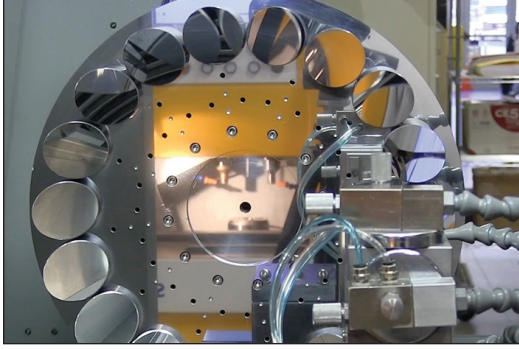
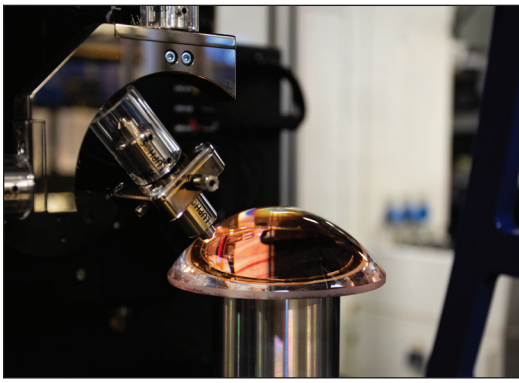
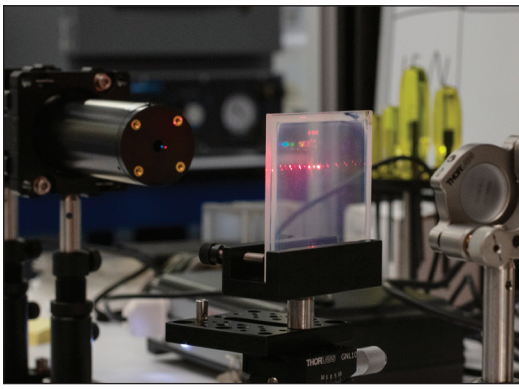
Custom and OEM Optics









End-to-End Optics Manufacturing

Thorlabs is a vertically integrated photonics company that offers end-to-end optical design and manufacturing services. Our highly skilled team leverages our in-house expertise and capabilities to continuously expand our offering of stocked optics, as well as to provide specialized components and assemblies to meet the unique needs of custom and OEM applications.

For OEM optics, our experienced optical design and manufacturing engineers will work closely with you to design a solution that achieves the performance requirements of your application. Our responsive team is committed to reducing your time to market by tailoring a fabrication process that minimizes manufacturing time and expense. We invite you to partner with us on your next project.

THORLABS

Lenses

Lenses come in a wide variety of shapes and can be tailored to match the needs of almost any application. However, it is important to choose lenses that are appropriate for a given system. Spherical lenses are the most common and affordable, while achromatic and aspheric lenses offer improved broadband and single-wavelength performance, respectively. Cylindrical and acylindrical lenses focus light along only one axis, while axicons can be used to generate ring-shaped beams.

Custom Optic Sizes

- Spherical Lenses: 4 – 400 mm (0.16" – 15.74")
- Aspheric Lenses: 5 – 250 mm (0.20" – 9.84")
- Cylindrical Lenses: 10 – 350 mm (0.39" – 13.78")
- Acylindrical Lenses: 10 – 100 mm (0.39" – 3.94")
- Plano and Flat Optics: 4 – 500 mm (0.16" – 19.69")



Spherical Lenses:

- Single Element
- Generally Most Affordable
- Chromatic and Spherical Aberrations



Achromatic Lenses:

- Multi-Element
- Ideal for Broadband Sources
- Fewer Aberrations Compared to Singlets



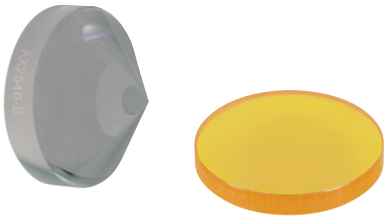
Aspheric Lenses:

- Single Element
- No Spherical Aberrations
- Diffraction-Limited Performance for Monochromatic Light Sources



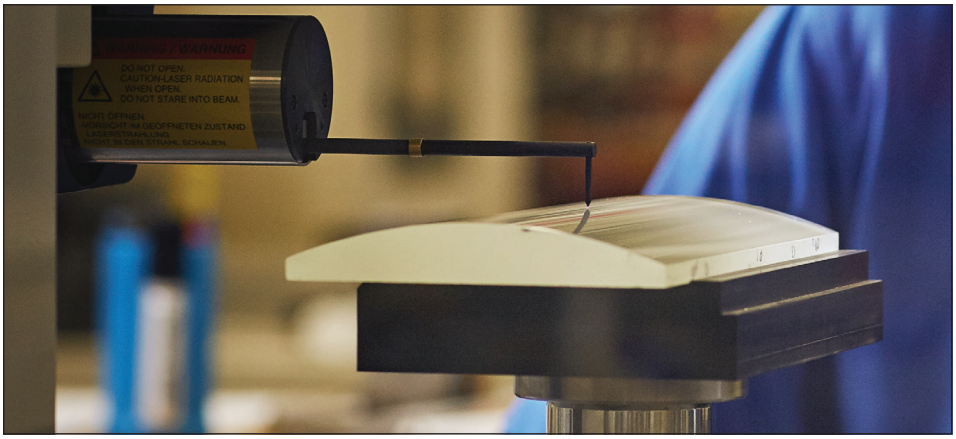
Cylindrical and Acylindrical Lenses:

- Focus or Expand Light Along Only One Axis
- Ideal for Barcode Scanners or Laser Diode Collimation



Axicon Lenses:

- One Conical Side and One Plano Side
- Can Create Ring-Shaped Beam Profiles
- Useful for Material Processing Applications



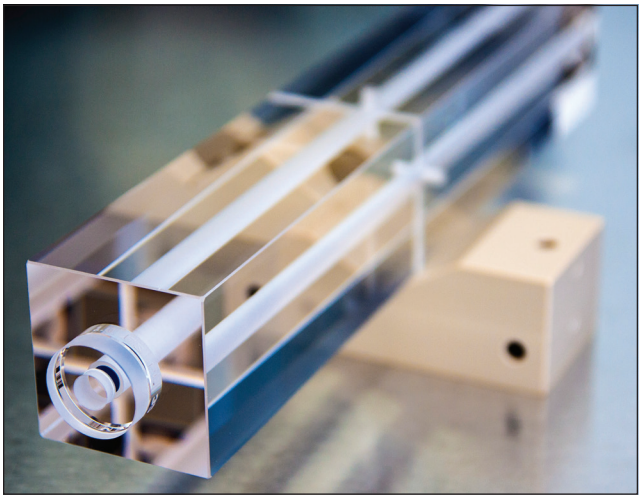
Inspection of the Surface Profile of a Cylindrical Lens



Diamond-Embedded Ferrofluids Polishing an Asphere in an MRF Polisher



Our Single-Point Diamond Turning Capabilities Allow Us to Produce Custom Off-Axis Parabolic and Aspheric Mirrors



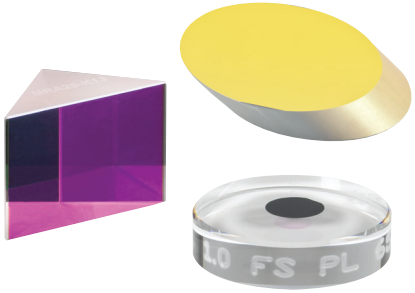
Custom Laser Cavity Assembled with One of Our Crystalline Mirrors



Metallic Mirror Blanks Mounted for Coating in One of Our E-Beam Evaporation Chambers

Thorlabs is capable of producing mirrors of many different shapes and sizes, from plano circular, elliptical, rectangular, or D-shaped mirrors, to concave and off-axis parabolic mirrors. Mirrors can be coated with broadband metallic coatings, which offer high reflectance from VIS to MIR wavelengths, or with broadband dielectric coatings, which offer >99% average reflectance over their design wavelength range. Laser line mirrors are fabricated with specialized coatings that offer high reflectance and high damage thresholds at common laser wavelengths. Ultrafast mirrors are optimized for low group delay dispersion (GDD) and high reflectance for Ti:Sapphire, Ytterbium, and other ultrafast laser sources.

We also offer single-crystal, GaAs/AlGaAs coated supermirrors, which provide extremely high reflectance (>99.99%) at their center wavelengths. These mirrors are ideal for high-performance applications such as high-finesse laser cavities and can be ordered with custom center wavelengths.

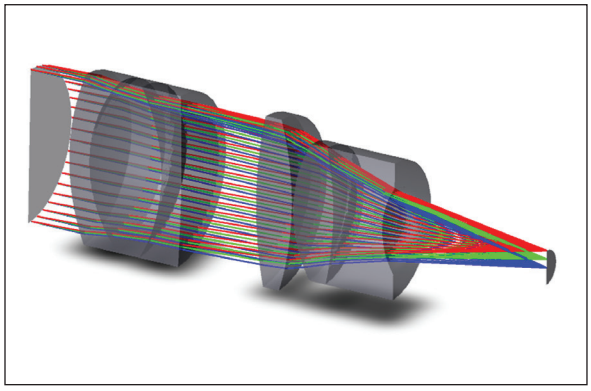


Mirrors are available in many different shapes and sizes with standard or custom coatings.

For more information regarding custom optics or special services, contact our team of technical project managers by emailing techsales@thorlabs.com.

Start-to-Finish Design

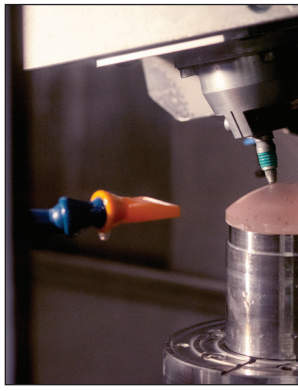
DESIGN → FABRICATION → VERIFIC



Design engineers use software packages including Solidworks, Zemax, Code V, and Optilayer to design optics to fit your application.



Expert opticians shape raw materials into polished optics using both Computer Numerical Controlled (CNC) machines and conventional polishing equipment.



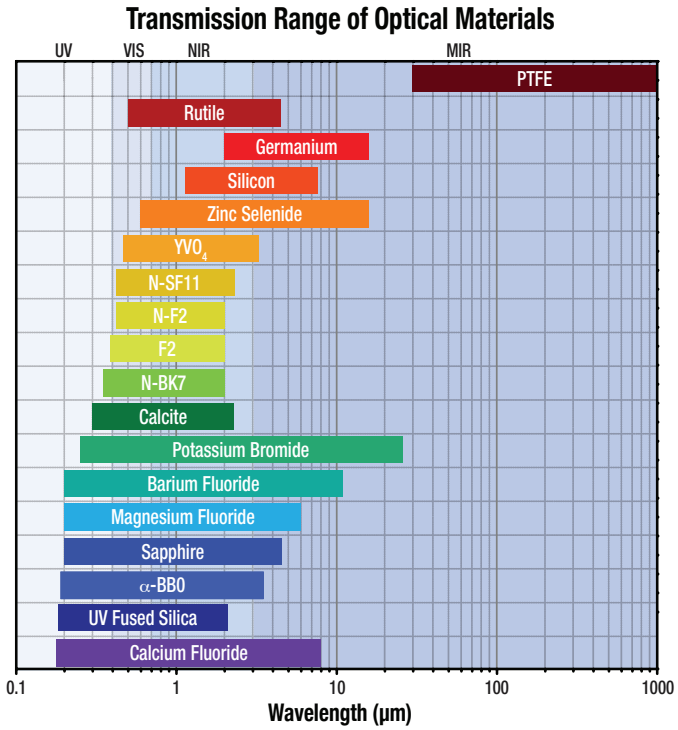
Optics are validated and ve metrology and inspection eq custom inspection services.

Optical Substrates Optimized for Your Application

The combined transmission range of our wide selection of optical substrates extends from the UV into the MIR, making it possible to produce optics and assemblies that are ideal for use in numerous applications.

Our facilities are capable of producing optics of many different shapes and sizes, from plano filters, windows, and mirrors to off-axis parabolic mirrors, spherical lenses, and aspheric lenses. Select optics can be precision polished to <0.5 µm wavefront error utilizing Magnetorheological Finishing (MRF). We also manufacture polarization optics, such as wave plates, retarders, and polarizers, from crystalline substrates.

Stock items can be modified upon request to meet your specific criteria. If our vast catalog does not contain a solution for your application, our team of application engineers and OEM specialists will work with you to create an item or assembly that will. We are happy to accommodate requests that require the shaping of challenging and exotic materials.



Substrates

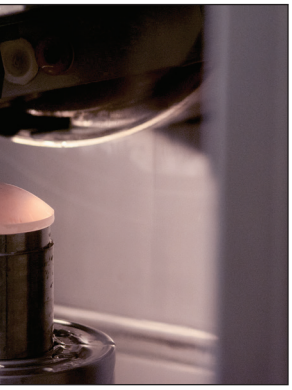
- Aluminum
- Ceramics
- Copper
- Crystals
- Integrated Optical Devices
- Laser Rods
- Optical Fiber
- Optical Glass
- Polymers

Available Services

- Customization of Catalog Optics
- Precision Mounting
- Spectral Scans
- Comprehensive Interferometric Characterization
- Volume Ordering
- Optical and Mechanical Schematics
- Certified Optical Performance Data
- Custom Optical Assemblies
- QuickTurn™ Optics with Rapid Turnaround

and Manufacturing

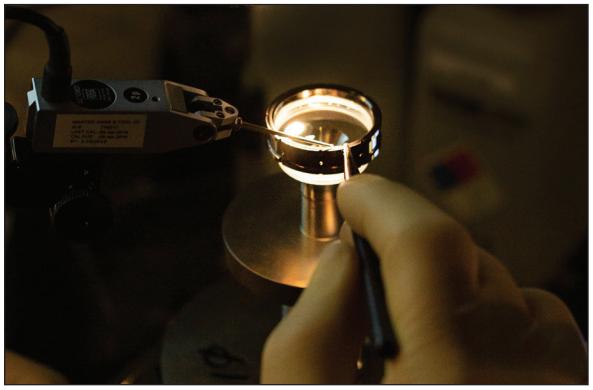
CATION | COATING | ASSEMBLY



rified using our extensive quipment. We also provide



A range of coating techniques to deposit metallic and dielectric coatings are performed by our coating technicians with in-process spectral characterization.



Products are assembled at specialized workstations, many of which are custom-designed and built from our broad portfolio of photonics equipment.

Spectral, Anti-Reflective, and Highly Reflective Coatings

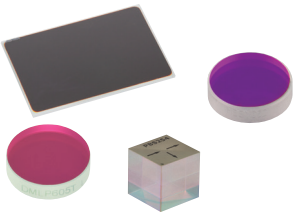
Reflective or Absorptive Neutral Density Coatings

Choose from a range of fixed attenuations. We also produce continuously variable, step-variable, and apodizing filters.



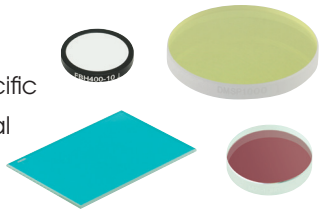
Polarizing and Non-Polarizing Beamsplitter Coatings

Various coatings can be deposited on the surfaces of our polarizing and non-polarizing beamsplitters, including broadband, laser line, and high-power options.



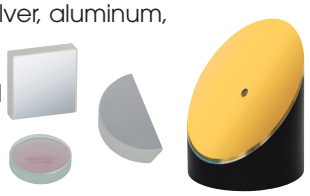
Narrowband, Broadband, Notch, and Edgepass Coatings

Our filters can be optimized for passband transmission, stopband suppression, or specific environmental or experimental requirements in various bandwidths.



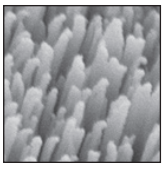
Broadband Dielectric, Narrowband, and Metallic Mirror Coatings

Deposited metals include gold, silver, aluminum, nickel, Inconel, and chromium on a variety of plano and curved substrates. Dielectric mirrors with >99% reflectance are available.

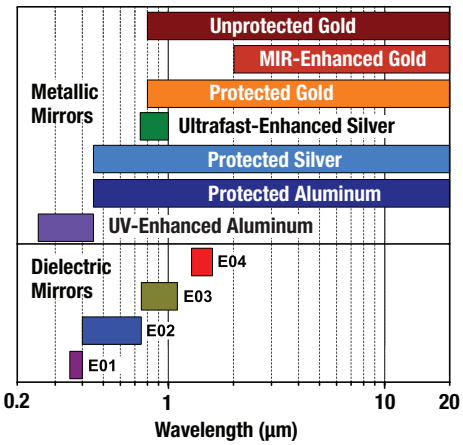


Textured Anti-Reflective Surfaces

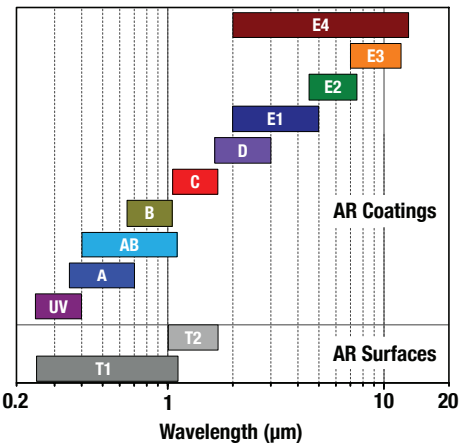
Using a proprietary process, sub-wavelength nanostructures are created on the optic surfaces. This results in extremely low, broadband reflectance of <0.25% and high laser damage thresholds.



HR Coating Ranges: UV to MIR



AR Coating* & Surface Ranges: UV to MIR



*Laser-Line AR Coatings Available: 405, 532, 633, 780, 1064, 532/1064, and 1550 nm

Custom Optical Assemblies

Optical assemblies consist of complex combinations of optical components and mechanical and electronic hardware. Such assemblies are used in a variety of life science, medical, industrial, semiconductor, entertainment, and defense applications. Proper design, assembly, and testing are key to ensuring any optical system works as intended. At Thorlabs, we have 90 000 sq. ft. of manufacturing space dedicated to custom optical assemblies. We can help you tackle and solve complex optical design challenges and can transition a product seamlessly from early concept planning all the way to volume manufacturing.



We will work closely with you to design a solution that fully achieves the requirements of your application.

QuickTurn™ Optics

- Custom Optics and Engineered Multi-Element Assemblies in a Fraction of Typical Industry Lead Times
- Our Vertically Integrated Structure Allows Us to Eliminate Typical Wait Times Between Manufacturing Steps
- Enables our Customers to Have Shorter Product Development Cycles and Faster Times to Market

Custom Solutions

Our design engineers rely on extensive experience and cutting-edge equipment to deliver a variety of challenging assemblies:

- Doublets
- Triplets
- Fast Lenses
- Focus Lens Assemblies
- Zoom Lens Assemblies
- Wide Field of View (FOV) Lenses
- Athermal Lens Systems
- Imaging Lens Assemblies
- Microscope Objectives
- Coupling/Collimation Assemblies

Optical Isolators

Thorlabs offers custom optical isolators with a wide range of center wavelengths, operating temperatures, package sizes, and various other specifications. Our Free-Space Isolators are available in fixed and adjustable narrowband options, as well as broadband and tandem options. Our Fiber Isolators are available with SM or PM fiber.

Free-Space Optical Isolators

- Fixed Narrowband: CWLs from 633 to 1550 nm
- Adjustable Narrowband: CWLs from 375 to 4500 nm
- Broadband: CWLs from 650 to 1000 nm
- Tandem: CWLs from 633 to 1550 nm



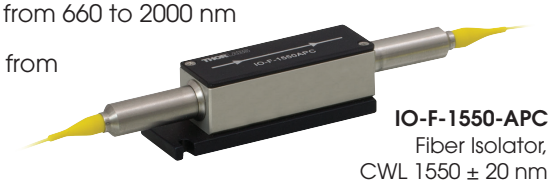
I4500W4
Free-Space Isolator,
CWL 4500 ± 50 nm



IO-5-532-HP
Free-Space Isolator,
CWL 532 -22/+18 nm

Fiber Optical Isolators

- SM Fiber: CWLs from 660 to 2000 nm
- PM Fiber: CWLs from 780 to 2000 nm



IO-F-1550-APC
Fiber Isolator,
CWL 1550 ± 20 nm

Application Services

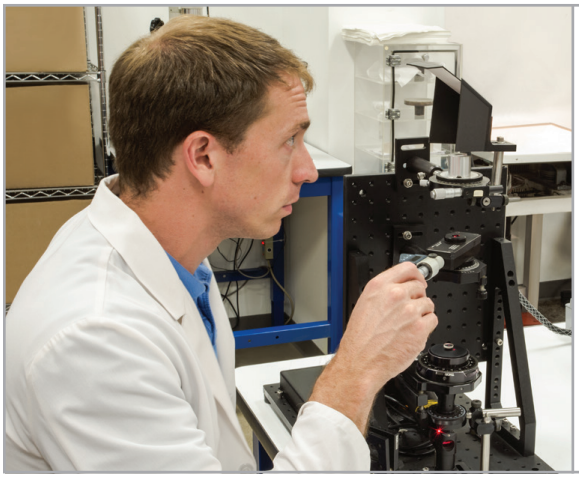
- Direct Integration into Laser Head Assemblies
- Combination Isolator and Fiber Coupling Units
- Filter Integration
- Active Temperature Control and Monitoring
- Feedback Monitoring

Optics Manufacturing Facilities at-a-Glance

Optical Coating

- Ion Beam and Magnetron Sputter Deposition
- E-Beam Deposition With or Without Ion Assist
- Resistive Heating Evaporation Deposition
- In-Process Spectral Characterization
- Coatings Ranging from UV to MIR Wavelengths
- Class 1,000 Clean Room



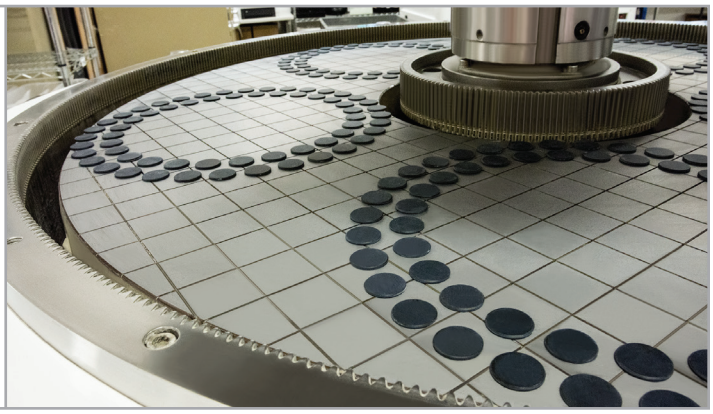


Metrology & Inspection

- Spherical and Aspherical Optics with Sub-Nanometer Surface Precision
- Angstrom-Level Surface Roughness Evaluation
- Transmitted and Reflected Wavefront Error
- Focal Length and Radius of Curvature
- Parallelism, Surface Analysis, Center Thickness, and Centration Errors
- Precision Contact and Noncontact Profilometry
- Laser Alignment of Optical Assembly

Shaping & Finishing

- Spherical/Aspherical Grinders and Polishers
- Single-Point Diamond Turning Machines
- Mills, Dicing Saws, and Coring Drills
- Automated Edging Machines
- Large Volume, Double-Side Polishers
- Magnetorheological Finishing (MRF)
- Conventional Grinders, Polishers, and Saws





Manufacturing Quality Standards

- Compliances Met: ITAR, RoHS, and REACH
- Military Specifications: MIL-PRF-13830B and MIL-C-48497A
- ISO Standards: ISO 10110, ISO 19012, ISO 8039, ISO 9345, and ISO 9001:2015
- Additional: ANSI/ASQ Z 1.4-2003

Worldwide Support



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Email: sales@thorlabs.jp

*Production Facilities for Products Featured in this Brochure