simulation of space environments from  $300^{\circ}\text{K}$  to  $-100^{\circ}\text{K}$ , including compensation for gravity and vacuum.
- **Blanks materials processing** include ULE (ultra-low expansion) glass, fused silica, Zerodur (glass ceramic), and BK7 (transmissive glass).

### History of Success

ITT has contributed to a long list of notable projects, including NASA's Chandra X-ray Observatory, the Lawrence Livermore Fusion National Ignition Facility (laser fusion), the Keck Observatory, GeoEye's IKONOS and GeoEye-1, DigitalGlobe's QuickBird and WorldView I & II commercial remote sensing satellites.



ITT processed the 94 mirror segments on the Southern African Large Telescope (SALT). Similar to the Hobby-Eberly Telescope in Texas, where ITT also successfully processed the mirror segments, the SALT is used to record distant stars, galaxies a billion times too faint to be seen with the unaided eye.

---

ITT provides a full range of remote sensing solutions. Learn more at [www.ssd.itt.com](http://www.ssd.itt.com)

**For further information, contact the Business Development Department at:**

ITT  
Space Systems Division  
1447 St. Paul Street  
Rochester, New York 14606  
Telephone: 585-269-5600  
[www.ssd.itt.com](http://www.ssd.itt.com)