Metal Mirrors

Inrad Optics fabricates and coats glass custom mirrors up to 500 mm in diameter. All mirrors are fabricated, polished, and tested in our Northvale, NJ facility on single spindle and large continuous polishing stations, ensuring complete traceability and satisfaction with every single product.

In addition to traditional glass mirrors, Inrad Optics employs proprietary single-point diamond machining and optical polishing methods to produce high quality metal optics from 5 mm to 1 meter diameter in a wide variety of materials and spherical and aspherical surface shapes.

For ultra-lightweight high-stability mirrors, beryllium and AlBeMet are ideal materials. Beryllium offers high thermal conductivity, corrosion resistance, a low CTE, and the highest strength and stiffness-to-weight ratios of nearly any metal alloy available. These properties make it uniquely qualified for:

- Fast steering mirrors
- Ground vehicle head mirrors
- Space telescope mirrors
- Airborne EO/IR platforms

AlBeMet (/pdfs/whitepaper.pdf) is a cost-effective alternative to pure beryllium. These alloys usually contain 40-62% **beryllium (/pdfs/whitepaper.pdf)** and combines the lightweight strength of Be with the machinability and cost savings of aluminum.

Flatness specifications to **λ**/20, 1-2 µrad slope error, and sub-20 Å surface roughness are readily achieved with our polishing, diamond turning, diamond fly-cutting and post-polishing processes. Inrad Optics specializes in integrating metal optics into optomechanical assemblies – learn more about assemblies **here (/optomechanical-assemblies)**.

Scan Mirrors

Scan mirrors can be elliptical, oval or free-form outline shapes up to 1 meter in the major axis. We can produce both single- and multi-facet elements. Scan mirrors can be machined with integrated features for:

- Mounting, including journals or bearings
- Lightweighting on the backside of the mirror
- Assemblies

Inrad Optics' design-for-manufacturability and machining expertise ensures that all mechanical interfaces conform to tight tolerances that minimize assembly distortion of the finished optic.

Parabolas

Our diamond turning operations can produce parabolic surfaces to the most stringent specifications.

- **Highly Accurate.** Our parabolic optics meet accuracy requirements down to 1/10 wave.
- **Off-axis Elements.** Using our advanced Precitech diamond turning machine, which offers a swing in excess of 40 inches, we can produce off-axis parabolic elements up to 18 inches.

Polygons

We manufacture polygons with ranging from 2 to 360 facets. Polygons are produced with a flycutting operation on high-precision, granite-based diamond cutting machines. In addition to straight polygon surfaces, we also produce rastered polygons using precision rotary indexers with sine-plate adjustment. Polygon features and options include:

- Aluminum construction, both bare and nickel-plated
- Angularity tolerances to less than 15 arcsec
- Facet-to-axis tolerances less than 0.0001-inch
- Optical accuracy to λ/10 P-V, including journals or bearings
- Surface quality to 40/20 scratch dig
- Low scatter polish on nickel
- Electrolytic gold over nickel

Spheric, Aspheric, and Elliptical Mirrors

One of our specialities is in large form factor metal optics. With one of the largest high precision diamond turning machines in the industry, we can produce mirrors as large as 1 meter in diameter. Available surface shapes include:

- Plano
- Spherical
- Elliptical
- Toroidal
- Parabolic
- Nth order aspheres

Aspheric optic features and options include:

- Accuracies exceed λ/10 P-V
- Sizes up to 1 meter diameter
- Slope errors less than 2 µrad
- Datums, tabs and adjacent features to 30 millionths
- Surface finishes down to less than 15Å on nickel-plated mirrors
- Surface quality to 40/20 scratch dig
- Low scatter polish on nickel
- Electrolytic gold over nickel

TYPICAL MIRROR SPECIFICATIONS		
Materials	Fused Silica, Optical Glass, Silicon, Germanium	
	Aluminum, Beryllium, AlBeMet, Electroless-nickel plated substrates, Aluminum-SiC, Silicon Carbide, Stainless Steel, Beryllium Copper, and Molybdenum	
	Non-metal	**Metal**
Dimensions	OD from 5 mm to 500 mm	OD up to 1 meter
	Standard	**Superior**
Angular Accuracy	5 arcmin	1 arcsec
Surface Quality	60-40	20-10
Flatness	< λ/4	< λ/20
Coatings	Dielectric HR, Enhanced and Protected Aluminum, Silver and Gold *(learn more about our **coating (/capabilities/coating/thin-film)** performance and capabilities)*	