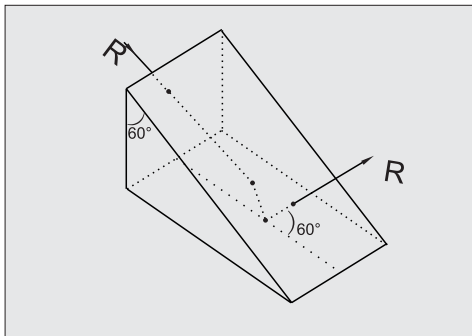


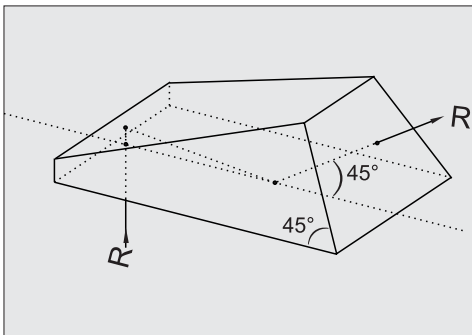
Reflection Prism

The reflection prisms are usually used for diverging the ray or for changing image location in relation to the subject (rotation, inversion). All the surfaces of the reflection prisms are flat. Reflection surfaces are mirrored, but it is possible, however to make use of Total Internal Reflection (TIR). Besides the Right angle prism, Penta prism, Corner Cube and Dove Prism, Foctek also produces many other kinds of Reflection Prism, for examples, the Bauernfeind Prism, Roof Prism, Rhomboid Prism, Abbe-Koenig Prism.



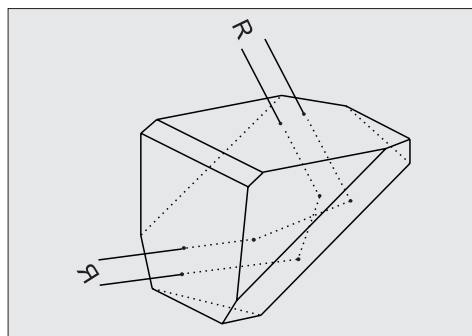
BAUERNFEIND prism 60°

The input beam is deflected by 60°, which depends on the 60° angle between the input surface and the first reflection surface. There is neither horizontal nor vertical displacement of the image. It is necessary to put the mirror coating on the longer short surface of the prism.



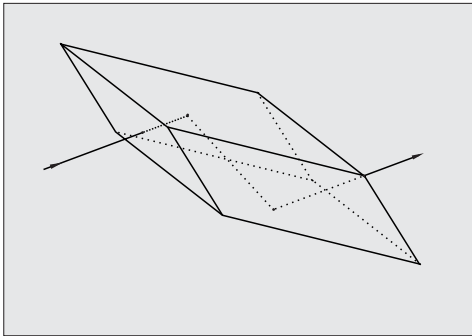
BAUERNFEIND prism 45°

The input beam is deflected by 45°. There is neither horizontal nor vertical displacement of the image. It is necessary to put the mirror coating on the longer short surface of the prism.



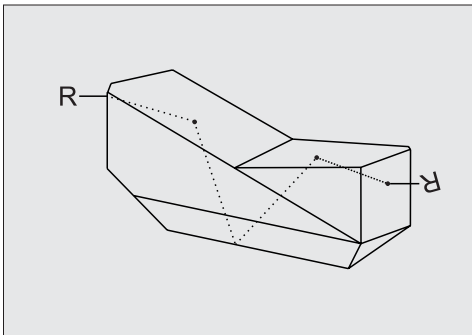
AMICI roof prism

AMICI reflection prism called also roof prism or right angle roof prism, which deflects the beam through an angle of 90° and inverts the image. For this reason, this prism is perfect for erecting images inverted by the objectives.



RHOMBOID prism (off-set prism)

The RHOMBOID prism simply displaces beam at a certain distance. It doesn't cause any deviation and influence on orientation of the image.



ABBE-KOENIG prism

ABBE-KOENIG prism is an image erector. It consists of one roof prism and one right angle prism with their hypotenuse surface cemented. The Prism completely reverses the image.

Standard Specifications:

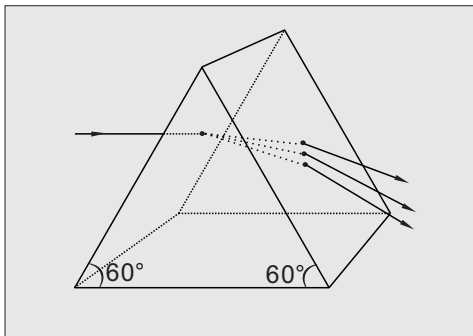
| Attribute | Specification |
|--------------------------|--|
| Material | On request, for example N-BK7, Fused Silica, MgF ₂ , N-SF10, etc. |
| Range of Size (mm) | 4 ~ 300 |
| Dimension Tolerance (mm) | ±0.1 |
| Clear Aperture | >90% |
| Angle Accuracy | ±3 arc min. |
| Pyramid Error | ±5 arc min. |
| Flatness (@633nm) | <λ/2 |
| Surface Quality | 60/40 |
| Coating | uncoated, AR, HR, PR coated etc. |

Note:

According to Customer's requirement, we can make non-standard Reflection Prisms with significantly higher optical parameters. Surface quality better than 10/5, flatness better than λ/10, angle tolerance better than +/-10 arc sec is available. Prism in mounting is also available.

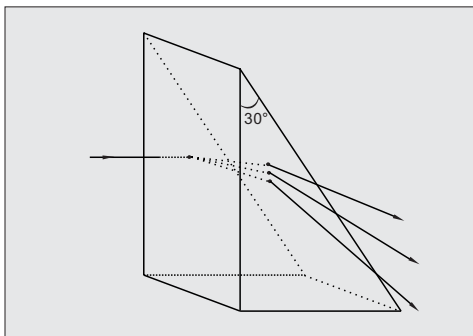
Dispersion Prism

Besides the Reflection Prisms, Foctek also offers the Dispersion Prisms. The most typical dispersion prism is equilateral prism made of high difference of refraction indexes for different wavelengths. The dispersion prisms of special use are: Littrow prisms, Pellin-Broca prisms, Brewster prisms, Amici Prisms.



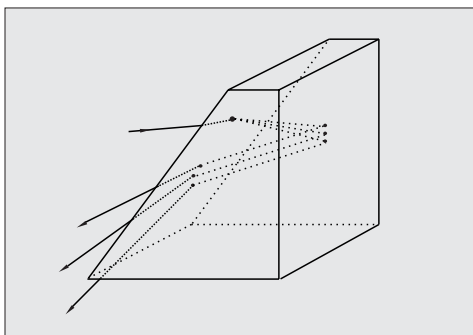
EQUILATERAL dispersion prism

EQUILATERAL dispersion prisms have three equal 60° angles, which are made of optical materials with high difference of refraction indexes for different wavelength, such as the SF₁₀.



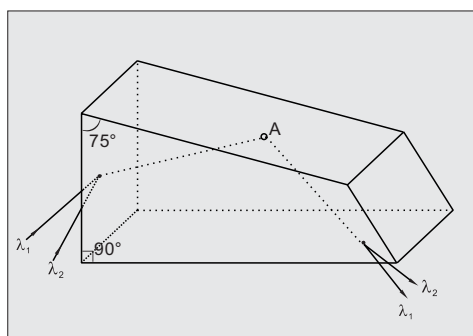
ISOSCELE prism

ISOSCELE dispersion prisms have the three angle with 30° - 60° - 90° . The prisms are also made of optical materials with high difference of refraction indexes for different wavelength, such as the SF₁₀.



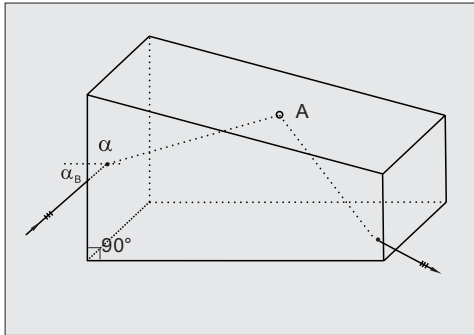
LITTROW prism

Light crossing the LITTROW prism is spectrally dispersed with simultaneous inversion of the path of rays caused by the reflection taking place on the back surface of the prism. The reflection surface has to be mirrored coating.



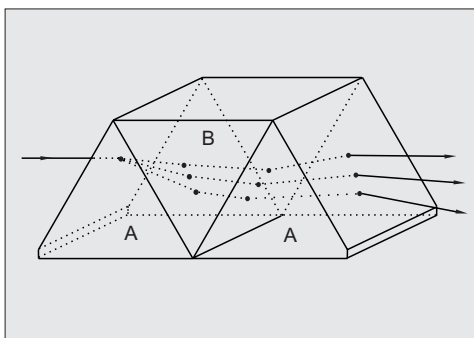
PELLIN - BROCA prism

PELLIN - BROCA prism is a special kind of dispersion prism. Besides dispersing properties, the prism has the property of diverging rays by 90° . By rotating the prism around it's A axis, you can select the wavelength what you require.



BREWSTER prism

BREWSTER prism is recommended for polarized light. P-polarized beam is transmitted with no losses when input beam is at the Brewster angle, while the S-polarized beam is reflected.



AMICI prism (Direct Vision Prisms)

The AMICI prisms generate dispersion of polychromatic light with simultaneous correction of divergence. All the dispersed beam output from the prism are parallel to the input beam. These Prisms consist of three prisms, which are cemented together. Two of the three prisms (A prism in the left draft) are made of different material to the other prism (B prism in the left draft). Typical combination of materials are Flint glass for A and Crown glass for B.

Standard Specifications:

| Attribute | Specification |
|--------------------------|---|
| Material | On request, for example N-BK7, Fused Silica, MgF ₂ , N-SF ₁₀ etc. |
| Range of Size (mm) | 4 ~ 300 |
| Dimension Tolerance (mm) | ±0.1 |
| Clear Aperture | >90% |
| Angle Accuracy | ±3 arc min. |
| Pyramid Error | ±5 arc min. |
| Flatness (@633nm) | <λ/2 |
| Surface Quality | 60/40 |
| Coating | uncoated, AR, HR, PR coated etc. |

Note:

According to Customer's requirement, we can make non-standard Dispersion Prisms with significantly higher optical parameters. Surface quality better than 10/5, flatness better than λ/10, angle tolerance better than +/-10 arc sec is available. Prism in mounting is also available.

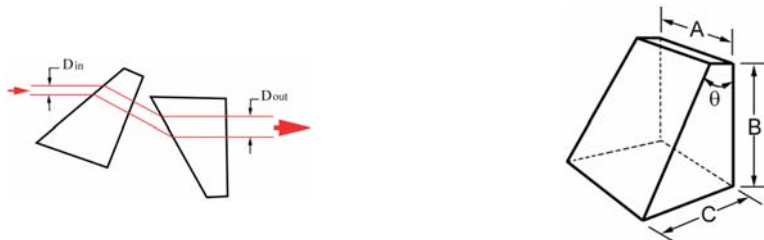
Anamorphic Prism

With a anamorphic prism, the beam size can be changed along the axis while leaving the beam unchanged along the other axis, so the beam can be expanded, reduced or reshaped.

Anamorphic prisms are used to correct the asymmetric, elliptical beams produced by laser diodes, so that the beams are nearly circular in shape.

Standard Specifications

| Attribute | Specification |
|--------------------------|--|
| Material | N-SF11, H-ZF13 Grade A optical glass |
| Dimension Tolerance (mm) | +0.0/-0.2 |
| Clear Aperture | 80% |
| Flatness (@633nm) | $\lambda/8$ |
| Theta | $\theta=29^{\circ}27' \pm 30''$ |
| Surface Quality | 60/40 |
| Coating | MgF ₂ single layer coating on perpendicular surface |



| Part No. | A(mm) | B(mm) | C(mm) |
|----------|-------|-------|-------|
| FAP0101 | 12.0 | 12.0 | 8.5 |

Mount of anamorphic prism is available upon request.

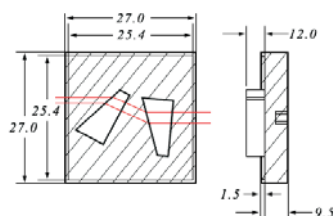
Note: The prism is counted quantity at every piece. It shall be used as pair (two pieces).

Holders for Anamorphic Prism

Specifications:

Material: Black anodized aluminum

Dimension tolerance: $\pm 0.1\text{mm}$



| Part No. | Width (mm) | Height (mm) | Thickness (mm) |
|----------|------------|-------------|----------------|
| APH12 | 27.0 | 27.0 | 9.5 |

Note: Please specify the anamorphic ratio for designing the holder.

RGB Prism (Philips Prism)

The RGB (Philips) Prism is designed for reflective LCOS Projector, matrix camera applications, and is well-suited to fast lenses imaging onto three CCD/CMOS sensors.

Foctek has developed the unique thin air-space ($8\mu\text{m} \pm 2\mu\text{m}$) cementing technique for this prism, which allows Foctek to custom-made high precision Philips Prism for the customers.

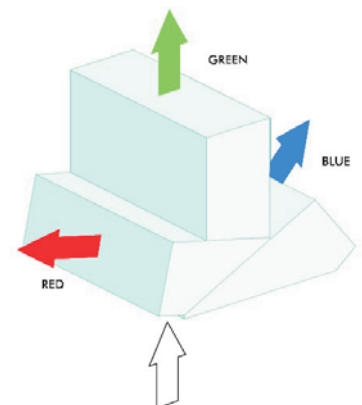
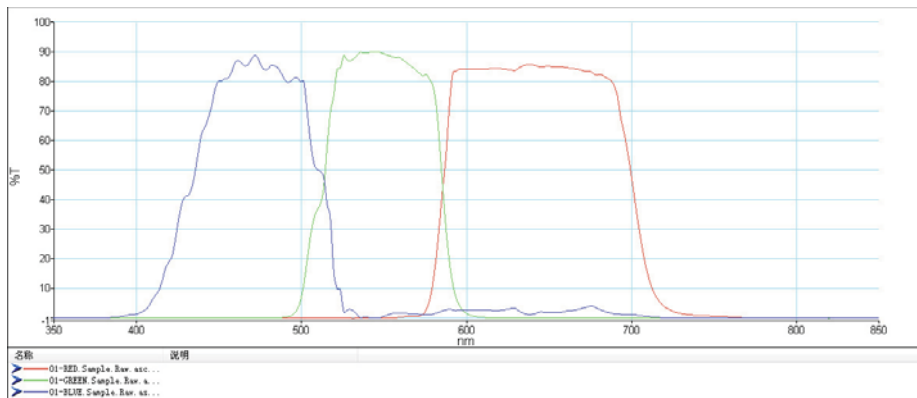


1.Coating for each prism:

| Wavelength(nm) | 430~480 | 520~560 | 600~670 |
|----------------|-----------|-----------|-----------|
| B | HT, T>95% | T<0.1% | T<0.1% |
| R | T<0.1% | T<0.1% | HT, T>95% |
| G | T<0.1% | HT, T>95% | T<0.1% |

2.Optical Parameters:

| Attribute | Specification |
|------------------------|---------------|
| Optical Path | 14~150 mm |
| Clear Aperture | up to 50x50mm |
| Wavelength range | 430~670nm |
| Antireflection coating | R<0.4% |
| Type of coating | Dichroic |
| Blue | 430~480 nm |
| Green | 520~560 nm |
| Red | 600~670 nm |
| Transmission | >80% |
| Interface | upon request |
| Mount type | upon request |
| Output trimming filter | upon request |



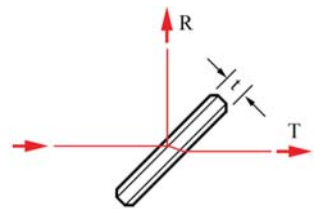
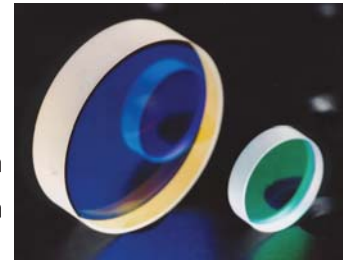
For three sensors camera application, Foctek also has the ability to assembly the sensors onto the prism output surfaces for you, and guarantee the high precision optical path and position between three sensors.

BeamSplitter

The common Beam splitters are used to split or combine laser beam. However Polarization BeamSplitters are used to split or combine two perpendicular polarization laser beam. The performance of beamsplitters is mainly dependent on the coating specifications.

BeamSplitter Plate

Material: ----- N-BK7 or H-K9L Grade A optical glass
 Dimension Tolerance: ----- ±0.2mm
 Thickness Tolerance: ----- ±0.2mm
 Flatness: ----- $\lambda/4@632.8\text{nm}$
 Surface Quality: ----- 60-40 scratch and dig
 Parallelism: ----- <1 arc minute
 T/R: ----- 50/50±5%, for random polarization
 ----- $T=(T_s+T_p)/2, R=(R_s+R_p)/2$
 Coating: (Incidence Angle: 45 degree)
 Surface 1: ----- Partial Reflectance coating
 Surface 2: ----- AR Coating
 Standard Coating wavelength:
 Narrow Band: ----- 488, 532, 632.8, 650, 808, 850, 980, 1064, 1310, 1550 nm
 Broadband: ----- 450-650, 650-900, 900-1200, 1200-1550, 1500-1610 nm



| Size(mm) | Narrow Band | Broadband |
|-------------|-------------|-----------|
| | Part No. | Part No. |
| 10x10x2 | BSP1103 | BSP1203 |
| 12.7x12.7x2 | BSP1104 | BSP1204 |
| 25.4x25.4x2 | BSP1105 | BSP1205 |
| φ25.4x2 | BSP1106 | BSP1206 |

Ordering Information

Part No. - Wavelength

For Example, BSP1203 - 1500-1610nm

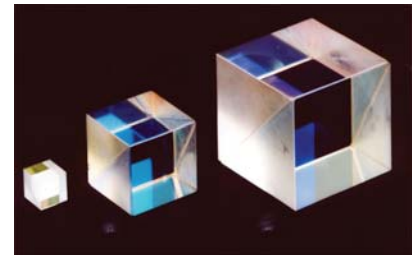
Beamsplitter 10x10mm, 1500-1610nm broadband coating

Note for BeamSplitter Plate:

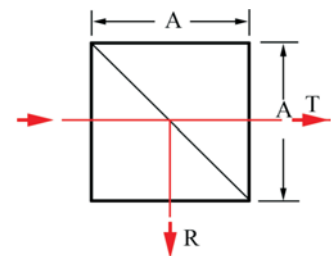
1. Custom-made non-standard Beamsplitter Plate at any size (from 2.0x2.0x2.0mm to 50.0x50.0x50.0mm) or shape (such as quadrate, triangular.) is available upon request.
2. Besides N-BK7, Custom-Made Beamsplitter Plate, which is made of other optical material, such as Fused Silica, Pyrex, is available upon request.
3. High Precision Beamsplitter Plate with better Flatness ($<\lambda/8$), Better Surface Quality (better than 20/10) and Better parallelism ($<3''$) is available upon request.
4. Besides 50/50, non-standard splitting ratio (from T/R=90/10 to 10/90) is available upon request.

Cube BeamSplitter

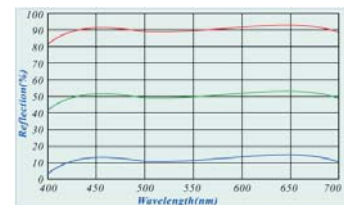
Cube beamsplitters are constructed by cementing two precision right angle prism together with appropriate interference coating on the hypotenuse surface. The absorption loss to the coating is minimal transmission and reflection approach 50% (average) though output is partially polarized. If polarization sensitivity is critical to your application, we recommended that you select from our Polarization Cube Beamsplitter or Non-polarization Cube Beamsplitter.



Material: ----- N-BK7 or H-K9L Grade A optical glass
 Dimension Tolerance: ----- ±0.2mm
 Flatness: ----- λ/4@632.8nm
 Surface Quality: ----- 60-40 scratch and dig
 Beam Deviation: ----- <3 arc minutes
 T/R: ----- 50/50±5%, for random polarization
 ----- T=(Ts+Tp)/2, R=(Rs+Rp)/2
 Coating: Hypotenuse Face: ----- Partial Reflectance coating
 All Input and Output Faces: ----- AR Coating
 Standard Coating wavelength:
 Narrow Band: ----- 488, 532, 632.8, 650, 808, 850, 980, 1064, 1310, 1550 nm
 Broadband: ----- 450-650, 650-900, 900-1200, 1200-1550, 1500-1610 nm



| Size(mm) | Narrow Band | Broadband |
|----------------|-------------|-----------|
| | Part No. | Part No. |
| 3.2x3.2x3.2 | BSC1101 | BSC1201 |
| 5x5x5 | BSC1102 | BSC1202 |
| 10x10x10 | BSC1103 | BSC1203 |
| 12.7x12.7x12.7 | BSC1104 | BSC1204 |
| 15x15x15 | BSC1105 | BSC1205 |
| 20x20x20 | BSC1106 | BSC1206 |
| 25.4x25.4x25.4 | BSC1107 | BSC1207 |



R=50%±5% @450-650nm

Ordering Information

Part No. - Wavelength
 For Example, BSC1203 - 1500-1610nm
 Beamsplitter Cube 10x10x10mm, 1500-1610nm broadband coating

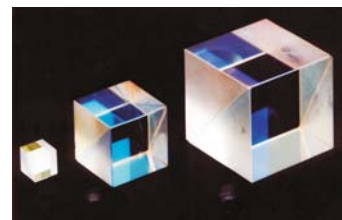
Note for Cube BeamSplitter:

1. Custom-made non-standard Beamsplitter Cube at any size (from 2.0x2.0x2.0mm to 50.0x50.0x50.0mm) is available upon request.
2. Besides N-BK7, Custom-Made Beamsplitter Cube, which is made of other optical material, such as Fused Silica, Pyrex, is available upon request.
3. High Precision Beamsplitter Cube with better Flatness (<λ/8), Better Surface Quality (better than 20/10) and Better Beam Deviation (<1') is available upon request.
4. Besides 50/50, non-standard splitting ratio (from T/R=90/10 to 10/90) is available upon request.

■ Holder For Cube Beamsplitter is available, please see PART 6 HOLDER.

Non-Polarizing Cube BeamSplitter

consists of a pair of precision high tolerance right angle prisms cemented together with a metallic-dielectric coating on the hypotenuse of one of the prisms. The low polarization dependence of the metallic-dielectric coating allows the transmission and reflection for S- and P- polarization states to be within 6% of each other. This means that they will not change the state of polarization of the incident beam.

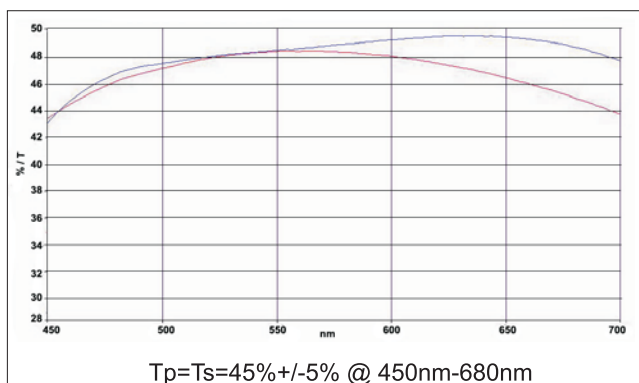


We offer both broadband and single wavelength non-polarizing cube beamsplitters (NPBS). An antireflective coating has been applied to each face of the beamsplitter in order to produce maximum transmission efficiency for the appropriate wavelength range.

Broadband NPBS Specification:

Material:----- N-BK7 grade A, optical glass
 Dimension Tolerance:----- ±0.2mm
 Flatness:----- λ/4 @ 632.8 nm per 25mm
 Surface Quality:----- 60/40 scratches and dig
 Beam Deviation:----- <3 arc minutes
 Clear Aperature:----- 90%
 Bevel:----- <0.3 mm X 45 deg
 Coating: Hypotenuse Face: ----- NPBS Coating
 All Input and Output Faces:----- AR Coating
 Splitting Ratio: ----- $T_p/R_p = T_s/R_s = 45\% \pm 5\%$
 Polarization:----- $|T_p - T_s| < 6\%$, $|R_p - R_s| < 6\%$
 Absorption:----- <10%
 AR Coating:----- $R_{avg} < 0.5\%$ @450-680nm, $R_{avg} < 0.5\%$ @700-1000nm, $R_{avg} < 0.5\%$ @1300-1600nm
 Standard Wavelength: 450-680nm, 700-1000nm, 1300-1600nm.

| Size(mm) | Part NO. |
|----------------|----------|
| 5.0x5.0x5.0 | NPB1201 |
| 10.0x10.0x10.0 | NPB1202 |
| 12.7x12.7x12.7 | NPB1203 |
| 20.0x20.0x20.0 | NPB1204 |
| 25.4x25.4x25.4 | NPB1205 |
| 30.0x30.0x30.0 | NPB1206 |
| 40.0x40.0x40.0 | NPB1207 |
| 50.8x50.8x50.8 | NPB1208 |



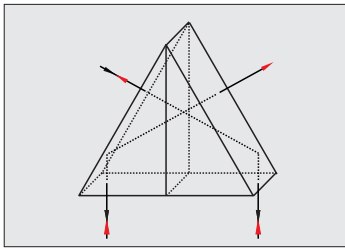
Note: Other sizes, split ratio and wavelengths are available upon request.

Ordering Information

Part No. - Wavelength

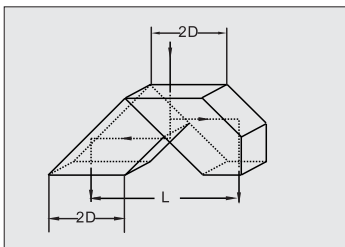
For Example, NPB1202 - 450~680nm

Non-polarizing Cube Beamsplitter 10x10x10mm, 450~680nm broadband coating



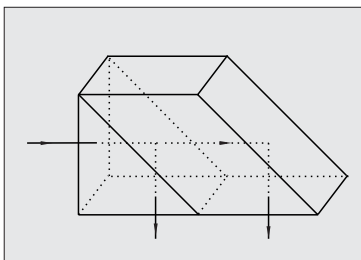
Koster Prism

The Koster Prism is made with two identical prisms (90°-60°-30°). Longer leg surfaces, with beam splitting coating on one of them, are cemented. With this prism, the light beam can be split into two parallel beams. The splitting ratio is depended on the coating. The Distance between two-output beams can be adjusted. The two-split beams have the same optical path.



Parallel Splitting Prism

This special Beam Splitter is made of two special designed prisms. The cemented surface of one prism is beam splitter coating. The Prism enables splitting beam of light per two beams parallel to each other, and parallel to the input beam with high accurate. The distance between two output beams can be different for different prism size, but, shall be at least 4 times of beam size. The two-split beams have the same optical path.



Beam-Splitting Prism

This special prism consists of one Right Angle prism and one Rhomboid Prism. The hypotenuse surface of the Right Angle Prism is beam-splitting coated and cemented to the Rhomboid Prism. The two split output beams are parallel to each other, and perpendicular to the input beam at high accurate. Distance of two-output beam can be different by changing the length of the rhomboid prism. The optical path of the two-split beams is different.

Standard Specifications:

| Attribute | Specification |
|--------------------------|---|
| Material | On request, for example N-BK7, Fused Silica, MgF ₂ , N-SF ₁₀ etc. |
| Dimension Tolerance (mm) | ±0.1 |
| Clear Aperture | >90% |
| Angle Accuracy | ±30 arc sec. |
| Beam Deviation Tolerance | ±1 arc min. |
| Flatness (@633nm) | <λ/2 |
| Surface Quality | 60/40 |
| Spectral Range (nm) | 100-2500 |
| Splitting Ratio R:T (%) | 10:90 to 90:10 |
| Coating | uncoated, dielectric coated AR, HR, PR or metal coated Al, Ag, Au etc. |

Note:

According to Customer's requirement, we can make non-standard Beam Splitting Prisms with significantly higher optical parameters. Surface quality better than 10/5, flatness better than λ/10, angle tolerance better than +/-10 arc sec is available, beam deviation better than +/-15 arc sec is available. Prism in mounting is also available.

Lens

Optical lenses are transparent components made of one or more pieces of optical-quality materials (ground and polished or molded) and curved (always spherical) to converge or diverge transmitted rays from an object. These rays then form a real or virtual image of the object.

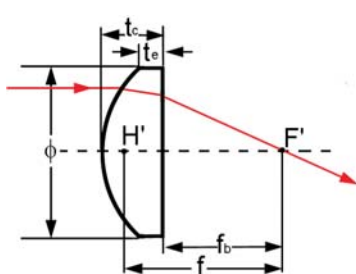
FOCtek provides spheric lens, aspheric lens, cylindrical lens and achromatic lens with a wide range of sizes and materials including N-BK7, H-K9L, Fused Silica, N-SF5, Sapphire, CaF₂, Silicon, Germanium, etc.



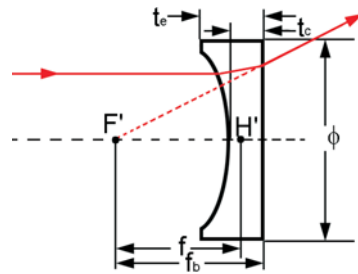
Spheric Lens

FOCtek provides five kinds of spheric lens forms, or shapes, that determine the imaging Characteristics of the lenses, they are plano-convex, plano-concave, Double-convex, Double-concave and Meniscus.

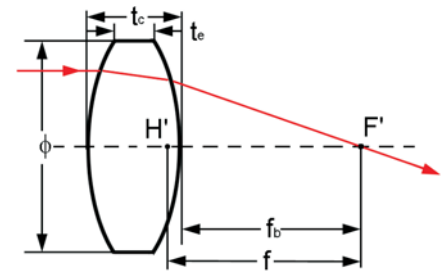
- Plano-convex lens has a positive focal length, which makes it ideal for collecting and focusing light for many imaging applications..
- Plano-concave lens has a negative focal length and is used for image reduction or to spread light.
- Double-convex lens has a positive focal length and is useful for 1:1 imaging and in multielement systems. also known as biconvex or equiconvex.
- Double-concave lens has a negative focal length and is useful for 1:1 imaging and in multielement systems. also known as biconcave or equiconcave.
- Meniscus lens has a positive or negative focal length, it forms a real or virtual image of objects.



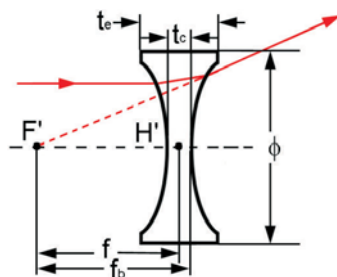
Plano Convex Lens



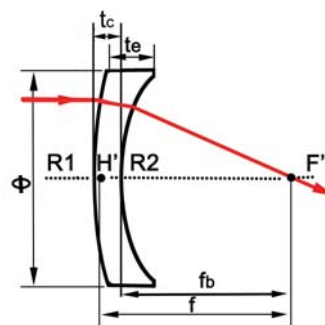
Plano Concave Lens



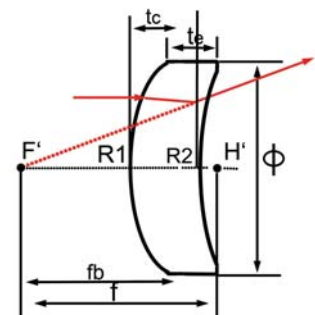
Double Convex Lens



Double Concave Lens



Positive Meniscus Lens



Negative Meniscus Lens

Specifications of Spheric Lens

| Attribute | Specification |
|---|--|
| Material ⁽¹⁾ | N-BK7, H-K9L, Fused Silica, N-SF ₁₀ , Silicon, CaF ₂ , Sapphire etc. |
| Typical Diameter (Φ mm) ⁽²⁾ | 10.0, 12.7, 15.0, 20.0, 25.4, 30.0, 50.8, etc. |
| Diameter Tolerance (mm) | +0.0/-0.2 (General), +0.0/-0.02 (High Precision) |
| Paraxial Focal Length Tolerance (mm) ⁽³⁾ | ±2% |
| Centration ⁽⁴⁾ | <3 arc min |
| Clear Aperture | >80% (Small Size), >95% (Large Size) |
| Surface Figure (per 25mm@632.8nm) | <1.5λ, (General), <λ/4 (High Precision) |
| IRR (@632.8nm) | <λ/4 (General), <λ/10 (High Precision) |
| Surface Quality | 60/40 (General), 10/5 (High Precision) |
| Bevel (face width x 45°) | <0.25mm |
| Coating ⁽⁵⁾ | uncoated, AR, HR, PR Coating, etc. |

Note for Spheric Lens:

- (1). Other optical glass materials from Schott or Chinese CDGM are also available upon request.
- (2). Custom-made Spheric Lenses at any size from diameter 2.0mm to 300mm are available upon request.
- (3). Typical paraxial focal length tolerance is ±2%, better tolerance is available upon request
- (4). Typical centration is 3 arc minutes, better precision is available upon request.
- (5). Besides uncoated, Lenses with Anti-Reflective(AR), High-Reflective(HR), Partial-Reflective(PR) coating are available upon request, Please refer to Part 5 OPTICAL COATING for more information about coating.



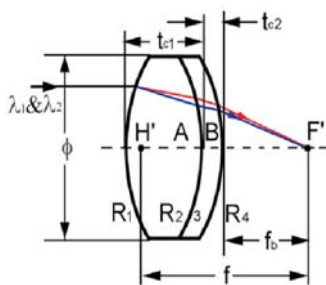
Mass Production: 1 Million Pieces Per Month

Medium/Small Batch Production: 100K Pieces Per Month

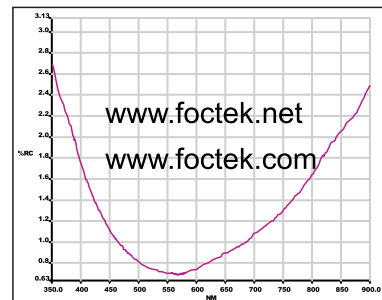
Achromatic Lens⁽¹⁾

Achromatic lenses are very common type of viewer lenses, they consist of two or more lens elements, which have been corrected for chromatic aberration with respect to two selected wavelengths, The elements must be fixed in relation to one another by either mounting or cement.

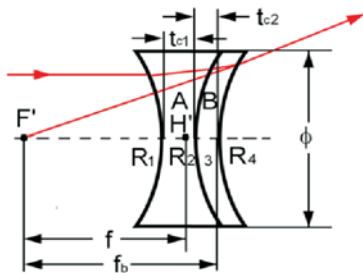
Achromatic Lenses are designed to specifically function within the infrared, visible, or ultra-violet wavelength ranges, and they are not symmetric devices. They must be installed with the correct front-to-back orientation (thicker element usually faces the eyes). If installed incorrectly, with the lens orientation installed backwards the result will be extensive distortion and aberration.



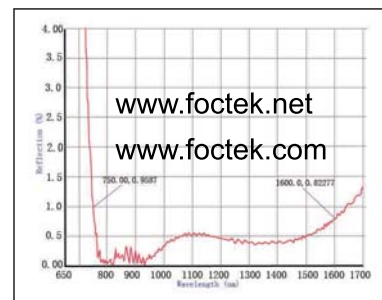
Positive Achromatic Lens



MgF₂@400 -700 Ravg<1.75%



Negative Achromatic Lens



AR/AR@750 -1605nm, R<1%

| Attribute | Specification |
|--------------------------------------|--|
| Design Wavelength | upon request |
| Diameter Tolerance (mm) | +0.0/-0.2 (General), +0.0/-0.02 (High Precision) |
| Paraxial Focal Length Tolerance (mm) | ±2% |
| Centration | <3 arc min |
| Clear Aperture | >80% (Small Size), >95% (Large Size) |
| Surface Figure (per 25mm@632.8nm) | <1.5λ, (General), <λ/4 (High Precision) |
| IRR (@632.8nm) | <λ/4 (General), <λ/10 (High Precision) |
| Surface Quality | 60/40 (General), 10/5 (High Precision) |
| Bevel (face width x 45°) | <0.25mm |
| Coating | upon request |

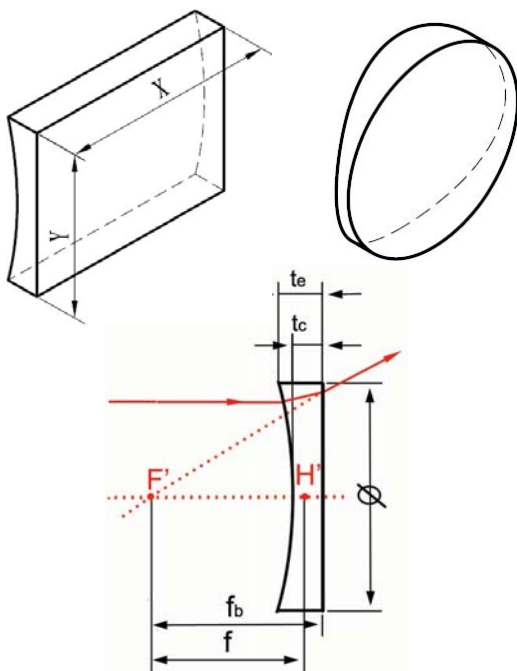
Note:

- (1). Please refer to our web for list of standard Achromatic Lenses.
- (2). Custom-made Achromatic Lenses are available from FOCtek.
- (3). FOCtek can design Achromatic Lenses for you according your requirement.

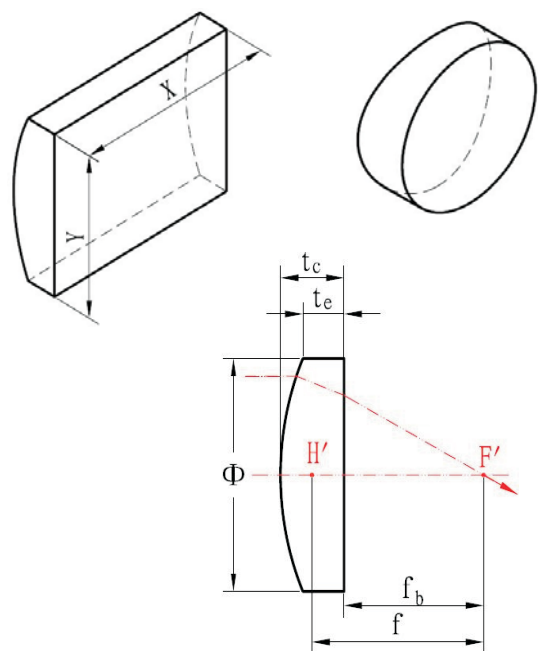
Cylindrical Lens

Cylindrical lenses are used to correct astigmatism in the eye and in rangefinders, to produce astigmatism, stretching a point of light into a line, they are widely used in bar code scanning, projection optics systems, laser measurement systems and holography.

Cylindrical lenses are available in either plano-concave or plano-convex configurations from FOCtek, Plano-concave lenses have a negative focal length and are used for image reduction or to spread light. Plano-convex lenses have a positive focal length, which makes them ideal for collecting and focusing light for many imaging applications.



Plano-Concave Cylindrical Lens



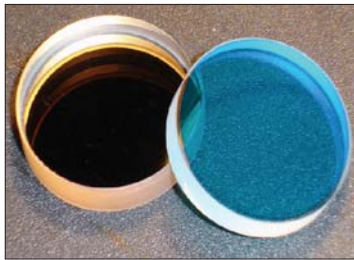
Plano-Convex Cylindrical Lens

| Attribute | Specification |
|-------------------------------------|---|
| Typical Material | On request, for example N-BK7, H-K9L, Fused Silica, N-SF10 etc. |
| Diameter Tolerance (mm) | ±0.2 (General), ±0.05 (High Precision) |
| Focal Length Tolerance (mm) | ±2% |
| Centration | <3 arc min |
| Surface Figure X (per 25mm@632.8nm) | λ/2 (General), λ/4 (High Precision) |
| Surface Figure Y (per 25mm@632.8nm) | 2λ (General), λ (High Precision) |
| Surface Quality | 60/40 (General), 10/5 (High Precision) |
| Bevel (face width x 45°) | <0.2-0.5mm (General), 0.05-0.2 (High Precision) |
| Coating | upon request |

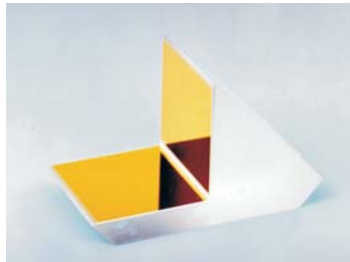
Note: Call for OEM cylindrical lens.

Mirror

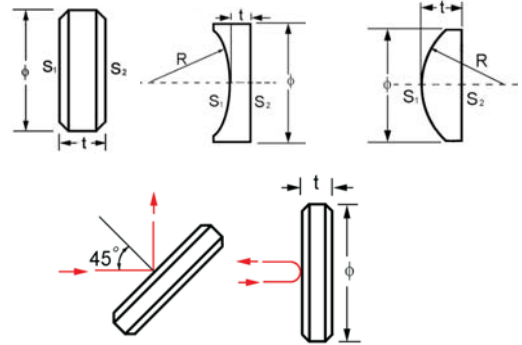
FOCtek offers dielectric coated mirrors and metal coated mirrors which are made of substrate such as N-Bk7, H- K9L, Fused Silica, CaF₂, Sapphire and so on.



Dielectric coated mirror



Metal coated mirror**



45° Incidence angle

0° Incidence angle

****Coating Curve of Metal Reflection Coating please refer to Part 5 Coating of this Catalog**

| Attribute | Specification |
|--|--|
| Material ⁽¹⁾ | N-BK7, H-K9L, Fused Silica, etc. |
| Typical Diameter (Φ mm) ⁽²⁾ | 10.0, 12.7, 15.0, 20.0, 25.4, 30.0, 50.8, etc. |
| Diameter Tolerance (mm) | +0.0/-0.2 (General), +0.0/-0.02 (High Precision) |
| Typical Thickness (mm) ⁽³⁾ | 2.0, 3.0, 6.0, 6.35 |
| Thickness Tolerance (mm) | ±0.2 (General), ±0.005 (High Precision) |
| Clear Aperture | >80% (Small Size), >95% (Large Size) |
| Flatness (per 25mm@633nm) | λ (General), λ/10 (High Precision) |
| Incidence Angle | 0° or 45° |
| Surface Quality ⁽⁴⁾ | 60/40 (General), 10/5 (High Precision) |
| Parallelism | 3 min. (General), 3 sec. (High Precision) |
| Bevel (face width x 45°) | <0.25mm |
| Coating ⁽⁵⁾ | Dielectric coated AR, HR, PR or metal coated Al, Ag, Au etc. |

Note for Mirror:

- (1). Other optical glass or optical crystals of Mirrors are available.
- (2). Custom-made Mirrors at any size from diameter 2mm to diameter 300mm and with shape of quadrate, triangular or other polygonal are available upon request.
- (3). Thickness from 1mm to 20mm are available upon request.
- (4). Typical surface quality is 60/40, better precision such as 40/20,10/5 is available upon request.
- (5). Please refer to Part 5 for Coating.

Colored Glass Filter Applications

Photographing Apparatus
Meter and Instrument
Optical Device
Medical Treatment Apparatus
Teaching Apparatus
UV Analyzer
Financial Equipment
Airport Lamps
Military Equipment
Technological Research Institute
Public Security Department



Colored Glass Filter Type Table

| Cut-Off Type Colored Filter Glass | Selective Absorption Colored Optical Filter Glass | | Neutral Filter Glass |
|-----------------------------------|---|---------------------------------|---|
| Ultraviolet Glass | Ultraviolet Glass | Infrared Glass | Neutral Grey Colored Ultraviolet Glass |
| Golden(Yellow)Glass | Violet Glass | Protective Glass | |
| Orange Glass | Blue Glass | Heat-absorbing Glass | |
| Red Glass | Green Glass | Multiband Calibration Glass | |
| Infrared Glass | Golden(Yellow) Glass | Sky-light Glass | |
| | Orange Glass | Rising Color Temperature Glass | |
| | Red Glass | Falling Color Temperature Glass | |

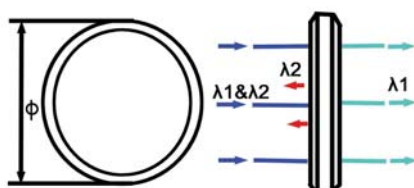
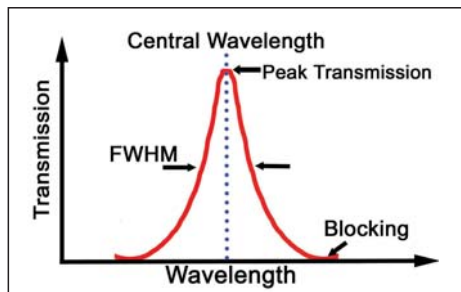
Note: Please visit our web for detailed specifications of each kind of Colored Glass Filter.

Fabricating Specifications

| Attribute | Specification |
|---------------------------|--|
| Material | colored glass filter |
| Dimension Tolerance (mm) | +0.0/-0.2 (General), +0.0/-0.05 (High Precision) |
| Thickness Tolerance (mm) | ±0.2 (General), ±0.05 (High Precision) |
| Clear Aperture | >80% (Small Size), >95% (Large Size) |
| Parallelism | 1 min. (General), 3 sec. (High Precision) |
| Surface Quality | 60/40 (General), 10/5 (High Precision) |
| Flatness (per 25mm@633nm) | λ (General), $\lambda/10$ (High Precision) |
| Bevel (face width x 45°) | <0.25mm |
| Coating | Uncoated, Dielectric AR Coating, Dichroic Filter Coating, etc. |

Interference Filter Applications

- Biomedical
- Fluorescence Microscope
- Laser System
- Inspection Apparatus
- Selective Interference
- Hg Lamp Spectrum
- Analyzing Spectrum
- Imaging Optics Systems



Interference Filter Specifications

| Attribute | Specification |
|--|---|
| Material | Colored glass filter or optical coating glass |
| Typical Diameter (Φ mm) ⁽¹⁾ | 12.0, 15.0, 25.0, 25.4, etc. |
| Typical Thickness (mm) ⁽²⁾ | 2.0 ~ 10.0 |
| Dimension Tolerance (mm) ⁽³⁾ | ± 0.2 |
| FWHM (nm) ⁽⁴⁾ | 10 ~ 80 |
| Wavelength Tolerance (nm) ⁽⁵⁾ | ± 2 (10nm FWHM) |
| Surface Quality ⁽⁶⁾ | 80/50 (General), 40/20 (High Precision) |
| Wavelength (nm) ⁽⁷⁾ | 220, 254, 265, 280, 295, 313, 340, 365, 405, 340, 380, 400, 405, 430, 450, 492, 497, 510, 524, 530, 546, 550, 555, 578, 590, 592, 600, 612, 620, 630, 690, 700, 750, etc. |

Note for Interference Filter:

- (1). Custom-made diameter is available, Custom-made shape of interference filter is available.
- (2). Typical thickness is from 2.0mm to 5.0mm, custom-made thickness from 2.0mm to 10.0mm is available.
- (3). Typical dimension tolerance is ± 0.2 mm, better precision is available upon request.
- (4). Typical FWHM (transmitted wavelength range, as defined by the Full Width Half Maximum of transmission curve) from 10nm to 80nm, broadband from 1nm to 100nm are available upon request.
- (5). Typical wavelength tolerance is ± 2 nm when FWHM is 10nm, better precision is available upon request
- (6). Typical surface quality is 80/50, better precision such as 60/40, 40/20 is available upon request.
- (7). Wavelength is various due to different applications, they are UV (200nm-399nm), VIS (400nm-700nm), IR (750nm-2500nm), Please tell us your special use wavelength.

Neutral Density Filter

Neutral density filters attenuate, split or combine beams in a range of irradiance ratios with little dependence on wavelength.

FOCtek offers two kinds of neutral density filters, which are neutral grey glass type filters and metallic coated type filters made of optical glass such as N-BK7, H-K9L Fused Silica and so on.

The thickness of neutral grey glass type filters determine the transmission, however, transmission is determined by coating thickness in the metallic coated optical material type.

Neutral Density Filter Specifications

| Attribute | Specification | |
|--|--|---|
| | Neutral Density Glass Type | Metallic Coating Type |
| Material | Optical Neutral Density Glass | N-BK7, H-K9L, Fused Silica |
| Typical Size (mm) ⁽¹⁾ | Φ 25.0, 50.0 x 50.0 | Φ 25.0 x 2.0, 50.0 x 50.0 x 2.0 |
| Size Tolerance (mm) ⁽²⁾ | ±0.2 | |
| Parallelism ⁽³⁾ | 3 arc min. | |
| Flatness (per 25mm@633nm) ⁽⁴⁾ | 2 λ (General), λ /2(High Precision) | |
| Surface Quality ⁽⁵⁾ | 80/50 (General), 20/10 (High Precision) | |
| Optical Density ⁽⁶⁾ | 0.04, 0.1, 0.2, 0.3, 0.4, 0.5, 0.8, 1.0, 2.0, 3.0, 4.0, etc. | 0.1, 0.2, 0.3, 0.5, 0.8, 1.0, 2.0, 3.0, 4.0, etc. |
| Optical Density Tolerance | ±5% | |

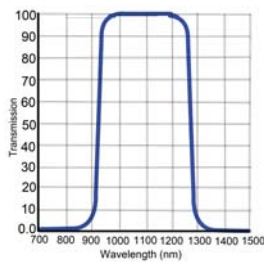
Note for Interference Filter:

- (1). Typical diameter is phi 10.0mm, 15.0mm, 20.0mm, 25.4mm, other size at shape of quadrate, triangular, or other polygons are available upon request.
- (2). Typical size tolerance is ±0.2mm, better precision is available upon request.
- (3). Typical parallelism is 3 arc minutes, better parallelism is available upon request
- (4). Typical flatness is 2λ, high precision such as λ/2 is available upon request.
- (5). Typical surface quality is 80/50, better precision such as 60/40, 40/20, 20/10 is available upon request.
- (6). Optical density (D) is defined as the base 10 logarithm of the reciprocal of transmittance (T):
 $D = \log(1/T)$ or $T = 10^{(-D)}$, Besides the typical optical density listed as above, others are available upon request.

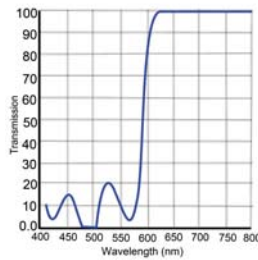
Dielectric Coating Filter

FOCtek offers dielectric coating filters made of optical materials such as Colored Glass, N-BK7, H-K9L, Fused Silica, Sapphire and so on.

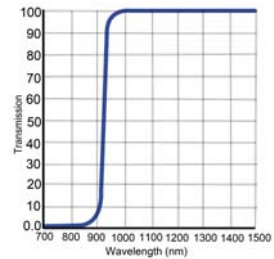
The dielectric coating filters include bandpass filters, dichroic filters, longpass filters and shortpass filters. The transmissive rang of wavelength is customized and high transmission at specified wavelength is available upon request.



Bandpass Filter



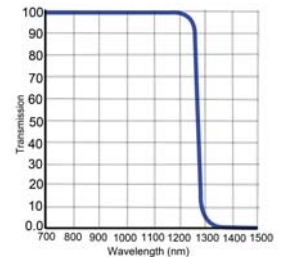
Dichroic Filter



Longpass Filter

Specifications

| Attribute | Specification |
|---------------------------------------|---|
| Material ⁽¹⁾ | Optical glass |
| Typical Diameter (Φmm) ⁽²⁾ | 10.0, 12.7, 15.0, 20.0, 25.4, etc. |
| Typical Thickness (mm) | 0.2 ~ 20.0 |
| Dimension Tolerance (mm) | ±0.2 (General), +0.0/-0.05 (High Precision) |
| Surface Quality | 80/50 (General), 40/20 (High Precision) |
| Wavelength (nm) ⁽³⁾ | Upon request |
| Coating ⁽⁴⁾ | Dielectric coated AR, HR, PR, etc. |



Shortpass Filter

Note for Dielectric Coating Filter:

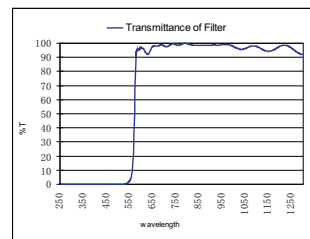
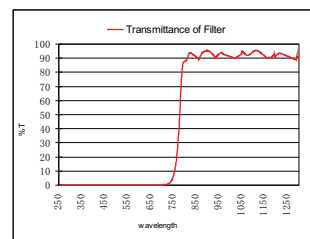
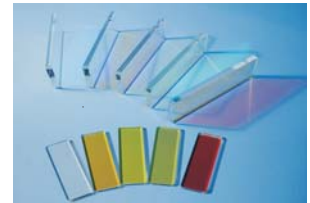
- (1). Optical glass such as Colored Glass, N-BK7, H-K9L, B270 Fused Silica, Sapphire and so on.
- (2). Dielectric Coating Filter at any size with shape of quadrate, triangular, or other polygonal are available
- (3). Wavelength range such as UV (200nm-399nm), VIS (400nm-700nm), IR (750nm-2500nm) is available.
- (4). Please refer to Part 5 for more information about Coating.

IPL Filter

IPL filter is the key optical element for IPL (Intense Pulsed Light) machine, which filters the UV wave and reserve the useful wave from 400nm to 1200nm for cosmetic laser, such as photorejuvenation, hair removal, vascular and acne treatment. The IPL Filters include **IPL Internal Filters** and **IPL External Filters**.

IPL Filter Typical Specifications

| Attribute | Specification |
|--------------------------------------|--|
| Material | N-BK7, H-K9L, Fused Silica, Sapphire etc. |
| Dimension Tolerance (mm) | ±0.1 (General), ±0.01 (High Precision) |
| Thickness Tolerance (mm) | ±0.2 (General), ± 0.005 (High Precision) |
| Surface Quality | 60/40 or Better |
| Clear Aperture | >90% |
| Parallelism | <3 arc min. (General), <5 arc sec. (High Precision) |
| Wavefront Distortion(per 25mm@633nm) | <λ/2 (General), λ/8 (High Precision) |
| Bevel (face width x 45°) | 0.2-0.5mm |
| wavelength (nm) | 515-1200, 530-1200, 550-1200, 560-1200, 570-1200, 590-1200, 615-1200, 615-1200, 695-1200, 755-1200, 780-1200 |



IPL Light Guide

FOCtek supplies the IPL light guide with all surfaces polished by advanced polishing technic. The high surface quality as 20/10, flatness better than λ/10 is achievable. This special polished products can be made of materials such as N-BK7, Fused Silica and so on.

****IPL Filter Coating on IPL Light Guide is available.**

| Attribute | Specification |
|---------------------------|---|
| Material | N-BK7, H-K9L, Fused Silica, Sapphire etc. |
| Dimension Tolerance (mm) | ±0.1 (General), +0.0/-0.01 (High Precision) |
| Surface Quality | 60/40 (General), 20/10 (High Precision) |
| Clear Aperture | >90% (General), >97% (High Precision) |
| Parallelism | <1arc min. (General), <10arc sec.(High Precision) |
| Flatness (per 25mm@633nm) | <λ/2 (General), <λ/10 (High Precision) |
| Bevel (face width x 45°) | <0.25mm (General), No Bevel (High Precision) |
| Chip (mm) | <0.2 (General), <0.05 (High Precision) |



Note: FOCtek provides a wide variety of custom design IPL Products upon request

- 1、 Custom Size is available upon request
- 2、 Custom coated wavelength is available upon request
- 3、 Custom made mounter for the IPL Products is available