AGENDA

• Introduction
• Hyperion Capabilities
• Quotation Review
• Questions & Discussion
What are your biggest supply chain pain points?

- Lack of Oversight
- Long Lead Time
- Provider may not understand end application
- Lack of Engineering Support
- Quality Issues

OUTSOURCING CHALLENGE
WHO ARE WE?

Hyperion is a premium custom optics & optical assembly provider established in 2008. Our team works in an iterative + collaborative way with our clients to optimize their go-to-market strategies.

We specialize in **DFM/ DFA (Design for Manufacturability/ Assembly)** and providing cost-competitive, high-quality custom optics and lens assemblies.

We work with clients in industries such as biomedical, aerospace, commercial sensing, and R&D labs to create compact yet high-performance optical systems.
THE HYPERION DIFFERENCE

ENGINEERING CREATIVITY
Hyperion often comes up with out-of-the-box solutions for challenging optical designs.

FREE INITIAL DESIGN CONSULTATION
Thorough engineering review for component-level design prior to fabrication, complete with tolerance analysis for custom parts.

COMPETITIVE PRICING
Hyperion adopts a cost-effective philosophy and delivers the savings to our customers via optimization of specs and fabrication processes.

Meticulous Engineering Review:
Hyperion conducts a detailed review of the user application to take in all considerations during specs evaluation.

QUICK TURNOVER
Hyperion's diligence to meet short deadline has earned us a reputation of the overseas supplier with the fastest lead time.

CRITICAL STAGE STATUS REPORT
Hyperion regularly updates customers during mid-production for better timeline management and on-time delivery.
FACILITY

TWO MANUFACTURING SITES @JIANGSU

- **DanYang facility**
  - 2,583 sq.ft,
  - SPDT capability
  - Specialized fabrication in high-precision aspherical & free-form optics

- **ChangZhou facility**
  - 21,000 sq.ft.
  - Specialize in volume production of spherical/ custom lens components, & high-precision lens assembly
  - Conventional grinding & polishing devices,
  - 2 Coating chambers with VIS to IR capabilities
LOCAL SUPPORT

SALES OFFICE IN EDISON, NJ

• In-depth understanding of US business culture and processes

• Proximity advantage = better service
  • 24 hours turnaround quotation
  • In-timezone communication
  • Bilingual support
FAST PROTOTYPING

LRIP (LOW RATIO INITIAL PRODUCTION)

- Fast material accesses (strong material suppliers w/ Ohara, CDGM)
- Pre-mold pressed substrates at competitive price
- > 6000+ test plates; dramatically shorten the overall lead time
- Specialized prototyping production team oversees projects with aiming at delivery <4 weeks, from grinding, polishing, to coating
LENS DESIGN WORKFLOW

PROJECT BUDGETARY & EXPECTATION STUDY

PRELIMINARY DESIGN
- Parameters & Analysis
- Cost
- Results Dispatch

YES

NO

TIPS:
- Hyperion Optics is responsible for the final performance of your application.
- Our typical lead time is 1-2 weeks for preliminary design, 4-6 weeks production, further 1 week inspection.
- Acceptance criteria must be clearly stated in P.O.

PRODUCTION PRINTS
- Mechanical Design
- Prints for Production
- Material Preparation

INSPECTION
- Dimensions
- Surface Accuracy
- Centering
- Cosmetic
- Coating Performance

OPTICS

MECHANICS
- Dimensions
- Treatment
- Cosmetic
- Strength

VENDORS
- SCHOTT
- OHARA
- CORNING
- ROHM
- HAAS
- CDGM
- NHG

MATERIAL AVAILABILITY CHECK & COST ANALYSIS
- Best Material Mix
- Material Cost
- Lead Time

YES

NO

ASSEMBLY & TESTING
- MTF Testing
- EFL, BFL Testing
- F# Testing
- Distortion Inspection
- Chromatic Inspection
- Wavefront Error Inspection
- Customized Testing

MANUFACTURING
- Components
- Mechanical Parts

PRODUCTION & ENGINEERING TEAM
- Feasibility
- Optimization Possibility
- Cost: Calculation

YES

NO
DFM/ DFA INPUT

Hyperion’s DFM-Driven Approach = Optimal Cost-to-Performance Ratio

- **Optical Engineering Expertise**
  - 15 Optical and Mechanical Engineers
  - Feasibility Study/ Proof of Concepts
  - Free-Initial Design Consultation

- **10+ Years of Precision Optics Fabrication**
  - Pre-Production Tolerance Analyses
  - 3D CAD Modeling
  - Optimizes Production Yield Based on Application Requirements
CUSTOM COMPONENTS

SPHERICAL LENSES

- Achromatic Doublet Lenses
- Ball & Half Ball Lenses
- Micro Sphere Lenses
- Singlet Lenses

- Plano-Convex/Concave, Bi-Convex, Bi-Concave
- Positive and Negative Meniscus
- Custom coatings
- Available in various optical glass types (Schott, Ohara, CDGM), fused silica, and crystal
- Special treatment (i.e. edge blackening/ special packaging/ labeling) available upon request
CUSTOM COMPONENTS

ASPERHERICAL LENSES

- Capabilities from high precision VIS imaging systems to LWIR/ infrared athermal lenses
- Precise fabrication on optical glasses and infrared materials including Germanium, Zinc Sulfide, Zinc Selenide, Calcium Fluoride, Chalcogenide glasses, and more
- Diameter ranges from 3mm - 250mm *refer to appendix for our standard asphere production tolerances
CUSTOM COMPONENTS

CYLINDRICAL LENSES

- Various optical glass available depending on the design
- Dia. Tol.: ±0.025mm
- Precision grade: Irregularity can achieve 1/10L; S/D 10-5
CUSTOM COMPONENTS

WINDOWS, FILTERS, DOMES, MIRRORS

- Custom fabricated based on drawings and specifications
- Prototyping quantities (as low as 2, 5pcs) available depending on the part
COATING CAPABILITIES
COATING CAPABILITIES

Hyperion offers custom coating designs, including:

- Anti-reflective (AR), High-Reflective (HR), partial reflective coatings
- Dielectric Coatings: BBAR Coatings, V-coatings, Dual wavelength coatings, sharp cut-on and cut-off filters coating
- Other specialized coating, such as ITO, DLC, hydrophobic coating, complex multilayer stacks
ASSEMBLY CAPABILITIES
ASSEMBLY CAPABILITIES

Hyperion Optics has more than 40+ custom precision assembly projects annually, from prototyping to mass production.

Our lens assembly projects range from microscope objective lenses, expanders, to SWIR/MWIR/LWIR lenses, and more.
LENS ASSEMBLIES

COLLIMATING LENS

- Custom collimators in both singlet and chromatic formats
- Responsive at UV-VIS, or VIS-NIR spectrum
LENS ASSEMBLIES

BEAM EXPANDERS

- Consultation on optical & mechanical design
- DFM Engineering/ prototyping services
- End-user application performance guarantee
LENS ASSEMBLIES

SWIR LENSES

- Advantages over visible-NIR wavebands; 900nm-1700nm / 700nm-3400nm
- Compatible with the detector size up to 20mm diagonal and pixel size of 15-50μm
- Machine vision, quality inspection, military applications
- DFM Engineering/ prototyping services
LENS ASSEMBLIES

F-THETA LENSES

- Off-the-shelf design availability
- Laser scanning application
- DFM Engineering/ prototyping services
- End-user application performance guarantee
LENS ASSEMBLIES

MICROSCOPE OBJECTIVE LENSES

- Range from UV to Infrared wavelength
- Diffractive limit microscope objective lenses fit most research oriented labs applications and commercial microscope devices
- Custom options available
METROLOGY

You don’t know what you can’t measure!

- Zygo© Verfire Interferometer
- TriOptics© MTF Station
- Mitutoyo Profiler
- Industrial-grade projector
- CMM Station (Coordinates Measurements)
- Spectrophotometer
METROLOGY

- ASPHERICAL SURFACE
  - Dimension
  - Profile
  - Surface Accuracy
  - Focal Length
  - Centering
  - Coating

- TESTING ITEMS
  - COC Cert
  - Material Cert
  - Inspection Report
  - Profiler Report
  - Spectral Report

- DOCUMENTATION
  - Dimensional data
  - Focal Length
  - Centering Data
  - Cosmetic

- SPHERE SURFACE, DOUBLET/TRIPLET
  - Dimension
  - Radius
  - Surface Accuracy
  - Focal Length
  - Centering
  - Coating

- TESTING ITEMS
  - COC Cert
  - Material Cert
  - Inspection Report
  - Interferometry Report
  - Spectral Report

- DOCUMENTATION
  - Dimensional data
  - Radius
  - Focal Length
  - Centering Data
  - Cosmetic

- LENSES
  - MTF
  - EFL, BFL
  - F#/N.A
  - Chromatic Aberration
  - Distortion
  - Chief Ray Angle

- TESTING ITEMS
  - COC Cert
  - Material Cert
  - Elements Inspection Report
  - Lens Inspection Report
  - Interferometry Report
  - MTF Chart Report
  - Spectral Report

* Customized Documentation is also available
ISO:9001:2015 CERTIFIED

QUALITY ASSURANCE IS OUR COMMITMENT

- Renewed/ Upgraded to 9001:2015
- Material certificate & COC
- Each order shipment include standard inspection reports
  - Dimensional measurements
  - Zygo Interferometry reports
  - Actual coating curve
  - Profiler plot
  - Custom/ specialized tests available upon request*

We hereby certify that the organization:
Hyperion Optics

Is in conformity with Quality Management System Standard:
GB/T19001-2016 idt ISO9001:2015

The certificate is valid to the following product(s)/service:
Sales and manufacturing service of Laser crystal, optical prism, windows, spherical and aspherical lenses, filters (VIS to IR), optical system design, assembly and metrology

Registration Address: Nanjing Jiangning district, Changxing street 764-302 Xintiandi block building 14 302
Audit Address: Nanjing aoti avenue #118, Danjie road #100

Date of Initial Issuance: Mar 05, 2019
Date of This Issuance: Mar 05, 2019
Date of Expiration: Mar 04, 2022

*Renewed/ Upgraded to 9001:2015
• Material certificate & COC
• Each order shipment include standard inspection reports
  • Dimensional measurements
  • Zygo Interferometry reports
  • Actual coating curve
  • Profiler plot
  • Custom/ specialized tests available upon request*
ISO:9001:2015 CERTIFIED

QUALITY ASSURANCE IS OUR COMMITMENT
APPENDIX A-1

MANUFACTURING TOLERANCES FOR SPHERICAL LENSES

<table>
<thead>
<tr>
<th></th>
<th>COMMERCIAL GRADE</th>
<th>FACTORY STANDARD</th>
<th>PRECISION GRADE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter Tolerance (mm)</td>
<td>±0.05</td>
<td>±0.03</td>
<td>±0.0125</td>
</tr>
<tr>
<td>Center Thickness (mm)</td>
<td>±0.01</td>
<td>±0.03</td>
<td>±0.025</td>
</tr>
<tr>
<td>Radius (%)</td>
<td>±1%</td>
<td>±0.5%</td>
<td>±0.3%</td>
</tr>
<tr>
<td>Focal Length Tolerance (%)</td>
<td>±3%</td>
<td>±1%</td>
<td>±0.5%</td>
</tr>
<tr>
<td>Cosmetic (MIL-C-13830A)</td>
<td>100-80</td>
<td>40-20</td>
<td>10-5</td>
</tr>
<tr>
<td>Figure Tolerance in λ (Pow/irreg)</td>
<td>3 - 1</td>
<td>2 - 1/4</td>
<td>1 - 1/10</td>
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<tr>
<td>Centration (Arc min)</td>
<td>6</td>
<td>&lt;3</td>
<td>&lt;1</td>
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<tr>
<td>Dia. To Thick Ratio</td>
<td>9~50:1</td>
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<td></td>
</tr>
<tr>
<td>Coating (T% avg)</td>
<td>96-98%</td>
<td>99%</td>
<td>99.5%</td>
</tr>
<tr>
<td>Materials</td>
<td></td>
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# APPENDIX A-2

## Manufacturing Tolerances for Aspherical Lenses

### Manufacturing Limits for Aspheric Surfaces

Based on Form Error Tolerance

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter (mm)</td>
<td>3</td>
<td>250</td>
</tr>
<tr>
<td>Local Radius (mm)</td>
<td>-8 (Concave)</td>
<td>∞</td>
</tr>
<tr>
<td>Sag (mm)</td>
<td>0</td>
<td>502</td>
</tr>
<tr>
<td>Departure (mm)</td>
<td>0.01</td>
<td>20</td>
</tr>
<tr>
<td>Included Angle (°)</td>
<td>0</td>
<td>120</td>
</tr>
</tbody>
</table>

### Form Error 0.5 – 2μm Higher Resolution Profilometry (2-D)

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter (mm)</td>
<td>3</td>
<td>250</td>
</tr>
<tr>
<td>Local Radius (mm)</td>
<td>-12 (Concave)</td>
<td>∞</td>
</tr>
<tr>
<td>Sag (mm)</td>
<td>0</td>
<td>252</td>
</tr>
<tr>
<td>Departure (mm)</td>
<td>0.01</td>
<td>20</td>
</tr>
<tr>
<td>Included Angle (°)</td>
<td>0</td>
<td>150</td>
</tr>
</tbody>
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### Form Error < 0.5μm Interferometry with Stitching (3-D)

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter (mm)</td>
<td>3</td>
<td>250</td>
</tr>
<tr>
<td>Local Radius (mm)</td>
<td>-13 (Concave)</td>
<td>∞</td>
</tr>
<tr>
<td>Sag (mm)</td>
<td>0</td>
<td>252.4</td>
</tr>
<tr>
<td>Departure (mm)</td>
<td>0.002</td>
<td>1</td>
</tr>
<tr>
<td>Included Angle (°)</td>
<td>0</td>
<td>120+5</td>
</tr>
</tbody>
</table>
## APPENDIX A-3

MANUFACTURING TOLERANCES FOR ACYCLINDRICAL LENSES

<table>
<thead>
<tr>
<th>Achromatic Cylindrical Lenses</th>
<th>Commercial Grade</th>
<th>Factory Standard</th>
<th>Precision Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size Tolerance Length/Width (mm)</td>
<td>+0/-0.30</td>
<td>+0/-0.25</td>
<td>+0/-0.25</td>
</tr>
<tr>
<td>Diameter (mm)</td>
<td>+0/-0.15</td>
<td>+0/-0.10</td>
<td>±0.025</td>
</tr>
<tr>
<td>Wedge (along axis)</td>
<td>5 mrad</td>
<td>3 mrad</td>
<td>1 mrad</td>
</tr>
<tr>
<td>Focal Length Tolerance (%)</td>
<td>±2%</td>
<td>±2%</td>
<td>±1%</td>
</tr>
<tr>
<td>Cosmetic (MIL-C-13830A)</td>
<td>80-50</td>
<td>60-40</td>
<td>10-5</td>
</tr>
<tr>
<td>Irregularity (Lambda @ 632.8nm)</td>
<td>1 L</td>
<td>1/2 L</td>
<td>1/10 L</td>
</tr>
<tr>
<td>Centration (Arc min)</td>
<td>&lt;5'</td>
<td>&lt;3'</td>
<td>&lt;1'</td>
</tr>
<tr>
<td>Coating (T% avg)</td>
<td>99%</td>
<td>99.5%</td>
<td>99.5%</td>
</tr>
<tr>
<td>Materials</td>
<td>Optical Glasses Depends On Design</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
THANK YOU!

We Look Forward To Becoming Your Trusted Partner In Your Optics Procurement Process