Shanghai OPTICS

Shanghai Optics
Optical Components

Why Shanghai Optics?

- Low cost and high quality
- Short lead times
- Rapid prototyping
- DFM (Design for manufacturing) input
- World-class customer service that is “Second to none!”
- Strategically placed sales office to support customers in North America

Material

- Schott /Ohara/Chinese Equivalent Glass
- Color glass/Schott Equivalent
- Pyrex
- Zerodur
- Silicon
- Quartz
- CaF_2, MgF_2

- Fused Silica
- GaAs
- Ge
- ZnSe
- ZnS
- YVO_4
- $LiNbO_3$
- Sapphire

Glass/Plastic Molding

Shanghai Optics can offer precision molded laser optical blanks from 2.4mm to 100mm with a fine polished finish on all surfaces using our developed technique. Fine custom etching of text or graphics are also available.

After molding tech:

- Ideal for higher requirement on the lens' specs
- Molding limited precision breaking
- Bevel grinding/adjusting, tighten tolerance for assembly

These custom shaped parts can be offered in many different materials (Corning, Schott, Ohara, CDGM).
Melt data available upon request.

Molding Glass/Small Volume

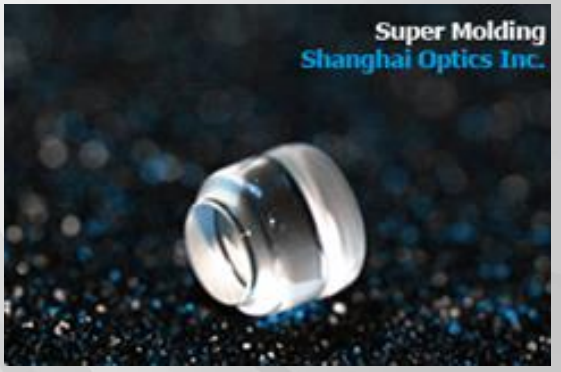
Lower costs -

- Affordable prototyping cost, saving you costs on molding fees.
- Small volume production available without molding investment.
- Quick turn around time for prototyping adjustment.

Improve specifications -

- Better surface quality, bevels, and OD fully polished to 60/40 grade.
- Tighter dimensional tolerance, +/- 0.05 mm.
- Improved yield than traditional molding method.

Custom shaped parts can be offered in many different materials (Corning, Schott, Ohara, CDGM), with melt data available.



Aspheric Design & Manufacturing

Molding -

Shanghai Optics utilizes plastic material and several different glasses that are suitable for precision molding due to their low transformation temperatures, including Acrylic, Plastic, BK-7, B270, Pyrex, Borosilicate, F2 etc.

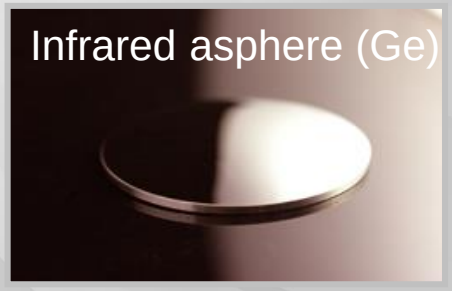
Polishing –

At Shanghai Optics we pride ourselves in our ability to produce affordable high precision glass aspheres that can give our customers a competitive advantage.

Diameter: from under 10 mm to over 300 mm.

Maximal aspheric deviation from best-fit-sphere: from a few waves to a few millimeters.

Maximal PV of surface from error: from under 1/10 wave to a few waves.



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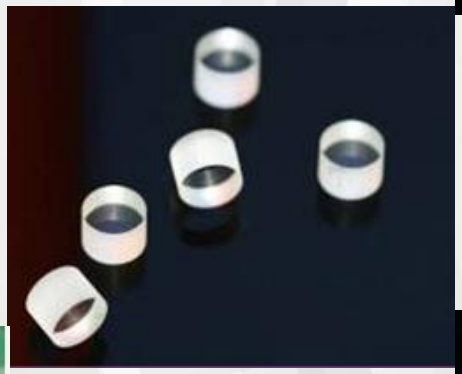
Optical Products

- Micro Optics
- Mirrors
- Sphericals (Lenses, Doublets, Triplets)
- Asphere
- Plano Optics
- Cylinders
- Prisms
- Beamsplitters



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Optical Mirrors

Flat Mirror -

- Dielectric mirror
- Metallized mirror
- Cold mirror

Focusing Mirror

- Reflector
- Off-axis parabolic metal mirror
- Spherical mirror

Diverging Mirror

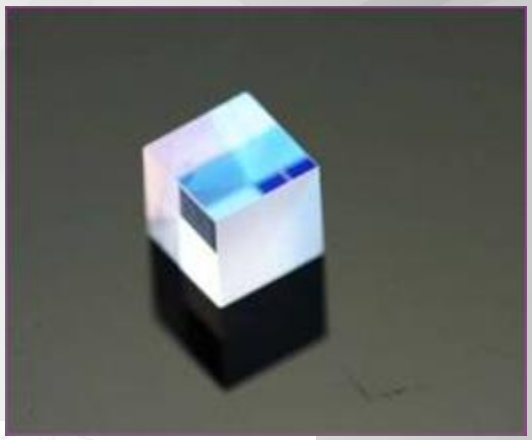
- Convex spherical mirror

Micro Optics

Microlenses -

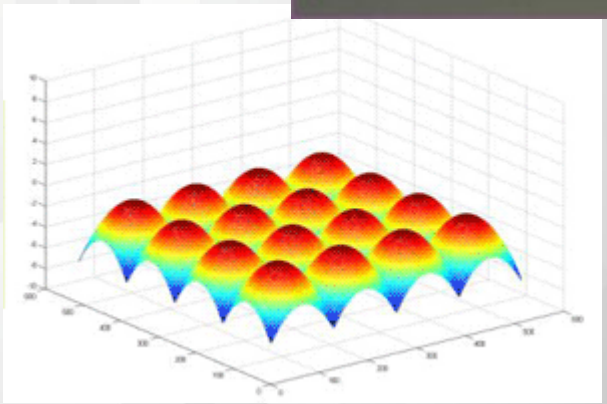
- Microlenses for a variety of demanding miniaturization applications
- Diameters down to 0.06 inches - focal lengths to less than 2mm
- Plano convex, plano concave, biconvex, and biconcave lens shapes available as standard parts
- Precision polished to λ/2 surface figures
- Ideal for coupling fibers and laser diodes to each other - or to systems
- Mounting of microlenses in aluminum housings available

Micro Optics



Microlens Arrays

- Excellent uniformity in focal length and extremely low insertion loss for 1D and large 2D array configurations
- High Transmission with Low Insertion Loss (<0.5 dB)
- Spherical Error <15nm rms, <70nm p-v
- Diffraction limited lenses possible



Applications:

- DWDM (MUX, DeMUX, Optical add/drop)
- Optical Switches, Amplifiers, and Isolators
- Variable Optical Attenuators
- Waveguide to Fiber Coupling

Micro Optics

Micro Penta Prism

- Material:BK7 glass
- Dimension Tolerance: +0.0, -0.2 mm
- Clear Aperture: >80%
- Flatness: λ/2 @632.8 nm
- Surface Quality: 60-40 scratch and dig
- Reflectivity: R>95% per face @ center wavelength
- Working Wavelength: 1310, 1550, 1590 mm
- Bevel: 0.2 mm to 0.5 mm

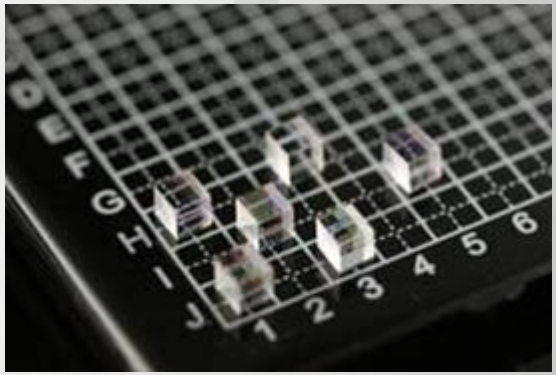
Micro Right-Angle Prisms

- Material: BK7 Grade A optical glass
- 90 degree Deviation Tolerance: Standard series: <30 arc seconds
  Precision series: <10 arc seconds
- Flatness: Standard series: λ/2 at 632.8 nm
  Precision series: λ/4 at 632.8 nm
- Reflectivity: R > 95% per face from @1550 nm
- Surface Quality: 40-20 scratch and dig
- Working Wavelength: 1310, 1550, 1590 nm

Micro Optics

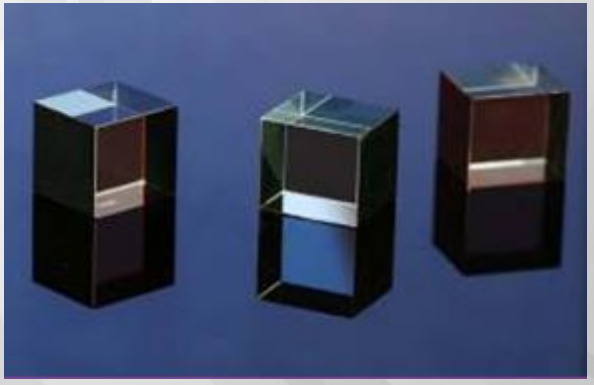
Micro PBS

- Micro PBS separates a laser beam into two different polarization beams. Micro PBS is generally used in fiber optical communication as the core component of polarizer, polarization beam combiner, and interleaver.



Specification:

- Material: BK7 grade A, optical glass
- Dimension: 0.2mm
- Flatness: λ/4 @ 632.8 nm per 25mm or better
- Extinction Ratio: >100:1
- Beam Deviation: <3 arc minutes
- Principal Transmittance: >98% and Ts<0.5%
- Principal Reflectance: Rs>99.5% and Rp<2%
- Coatings: Polarization beamsplitter coating on hypotenuse face, AR-coatings (R<0.25%) on all input and output face.



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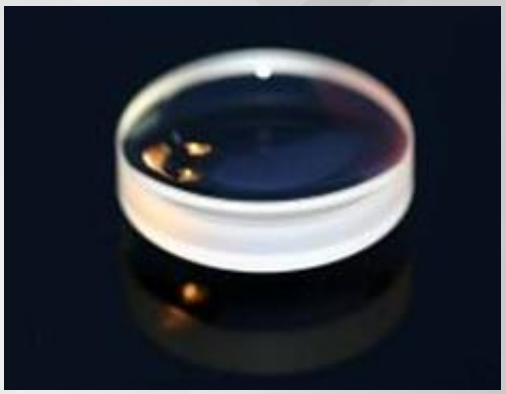
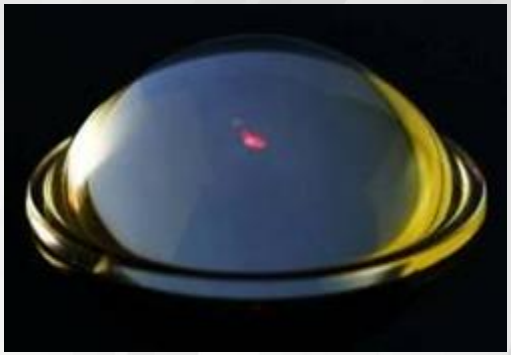
Spherical Lenses (Doublets, Triplets)

- Glass Quality (Nd): +/- 0.0005
- Diameter: + 0/- 0.01 mm
- Center Thickness: +/- 0.010 mm
- Radius: +/- 0.025%
- SAG: +/- 0.01 mm
- Radius: +/- 0.025%
- Wedge Lens (ETD, mm): 0.002
- Irregularity (fringe): λ/10
- Scratch and Dig: 10 – 5



Material:
BK7, Fused Silica, MgF2, CaF2, Sapphire etc.

Aspheric Lenses



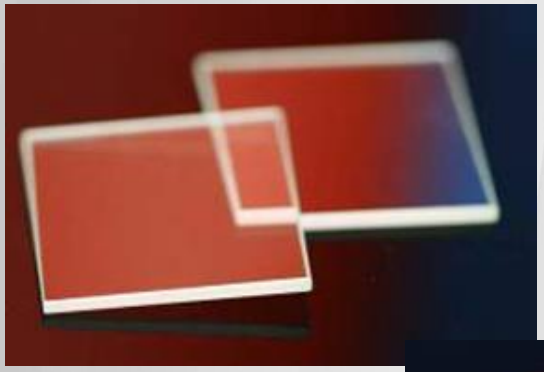
Applications:

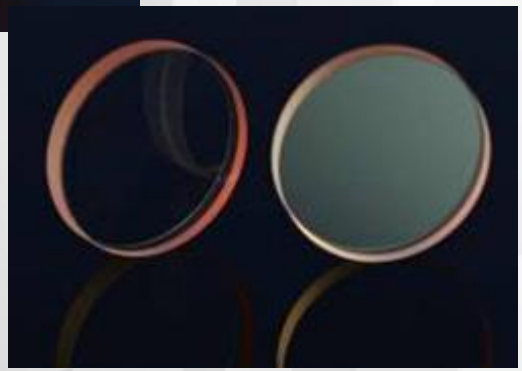
- Digital Still Cameras (DSC)
- Digital Single Lens Reflex Cameras
- Camcorders
- Digital Projection
- Microscopy Eyepiece
- Binoculars
- Illumination Systems

Optical Glass Asphere
Material: Glass, Fused Silica
Infrared Material Asphere
Material: Si, Ge, ZnSe, ZnS
and more

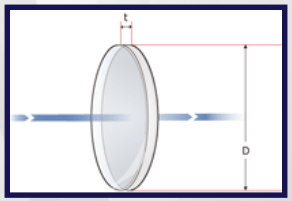
Forms of Supply:
Lens diameter: 5 to 120 mm
Lens thickness: 2 to 10 mm
Radii / pole radii Concave 20 to 250 mm
Radii / pole radii Convex 20 to 250 mm

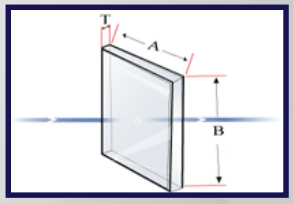
Plano Optics





- Glass Quality (Nd): +/- 0.0005
- Dimension (mm): + 0/ - 0.01
- Wedge Prism: 1 arc sec
- Parallelism: 5 arc sec
- Irregularity (fringe): λ/10
- Scratch-Dig: 10 – 5
- Parallelism: 5 arc sec

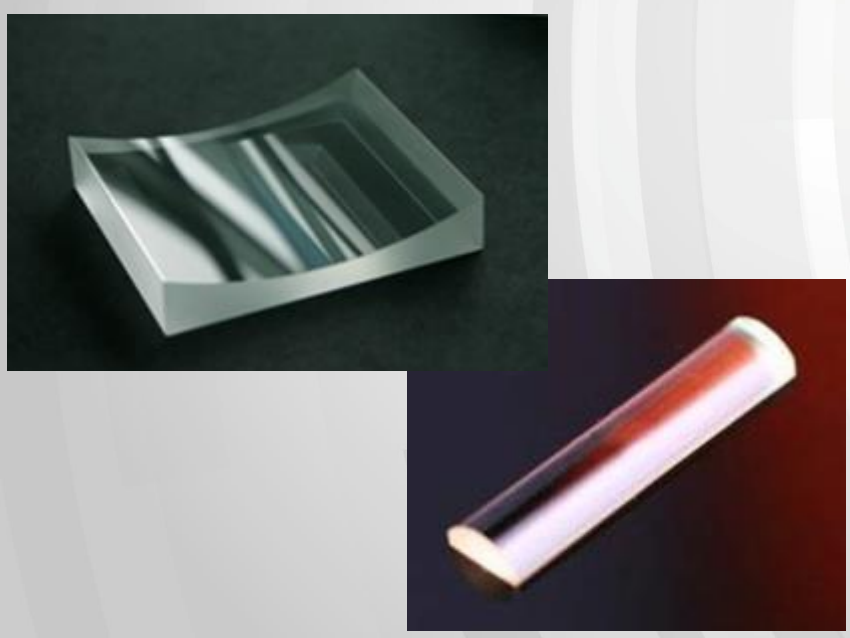




Material:
BK7, Fused Silica, MgF2, CaF2, Sapphire etc.

Cylindrical Lenses

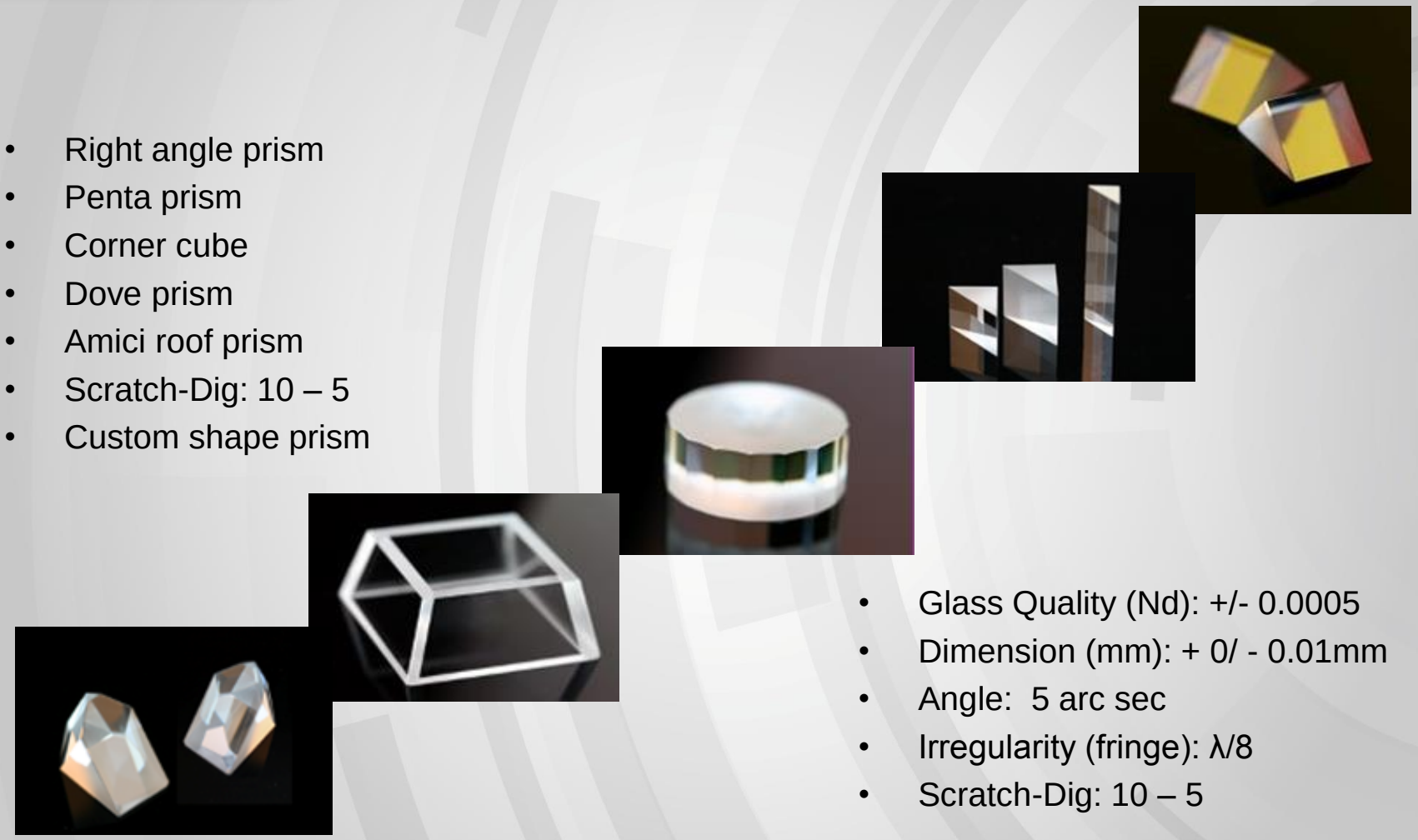
A cylindrical lens is a lens which focuses light which passes through onto a line instead of a point, as a spherical lens would. The curved face or faces of a cylindrical lens are sections of a cylinder that focus the image passing through it onto a line parallel to the intersection of the surface of the lens and a plane tangent to it. The lens compresses the image in the direction perpendicular to this line, and leaves it unaltered in the direction parallel to it (in the tangent plane). Lenses with cylindrical characteristics can be used to correct ocular astigmatism.



- Substrate Material: BK7, Fused Silica and more
- Shape: P-Concave, P-Convex or Aspheric
- Focal length: +/-1%
- Surface Quality: 40-20(after coating)
- Surface figure: l/4 @ 633nm
- Angle: +/-5"

Prisms

- Right angle prism
- Penta prism
- Corner cube
- Dove prism
- Amici roof prism
- Scratch-Dig: 10 – 5
- Custom shape prism



- Glass Quality (Nd): +/- 0.0005
- Dimension (mm): + 0/ - 0.01mm
- Angle: 5 arc sec
- Irregularity (fringe): λ/8
- Scratch-Dig: 10 – 5

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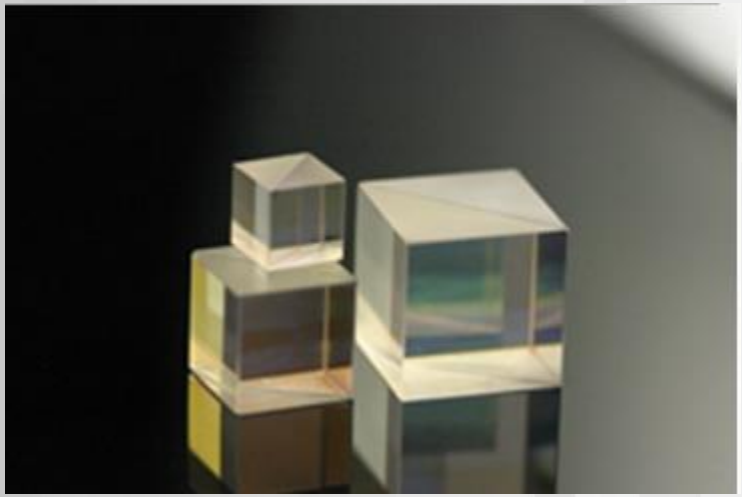
Beamsplitter



- Material: BK7 Grade A Optical Glass
- Dimension Tolerance: +/- 0.2mm
- Flatness: l/4 @ 632.8 nm Surface
- Quality: 60/40 scratch and dig
- T/R: 50/50+/- 5% T=(Ts+Tp)/2, R=(Rs+Rp)/2
- Beam Deviation: <3 arc minutes

- Broadband Non-Polarizing Beamsplitter Cube
- Broadband Polarizing Beamsplitter Cube
- Narrowband Beamsplitter Cube
- Laser Polarizing Beamsplitter Cube

UV & IR Optics

Shanghai Optics offers high quality standard ultraviolet and infrared optics. From Germanium to Zinc Selenide and Silicon, our IR optics are an excellent choice to reduce prototyping costs and speed up the time it takes to get products onto the market. Contact us to discuss your application and for pricing on standard and custom UV & IR optics.

Infrared Optics Specifications	
Infrared Materials	Zinc Selenide (ZnSe)
	Germanium (Ge)
	Silicon (Si)
Coating	Reflective, Anti-Reflective, Beamsplitting, Filter, etc.
Optic Types	Flats (Windows, Mirrors, Prisms, Beamsplitters)
	Spherical (PI-CX, Bi-CX, PI-CV, Bi-CV, Meniscus)
	Aspheric

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UV & IR Optics

Ge Components

Germanium is the most widely used infrared material for windows and optical elements in thermal-imaging systems. Germanium has excellent transmission across 2-14μm waveband and can be used in both mid-wave infrared and long-wave infrared systems.

- High Index of Refraction
- Minimal Chromatic Aberration Due to Low Dispersion
- Perfect for Rugged IR Applications

Aspheric Ge Lens

Ge Window

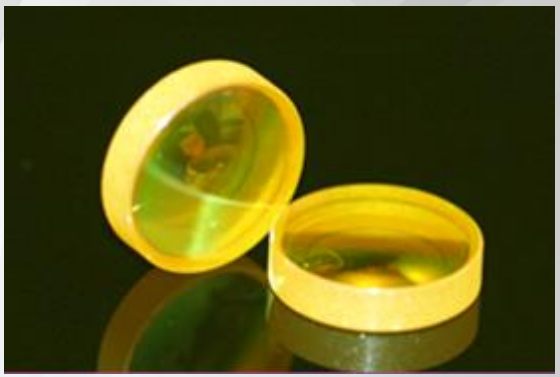
Spherical Ge Lens

UV & IR Optics

ZnSe Components:

ZnSe Lenses

- Usable Transmission Range is 0.6µm to 16µm
- Low Dispersion



ZnSe Windows

- Low Dispersion
- Greater than 90% Transmission from 3 - 12µm
- Ideal for Thermal Imaging, FLIR, and Medical Systems

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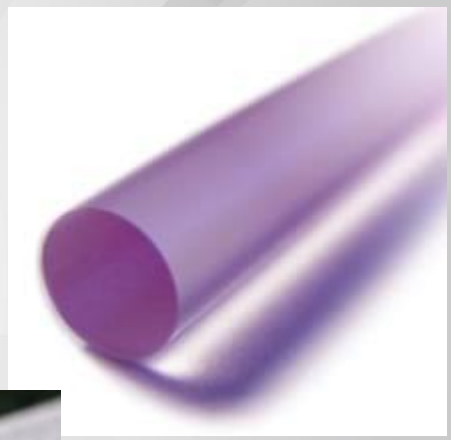
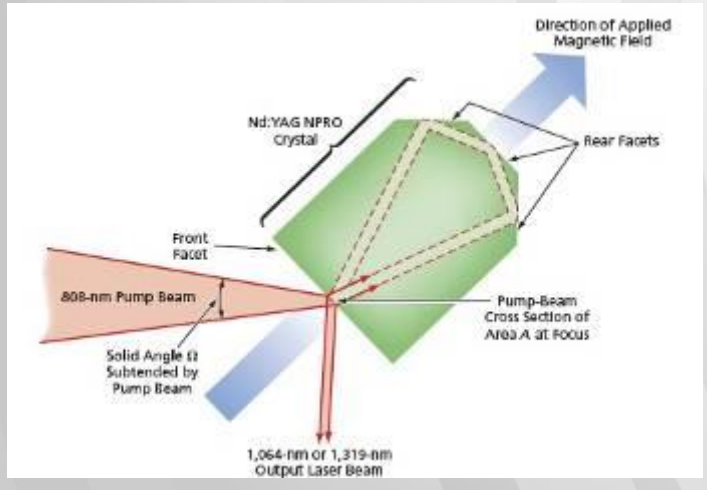
a-BBO

- Surface Quality: 20/10 Scratch and Dig
- Beam Deviation: <3 arc min
- Optical Axis Orientation: +/-0.5
- Flatness: λ/4 @632.8 nm
- Transmission Wavefront Distortion: <λ/2 @632.8 nm
- AR-coating: R<0.5%

YAG (Nd, Yb, Cr, Ce, Tm)

- Diameter Tolerance: +/-0.05mm(standard), +/-0.02mm(special)
- Length Tolerance: +/-0.75mm(standard), +/-0.25mm(special)
- Perpendicularity: <5 m(standard), <2 m(special)
- Parallelism: <10 s(standard)
- Flatness: λ/4(standard), λ/10(special)
- Scratch-Dig: 20-10(standard),10-5(special)





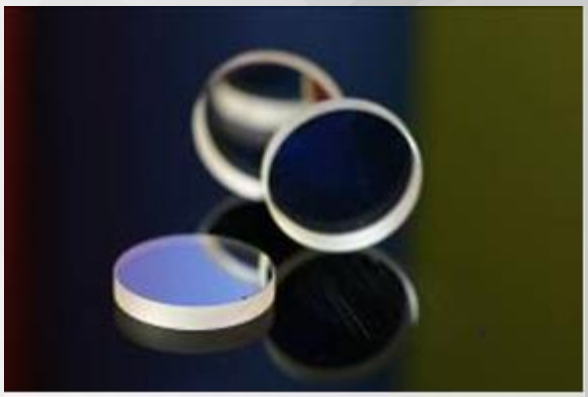
YVO4 (Nd, Yb, Cr, Ce)

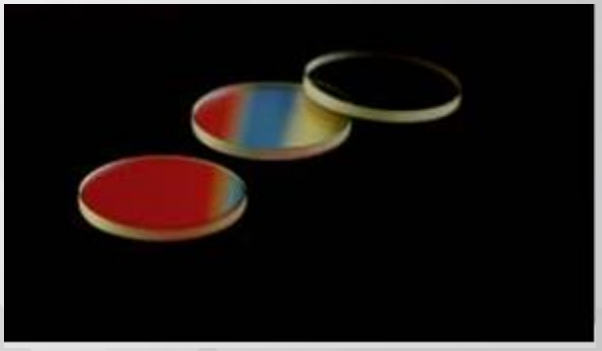
- Dimension tolerance: (W +/- 0.1 mm) x (H +/- 0.1 mm) x (L +/- 0.05mm)
- Transmitting wavefront distortion: λ/8 @633nm
- Clear aperture: > 90% central area
- Flatness: λ/8 @633nm
- Scratch/Dig code: 10/5 to MIL-O-13830A
- Parallelism: better than 10 arc seconds
- Perpendicularity: 5 arc minutes
- Angle tolerance: $\Delta\theta$< +/-0.5°, $\Delta\Phi$ < +/- 0.5°
- AR coating: R< 0.2% at 1550nm
- Wedge Angle tolerance: 0.1° (wedges)

KTP

Potassium Titanyl Phosphate (KTP) has the following exceptional properties that make it a very important nonlinear crystal:

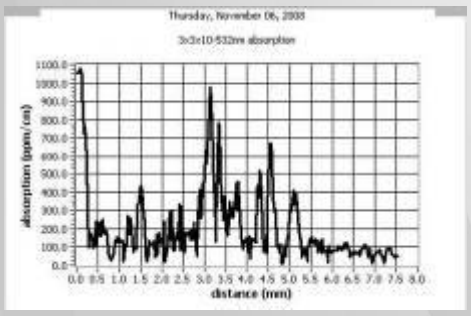
- Large nonlinear optical coefficient
- Wide angular bandwidth and small walk-off angle
- Broad temperature and spectral bandwidth
- High electro-optic coefficient and low dielectric constant
- Large figure of merit
- Nonhydroscopic, chemically and mechanically stable
- High thermal conductivity
- Moisture free
- Minimum mismatch gradient
- Low cost compare with BBO and LBO

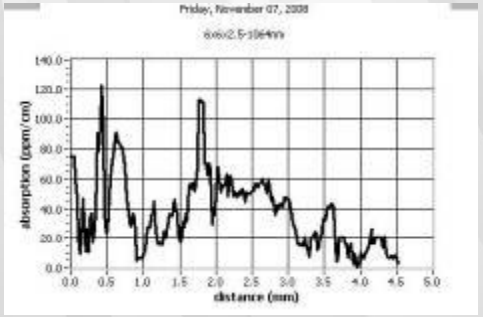




LBO

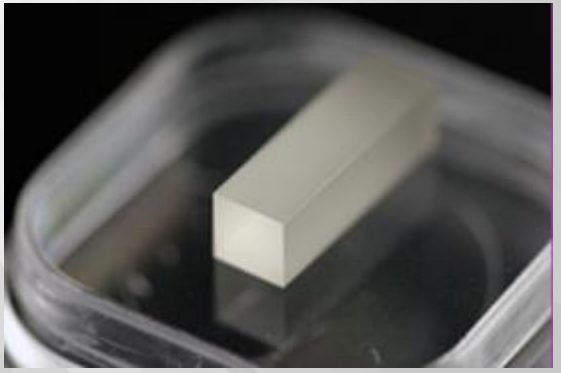
- Dimension tolerance: (W +/- 0.1 mm) x (H +/- 0.1 mm) x (L + 0.2 mm/-0.1mm)
- Flatness: λ/8 @633nm
- Clear aperture: > 90% central area
- Surface quality: 10/5 Scratch/Dig per MIL-O-13830A
- Parallelism: <20 arcsec
- Perpendicularity: <5 arcmin
- Angle tolerance : $\Delta\theta < +/-0.5^\circ$, $\Delta\Phi < +/- 0.5^\circ$
- AR coating:
  (SHG): R< 0.25% at 1064nm and R<0.4% at 532 nm
  (THG): R< 0.6% at 1064nm & R<0.4% at 532 nm & R<0.5% at 355 nm
- Coat damage threshold: >500MW/cm^2





$LiNbO_3$

- Dimension tolerance: +/-0.1mm
- Flatness: λ/8 @633nm
- Clear aperture: > Central 90%
- Surface quality: 20/10 Scratch/Dig per MIL-O-13830B
- Parallelism: better than 20 arc seconds
- Perpendicularity: 5 arc minutes
- Orientation: +/-0.5°
- AR coating: with R < 0.2% at center wavelength
- Material: Laser grade $LiNbO_3$



Ti: Sapphire

- Orientation: Optical axis C normal to rod axis
- Ti2O3 concentration: 0.06 - 0.5wt %
- Figure Of Merit: >250
- End configurations: Flat/Flat or Brewster/Brewster ends
- Flatness: l /10 @ 633 nm
- Parallelism:10 arc sec
- Surface finishing:10/5 scratch/dig to MIL-O-13830A
- Wavefront distortion: l /4 per inch
- Note: AR Coating is available on request

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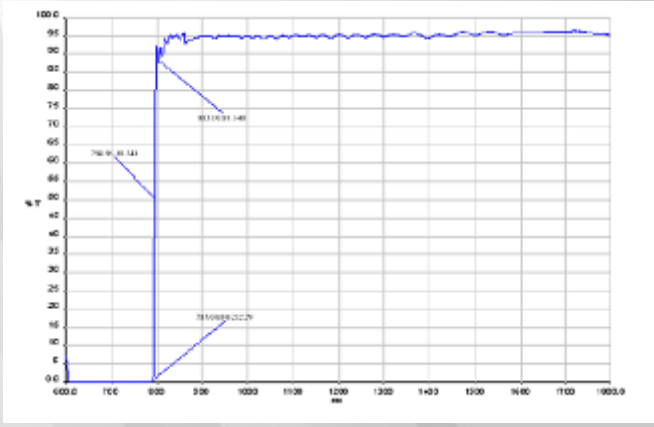
Raman Filter

Specifications:

- Edge Steepness: 0.5% of laser wavelength (typical)
- Transition Width: <2% of laser wavelength (from T=50% to OD6)
- Laser Damage Threshold: 1J/cm^2@532nmwith 10ns pulse width
- Mounting: Black-anodized aluminum ring
- Diameter Tolerance: +0/-0.1mm
- Thickness Tolerance: ±0.1mm
- Angle of Incidence: 0.0±2.0°
- Cone Half Angle: <5°
- Angle Tuning Range: -0.3% of laser Wavelength
- Temperature Dependence: <5ppm/° C
- Operating Temperature: - 45° C~ 85° C
- Physical Durability: MIL-C-48497A
- Laser Line Blocking: >6.0 Optical Density
- Clear Aperture: >80%
- Passband Transmission: >90%
- Surface Quality: 60-40
- Beam Deviation: <30 arc sec
- Transmitted Wavefront: 1/4λRMS@633nm (per inch)
- Environmental Durability: MIL-STD-810F
- Substrate Material: Fused silica or NBK7 or equivalent



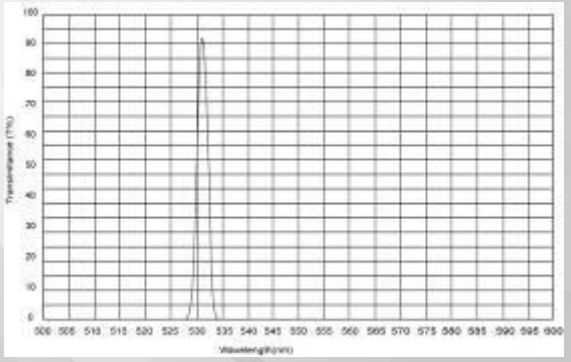
Laser Line Filter

Features:

- Ultrahigh Peak Transmission T >90%
- Excellent Blocking (OD>5.0) from ±1% of Laser Wavelength
- Narrow Bandwidth Typical FWHM is <0.38% of Laser Wavelength
- Hard Coatings and No Adhesives for Long Filter Life
- Dielectric Coated with IBS Technology

Specifications:

- FWHM, Typical: 0.38% of λc
- FWHM, Maximum: 0.7% of λc
- Blocking: OD>5.0 from λc±1.0% OD>6.0 from λc±1.5%
- Peak Transmittance : >90%
- Angle of Incidence: 0.0° ±2.0°
- Transmitted Wavefront: 1/4 λRMS@633nm per inch
- Diameter Tolerance: +0/-0.1mm
- Temperature Dependence: <5ppmr/° C
- Thickness Tolerance: ±0.1mm
- Surface: 60/40
- Beam Deviation: < 11 arc sec.
- Substrate: Low Fluorescence BK7 or Equivalent



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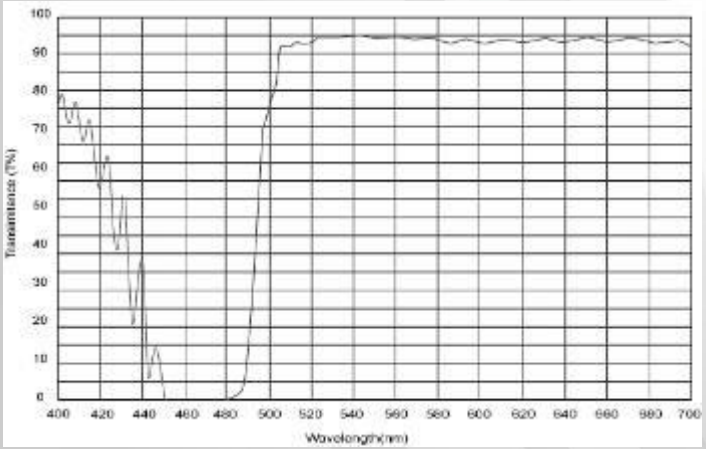
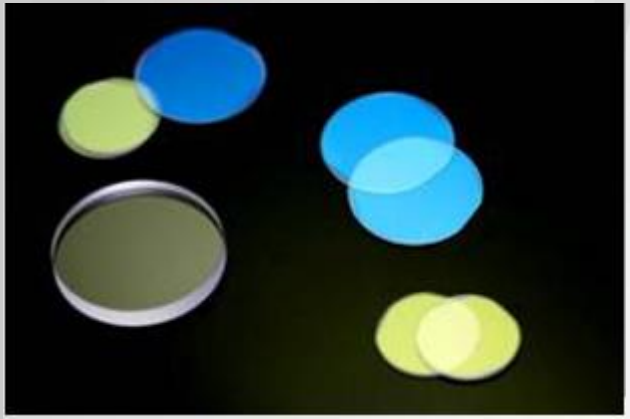
Dichroic Filter

Specifications:

- Angle of Incidence: 45.0°
- Longpass Type Transmittance: Tabs>90%
- Shortpass Type Transmittance: Tabs>85%
- Reflection Band: Rabs>98%
- Transmitted Wavefront: 1/4λRMS@633nm (per inch)
- Substrate: UV Grade Fused Silica



Fluorescence Filter

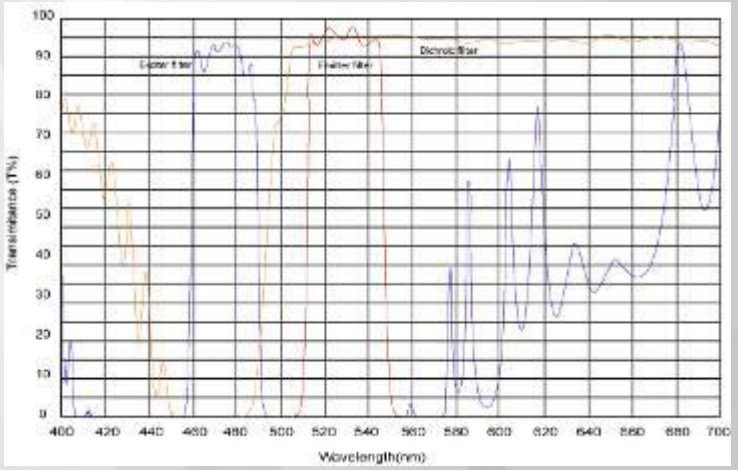


Application:

- Fluorescence Microscope
- Co-localization Fluorescence Measurements
- Fluorescence in Situs Hybridization (FISH)
- Comparative Genomic Hybridization (CGH)
- Gel and Spot Imaging Comparisons

Specifications:

- Diameter Tolerance: +0/-0.1mm
- Passband Transmission: T>90%
- Surface Quality: 60-40
- Angle of Incidence: 0° +/- 5°
- Beam Deviation: <11 arc sec.
- Transmitted Wavefront: 1/4λRMS@633nm
- Temperature Dependence: <5ppm/° C
- Blocking OD>6.0(typical): UV-700nm, λc <500nm
  UV-925nm, λc >500nm
- Substrate: Low Fluorescence BK7 or Equivalent



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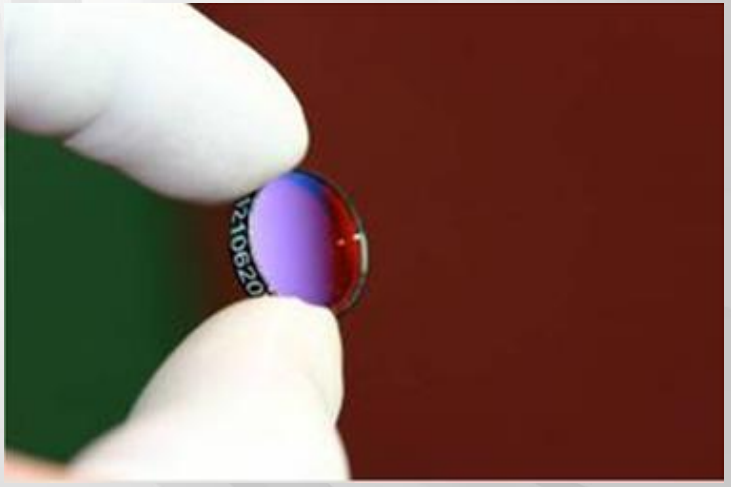
High Transmission OD6 Bandpass Filter

Our High Transmission OD6 Bandpass filters are perfectly matched to common fluorophores used in fluorescence imaging applications. Featuring >93% transmission and >OD6 blocking outside of the passband, these filters are also ideal components in spectroscopy and clinical chemistry applications and biotech instrumentation. Each filter is hard sputtered coated on a single fused silica substrate, and mounted in a black anodized ring.

Features of High Transmission OD6 Bandpass Filters:

- Common Wavelengths for Popular Fluorophores
- >93% Transmission
- >OD6 Blocking, <3% from Edge of Bandwidth

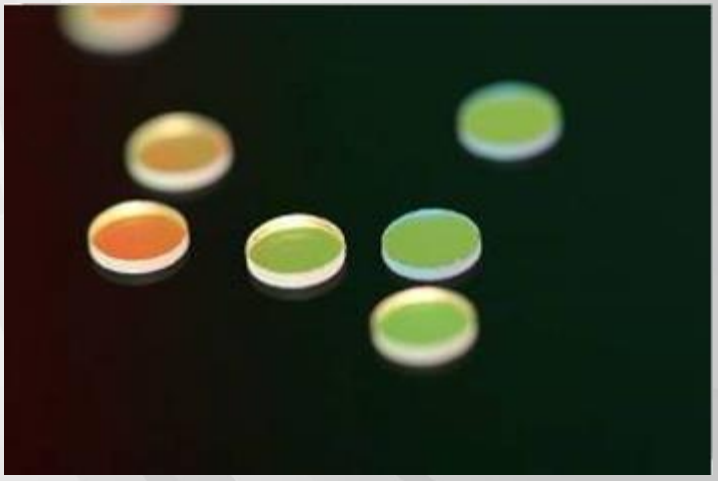


OD4 Notch Filters

Our OD4 Notch Filters are low-cost alternatives to our families of Rugate Notch Filters. They feature narrow rejection bands of just ±2.5% of the CWL while offering >99% reflection of the laser wavelength. The low cost design offers a more limited transmission range than the Rugate Filters. The filters are fabricated utilizing our hard sputtered APRS technology, guaranteeing durable coatings that will not degrade with time, temperature, or humidity. All filters are mounted in black anodized rings which have been engraved to ease filter handling, identification, and orientation.

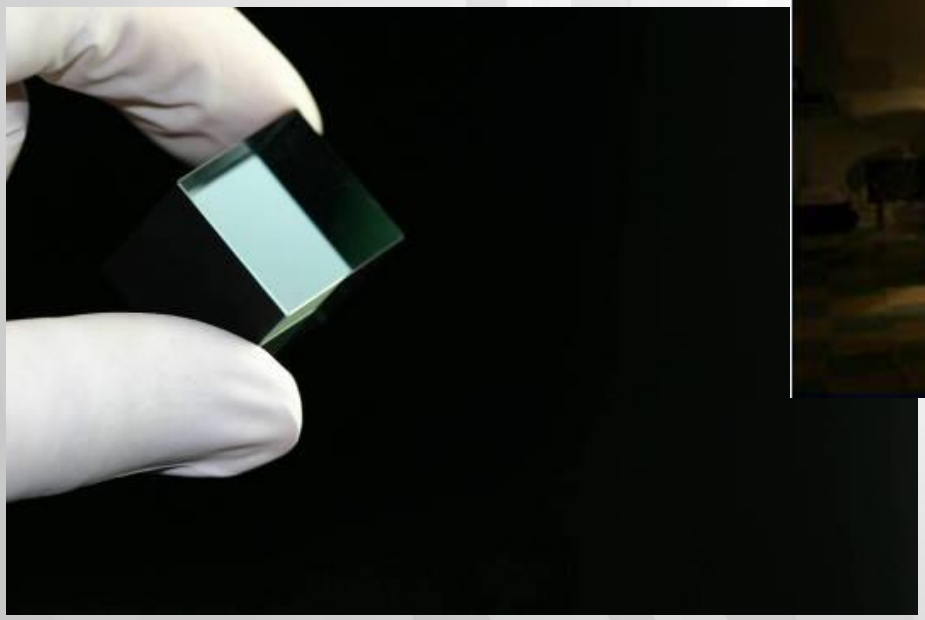
Features of High Transmission OD4 Notch Filters:

- Low Cost Design
- >OD 4.0 Rejection of Laser Wavelength
- Broad Transmission Range



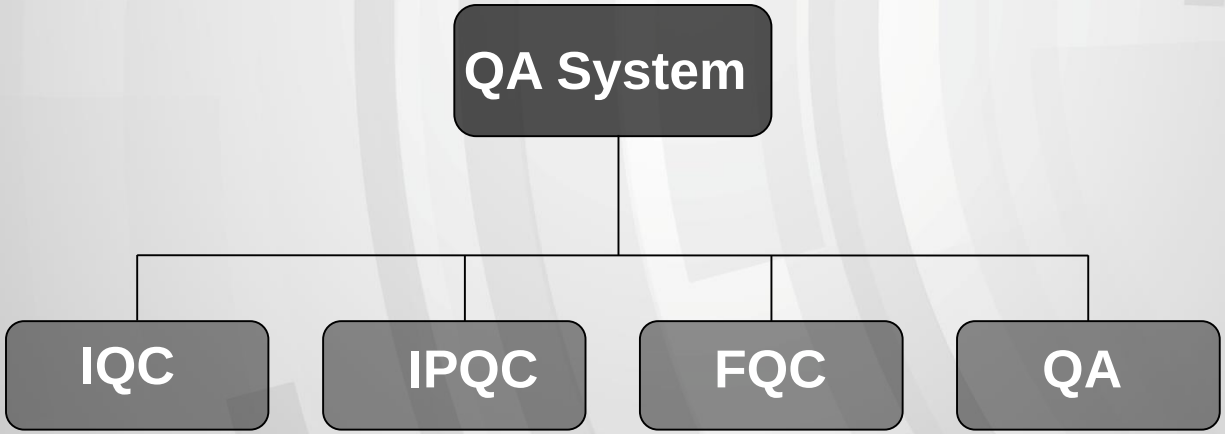
Quality Assurance

- Shanghai Optics stands behind our products 100%
- All parts are under the comprehensive quality control system (ISO: 9001 & 14001 certified)
- 100% inspection of all parts
- State-of-the-art metrology equipment



Frame of QA System

With the continuous development of technology，we strive to improve the quality of our products to meet the customers’ requirements with competitive solutions.



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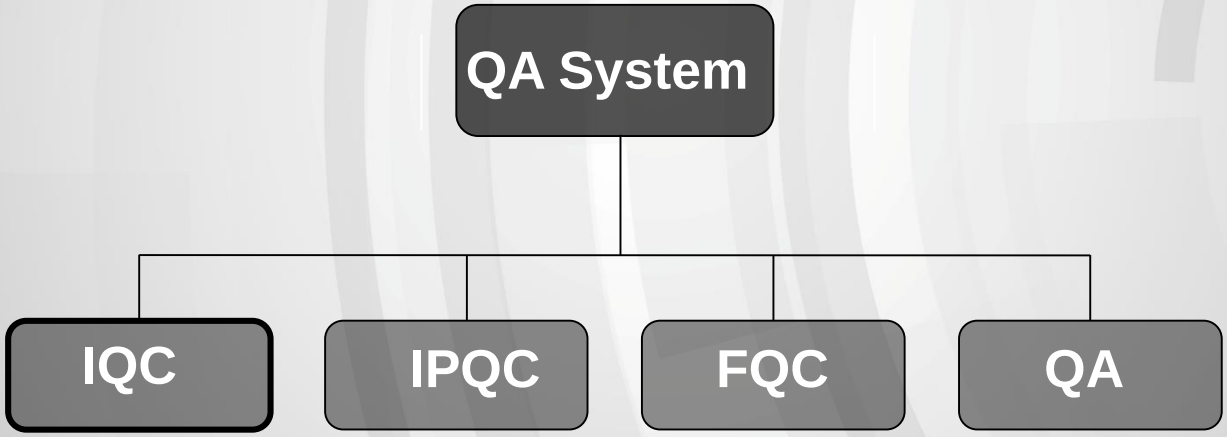
Frame of QA System

IQC (Incoming Quality Control):

IQC is responsible for the incoming raw materials' quality control, such as inclusion, impurity, etc.



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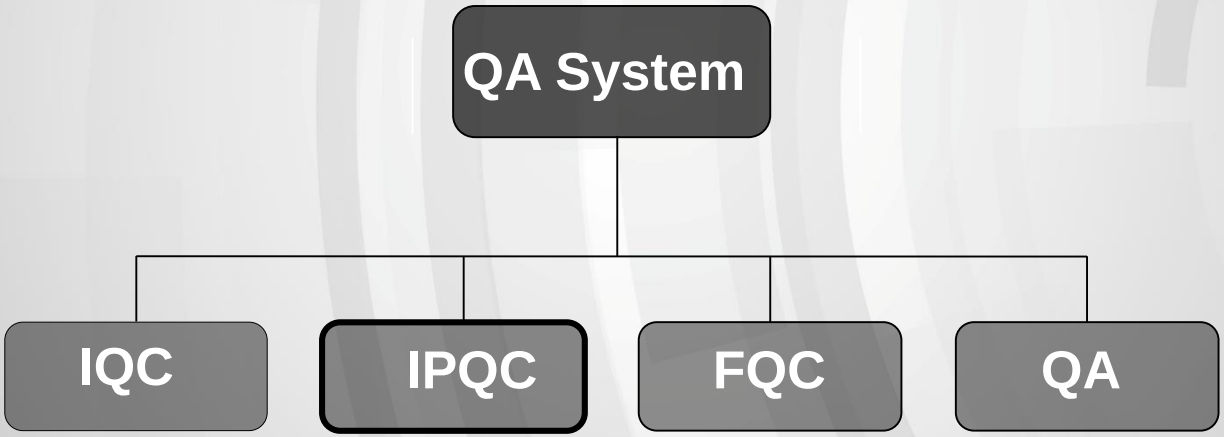
Frame of QA System

IPQC (In Process Quality Control):

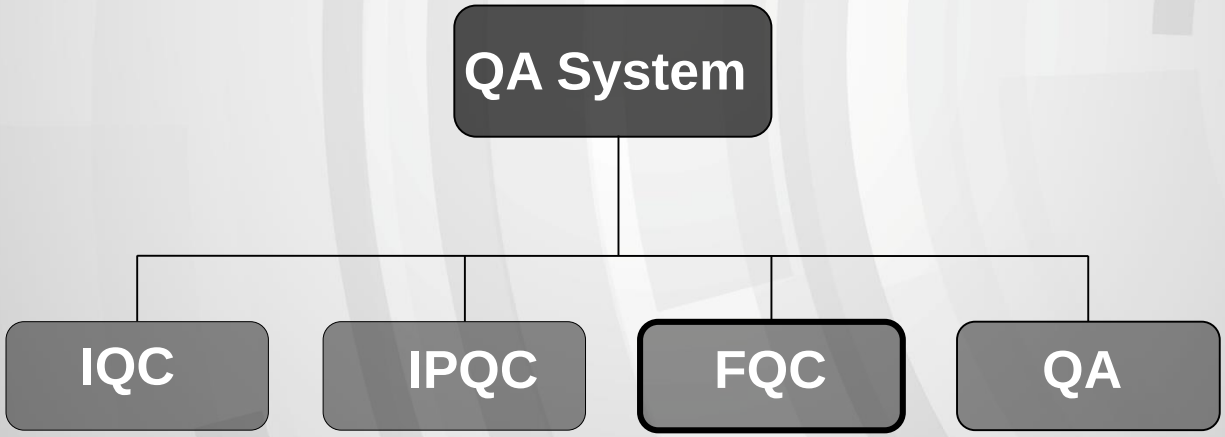
IPQC checks the quality of each item upon the completion of each processing stage.



Frame of QA System

FQC (Final Quality Control):

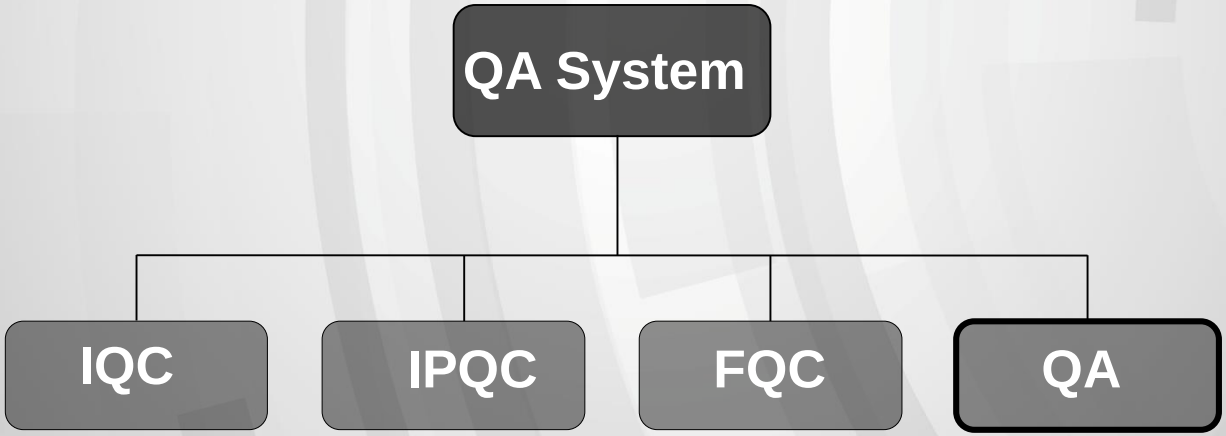
FQC is responsible for the final quality control. We conduct a thorough check of all the relevant specs on the items, such as Dimension, Wavefront distortion, Parallelism, Chip, and Bevel, etc.



Frame of QA System

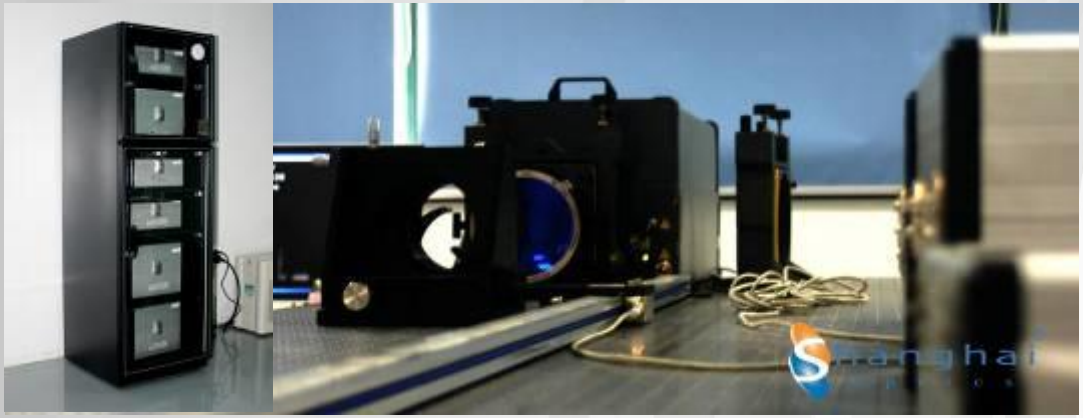
QA (Quality Assurance):

QA is involved in all the works concerning quality assurance, including but not limited to crystal absorption and transmission tests, data analysis, quality standards formation, measurement equipment calibration, and corrective actions.

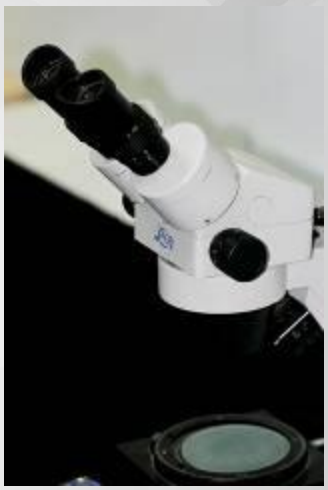


Metrology Equipment

- Zygo Interferometer 6’

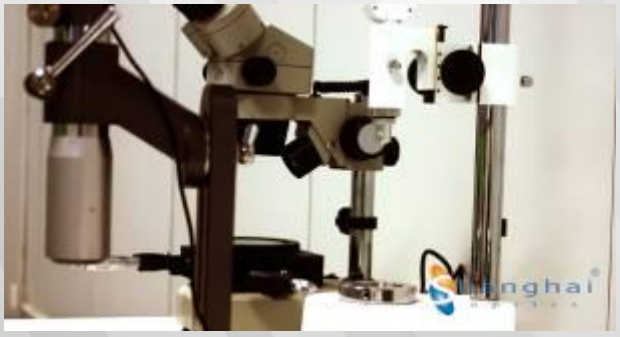


- Industrial Microscope



- Parallel Photocell

- Goniometer



- TriOptics MTF

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Metrology Equipment

- **Optical Bench**

- **3D Projector**

- **Goniometer**

- **Spectrophotometer: lambda 900/SHIMADZU UV3600**