WHO IS EDMUND OPTICS®?

The Future Depends on Optics® and the world-changing innovations they enable. Edmund Optics® (EO) has contributed to this innovation by manufacturing and supplying industries across the globe with precision optical components and subassemblies for more than 79 years.

Whether you need off-the-shelf optics for rapid prototyping or cost-effective custom components for volume production, we have the capabilities and engineering expertise to meet your specifications, timelines, and budgets. Our engineers create tailored solutions for unique optical challenges through expert application support, both build-to-print and complexity-custom design, and a world-class quality and metrology program. Every step of the way, Edmund Optics® is committed to ensuring product and procedural quality.

We are a family-owned business with over 1,000 employees in 12 countries around the world, and we look forward to working with you!

Warm regards,

Marisa Edmund, CMO & 3rd generation owner

Contact Us for Confidential Application Support!
• Phone, Email, and Online Chat Contact Methods – Get Engineering Assistance Your Way!
• Dedicated Global Technical Support Team
• Quick Non-Disclosure Agreement (NDA) and Confidential Disclosure Agreement (CDA) Process

Leverage the Wealth of Technical Content on our Website!
• Over 132,000 Downloadable Documents and Drawings – 2D & 3D Drawings
• Prescription Files
• Coating Curves and More!
• Over 900 videos, Tech Tools, Application Notes, Articles, and FAQs in Our Online Knowledge Center

WHY EDMUND OPTICS®?

With over 79 years in business and 8 global manufacturing facilities, EO’s promise to customers is:

MORE OPTICS, MORE TECHNOLOGY, AND MORE SERVICE.

Selection & Reliability
• Over 34,000 Unique Optical Components
• Available to Ship Same Day
• No Hassle 30 Day Evaluation Period and Return Policy
• Detailed Specifications, Drawings, and Prescriptions Online
• Published Price Breaks for Frequently-Ordered Quantities
• Additional OEM Volume Pricing Available

Service
• Free Global Technical Assistance, Applications Engineering, and Design Assistance – Available in 7 Languages

Quality
• ISO 9001 Certified and ISO 10110 Compliant with MIL-SPEC Quality Programs

CUSTOM
Can’t find what you need in our selection of standard products? Need an optic built to your specifications? We can make it for you. EO’s expert design and manufacturing engineers are ready to develop a custom solution to meet your needs and exceed your expectations.

• Build-to-Print Manufacturing
• Global Manufacturing Facilities
• ITAR Registered and Compliant
• Competitive Volume Pricing
• Precision Optical Components – Spherical Lenses – Aspheric Lenses – Mirrors – Windows – Filters – Prisms – Cube and Plate Beamsplitters
• Precision Multi-Element Assemblies
• State-of-the-Art Metrology from Interferometry to Spectroscopy to MTF Testing
• Environmental Testing Capabilities
Edmund Optics® is a recognized leader in aspheric lens manufacturing, with extensive experience producing polished aspheric lenses for ophthalmic instruments, surgical devices, analytical instruments, and defense applications. Edmund Optics’ high volume aspheric lens manufacturing cell operates 24 hours a day to produce thousands of precision aspheric lenses per month. Our manufacturing cells feature state-of-the-art production and metrology equipment, which complements our expert knowledge in aspheric lens design and manufacturing.

Whether your application calls for a standard component from our vast inventory, a build-to-print lens, or a fully customized design effort, our expert optical design and manufacturing engineers can develop solutions to meet your needs.

### MANUFACTURING EQUIPMENT

- S-Axis CNC Grinding Machines
- S-Axis CNC Polishing Machines
- OED MRF Finishing Machines for Fine Finishing
- Centering Machines

### METROLOGY

- Talysurf PGI 1240 Profilometers
- QED ASI Aspheric Stitching Interferometers
- Zygo® NewView White Light Interferometers
- OptiPro UltraSurf 4K 100 Non-Contact Profilometers
- TRIOPTICS Opticentric® Centration Measurement Machines
- Zeiss Contura G2 CMMs
- Design-Specific Computer Generated Holograms (CGH)
- LUPHOScan 260 HD

### ASPHERIC LENSES

- Manufacturing in US and Singapore
- Standard and Custom, from Design and Prototype to Volume Production
- Build-to-Print Capabilities
- Over 600 Aspheric Lens Designs Available for Delivery
- MRF Fine Finishing Consistently Exceeding 1/40 Surface Accuracy and State-of-the-Art Metrology

For more information on ASPHERIC LENSES, visit www.edmundoptics.com/capabilities/aspheric-manufacturing
BEAMSPLITTERS

- Wide Variety of Beamsplitter Types Including Polarizing, Non-Polarizing, and Laser Line
- Customized Solutions for Prototype to Volume Production
- Design & Application Expertise for Complex Coating and Geometry Needs

Edmund Optics® is a premier manufacturer of cube and plate beamsplitters for applications ranging from the ultraviolet (UV) to the infrared (IR) wavelength spectra. Our expert design and manufacturing engineers develop customized solutions for both prototyping and volume production, supporting you throughout your entire product development process. World-class metrology ensures that all beamsplitters meet your application requirements. What can we make for you?

Our beamsplitters are manufactured from a wide variety of SCHOTT, Ohara, and CDGM materials. Whether you require several beamsplitters for prototyping, a few dozen for pre-production, or large quantities for mass production, we can develop a solution tailored for your application. Some values may depend on material and the other required specifications.

For more information on BEAMSPLITTERS, visit www.edmundoptics.com/capabilities/beamsplitter-manufacturing

SPHERICAL LENSES

- Prototype Through High Volume Production Capabilities
- Large Variety of SCHOTT, Ohara, and CDGM Glass Types in Stock
- Build-to-Print Capabilities
- Standard and Custom Coating Options Available
- MRF Fine Finishing Consistently Exceeding 1/40 Surface Accuracy

<table>
<thead>
<tr>
<th>Spherical Manufacturing Capabilities</th>
<th>Commercial</th>
<th>Precision</th>
<th>High Precision</th>
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<td>Diameter:</td>
<td>4 - 200mm</td>
<td>4 - 200mm</td>
<td>4 - 200mm</td>
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<td>±0.1/40mm</td>
<td>±0.1/40mm</td>
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<td>Thickness:</td>
<td>±0.10mm</td>
<td>±0.10mm</td>
<td>±0.10mm</td>
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<td>Sag Height:</td>
<td>±0.15mm</td>
<td>±0.15mm</td>
<td>±0.15mm</td>
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<tr>
<td>Gaussian Aperture:</td>
<td>68%</td>
<td>70%</td>
<td>70%</td>
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<tr>
<td>Radius:</td>
<td>±0.3%</td>
<td>±0.3%</td>
<td>±0.3%</td>
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<tr>
<td>Power (P - V):</td>
<td>3.00</td>
<td>1.50</td>
<td>±0.25</td>
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<td>Irregularity (P - V):</td>
<td>30/70</td>
<td>30/70</td>
<td>30/70</td>
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<tr>
<td>Centering (RMS Deviation):</td>
<td>1/16</td>
<td>1/16</td>
<td>1/16</td>
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<tr>
<td>Bond (Face Width @ 45°):</td>
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<td>&lt;0.05mm</td>
<td>&lt;0.05mm</td>
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<tr>
<td>Surface Quality:</td>
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<td>40-20</td>
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<th>Prism Manufacturing Capabilities</th>
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<th>High Precision</th>
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<td>Diameter:</td>
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<td>2 - 150mm</td>
<td>2 - 150mm</td>
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<tr>
<td>Dimensional Tolerance:</td>
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<td>±0.1/20mm</td>
<td>±0.1/20mm</td>
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<tr>
<td>V-Height:</td>
<td>±0.20mm</td>
<td>±0.20mm</td>
<td>±0.20mm</td>
</tr>
<tr>
<td>Irregularity:</td>
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<td>±0.05mm</td>
<td>±0.05mm</td>
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<tr>
<td>Prism Physical Angle Tolerance:</td>
<td>±0.2°</td>
<td>±0.2°</td>
<td>±0.2°</td>
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<tr>
<td>Prism Tilt Deviation:</td>
<td>±1°</td>
<td>±1°</td>
<td>±1°</td>
</tr>
<tr>
<td>Max Bond (Face Width @ 45°):</td>
<td>±0.6mm</td>
<td>±0.6mm</td>
<td>±0.6mm</td>
</tr>
<tr>
<td>Surface Quality (Radius Deviation):</td>
<td>80-10</td>
<td>48-20</td>
<td>18.5</td>
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<table>
<thead>
<tr>
<th>Beamsplitter Manufacturing Capabilities</th>
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<th>High Precision</th>
</tr>
</thead>
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<tr>
<td>Dimensional Tolerance:</td>
<td>±0.01mm</td>
<td>±0.01mm</td>
<td>±0.01mm</td>
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<tr>
<td>Dimensions:</td>
<td>5 - 750mm</td>
<td>5 - 750mm</td>
<td>5 - 750mm</td>
</tr>
<tr>
<td>Irregularity (or Flatness):</td>
<td>±1.0μm</td>
<td>±1.0μm</td>
<td>±1.0μm</td>
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<tr>
<td>Surface Quality (Surf Deviation):</td>
<td>80/10</td>
<td>40/20</td>
<td>10-5</td>
</tr>
<tr>
<td>Max Bond (Face Width @ 45°):</td>
<td>±0.5mm</td>
<td>±0.5mm</td>
<td>±0.5mm</td>
</tr>
<tr>
<td>Bond Deviation:</td>
<td>±0.5mm</td>
<td>±0.5mm</td>
<td>±0.5mm</td>
</tr>
<tr>
<td>Bevel (Face Width @ 45°):</td>
<td>&lt;1.0mm</td>
<td>&lt;0.5mm</td>
<td>&lt;0.5mm</td>
</tr>
<tr>
<td>Surface Quality (Scratch Dig):</td>
<td>±0.05mm</td>
<td>±0.05mm</td>
<td>±0.05mm</td>
</tr>
<tr>
<td>Power (P - V):</td>
<td>±0.5%</td>
<td>±0.5%</td>
<td>±0.5%</td>
</tr>
<tr>
<td>Extinction Ratio (Broadband Non-Polarizing):</td>
<td>&lt;15%</td>
<td>&lt;15%</td>
<td>&lt;15%</td>
</tr>
<tr>
<td>Extinction Ratio (Polarizing):</td>
<td>±15%</td>
<td>±15%</td>
<td>±15%</td>
</tr>
<tr>
<td></td>
<td>&lt;10%</td>
<td>&lt;10%</td>
<td>&lt;10%</td>
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<tr>
<td></td>
<td>&lt;5%</td>
<td>&lt;5%</td>
<td>&lt;5%</td>
</tr>
</tbody>
</table>

DID YOU KNOW?

Edmund Optics® is a leading manufacturer of spherical lenses, producing millions of precision quality lenses every year in our Japan and Singapore facilities.

SPHERICAL LENSES and PRISMS

- Standard or Custom, from Design and Prototype to Volume Production
- Wide Assortment of Prism Shapes In Stock
- Build-to-Print Capabilities
- Available in Many Glass Types with a Variety of Standard and Custom Coatings

DID YOU KNOW?

Custom prism manufacturing with angle tolerances down to 0.5 arcsec and irregularity down to 1/20.

MANUFACTURING EQUIPMENT

- Conventional and High-Speed Grinding Machines
- Conventional and High-Precision Polishing Machines
- Slicing Machines
- QED MRF Machines for Fine Finishing
- Coating Chambers, including ion Beam Sputtering (IBS)
- DMG MORI® for Truncation and Shaping

METROLOGY

- OGP Smartscopes
- Nikon 6D Autocollimators
- Zygo® VeriFire™ High Resolution Interferometers
- Zygo® NewView White Light Interferometers
- Zygo® GPI 4” Aperture Vertical & Horizontal Interferometers
- Zeiss Contura G2 CMMs
- Olympus MX51 Microscopes
- Spectrophotometers
- Spectrometers

For more information on BEAMSPLITTERS, visit www.edmundoptics.com/capabilities/beamsplitter-manufacturing
**Absorptive Optical Filter Glass**

- >60 SCHOTT Optical Filter Glass Types in Stock
- No Minimum Order Quantity for Either Standard or Custom Dimensions
- Build-to-Print Manufacturing and Full-Custom Design
- Rapid Turnaround for Prototypes

**Optical Filter Glass Manufacturing Capabilities**

<table>
<thead>
<tr>
<th></th>
<th>Commercial</th>
<th>High Precision</th>
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</thead>
<tbody>
<tr>
<td>Dimensions:</td>
<td>5 - 50mm</td>
<td>3 - 140mm</td>
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<tr>
<td>Dimensional Tolerance:</td>
<td>±0.3mm</td>
<td>±0.35mm</td>
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<tr>
<td>Thickness:</td>
<td>1.2, 2.5mm</td>
<td>0.5 - 4.0mm</td>
</tr>
<tr>
<td>Surface Quality:</td>
<td>80-50</td>
<td>80-10</td>
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<tr>
<td>Flatness:</td>
<td>±0.3λ</td>
<td>1/4</td>
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<tr>
<td>Neutral Density:</td>
<td>0.15 - 2.00</td>
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</tr>
<tr>
<td>Geometry:</td>
<td>Round, Elliptical, and Rectangular</td>
<td></td>
</tr>
<tr>
<td>Filter Glass Types:</td>
<td>Lenses, Shortcuts, Apertures, Neutral Density, and Combinations of Multiple Glasses</td>
<td></td>
</tr>
</tbody>
</table>

*Specifications per DIN ISO 10110. Manufacturing specifications per MIL-PRF-13830B also available.

**Polymer Polarizers**

- Wide Range of Polymer Polarizers for Visible Applications
- Custom Sizes and Shapes for Linear and Circular Polarizers, and Retarders
- Lamination on Glass or Plastic Substrates for Improved Stability
- No Minimum Order Quantities and Short Lead Times

**Diamond Turning**

- Experts with 10+ Years’ Experience
- Metals, Crystalline Materials, and Plastics
- Off-Axis Parabolic, Elliptical, and Toroidal Mirrors, Aspheric and Spherical Lenses, and Flatwork
- Build-to-Print Manufacturing and Full-Custom Design
- Wide Range of Coating Options

**Mirror Manufacturing Capabilities**

<table>
<thead>
<tr>
<th></th>
<th>Commercial</th>
<th>Precision</th>
<th>High Precision</th>
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<tbody>
<tr>
<td>Dimensions:</td>
<td>2.5 - 406.4mm</td>
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<tr>
<td>Dimensional Tolerance:</td>
<td>±0.25mm</td>
<td>±0.1mm</td>
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<tr>
<td>Diameter:</td>
<td>44mm - 300mm</td>
<td>66mm - 300mm</td>
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<tr>
<td>Surface Quality:</td>
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<td>80-10</td>
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<tr>
<td>Flatness:</td>
<td>±0.15λ</td>
<td>1/4</td>
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</tr>
<tr>
<td>Geometry:</td>
<td>Round, Elliptical, and Spherical Mirrors</td>
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<td></td>
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<tr>
<td>Coating Options:</td>
<td>Anti-Reflection, and Custom Coatings</td>
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<tr>
<td>Reflectivity:</td>
<td>85 - 99.9%</td>
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<tr>
<td>Wavelength Range Covered:</td>
<td>13.5mm - 400m</td>
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<tr>
<td>Substrate Options:</td>
<td>Metal, Glass, and Ceramic</td>
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<td>2.5 - 406.4mm</td>
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<tr>
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<td>Surface Quality:</td>
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<td>Surface Quality:</td>
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<td>Geometry:</td>
<td>Round, Elliptical, and Spherical Mirrors</td>
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<tr>
<td>Reflectivity:</td>
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<td>Wavelength Range Covered:</td>
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<td>Surface Quality:</td>
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<td>80-10</td>
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<td>Flatness:</td>
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<tr>
<td>Geometry:</td>
<td>Round, Elliptical, and Spherical Mirrors</td>
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<td>Wavelength Range Covered:</td>
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<tr>
<td>Substrate Options:</td>
<td>Metal, Glass, and Ceramic</td>
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**Diamond Turning Capabilities**

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<th></th>
<th>Commercial</th>
<th>Precision</th>
<th>High Precision</th>
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<tbody>
<tr>
<td>Reflected Wavefront Error (P - V @ 632nm):</td>
<td>2 - 1/2λ</td>
<td>1/2</td>
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<tr>
<td>Surface Quality:</td>
<td>80-50</td>
<td>80-10</td>
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<tr>
<td>Surface Roughness (RMS):</td>
<td>0.6 - 0.16µm</td>
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<td>Crystalline Materials and Plastics</td>
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<tr>
<td>Geometries:</td>
<td>Off-Axis Parabolic, Elliptical, and Round Mirrors, Spherical Surfaces, Aspheric Surfaces, and Plane Surfaces</td>
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<tr>
<td>Angle:</td>
<td></td>
<td></td>
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<tr>
<td>Diameter (Off-Axis):</td>
<td>2 - 254mm</td>
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<tr>
<td>Diameter (On-Axis):</td>
<td>8 - 254mm</td>
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<tr>
<td>Coatings:</td>
<td>Dielectric, Aluminized, SiO2, Silicon Film, and Sputtered Film Surfaces, Crystalline Materials, Reflection Coatings, and Custom Coatings</td>
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<tr>
<td>Materials:</td>
<td>Metal, Glass, Sputtered Film, and Custom Coatings</td>
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</tr>
</tbody>
</table>

**DID YOU KNOW?**

Edmund Optics® manufactures custom filters out of over 60 SCHOTT Optical Filter Glass types.
IMAGING and LASER OPTICS ASSEMBLIES

**IMAGING**

- Full Custom Lens Design for Your Specific Needs
- Designs for Newest Technology Trends Including Stability Ruggedized Lenses, Integrated Liquid Lenses, and Ultra-High Resolutions (100+ MP)
- M12, C-Mount, Factory Automation, Telecentric Lenses, & More
- Global In-Region Engineering Support & Service
- Volume Manufacturing & Designs Optimized for Integration

**LASER OPTICS ASSEMBLIES**

- Beam Expanders, Focusing Objectives, and Other Laser Optics Assemblies
- Laser Line and Broadband Coatings from 257nm to 3µm
- Low Group Delay Dispersion (GDD) Designs for Ultrafast Systems, Including Reflective Designs
- High-Power Assemblies with No Issues from Internally-Focusing Ghost Images
- Standard, Modified Standard, or Custom, from Design and Prototype to Volume Production

---

**IMAGING ASSEMBLIES**

<table>
<thead>
<tr>
<th>Imaging Lens Assembly Capabilities</th>
<th>Fixed Focal Length Lenses</th>
<th>Telescopic Magnifying Lenses</th>
<th>Fixed Magnification Lenses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor Sizes:</td>
<td>Up to 43.3mm</td>
<td>Up to 43.3mm</td>
<td>Up to 43.3mm</td>
</tr>
<tr>
<td>Resolution:</td>
<td>Up to 120 MegaPixel</td>
<td>Up to 32 MegaPixel</td>
<td>Up to Full Line Scan</td>
</tr>
<tr>
<td>Field of View:</td>
<td>&gt;100º</td>
<td>Up to 25º</td>
<td>0.2mm - 100cm</td>
</tr>
<tr>
<td>Lens Mounts:</td>
<td>C-Mount, 15mm Mount,</td>
<td>C-Alumin, Fixed Focus,</td>
<td>C-Alumin, F-Alumin,</td>
</tr>
<tr>
<td></td>
<td>Fixed Focus, 5-Mount,</td>
<td>Me, A12</td>
<td>Me, A12</td>
</tr>
</tbody>
</table>

---

**LASER OPTICS ASSEMBLIES**

- Full Custom Lens Design for Your Specific Needs
- Designs for Newest Technology Trends Including Stability Ruggedized Lenses, Integrated Liquid Lenses, and Ultra-High Resolutions (100+ MP)
- M12, C-Mount, Factory Automation, Telecentric Lenses, & More
- Global In-Region Engineering Support & Service
- Volume Manufacturing & Designs Optimized for Integration

**Beam Expander Capabilities**

- Expansion Power: 10 - 30X
- Design Wavelengths: Common Laser Lines Including Nd:YAG, Yb:YAG, Doppler, and Er/Yb-Doped Fiber Lenses, Broadband
- Mounts: C-Mount, M22, M30
- Focusing Mechanism Available: Sliding Optics, Rotating Optics, Fixed Focus
- Custom Design Capabilities: Yes, Contact Us Today!

---

**DID YOU KNOW?**

Edmund Optics® does full assembly development from modeling physical optics propagation, to designing lens elements, to coating, to assembly, to testing...
When developing a product, being able to quickly and easily iterate your prototypes is critical. In addition to our immediately available inventory of over 34,000 standard optics, quick “modified standard” customizations are available in just 2-3 weeks, simplifying the path to production.

Our modification services include: customizing the size, shape, and edges of standard optics; improving the surface figure or accuracy of the optical surface; sorting; mounting; kitting; inspection; and more! Find an achromat that has everything you need, but it’s just a little too big? We can edge it down for you. What about that mirror that you need in a non-standard size? We can cut it for you. Looking for a customized inspection report? We can measure it for you.

**One Standard Optic = Infinite Possibilities**

**Customized Optics in 2-3 Weeks**

**DID YOU KNOW?**

You can combine multiple modification services on the same optical component, such as resizing and coating, to reduce overall lead time and cost.

**FULL CUSTOM FAST!**

If off-the-shelf or modified standard components do not meet your prototyping needs, you can utilize our fully-custom prototyping capabilities to obtain custom glass components in a matter of days to a maximum of a few weeks.

Edmund Optics® maintains an inventory of over 70 of the most common optical glass types at all manufacturing sites. Using these materials reduces lead time of raw materials and facilitates quick prototyping.

**Rapid Prototyping**

**WHY NOT DESIGN FROM SCRATCH?**

When developing a product, being able to quickly and easily iterate your prototypes is critical. In addition to our immediately available inventory of over 34,000 standard optics, quick “modified standard” customizations are available in just 2-3 weeks, simplifying the path to production.

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**WHAT CAN WE MAKE FOR YOU?**

Learn more at www.edmundoptics.com/modify

**MODIFICATION SERVICES OFFERED**

- Diameter Reduction
- Transition & Linear Cut to Size
- Core Drilling & Through Hole
- Edge Blackening
- Mounting
- Engraving and Serialization

**FOR RAPID PROTOTYPING**

13 CREATIVE “HACKS” FOR RAPID PROTOTYPING

While every application has its own timelines, credentials, and specifications, there are several techniques that may be commonly utilized to decrease the amount of time required for prototyping. Below are several of the 13 creative “hacks” that can be used to quickly and efficiently make prototypes of optical sub-systems:

#1 – Go monochromatic to reduce element count and complexity
#2 – Approximate custom “best-form” elements with available standard singlets
#3 – Flip imaging lenses to use them as objectives
#4 – Customize compound assemblies with standard optics
#5 – Utilize inner diameter threaded prototyping tubes

**FOR FULL GLASS AND ZEMAX GLASS CATALOGS, visit www.edmundoptics.com/preferred-glass**

**Glass map indicating the Refractive Index (nd), Abbe Number (Vd), Coefficient of Thermal Expansion (CTE), and Relative Partial Dispersion (Pg,f).**

**DID YOU KNOW?**

EO has been able to turn around fully-custom spherical lenses in 3 weeks or less.
Edmund Optics® manufactures and supplies customers around the globe with millions of precision optical components and optical assemblies. Whether standard, modified standard, or custom, we have the expertise and resources necessary to manufacture optical products based on your project’s specific requirements. Our dedicated and skilled team members ensure that you receive the optimal solution for your application, while our quality assurance teams guarantee the best final products.

Additional Requirements? We’ve Got You Covered!

- Highly Flexible Volume Order Servicing
- Support Blanket Orders and Other Stocking Agreements
- Competitive Volume Discounts
- Well Versed in Configuration Control, Change Control, and Copy Exact Requirements
- Seamless Federal Acquisition Regulation (FAR), Defense Federal Acquisition Regulation (DFAR), Quality Assurance Provision (QAP), and Testing Requirement Flow-Downs
- ITAR Registered and Compliant; Defense Priorities and Allocations System (DPAS) Servicing and Support
- Global Supply Chain Network with Global Warehousing – Quickly and Easily Supporting Your Projects Wherever You Prefer
- Comprehensive First Article Inspection Reports (FAIR) for Product Qualification

For more information on VOLUME and OEM SERVICES, visit www.edmundoptics.com/volume

DEDICATED SUPPORT TEAMS FOR YOUR NEEDS

All customers with volume orders receive a dedicated support team to ensure their products are manufactured and specified to meet their needs, deadlines are kept, and a specified point of contact for general or technical questions is assigned. The support team consists of:

- Project Manager - The Project Manager coordinates all internal activities to meet project cost, schedule, and performance requirements for optical assemblies.
- Solutions Engineer - Your technical resource for your custom optical requirements provides specifications and guidance on cost-effective and manufacturable optical solutions.
- OEM Sales Rep - Your dedicated sales representative assists with volume price quotes, order placement, and delivery status to meet your project deadlines.
- Regional Sales Manager - Your dedicated account manager provides on-site support and capability knowledge to develop and grow our relationship with you.

For a FREE QUOTE, contact us at www.edmundoptics.com/contact-support

LAUNCH AND PRODUCTION

6 WEEK VOLUME PRODUCTION TIME

Edmund Optics® is proud to offer industry-leading 6 week production times for volume orders of custom optical components at no premium.*

In addition to our quality and customer service, we pride ourselves on speed and accuracy. We understand that ever-shrinking development and product cycles make short lead times crucial to many of our customers. For this reason, we offer quick turnaround solutions to get you the optics you need within your specified timeframes.

*Dependent on quantity, specifications, and glass availability. Exact lead time to be acknowledged at the time of order.

ENGAGE WITH US EARLY AND OFTEN

Speaking with our experts during your proof-of-concept phase can help significantly expedite custom manufacturing. We can help provide feedback on specifications to choose for your components and review your design for manufacturability, while assisting with possible cost reduction measures once your project moves from prototype to production.

BEHIND THE SCENES IN OPTICAL MANUFACTURING

Watch the following two videos to see the manufacturing processes of both aspheric lenses and imaging lens assemblies in Edmund Optics’ global manufacturing facilities.

How an Aspheric Lens is Made

www.edmundoptics.com/making-an-asphere

How an EO Imaging Lens is Made

www.edmundoptics.com/making-an-imaging-lens
DID YOU KNOW?
EO has over 230 engineers on staff, located at each of our global sales offices and manufacturing facilities, as well as our three dedicated design service locations in Arizona, New Jersey, and China.

TIPS FOR DESIGNING MANUFACTURABLE LENSES AND ASSEMBLIES
A successful lens design succeeds not only in the creation of a working model but also in manufacturing, assembly, testing, and implementation. Visit this online resource to learn the nuances of designing manufacturable lens assemblies including:
- Geometry Considerations
- Tolerancing Methods and Assumptions
- Modeling Surface Irregularity
- Stack-ups of Assembled Systems

For more DESIGN ASSISTANCE, visit www.edmundoptics.com/design

Zemax  code®
FRED® SolidWorks®

STATE-OF-THE-ART METROLOGY
OPTICAL METROLOGY CAPABILITIES
- Interferometers, Profilometers, Coordinate Measurement Machines (CMM), and a host of Optical and Mechanical Metrology
- Radiometrics: Stray Light, Veiling Glare, and More
- Semi-Automated MTF Measurement Equipment
- UV/VIS/NIR/IR Coating Characterization through Varian and PerkinElmer Spectrophotometers and Fourier Transform Infrared (FTIR) Spectroscopy
- Laser-Induced Damage Threshold (LIDT) and Beam Quality (M²) Measurement
- Environmental Testing Equipment such as Vibration, Humidity, and Immersion
- Over 50 Employees in Quality Control Functions Across the Company
- Product Testing and Certification Reports Available Upon Request

EDMUND OPTICS® IS COMPLIANT WITH:
- ISO 9001:2015
- ISO 14001
- ANSI / ASME Y14.5
- ISO 10110
- MIL-C-48497A
- MIL-STD-810
- MIL-PRF-13830B
- MIL-C-675C

IN-HOUSE OPTICAL ASSEMBLY TESTING
- MTF
- Stray Light
- Telecentricity
- Wavefront Distortion
- White Light Interferometry
- Mechanical Profilometry
- Much More

Laser-Induced Damage Threshold (LIDT) Testing

To learn more about our STATE-OF-THE-ART METROLOGY, visit www.edmundoptics.com/metrology

QUALITY AND METROLOGY
- Robust Global Compliance Systems
- Thorough Preventative and Corrective Action Procedures
- Commitment to Continuous Improvement
- ISO 9001:2015 Certified and ITAR Compliant

Edmund Optics® is committed to ensuring product and procedural quality. Guided by ISO 9001 certification standards, we employ a strict global quality program that is monitored by experienced staff and supported by the most innovative optical testing available. EO manufactured products undergo rigorous and thorough testing as part of our quality program and in compliance with EO’s global quality procedures, as well as a host of ISO and mil-spec standards.

Additionally, Edmund Optics® has documented plans for improving resource efficiency and waste reduction through the Environmental Management System (EMS) ISO 14001. We hope our initiative will develop and sustain both supply and demand for greener goods, services and products, and reduce waste both in and outside of the company.

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www.edmundoptics.com/manufacturable-lenses

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Using **off-the-shelf optics** in your next design project comes with many advantages.

If budget or time restrictions eliminate the possibility of utilizing custom optics in your application, standard optics are readily available and easily implemented to fit your design requirements. Here are some quick tips to help make designing with off-the-shelf optics easy!

1 **SIMPLIFY**

Start on paper with a paraxial design and break it into subsystems of finite and infinite conjugate optical groups. Determine the focal lengths you want for each group before trying to optimize in a code such as Zemax, Code V®, or another ray tracing software of your choice. Once you have the focal lengths required, you can start using paraxial equations to help choose the off-the-shelf lenses that provide the required focal lengths. Your preferred ray tracing code should have a selection of off-the-shelf lenses built into it (Figure 1) that you can use to model the selected lenses and optimize your spacing. If not, the lenses can typically be input into the software with the information provided by the supplier. All EO TECHSPEC® components are available in most design codes and Zemax files are available on our website at [www.edmundoptics.com/zemax](http://www.edmundoptics.com/zemax).

2 **GO MONOCHROMATIC**

If at all possible, use a monochromatic source such as an LED or Laser or use an optical filter to make your system monochromatic. Using a monochromatic or narrow band light will greatly reduce the complexity of the design. As a rough guideline, reducing the source waveband to less than 50nm will generally make using singlets possible in your design. Chromatic aberrations cause difficulty when composing a design, so your options will be simplified if a broadband light source is not required.

3 **UTILIZE OFF-THE-SHELF SUBSYSTEMS**

By using off-the-shelf components such as achromatic doublets, microscope objectives, machine vision lenses, multi-element relays, or other subsystems, you can often achieve your application’s exact correction requirements for factors such as color, field angles, and large apertures. In many cases, these subsystems can even be modeled in your code if the prescriptions are provided by the supplier (Figure 2). Even if the prescription is not available, a paraxial surface can be used to approximate the subsystem.

4 **CONSIDER MOUNTING OPTIONS**

Whether prototyping or trying to save the time and expense associated with purchasing custom housings, consider off-the-shelf mounting options. For example, the TECHSPEC® Optical Cage System allows you to easily assemble your optical components and provide plenty of freedom for making spacing adjustments. Most off-the-shelf cage systems allow for mounting common optical component sizes, as well as ways for mounting microscope objectives, C-mount camera lenses, and other sub-components (Figure 3).

5 **USE COMPONENTS WHERE THEY WORK**

Off-the-shelf lenses such as Plano-Convex (PCX), Plano-Concave (PCV), Double-Convex (DCX), Double-Concave (DCV), and Achromats are optimized for small fields and small apertures. These components work best when integrated into systems that do not have very steep ray angles. For example, when designing a high magnification relay, use a complex multi-element subsystem for the high numerical aperture side of the relay and an achromat for the low numerical aperture side. For instance, a 15X system consisting of a 20X infinite conjugate objective on the object side and a 150mm focal length achromatic lens on the image side, will provide a very well-corrected system.

For more **OPTICS APPLICATION NOTES**, visit [www.edmundoptics.com/appnotes](http://www.edmundoptics.com/appnotes)
**ASPHERIC LENSES**

- 600+ Standard Aspheres Ready for Purchase
- Edmund Optics® is one of the Largest Aspheric Lens Manufacturers in the World

**Spherical Lenses**

- 6,300+ Standard Spherical Lenses Ready for Purchase
- Available in Glass and Crystalline Materials with a Variety of Standard and Custom Coatings

**Prisms**

- Custom Prisms in a Wide Variety of Geometries
- Angle Tolerances Down to 0.5 arcsec and Irregularity Down to ±0.20

**BeamSplitters**

- Cube, Plate, Polarisim, Non-Polarizing, and Laser Line Capabilities
- Design and Application Expertise for Complex Coating and Geometry Needs

---

**Optical Coatings**

<table>
<thead>
<tr>
<th>Type</th>
<th>Standard Optics</th>
<th>High Precision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reflectivity</td>
<td>0.1 - 99.9%</td>
<td>0.01 - 99.9%</td>
</tr>
<tr>
<td>Anti-Reflective Wavelength Range</td>
<td>355 - 2,000nm</td>
<td>355 - 2,000nm</td>
</tr>
<tr>
<td>High-Reflective Wavelength Range</td>
<td>330 - 1,064nm</td>
<td>330 - 1,064nm</td>
</tr>
<tr>
<td>Shortpass Filter Cut-Off Wavelength</td>
<td>400 - 1,000nm</td>
<td>400 - 1,000nm</td>
</tr>
<tr>
<td>Longpass Filter Cut-On Wavelength</td>
<td>500 - 2,000nm</td>
<td>500 - 2,000nm</td>
</tr>
<tr>
<td>Bandpass Filter (BS) Center Wavelength</td>
<td>355 - 1,064nm</td>
<td>355 - 1,064nm</td>
</tr>
<tr>
<td>Reflective BS Filter Width</td>
<td>0.0005 - 0.95</td>
<td>0.0005 - 0.95</td>
</tr>
<tr>
<td>Filter Center Wavelength (CWL) Tolerance</td>
<td>±1nm</td>
<td>±1nm</td>
</tr>
<tr>
<td>Filter Edge Tolerance</td>
<td>±1nm</td>
<td>±1nm</td>
</tr>
<tr>
<td>OD 0.1 - OD 3</td>
<td>10,000:1</td>
<td>10,000:1</td>
</tr>
</tbody>
</table>

**Beam Expander Capabilities**

- 1X - 20X
- Expansion Power: Variable

- Custom Design Capabilities: Contact Us Today!
DIAMOND TURNING

• In-House Experts with 10+ Years' Experience
• Precision Diamond Turning of Metals, Crystalline Materials, and Plastics

POLYMER POLARIZERS

• Custom Polarizers Manufactured in ITOS, our German Manufacturing Facility
• No Minimum Order Quantity

OPTICAL FILTER GLASS

• >60 SCHOTT Optical Glass Types in Stock
• No Minimum Order Quantity

OPTICAL WINDOWS

• Wide Variety of Substrates Including Ge, Si, Ni-Bely, Fused Silica, ZnSe, and KBr
• Anti-Reflection Coating Options from the UV to IR

Window Manufacturing Capabilities

<table>
<thead>
<tr>
<th>Dimensions:</th>
<th>Commercial</th>
<th>Precision</th>
<th>Hi-precision</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5 - 400 mm</td>
<td>2.5 - 400 mm</td>
<td>2.5 - 400 mm</td>
<td>2.5 - 400 mm</td>
</tr>
<tr>
<td>Dimensional Tolerance:</td>
<td>±0.25 mm</td>
<td>±0.1 mm</td>
<td>±0.05 mm</td>
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<tr>
<td>Flatness:</td>
<td>±0.45°</td>
<td>±0.1°</td>
<td>±0.05°</td>
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<tr>
<td>Surface Quality (Scratch Dig):</td>
<td>80-10</td>
<td>40-10</td>
<td>10-5</td>
</tr>
<tr>
<td>Parallelism:</td>
<td>5 minutes</td>
<td>1 minute</td>
<td>1.5 seconds</td>
</tr>
<tr>
<td>Coating Options:</td>
<td>V-Coat for UV, VIS, and IR, Laser UV Coats</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Woodland Range Covered:</td>
<td>110° - 160°</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Substrate Options:</td>
<td>Optical Glass, Fused Silica, Ge, Si, ZnSe, CaF2, Sapphire, and Others</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Optical Filter Glass Manufacturing Capabilities

<table>
<thead>
<tr>
<th>Dimensions:</th>
<th>Commercial</th>
<th>Precision</th>
<th>Hi-precision</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 - 1500 mm</td>
<td>5 - 1500 mm</td>
<td>5 - 1500 mm</td>
<td>5 - 1500 mm</td>
</tr>
<tr>
<td>Dimensional Tolerance:</td>
<td>±0.2 mm</td>
<td>±0.1 mm</td>
<td>±0.05 mm</td>
</tr>
<tr>
<td>Thickness:</td>
<td>0.5 - 30 mm</td>
<td>0.5 - 30 mm</td>
<td>0.5 - 30 mm</td>
</tr>
<tr>
<td>Woodland Range Covered:</td>
<td>110° - 160°</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Substrate Options:</td>
<td>Optical Glass, Fused Silica, Ge, Si, ZnSe, CaF2, Sapphire, and Others</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Linear Polarizing Manufacturing Capabilities

<table>
<thead>
<tr>
<th>Linear Polarizing Film</th>
<th>PMMA Laminated</th>
<th>Glass Laminated</th>
<th>Wire-Grid Polishing Film</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions:</td>
<td>3 x 3 mm - 600 x 1000 mm</td>
<td>3 x 3 mm - 600 x 1000 mm</td>
<td>3 x 3 mm - 600 x 1000 mm</td>
</tr>
<tr>
<td>3 x 3 mm - 600 x 1000 mm</td>
<td>3 x 3 mm - 600 x 1000 mm</td>
<td>3 x 3 mm - 600 x 1000 mm</td>
<td></td>
</tr>
<tr>
<td>Thickness:</td>
<td>0.10 - 0.75 mm</td>
<td>0.10 - 3.5 mm</td>
<td>0.10 - 3.5 mm</td>
</tr>
<tr>
<td>Transmission:</td>
<td>Up to 98%</td>
<td>Up to 98%</td>
<td>Up to 98%</td>
</tr>
<tr>
<td>Extinction Ratio:</td>
<td>Up to 10,000</td>
<td>1.4 x 10^5</td>
<td></td>
</tr>
</tbody>
</table>

Optical Turning Capabilities

<table>
<thead>
<tr>
<th>Reflective Woodmark Error (P / V @ 0.52um)</th>
<th>Commercial</th>
<th>Precision</th>
<th>Hi-precision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface Quality:</td>
<td>80/10</td>
<td>60/40</td>
<td>40/20</td>
</tr>
<tr>
<td>Surface Roughness (RMS) Geometric:</td>
<td>15/6</td>
<td>15/6</td>
<td>15/6</td>
</tr>
<tr>
<td>Geometrically:</td>
<td>&lt;5λ for Dimensions 0.35 - 300mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Angular:</td>
<td>6 - 8°</td>
<td>6 - 8°</td>
<td>6 - 8°</td>
</tr>
<tr>
<td>Diameter (Off-Axis):</td>
<td>3 - 1000 mm</td>
<td>3 - 1000 mm</td>
<td>3 - 1000 mm</td>
</tr>
<tr>
<td>Coatings:</td>
<td>25% - 95%</td>
<td>25% - 95%</td>
<td>25% - 95%</td>
</tr>
<tr>
<td>Materials:</td>
<td>Metallic (Aluminum, Copper, Brass, and Nickel-Plated Solar Cells), Crystalline Materials (Germanium, Silicon, Carbon, Boron, and Zinc)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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** Exact values are dependent on the specific material and size.