



Optics Leading the Light

RONAR-SMITH® Laser Optics & IR Imaging



Introduction

RONAR-SMITH® Laser Optics

CEO Message:

Dear Customer:

Thank you for your interest to our company, our product and service.

We have been in the laser and image optics market for nearly 10 years. Based in Singapore, the hub of South East Asia, we have embedded quality and customer service grains deeply in our organization. We conduct Research Development, scale assembly and test in our Singapore facility which is certified ISO9001 since year 2004.

We have established our optics fabrication facility since year 2003. The facility has been certified ISO9001 and ISO14000 since year 2006. It has been expanded to 12000 square meters in 2010. Continuous investment on facility as well as production process and equipment has been made over the years. SPC and other tools are applied widely in factory quality and engineering management.

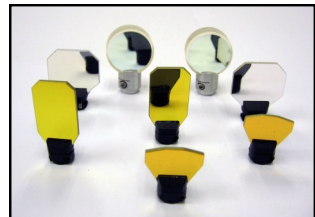
Training employee is high focus among our organization. From basic manufacturing skills to sophisticated capacity management system are provided in regular basis. We believe quality to customers is delivered from quality employee's hand. Thus we put training high priority in each year's agenda.

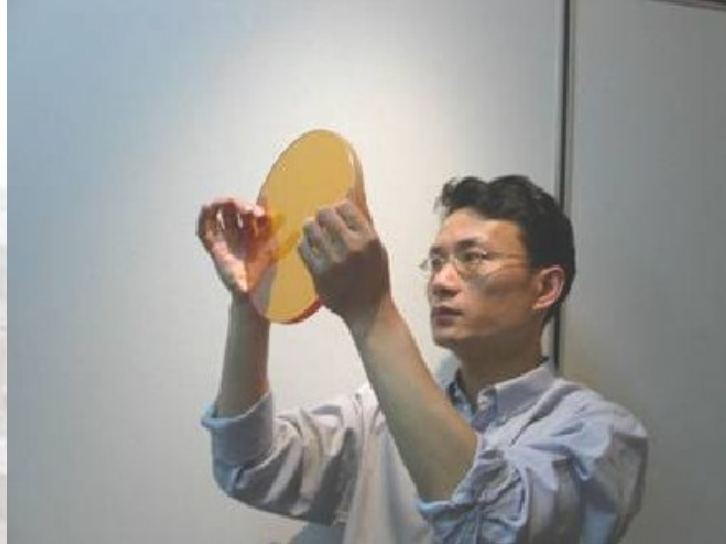
Maintaining business ethic such as honesty to customers, fairness to employees, respect to suppliers etc are cultivated in company culture. We emphasis on right fundamentals for long term organizational success.

Thanks for laser industry and imaging industry's growth over the years. Optical industry is also growing in a stable pace respectively. Laser system becomes smaller but power gets higher. IR Imaging device has extended detectable wave band from 3-5um to 0.8-5um which produces clearer image. Customer demands for long life span optics as well as environment-friendly optics. We are working on these challenges to meet the increasing demand. I believe Wavelength team will deliver to you solutions for your satisfaction.

I wish you enjoy reading our new product catalog, and be successful in your business and career.

Robert Huang
Chief Executive Officer





"We do not believe in perfection as what is perfect today may not be tomorrow but only through constant innovation and re-invention can we strive for excellence"

Huang

Robert Huang, CEO





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RONAR-SMITH® Laser Optics & IR Imaging



Introduction

RONAR-SMITH® Laser Optics

Optics for Medical Laser System

Optics for Semiconductor Spectroscopy Biomedical Application Laser

Optical Material

Laser Accessories Components

Registration Schedule

SCOPE OF REGISTRATION

“Design, Assembly and Trading of Optical Components”

Company Name: **WAVELENGTH TECHNOLOGY SINGAPORE PTE LTD**

Site(s) Registered: Blk 2 Bukit Batok Street 24
#06-03 Skytech Building
Singapore 659480

Standard: **BS EN ISO 9001:2008**

EAC: 19

Date of Re-Registration: 5th September 2007 Revision Date: 24th September 2009

Date of Expiry: 29th September 2010

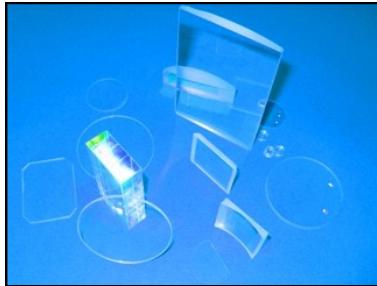
Certificate Number: AJA04/7893



Raymond Chan Timothy Dixon
Joint Chief Executives, AJA Registrars



This certificate is the property of AJA Registrars and must be returned on request



INTRODUCTION

Wavelength Technology

Basic Optic Knowledge

Optical Materials

Lenses Design Basics

Customized Optics

Polishing & Coating Services

RONAR SMITH® LASER OPTICS

Beam Expanders

.....10.6µm (UniBET series)

.....9.4µm/10.6µm (BEX series)

.....1064nm,532nm,355nm,266nm(BEX series)

.....2790nm,1550nm,1090nm,1053nm,904nm,680nm,633nm (BEX series)

Zoom Beam Expanders

.....9.4µm/10.6µm (BXZ series)

.....1064nm,800nm,532nm,355nm,266nm (BXZ series)

.....Motorized Zoom Beam Expander

F-THETA Scan Lens

.....10.6µm (Single Element)

.....10.6µm (Double Element)

.....10.6µm (Triple Element Made of ZnSe)

.....1550nm,1064nm,532nm,355nm,266nm

.....1064nm Fiber Scan Lens

.....1064nm,940nm(Achromatic)

Telecentric Scan Lens

.....10.6µm,9.6µm,1064nm,670nm,633nm, 532nm,405nm,355nm,266nm

.....650nm/ 532nm,650nm/450nm(Achromatic)

Focusing Lens

.....10.6µm

.....10.6µm Diverging Lens (Negative)

.....1064nm

.....1090nm,1064nm,532nm,355nm Diverging Lens (Negative)

.....10.6µm,1064nm,532nm,355nm (Air Spaced Doublet)

.....1064nm,532nm,355nm(Air Spaced Triplet)

.....Collimating and Focusing Lenses Assemblies

Special Lens

.....Axicon Lens

.....Deep Focus

.....Aspheric lens

Achromatic Lens



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Introduction

RONAR-SMITH®
Laser Optics

Optics for Medical
Laser
System

Optics for
Semiconductor
Application Laser
Biomaterial
Spectroscopy

Optical
Material



Laser
Accessories
Components



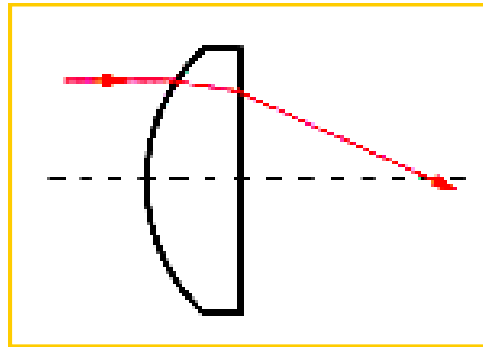
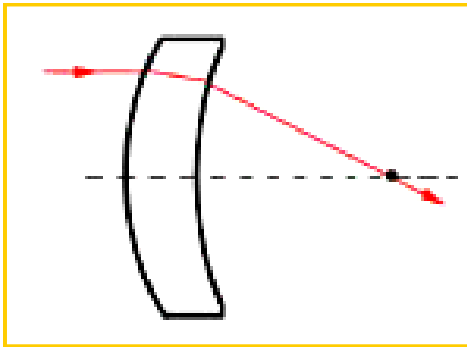
Optics Leading the Light

RONAR-SMITH® Laser Optics & IR Imaging



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Basic Optic Knowledge

Currently, lasers are employed over a huge range of applications including basic scientific research, test and measurement, industrial processing, etc. The vast application of laser put heavy interest on optics as well to guide and manipulate the light.

Light as a spectrum cover a wide wavelength range. Nonetheless, laser with its basic properties emit only a certain wavelength depends on the gain material and design. In order to manipulate the laser on those specific wavelengths, we need various different materials accordingly. The following is a few of most common material used.

Optical Material

BOROSILICATE GLASS (BK7)

Transmission Range (um)	0.35-2
Refractive Index@546.1nm	1.51872
Temperature Coefficient of Refractive Index, /°C	8.3×10^{-6}
Melting Point, °C	559
Density, g/cm ³	2.51

FUSED SILICA (SiO₂)

Transmission Range (um)	0.16-3
Refractive Index@5um	1.55-1.40
Hardness (Knoop), Kg/mm ²	500
Density, g/cm ³	2.201
Young's Modulus, GPa	73

BARIUM FLUORIDE (BaF₂)

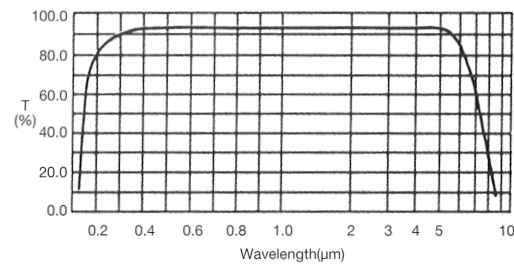
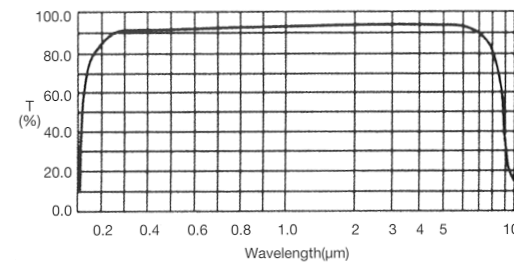
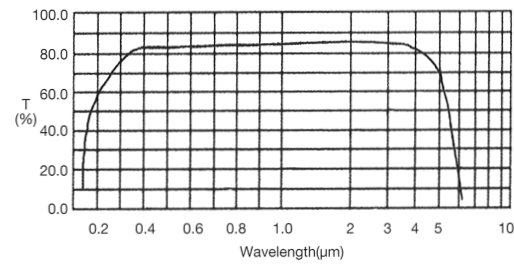
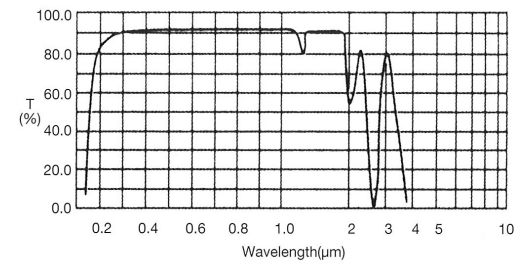
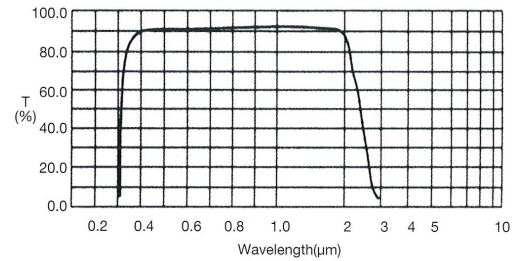
Transmission Range (um)	0.15-12.5
Refractive Index@2.6um	1.4626
Temperature Coefficient of Refractive Index, /°C	18.1×10^{-6}
Melting Point, °C	1280
Hardness (Knoop), Kg/mm ²	82
Density, g/cm ³	4.89
Young's Modulus, GPa	53.07

CALCIUM FLUORIDE (CaF₂)

Transmission Range (um)	0.13-10
Refractive Index@5um	1.39908
Temperature Coefficient of Refractive Index, /°C	18.85×10^{-6}
Melting Point, °C	1360
Hardness (Knoop), Kg/mm ²	158.3
Density, g/cm ³	3.18
Young's Modulus, GPa	75.8

MAGNESIUM FLUORIDE (MgF₂)

Transmission Range (um)	0.11-7.5
Refractive Index, n _o /n _e @0.405um	1.3836/1.3957
Temperature Coefficient of Refractive Index, /°C	$13.7/8.48 \times 10^{-6}$
Melting Point, °C	1255
Hardness (Knoop), Kg/mm ²	415
Density, g/cm ³	3.177
Young's Modulus, GPa	138.5





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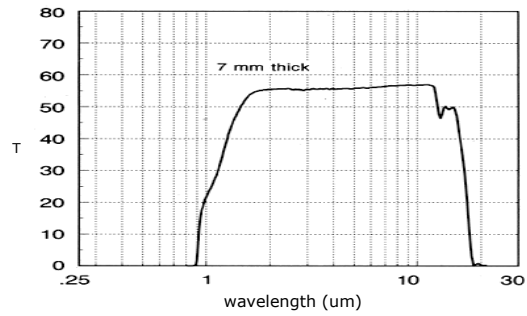


Introduction

RONAR-SMITH® Laser Optics

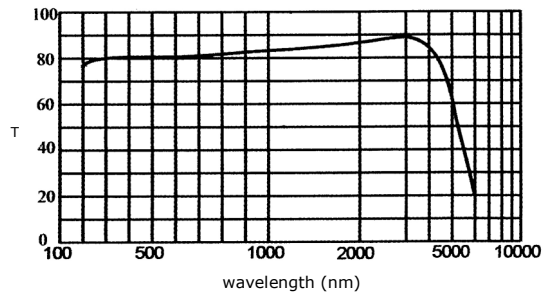
GALLIUM ARSENIDE (GaAs)

Transmission Range (um)	1-22
Refractive Index@10um	3.277
Temperature Coefficient of Refractive Index, /°C	149 x 10 ⁻⁶
Melting Point, °C	1600
Hardness (Knoop), Kg/mm ²	750
Density, g/cm ³	5.37
Young's Modulus, GPa	8.3



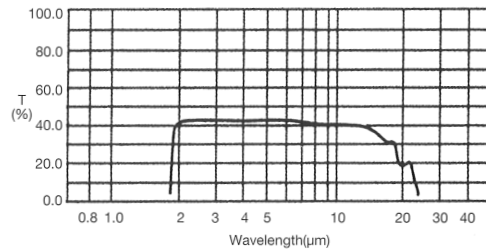
SAPPHIRE (Al₂O₃)

Transmission Range (um)	0.15-5.5
Refractive Index@1.0139um	1.755
Temperature Coefficient of Refractive Index, /°C	8.4 x 10 ⁻⁶
Melting Point, °C	2040
Hardness (Knoop), Kg/mm ²	2000
Density, g/cm ³	3.97
Young's Modulus, GPa	335



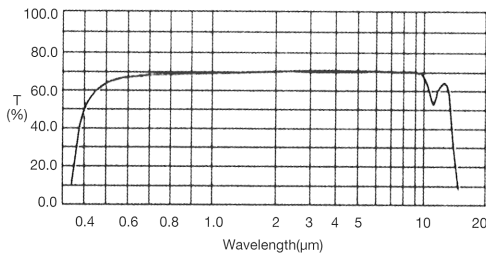
GERMANIUM (Ge)

Transmission Range (um)	1.8-23
Refractive Index@10um	4.0034
Temperature Coefficient of Refractive Index, /°C	5.5-6.1 x 10 ⁻⁶
Melting Point, °C	936
Hardness (Knoop), Kg/mm ²	780
Density, g/cm ³	5.327



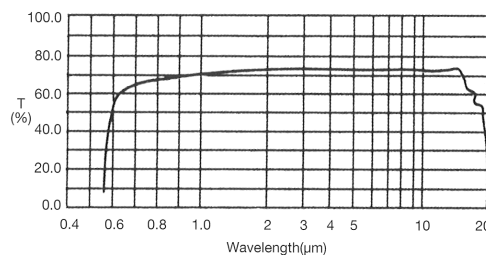
ZINC SULPHIDE (ZnS)

Transmission Range (um)	0.37-14
Refractive Index@10um	2.2008
Temperature Coefficient of Refractive Index, /°C	50 x 10 ⁻⁶
Melting Point, °C	1830
Hardness (Knoop), Kg/mm ²	250
Density, g/cm ³	4.09
Young's Modulus, GPa	74.5



ZINC SELENIDE (ZnSe)

Transmission Range (um)	0.5-22
Refractive Index@10.6um	2.4028
Temperature Coefficient of Refractive Index, /°C	7.8 x 10 ⁻⁶
Melting Point, °C	1525
Hardness (Knoop), Kg/mm ²	120
Density, g/cm ³	5.27
Young's Modulus, GPa	67.22



Optics for Medical Laser System
Semiconductor Spectroscopy
Biomedical Application Laser

Optical Material

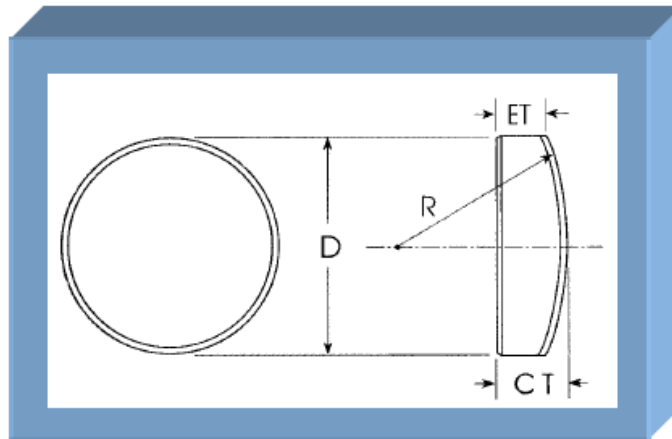
Laser Accessories Components

Lenses Design Basics

a) Convex lenses

Convex lenses are optical imaging components with positive focus length. After going through the convex lens, parallel beam of light becomes convergent.

Both surfaces of Biconvex lenses are spherical. If the radii of both surfaces of the lens are equal, the lens is called biconvex symmetrical, if the radii are different - we have unsymmetrical biconvex lens. The special kind of the latter is plane-convex lens, in which one radius equals ∞ .



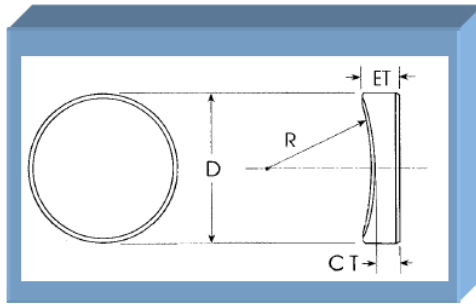
Optimal selection of radii depends on material, and required magnification of the lens. There is no possibility to eliminate chromatic aberrations of single lens, which depend on the relationship between index of refraction and wavelength used. It means that when the wavelength is changed, any existing arrangement of single lenses has to be adjusted.

Plano-convex lens is a special kind of unsymmetrical positive lens, where one surface is plane, and radius of the other depends on refraction index of the glass used, and the required refracting power. The planoconvex lenses are usually used for focusing plane parallel beam (Placing convex side of the lens next to the collimated beam minimize the spherical aberration).

b) Concave lenses

Single concave lenses spread, optical imaging elements with negative focal length. Collimated beam of light going through the lens becomes divergent and thus the image obtained is virtual. It can be observed through the lens in the incident direction of the light, only.

Biconcave lenses have two spherical, concave surfaces. When the radii of both surfaces are equal - we call the lens symmetrical biconcave lens; if however, they differ - then we get unsymmetrical biconcave lens. Special version of unsymmetrical biconcave lens is plano-concave lens, in which one of the radii of curvature equals $= \infty$ which means that one of the surfaces is plane.



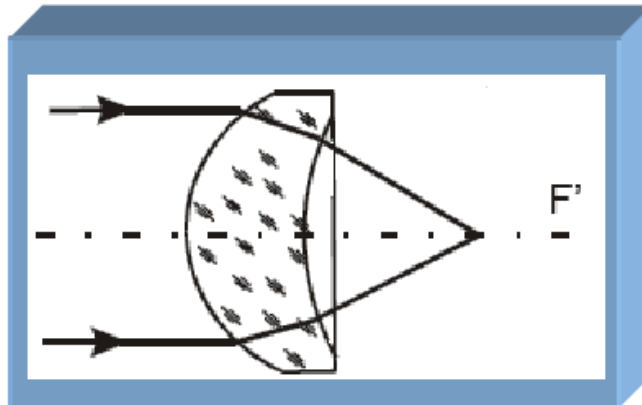
Biconcave unsymmetrical lenses with minimized spherical aberration are called best form lenses. These lenses should be adjusted in such way that they face the beam of smaller divergence with the shorter radius side.

The special version of biconcave unsymmetrical lens is plano-concave lens. Single plano-concave lens is mainly used for expansion of laser beam or for divergence beam of light collimation.

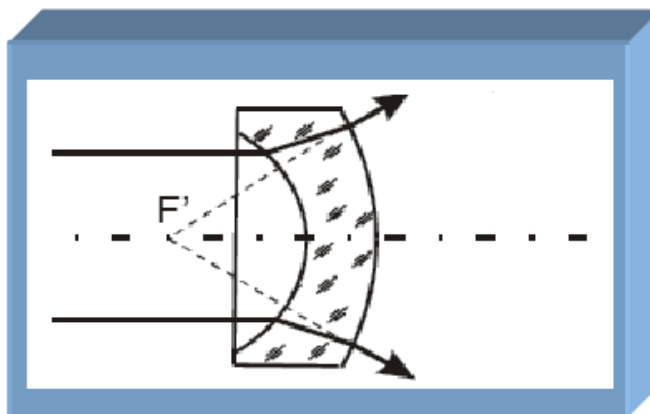
c) Meniscus (Concave-convex lenses)

One surface of meniscus lenses is concave, while the other - convex one. A meniscus lens is almost always used in combination with other kinds of lenses to build systems with focal length shorter or longer than that of the original lens.

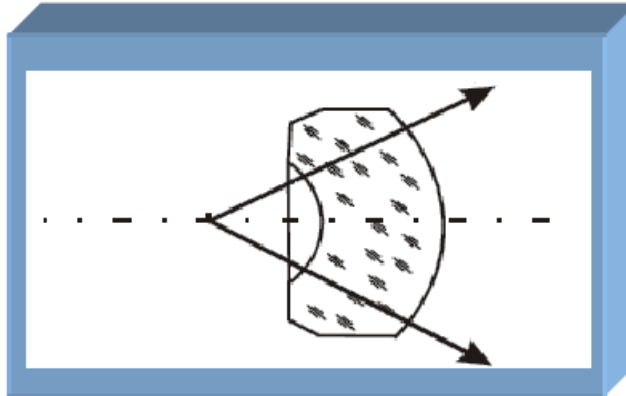
1. Positive meniscus lens focuses a beam of light.



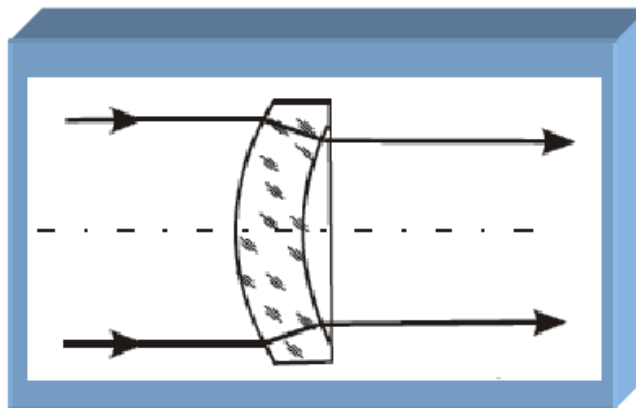
2. Negative meniscus lens diverges a beam of light.



3. zero-meniscus lens have both surfaces concentric. The lens does not change the divergence of the beam.

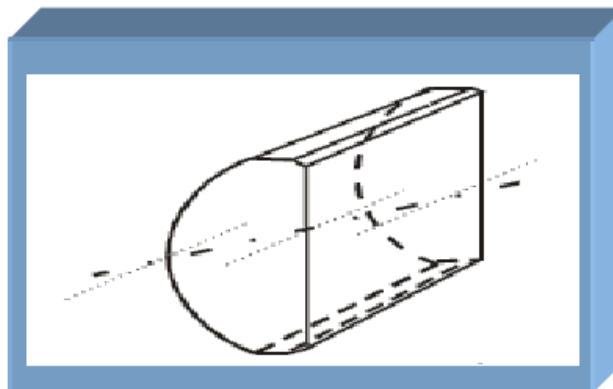


4. Zero meniscus lens also does not change the divergence of the beam, but makes it shift parallel.



d) Cylindrical lenses

Cylindrical lenses are optical imaging components with one of the surfaces being cylindrical instead of spherical. The second surface in this kind of lenses is usually flat. As the cylindrical surface deflects the rays in one direction only, it transforms the point image not into a point as in the case of spherical lenses, but into a line.

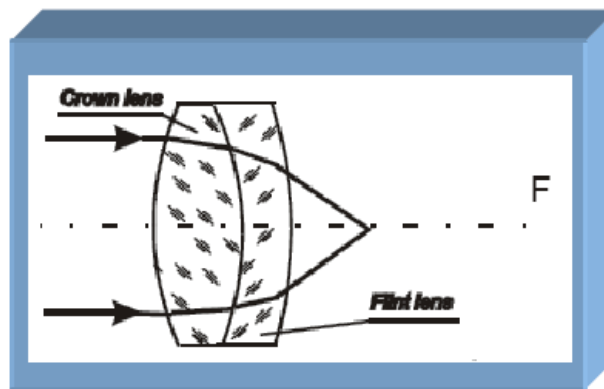


One can use the cylindrical lenses in illuminating systems of line detectors or slotted diaphragms in spectroscopy, in medical techniques for making pattern indicators in scanners.

e) Achromats

Achromats are optical components composed of lenses produced from different materials for correction of chromatic aberrations. An achromat, which consists of two lenses, is called achromatic doublet.

Typical selection of glasses: flint glass + crown glass Achromats work like focusing or diverging lenses, because they can have either positive or negative foci.



Lens Formula

These are some of the insights of fundamentals of lens design

Where,

- D: diameter of lens
- f_1, f_2 : focal length
- L_1, L_2 : object's size
- R_1, R_2 : radius of curvature of lens
- S_1, S_2 : principal point

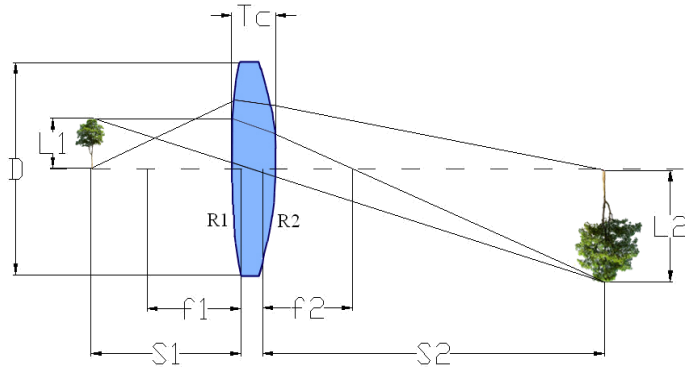
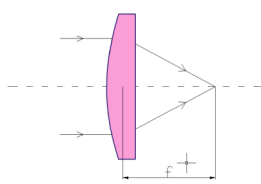


Fig. Typical Representation of light passage through a lens

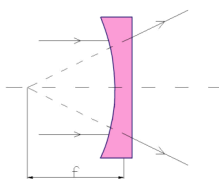
$$\frac{1}{f} = (n-1) \left[\frac{1}{R_1} - \frac{1}{R_2} + \left(\frac{(n-1)}{n} \right) \left(\frac{T_c}{R_1 R_2} \right) \right] \quad M = \frac{L_2}{L_1} = \frac{S_2}{S_1}$$

Simplified formulas of effective focal length of different types of thin lens are given by:



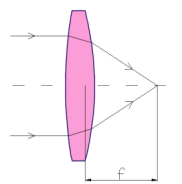
Plano-Convex

$$f = \frac{R}{(n-1)}$$



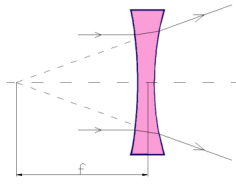
Plano-Concave

$$f = -\frac{R}{(n-1)}$$



Bi-convex

$$\frac{1}{f} = \frac{(n-1)}{R} \left[2 - \left(\frac{(n-1)}{n} \right) \left(\frac{T_c}{R} \right) \right]$$



Bi-concave

$$\frac{1}{f} = -\frac{(n-1)}{R} \left[2 - \left(\frac{(n-1)}{n} \right) \left(\frac{T_c}{R} \right) \right]$$



Optics Leading the Light

RONAR-SMITH® Laser Optics & IR Imaging



Introduction

Technical Definitions

RONAR-SMITH®
Laser Optics

Power: The number of times a lens or lenses multiplies an image with respect to the original size. Low power is recommended for scanning large surfaces. Higher powers are generally used for inspecting small areas.

Field of View: The maximum area seen through a magnifier. The entire field of view may not be in focus. See Flatness of Field.

Optics for Medical
Laser
System

Flatness of Field: Due to the physical laws of optics, the outer part of the image formed by a lens may be out of focus. The greater the power and curvature of the lens, the more pronounced this problem becomes. Magnifiers with multiple lenses can reduce this problem. The visible area which appears in focus is the flat field.

Working Distance: The distance from the magnifier lens to the object being viewed. As magnification power increases, the working distance decreases.

Aberration: This is a distortion caused by the lens. Spherical aberration is distortion of the image, as explained in Flatness of Field. Chromatic aberration is distortion of colors being viewed, as explained in Color Distortion.

Color Distortion: Lenses produce a prism effect which causes the image to develop false color fringes. This is due to the fact that different colors focus at different points. Achromatic lenses correct this problem by focusing many colors at the same point.

Parallax: Parallax is the apparent misalignment of two different items when viewed from an angle. It is the cause of improper registration when stripping multiple color jobs. Parallax is eliminated when viewing straight down on registration marks instead of from a slight angle.

Coated Lens: A coated lens helps to minimize or eliminate color distortion caused by different colors focusing at different locations. Optimum color viewing is obtained from coated achromatic lenses.

Optics for
Semiconductor
Spectroscopy
Biomedical
Application Laser

Optical
Material

Laser
Accessories
Components

Customized Optics

OPTICAL MATERIALS

Types of Materials	Infra-Red	Visible-Near Infra-Red
Ge	✓	
ZnSe	✓	
ZnS	✓	
GaAs	✓	
BK7		✓
Fused Silica		✓
CaF2		✓
Sapphire		✓

LENSES

Types of Lenses	Infra-Red	Visible-Near Infra-Red
GaAs	✓	
ZnSe	✓	
Ge	✓	
Sapphire lenses		✓
CaF2 lenses		✓
BK7 lenses		✓
Fused Silica lenses		✓
Cylindrical lenses	✓	✓

WINDOWS

Types of Materials	Infra-Red	Visible-Near Infra-Red
Ge	✓	
ZnSe	✓	
ZnS	✓	
GaAs	✓	
BK7		✓
Fused Silica		✓
CaF2		✓
Sapphire		✓

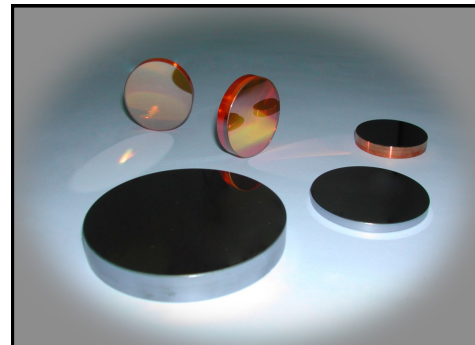
We provide customized optics upon any requests. The optics can be customized from various optical materials. In addition, the customized optics can come in a wide range of lens, windows, prisms and reflecting mirrors.

PRISMS

Types of Prisms
Penta Prisms
Right-Angle Prisms
Corner Cube Retroreflectors
Anamorphic Prisms
Dove Prisms

REFLECTING MIRRORS

Types of Reflecting Mirrors
CO ₂ Mirror
Nd:YAG Mirror
UV Mirror
Green Mirror
Visible Mirror



Polishing & Coating Services



Curve profiling

We offer high quality polishing services for lens, filters, mirrors, windows, prisms, domes and cubes. Our range of materials includes ZnSe, ZnS, Ge, Si, GaAs, Moly, CaF2, BK7, Fused Silica, etc.

We have our very own manufacturing plants and in-house testing facilities. You will be assured of only the finest quality products with very prompt delivery and competitive prices for all our products.

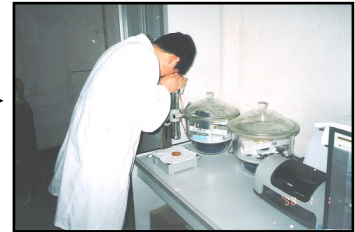
We strive to deliver best valuable products and services to our worldwide customers.



Polishing



Edging



Centering error measurement



Interferometer



Spectrophotometer



Thin-film Vacuum coating



Quality Assurance

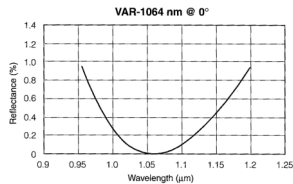
Wavelength Technology Singapore Pte. Ltd. specializes in the design, manufacturing, research and development of optical thin-film components. Our personnel are highly qualified in thin film design. Excellent technical and equipment resources ensure that we will meet customer requirements and objectives with coatings of reliable performance and quality.

Our optical thin-film coating products have been widely applied to optical and opto electronics systems, such as laser light source, industrial and medical laser equipments and optical data storage systems in the fields of physics, chemistry, biology, medicine and astronomy.

Wavelength Technology Singapore Pte. Ltd. develops coatings especially for laser systems and infrared systems. The coatings that we do include Antireflective Coatings, High Reflective Coatings, Partial Reflective Coatings, Beam Splitter Coatings, Laser Crystal Coatings, Infrared Coatings, Ultraviolet Coatings and Fiber Coatings. Other wavelengths, Incident angles and dimensions available upon request.

ANTI-REFLECTION (AR) COATING

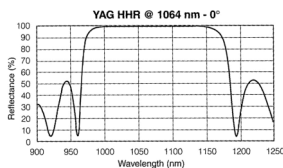
Substrate: fused silica, BK7
 Surface Figure: $<\lambda/10$ @ 632.8nm
 Surface Quality: 40-20
 Chamfer: 0.5mm, 45°
 Coating Material: Electron beam deposited dielectric multi-layers
 Incident: 0°
 Clear Aperture: > Central 85% of diameter



Wavelength (nm)	Residual Reflectance
193	<0.5%
284	<0.5%
355	<0.5%
632.8	<0.5%
670	<0.5%
780	<0.5%
808	<0.5%
980	<0.5%
1030	<0.5%
1053	<0.5%
1064	<0.5%
1310	<0.5%
1550	<0.5%

HIGH REFLECTIVE (HR) COATING

Substrate: fused silica, BK7
 Surface Figure: $<\lambda/10$ @ 632.8nm
 Surface Quality: 40-20
 Chamfer: 0.5mm, 45°
 Coating Material: Electron beam deposited dielectric multi-layers
 Incident: 0°, 45°
 Clear Aperture: > Central 85% of diameter



Wavelength (nm)	Reflectance
350-650	>99%
420-670	>99%
650-1050	>99%
1050-1550	>99%



Optics Leading the Light

RONAR-SMITH® Laser Optics & IR Imaging

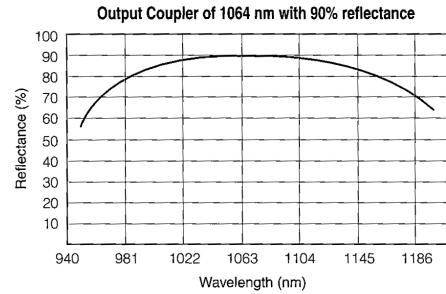


Introduction

RONAR-SMITH® Laser Optics

PARTIAL REFLECTIVE COATING

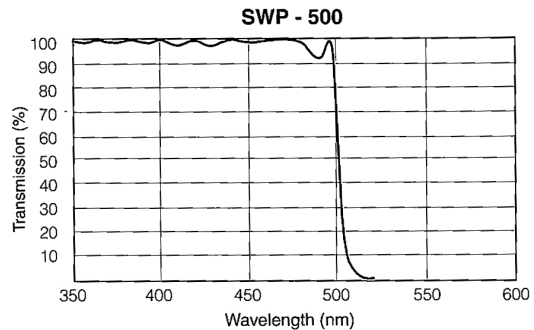
Substrate: fused silica, BK7
 Surface Figure: $<\lambda/10$ @ 632.8nm
 Surface Quality: 40-20
 Chamfer: 0.5mm, 45°
 Coating Material: Electron beam deposited dielectric multi-layers
 Incident: 0°,45°
 Clear Aperture: > Central 85% of diameter
 Rear Surface AR Coating: $R < 0.2\%$



Wavelength	Reflectance and Tolerance
190nm-10.6µm	10±2%, 20±3%, 30±3%, 40±3%, 50±3%, 60±3%, 70±3%, 80±3%, 90±2%, 95±1.5%, 98±1%, 99±0.5%

BEAM SPLITTER COATING

Substrate: fused silica, BK7
 Surface Figure: $<\lambda/10$ @ 632.8nm
 Surface Quality: 40-20
 Chamfer: 0.5mm, 45°
 Coating Material: Electron beam deposited dielectric multi-layer
 Incident: 0°
 Laser-Induced Damage Threshold: $>5J/cm^2$ (1.06µm, 1ns)



Incident Angle	Transmission Wavelength (nm)	Transmission	Reflective Wavelength (nm)	Reflectance
0°	808	>90%	946	>99.5%
0°	808	>90%	1064	>99.5%
0°	808	>90%	1320	>99.5%
0°	940	>90%	1030	>99.5%

Optics for Medical Laser System

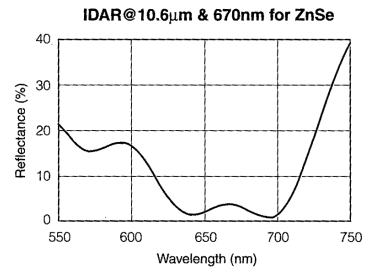
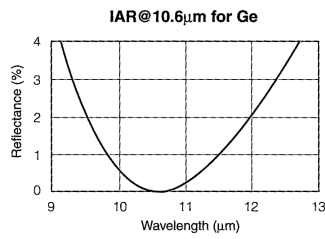
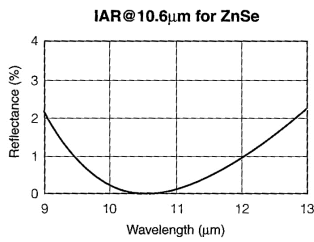
Semiconductor Spectroscopy Biomedical Application Laser

Optical Material

Laser Accessories Components

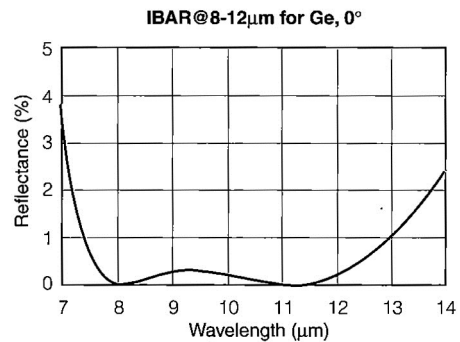
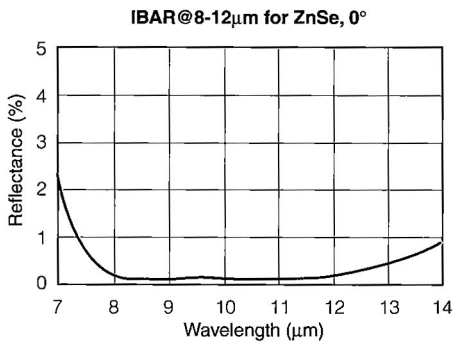
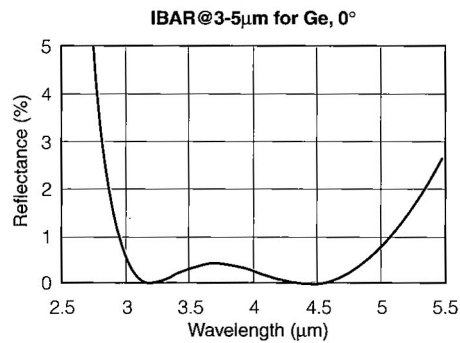
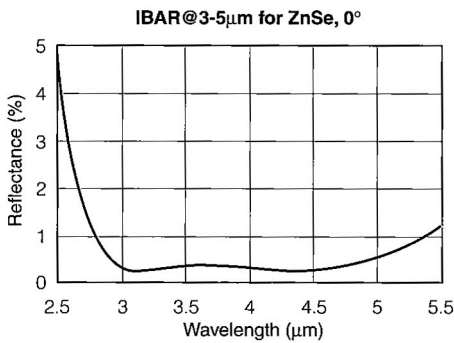
INFRARED NARROWBAND (AR) COATING

Incident: 0° or 45°
 Reflectance: $R_{ave} \leq 0.25$ @ 0°
 $R_{ave} \leq 0.5\%$ @ 45°
 Absorption: $\leq 0.1\%$ per surface
 Damage Threshold: ≥ 5 kw / cm²
 Durability: Meet adhesion and abrasion per MIL-C-675



INFRARED BROADBAND (AR) COATING

Incident: 0° or 45°
 Reflectance: $R_{ave} \leq 0.5$ @ 0°
 $R_{ave} \leq 1.0\%$ @ 45°
 Absorption: $\leq 0.1\%$ per surface
 Damage Threshold: ≥ 5 kw / cm²
 Durability: Meet adhesion and abrasion per MIL-C-675





Optics Leading the Light

RONAR-SMITH® Laser Optics & IR Imaging



Introduction

BEAM COMBINER COATING

Material: ZnSe, GaAs or Ge
 Surface Flatness: $< \lambda / 20$ @ 10.6 μm
 Surface Quality: $< 40 / 20$ (both sides)
 Parallelism: ≤ 3 arc min
 Diameter Tolerance: $< + 0.000'' / - 0.008''$
 Thickness Tolerance: $< \pm 0.010''$
 Clear Aperture: $\geq 85\%$ of diameter
 Angle of Incidence: 0° or 45°
 Coating: S1: AR @ 10.6 μm , 45° , S2: $R_{\geq 90\%}$ @ 650 nm ± 20 nm
 & HT $\geq 98\%$ @ 10.6 μm
 Absorption: $\leq 0.2\%$
 AOI: 45°
 Durability: Per MIL-M-13508

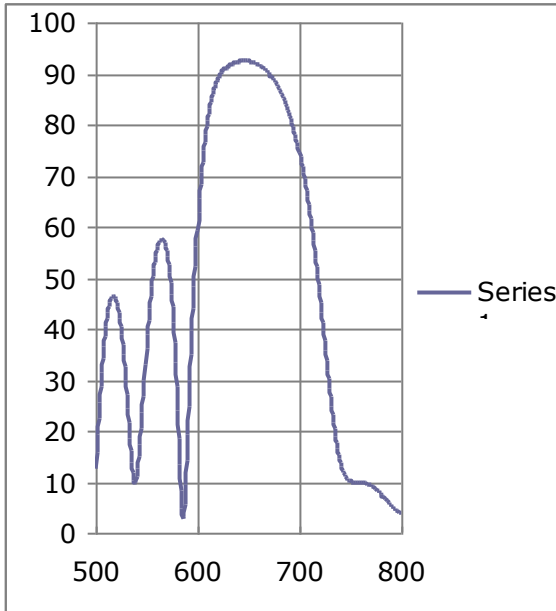
RONAR-SMITH® Laser Optics

Optics for Medical Laser System

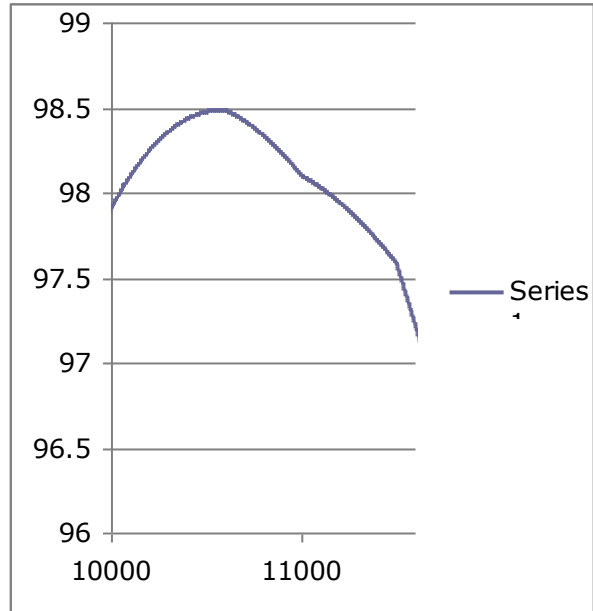
Optics for Semiconductor Spectroscopy Biomedical Application Laser

Optical Material

Laser Accessories Components



Wavelength (nm)



Wavelength (nm)



2. **RONAR-SMITH® Laser Optics**

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Beam Expanders

The most common type beam expander is derived from Galilean telescope which usually has one negative input lens and one positive output lens. The input lens presents a virtual beam focus at the output. For low expansion ratio, the Galilean telescope is most often employed due to simplicity, small package size and low cost. Beam expander is commonly used to magnify the laser diameter to be focused back in smaller spot size.

- 10.6 μ m (UniBET series) High Power BEX

UniBET series Beam expander is developed for higher power CO₂ laser >100w without water cool. With consistence in outer dimension and connecting thread M30x1, UniBET series provide customer convenience and wide range of fixed magnification of 1.5x-10x. it has input clear aperture 20mm and output clear aperture 28mm.

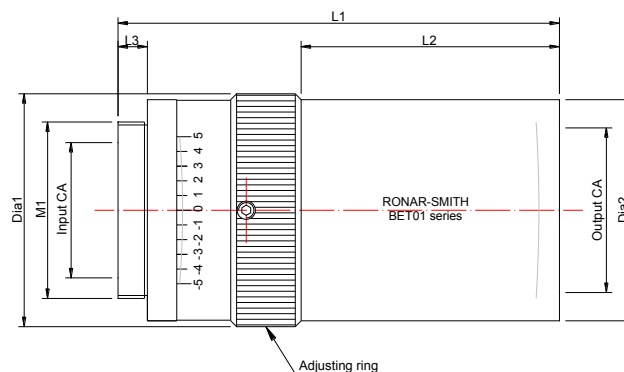
Specifications

For collimation of CO₂ laser >100W

Fixed magnifications 1.5x - 10x

Galilei Design

Adjustable divergence



Part No.	Magnification	Input CA (mm)	Output CA (mm)	L1 (mm)	Dia 1 (mm)	Dia 2 (mm)
BET0101.5	1.5	20.0	28.0	75.2	39.6	37.6
BET0102A	2.0	20.0	28.0	75.0	39.6	37.6
BET0102.5	2.5	20.0	28.0	75.6	39.6	37.6
BET0103A	3.0	20.0	28.0	75.0	39.6	37.6
BET0104A	4.0	20.0	28.0	75.0	39.6	37.6
BET0105A	5.0	20.0	28.0	75.0	39.6	37.6
BET0106A	6.0	20.0	28.0	75.0	39.6	37.6
BET0107A	7.0	20.0	28.0	78.5	39.6	37.6
BET0108A	8.0	20.0	28.0	75.0	39.6	37.6
BET0110A	10.0	20.0	28.0	85.0	39.6	37.6

Water Cool Beam Expander

BET-WC water cool series beam expander is developed for even higher power CO₂ laser >500W with consistence in outer dimension and water pipe connection.

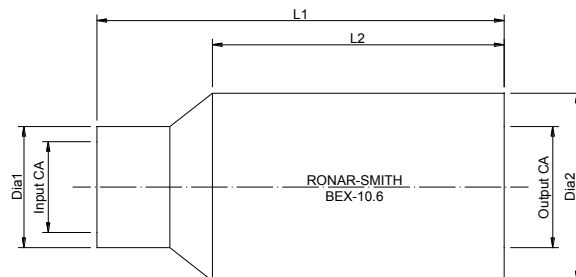
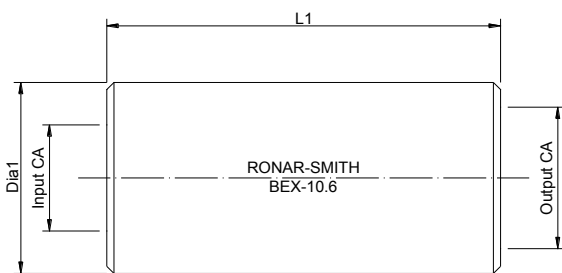
Part No.	Magnification	Input CA (mm)	Output CA (mm)	Total Length (mm)	Max. dim (mm)
BET0101.5-WC	1.5	20.0	28.0	82.9	65x65
BET0102-WC	2.0	20.0	28.0	82.9	65x65
BET0103-WC	3.0	20.0	28.0	82.9	65x65
BET0104-WC	4.0	20.0	28.0	82.9	65x65
BET0105-WC	5.0	20.0	28.0	82.9	65x65
BET0106-WC	6.0	20.0	28.0	82.9	65x65
BET0107-WC	7.0	20.0	28.0	82.9	65x65
BET0108-WC	8.0	20.0	28.0	82.9	65x65
BET0110-WC	10.0	20.0	28.0	82.9	65x65



- 9.4µm/10.6µm (BEX series)

CO₂ BEX - Fixed Series

Specifications
For collimation of CO ₂ laser <100W
Fixed magnifications 1.5x - 10x
Galilei Design



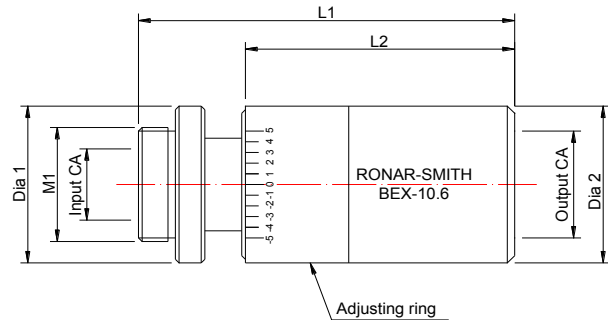
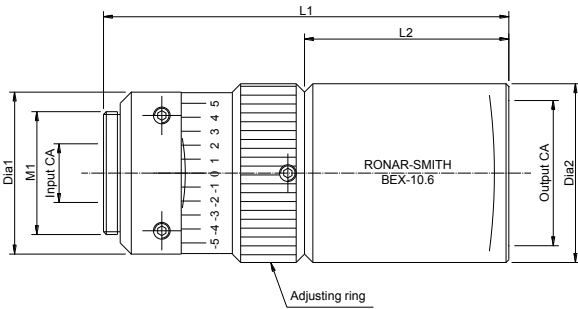
Part No.	Magnification	Input CA (mm)	Output CA (mm)	Dia1 (mm)	Dia2 (mm)	L1 (mm)	L2 (mm)
BEX-9.4-2X	2.0	16.5	23.0	M22X0.75	28.0	59.0	54.0
BEX-9.4-3X	3.0	10.0	20.0	28.0	28.0	61.0	51.5
BEX-9.4-5X	5.0	13.0	23.0	20.0	30.0	72.0	42.0
BEX-10.6-1.5	1.5	13.0	16.0	20.0	-	35.0	-
BEX-10.6-2A	2.0	15.0	17.0	22.0	-	35.0	-
BEX-10.6-2L	2.0	27.0	53.0	M44X1	63.0	72.0	47.0
BEX-10.6-2.5	2.5	12.0	20.0	27.0	-	54.0	-
BEX-10.6-3A	3.0	10.0	15.0	20.0	-	61.0	-
BEX-10.6-3B	3.0	12.5	20.0	20.0	28.0	59.0	29.0
BEX-10.6-3C	3.0	13.0	20.0	20.0	28.0	110.0	60.0

Part No.	Magnification	Input CA (mm)	Output CA (mm)	Dia1 (mm)	Dia2 (mm)	L1 (mm)	L2 (mm)
BEX-10.6-3.3	3.3	10.0	15.0	21.0	-	67.0	-
BEX-10.6-4	4.0	10.0	20.0	20.0	28.0	67.0	46.0
BEX-10.6-4A	4.0	10.0	25.0	20.0	31.0	67.0	48.0
BEX-10.6-4C	4.0	12.0	23.0	20.0	30.0	135.0	90.0
BEX-10.6-5	5.0	12.0	23.0	20.0	30.0	72.0	47.0
BEX-10.6-5A	5.0	12.0	28.0	20.0	36.0	70.0	45.0
BEX-10.6-6A	6.0	10.0	28.0	20.0	36.0	75.0	55.0
BEX-10.6-8	8.0	13.0	26.0	20.0	36.0	120.0	75.1
BEX-10.6-8A	8.0	10.0	30.0	20.0	36.0	73.0	55.5

CO₂ BEX – ADJUSTABLE SERIES

This series of beam expander has advantage as the internal lenses will only move along the optical axis without rotation. Adjustable ring with scales make it more convenient for user's operation. It has common connecting thread of M24x0.5, M33x0.5, M16x0.75, M22x0.75, M30x1

Specifications
For collimation of CO ₂ laser <100W
Fixed magnifications 1x-10x
Adjustable divergence
Galilei Design



Part No.	Magnification	Input CA (mm)	Output CA (mm)	M1	Dia1 (mm)	Dia2 (mm)	L1 (mm)	L2 (mm)
BEX-10.6-1X	1.0	16.0	18.0	M22x0.75	36.0	40.0	54.9	46.4
BEX-10.6-2Z	2.0	10.0	15.0	M16x0.75	22.0	22.0	51.0	37.0
BEX-10.6-2Z1	2.0	10.0	23.0	M22x0.75	32.0	32.0	48.0	38.0
BEX-10.6-2Z3	2.0	15.0	28.0	M22x0.75	36.0	36.0	48.0	33.0
BEX-10.6-2Z4	2.0	10.0	15.0	M16x0.75	20.0	20.0	50.0	37.0

Part No.	Magnification	Input CA (mm)	Output CA (mm)	M1	Dia1 (mm)	Dia2 (mm)	L1 (mm)	L2 (mm)
BEX-10.6-2.5Z	2.5	10.0	16.0	M16x0.75	20.0	20.0	55.2	45.0
BEX-10.6-2.5Z1	2.5	10.0	15.0	M16x0.75	20.0	20.0	34.0	25.0
BEX-10.6-2.5Z2	2.5	10.0	20.0	M22x0.75	28.0	28.0	56.0	40.5
BET 3X /10.6	3.0	11.0	20.0	M33*0.5	35.0	35.0	60.0	45.0
BEX-10.6-3Z1	3.0	10.0	16.0	M16x0.75	20.0	20.0	61.0	45.0
BEX-10.6-3Z2	3.0	10.0	20.0	M22x0.75	28.0	28.0	61.0	47.0
BEX-10.6-3Z3	3.0	10.0	16.0	M16x0.75	20.0	20.0	37.0	28.0
BEX-10.6-3Z4/1	3.0	10.0	25.0	M22x0.75	32.0	32.0	60.0	43.0
BEX-10.6-3Z5	3.0	15.0	35.0	M22x0.75	44.0	44.0	73.0	60.0
BEX-10.6-3Z6	3.0	15.0	28.0	M22x0.75	36.0	36.0	60.0	51.0
BEX-10.6-3.75Z	3.75	23.0	26.0	M33x0.5	36.0	36.0	64.0	48.0
BET 4X /10.6	4.0	11.0	17.0	M24*0.5	26.0	26.0	66.0	51.5
BEX-10.6-4Z	4.0	10.0	16.0	M16x0.75	20.0	20.0	55.0	47.0
BEX-10.6-4Z1	4.0	10.0	20.0	M22x0.75	28.0	28.0	71.0	55.0
BEX-10.6-4Z2	4.0	15.0	28.0	M22x0.75	36.0	36.0	66.0	51.0
BEX-10.6-4Z3	4.0	10.0	20.0	M22x0.75	26.0	32.0	70.0	50.0
BET 5X/10.6	5.0	12.0	23.0	M33*0.5	35.0	35.0	73.0	60.0
BEX-10.6-5Z	5.0	10.0	16.0	M16x0.75	20.0	20.0	58.0	43.0
BEX-10.6-5Z1	5.0	10.0	23.0	M22x0.75	30.0	30.0	71.0	56.0
BEX-10.6-6Z	6.0	10.0	25.0	M22x0.75	32.0	32.0	75.0	60.0
BEX-10.6-6Z1	6.0	10.0	35.0	M22x0.75	44.0	44.0	75.0	60.0
BEX-10.6-6Z2	6.0	10.0	15.0	M16x0.75	20.0	20.0	60.0	45.0
BEX-10.6-8Z1	8.0	10.0	33.0	M22x0.75	44.0	44.0	118.0	98.0
BEX-10.6-8Z2	8.0	10.0	23.0	M22x0.75	30.0	30.0	64.8	50.0
BEX-10.6-10Z1	10.0	10.0	36.0	M22x0.75	44.0	44.0	118.0	98.0



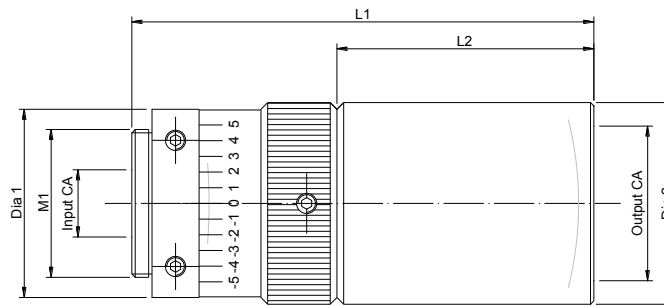
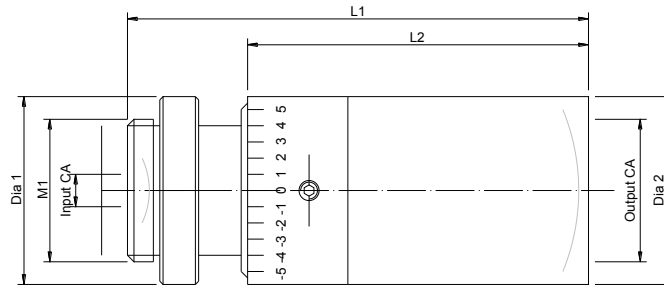
- 1064nm, 532nm, 355nm, 266nm(BEX series)

Specifications

Fixed magnifications

Adjustable divergence

Galilei Design

 Damage threshold: 5J/cm², 10ns
 Or 500MW/cm² (CW),1064nm


1064nm BEX - Adjustable Series

Part No.	Magnification	Input CA (mm)	Output CA (mm)	M1	Dia 1 (mm)	Dia 2 (mm)	L1 (mm)	L2 (mm)
BEX-1064-1X	1.0	15.5	23.0	M22x0.75	31.0	29.0	65.6	45.6
BEX-1064-1.2X	1.2	16.0	23.0	M22x0.75	29.0	29.0	54.9	50.5
BEX-1064-1.5X	1.5	15.0	22.0	M22x0.75	32.0	32.0	51.9	46.9
BEX-1064-1.5X1	1.5	15.5	23.0	M22x0.75	25.0	29.0	44.5	35.5
BET2X/1064	2.0	3.0	4.0	M24x0.5	26.0	M24x0.5	41.0	28.0
BEX-1064-2X	2.0	10.0	20.0	M22x0.75	26.0	26.0	42.0	28.0
BEX-1064-2X1	2.0	15.0	23.0	M22x0.75	29.0	31.5	45.0	31.0
BEX-1064-2.5X	2.5	10.0	23.0	M22x0.75	29.0	29.0	67.0	53.0
BEX-1064-2.5X1	2.5	10.0	23.0	M22x0.75	29.0	29.0	79.8	58.6
BET3X/1064	3.0	10.0	17.0	M24x0.5	26.0	26.0	58.0	45.0
BEX-1064-3X	3.0	10.0	20.0	M22x0.75	26.0	26.0	60.0	44.7
BEX-1064-3X1	3.0	10.0	33.0	M30x1	40.0	40.0	57.0	43.0
BEX-1064-3X3	3.0	10.0	23.0	M22x0.75	29.0	29.0	58.0	42.0
BEX-1064-4X	4.0	10.0	22.0	M22x0.75	29.0	29.0	81.0	64.0
BEX-1064-5X	5.0	10.0	23.0	M22x0.75	29.0	29.0	72.0	55.0
BEX-1064-5X1	5.0	10.0	16.0	M16x0.75	20.0	20.0	56.0	42.0
BEX-1064-5Z1	5.0	10.0	32.0	M30x1	37.6	M43x0.5	84.6	77.6
BET5X/1064	5.0	10.0	23.0	M33x0.5	M33x0.5	M33x0.5	73.1	57.0

Part No.	Magnification	Input CA (mm)	Output CA (mm)	M1	Dia 1 (mm)	Dia 2 (mm)	L1 (mm)	L2 (mm)
BEX-1064-6A	6.0	6.0	13.0	M16x0.75	20.0	20.0	71.8	56.8
BEX-1064-532-6X	6.0	8.0	23.0	-	26.0	35.4	90.5	48
BEX-1064-6X	6.0	10.0	22.0	M22x0.75	29.0	29.0	70.0	54.0
BEX-1064-6X2	6.0	6.0	16.0	-	25.0	25.0	69.6	-
BEX-1064-7X	7.0	6.0	23.0	M22x0.75	29.0	29.0	76.4	60.4
BEX-1064-8X	8.0	10.0	22.0	M22x0.75	29.0	29.0	76.0	58.0
BEX-1064-8Z	8.0	10.0	34.0	M30x1	36.0	M43x0.5	83.0	68.0
BEX-1064-10X	10.0	8.0	22.0	M22x0.75	29.0	29.0	70.0	52.0
BEX-1064-10X1	10.0	11.0	34.0	-	40.0	40.0	79.0	94.5
BEX-1064-12A	12.0	6.0	13.0	M16x0.75	20.0	20.0	79.8	64.8
BEX-1064-15X	15.0	7.5	28.0	M30x1	36.0	45.0	99.1	84.8
BEX-1064-20X	20.0	8.0	28.0	M22x0.75	32.0	45.0	91.3	76.3
BEX-1064-30X-1000P	30.0	10.0	100.0	M30x1	50.0	120.0	195.0	98.0
BEX-1064-30X	30.0	6.0	38.0	M22x0.75	30.0	46.0	118.6	103.6
BEX-1064-40X-1200P	40.0	8.0	128.0	M30x1	36.0	140.5	188.8	153.0

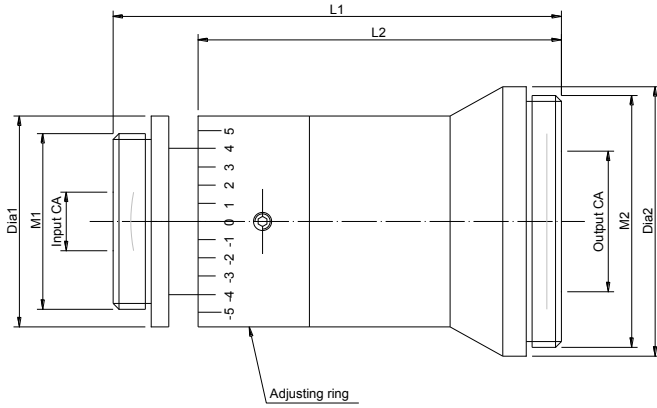
532nm BEX - Adjustable Series

Part No.	Magnification	Input CA (mm)	Output CA (mm)	M1	Dia1 (mm)	Dia2 (mm)	L1 (mm)	L2 (mm)
BEX-532-2X	2.0	6.0	23.0	M22x0.75	30.0	30.0	83.0	71.0
BEX-532-3X	3.0	6.0	23.0	M22x0.75	30.0	30.0	83.0	71.0
BEX-532-4X	4.0	6.0	23.0	M22x0.75	30.0	30.0	83.0	71.0
BEX-532-5X	5.0	8.0	24.0	M22x0.75	30.0	30.0	83.0	67.0
BEX-532-6X	6.0	10.0	23.6	M22x0.75	30.0	30.0	83.0	71.0
BEX-532-8X1	8.0	6.0	16.0	-	25.0	25.0	67.0	-
BEX-532-10X	10.0	6.0	23.0	M22x0.75	30.0	30.0	83.0	71.0
BEX-532-15V	15.0	6.0	32.0	M22x0.75	40.5	45.0	85.0	67.0
BEX-532-15X	15.0	6.0	32.0	M30x1	30.0	45.0	85.0	67.0
BEX-532-18X	18.0	5.0	40.0	20.5mm	20.5	47.0	176.5	163.0
BEX-532-20X	20.0	6.0	38.0	M30x1	40.0	40.0	95.2	66.7
BEX-532-30X	30.0	5.0	38.0	M22x0.75	30.0	46.0	123.7	108.7

405nm BEX - Adjustable Series

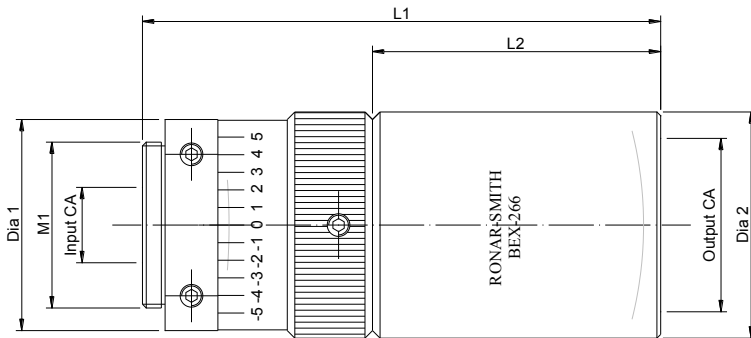
Part No.	Magnification	Input CA (mm)	Output CA (mm)	Dia1 (mm)	Dia2 (mm)	L1 (mm)	L2 (mm)
BEX-405-1.5X	1.5	6.0	30.0	37.6	46.0	85.0	71.0
BEX-405-2X	2.0	6.0	30.0	37.6	46.0	85.0	71.0
BEX-405-3X	3.0	6.0	30.0	37.6	46.0	85.0	71.0
BEX-405-5X	5.0	6.0	30.0	37.6	46.0	85.0	71.0
BEX-405-7X	7.0	4.2	30.0	37.6	46.0	85.0	71.0
BEX-405-10X	10.0	3.0	30.0	37.6	46.0	89.0	75.0
BEX-405-20X	20.0	1.5	30.0	37.6	46.0	95.0	80.0

355nm BEX - Adjustable Series



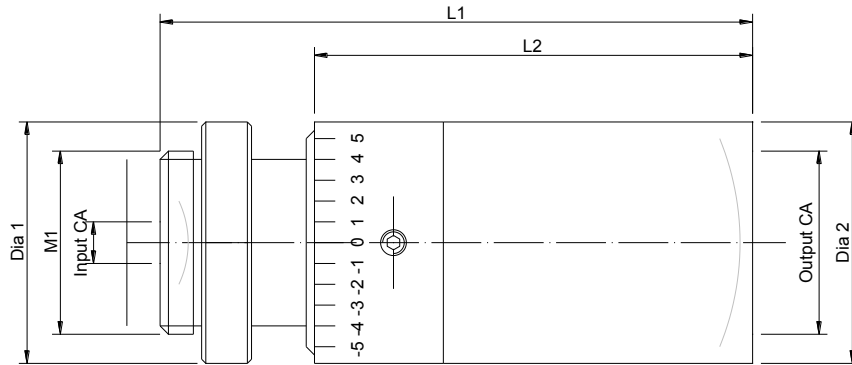
Part No.	Magnification	Input CA (mm)	Output CA (mm)	M1	Dia1 (mm)	Dia2 (mm)	L1 (mm)	L2 (mm)
BEX-355-1.5X	1.5	6.0	24.0	M30×1	36.0	46.0	76.5	48.1
BEX-355-2X	2.0	6.0	24.0	M30×1	36.0	46.0	75.6	47.2
BEX-355-3X	3.0	6.0	24.0	M30×1	36.0	46.0	77.3	48.9
BEX-355-4X	4.0	6.0	28.0	M30×1	36.0	46.0	75.0	56.5
BEX-355-5X	5.0	6.0	28.0	M30×1	36.0	45.0	73.5	56.5
BEX-355-7X	7.0	6.0	28.0	M30×1	32.0	45.0	88.1	73.1
BEX-355-8X	8.0	6.0	28.0	M30×1	36.0	46.0	84.0	70.0
BEX-355-10X	10.0	6.0	28.0	M30×1	36.0	45.0	96.0	80.5
BEX-355-20X	20.0	6.0	28.0	M30×1	36.0	45.0	97.0	81.3

266nm BEX - Adjustable Series



Part No.	Magnification	Input CA (mm)	Output CA (mm)	M1	Dia1 (mm)	Dia2 (mm)	L1 (mm)	L2 (mm)
BEX-266-1.5X	1.5	8.0	24.0	M22×0.75	30.0	30.0	63.7	46.2
BEX-266-2X	2.0	8.0	24.0	M22×0.75	30.0	30.0	73.0	55.0
BEX-266-3X	3.0	6.0	30.0	M22×0.75	30.0	30.0	68.7	38.2
BEX-266-5X	5.0	6.0	30.0	M22×0.75	30.0	30.0	69.6	38.1
BEX-266-10X	10.0	3.0	30.0	M22×0.75	27.0	30.0	95.6	62.1
BEX-266-20X	20.0	1.5	30.0	M22×0.75	30.0	30.0	96.0	63.0

- 2790nm,1550nm,1090nm,1053nm,904nm,680nm,633nm (BEX series)



2790nm Beam Expander

Part No.	Magnification	Input CA (mm)	Output CA (mm)	Dia 1 (mm)	Dia 2 (mm)	L1 (mm)	L2 (mm)
BEX-2790-6X	6.0	13.0	30.0	37.6	45.0	75.0	57.0

1550nm Beam Expander

Part No.	Magnification	Input CA (mm)	Output CA (mm)	Dia 1 (mm)	Dia 2 (mm)	L1 (mm)	L2 (mm)
BEX-1550-7X	7.0	10.0	25.0	32.0	32.0	75.0	63.0
BEX-1550-8X	8.0	10.0	30.0	36.0	36.0	85.0	72.0
BEX-1550-10X	10.0	10.0	58.0	56.0	65.0	98.0	80.0

1090nm Beam Expander

Part No.	Magnification	Input CA (mm)	Output CA (mm)	Dia 1 (mm)	Dia 2 (mm)	L1 (mm)	L2 (mm)
BEX-1090-2.8X	2.8	9.0	24.0	14.0	30.0	83.5	65.5
BEX-1090-3.7X	3.7	9.0	19.0	14.0	24.0	115.5	97.5

1053nm Beam Expander

Part No.	Magnification	Input CA (mm)	Output CA (mm)	Dia 1 (mm)	Dia 2 (mm)	L1 (mm)	L2 (mm)
BEX-1053-5X	5.0	8.0	25.0	30.0	33.0	84.5	67.5
BEX-1053-10X	10.0	10.0	73.0	30.0	87.0	119.9	103.9

904nm Beam Expander

Part No.	Magnification	Input CA (mm)	Output CA (mm)	Dia 1 (mm)	Dia 2 (mm)	L1 (mm)	L2 (mm)
BEX-904-10X	10.0	8.0	28.0	M30X1	M43X0.5	86.0	69.0

680nm Beam Expander

Part No.	Magnification	Input CA (mm)	Output CA (mm)	Dia 1 (mm)	Dia 2 (mm)	L1 (mm)	L2 (mm)
BEX-680-4A	4.0	5.0	17.0	29.0	34.0	56.5	41.0

633nm Beam Expander

Part No.	Magnification	Input CA (mm)	Output CA (mm)	Dia 1 (mm)	Dia 2 (mm)	L1 (mm)	L2 (mm)
BEX-633-3X	3.0	10.0	23.0	-	33.0	63.7	-
BEX-633-5X	5.0	8.0	23.0	30.0	33.0	110.0	93.0
BEX-633-8X	8.0	11.0	23.5	-	35.0	117.5	-
BEX-633-10X	10.0	8.0	23.0	30.0	33.0	146.0	129.0
BEX-633-20X	20.0	8.0	76.0	30.0	90.0	198.0	184.0
BEX-633-40X	40.0	8.0	100.0	40.0	112.0	246.0	232.0
BEX-633-50X	50.0	10.0	81.0	30.0	92.0	304.0	281.0



Zoom Beam Expanders

- 9.4µm/10.6µm (BXZ series)

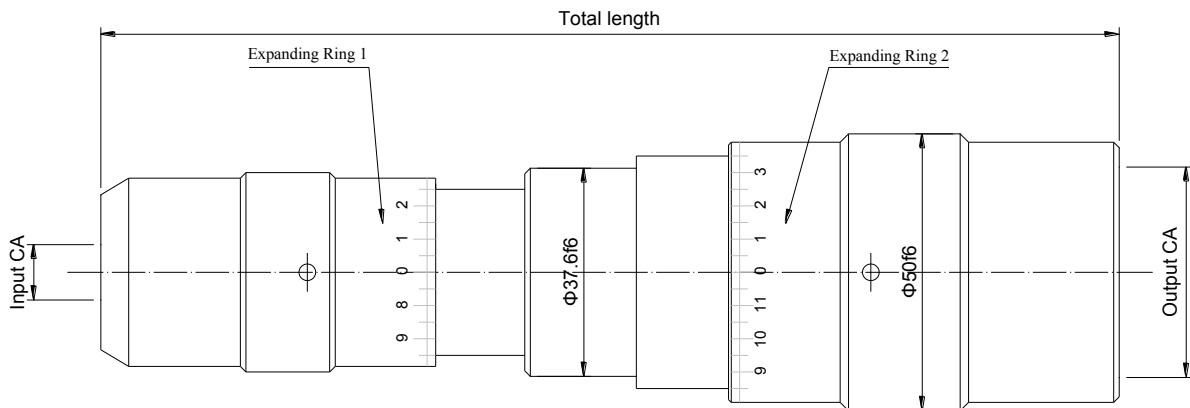
Extensive BXZ series zoom expander includes low power, high power, large aperture, manual zoom and motorized variable zoom beam expanders, covering wavelengths from the UV to the IR.

Beam expanders are useful laser accessories when the beam diameter must be increased. However, their main function is in decreasing the divergence of laser beams which are to be projected over long distances. ZOOM Beam expanders have been designed for use with various magnification.



Specifications
Variable magnifications
Adjustable divergence
Alignment error < 3min.
Damage threshold: 1.5KW/cm ² @10.6µm

Part No.	Magnification	Input CA (mm)	Output CA (mm)	Total Length (mm)
BXZ-10.6-1-4XA	1x-4x	18.0	48.0	133.9
BXZ-10.6-2-6X	2x-6x	16.0	96.0	205.8-212.4
BXZ-10.6-2-6XA	2x-6x	18.0	28.0	205.1-213.0
BXZ-10.6-2-8X	2x-8x	10.0	36.0	168.0-172.0
BXZ-9.4-0.5-3X	0.5x-3x	23.0	38.0	137.7
BXZ-9.4-2-8X	2x-8x	10.0	36.0	168.0-172.0



-1550nm, 1064nm,800nm,532nm,355nm,266nm (BXZ series)

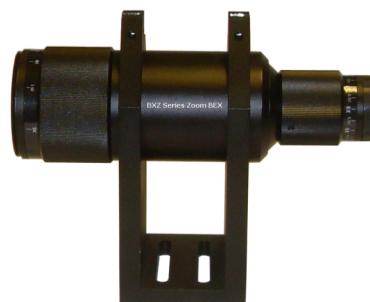
BXZ series zoom beam expander is specially designed to cater for the various variable magnification. It consists of adjustable divergence. These beam expanders are developed with wavelength from 266nm-1550nm.

Specifications

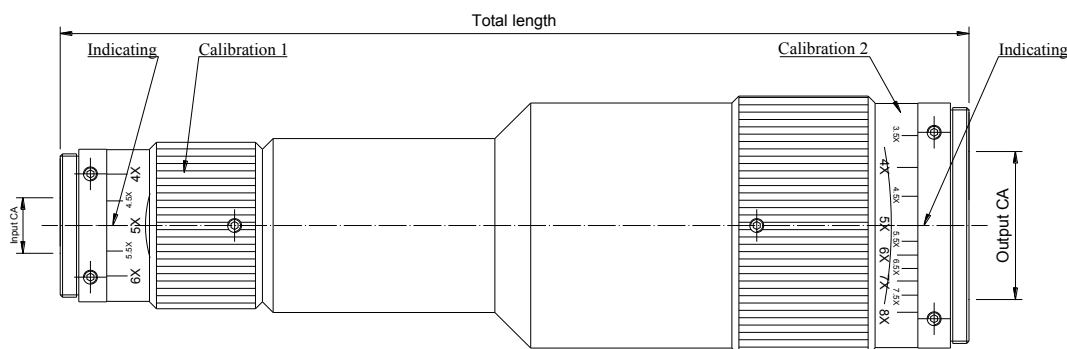
Variable magnifications

Adjustable divergence

Alignment error < 3min.



Part No.	Wavelength (nm)	Magnification	Input CA (mm)	Output CA (mm)	Total Length (mm)	Remark
BXZ-1550-1-4X	1550	1x-4x	14.0	28.0	126.8	Fused Silicon
BXZ-1064-1-3X	1064	1x-3x	10.0	20.0	102.9	Fused Silicon
BXZ-1064-1-3X-V	1064	1x-3x	10.0	20.0	116.9	Fused Silicon
BXZ-1064-1-3X-A	1064	1x-3x	20.0	38.0	118.0	Fused Silicon
BXZ-1064-1-8X-Q	1064	1x-8x	12.0	32.0	167.0-202.0	Fused Silicon
BXZ-1064-2-8X	1064	2x-8x	10.0	30.0	142.0-149.0	-
BXZ-1064-2-8X-A	1064	2x-8x	13.0	60.0	162.0-169.0	-
BXZ-800-2-8X	800	2x-8x	10.0	30.0	142.0-149.0	-
BXZ-532-1-3X	532	1x-3x	10.0	20.0	85.0	Fused Silicon
BXZ-532-2-8X	532	2x-8x	10.0	30.0	131.1	-
BXZ-532-2-8X-A	532	2x-8x	11.0	60.0	190.0	-
BXZ-532-2-8X-Q	532	2x-8x	12.0	32.0	186.7	Fused Silicon
BXZ-532-1-8X-Q	532	1x-8x	12.0	32.0	152.9-187.5	Fused Silicon
BXZ-355-2-8X-Q	355	2x-8x	11.0	32.0	183.0	Fused Silicon
BXZ-355-1-8X-Q	355	1x-8x	12.0	32.0	157.0-191.0	Fused Silicon
BXZ-355-2-8X-QA	355	2x-8x	12.0	60.0	200.8	Fused Silicon
BXZ-266-1-8X	266	1x-8x	10.0	30.0	162.0-200.0	Fused Silicon



-Motorized Zoom Beam Expander (BXZ series)

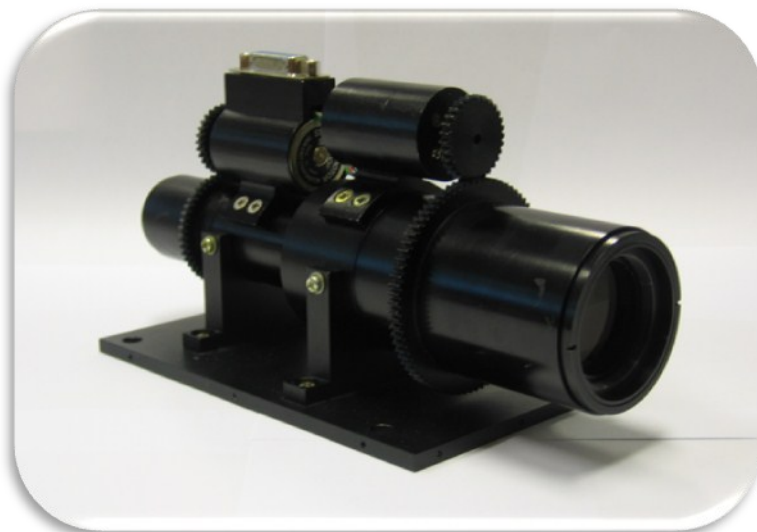
This Motorized Zoom Beam Expander is designed for an alignment of zoom and divergence to facilitate adjustments on the Beam Expander.

It preserved all optical properties of manual zoom expander while offering full motorized adjustment, with expansion range from 1x to 8x.

Motorized Beam Expander consists of two separate lens groups which are moved by two step-motors. Separate electronic control module and software allows user to change the beam expansion of your optical system. The lens groups will move automatically to their pre-set position. Independent movements of the lens groups are also possible to create any desired variation of your laser beam.

Specifications
Variable magnifications
Adjustable divergence
Alignment error < 3 arc minutes
Connecting type: RS 232
Operating voltage of the Controller: 12V

Part No.	Wavelength (nm)	Magnification	Input CA (mm)	Output CA (mm)	Total Length (mm)
BXZ-10.6-2-8X-MOT	10600	2x-8x	10.0	30.0	190.0
BXZ-1064-1-8X-MOT	1064	1x-8x	10.0	32.0	159.0
BXZ-532-1-8x-MOT	532	1x-8x	10.0	32.0	159.0
BXZ-355-1-8X-MOT	355	1x-8x	10.0	32.0	136.0
BXZ-266-1-8X-MOT	266	1x-8x	10.0	32.0	136.0



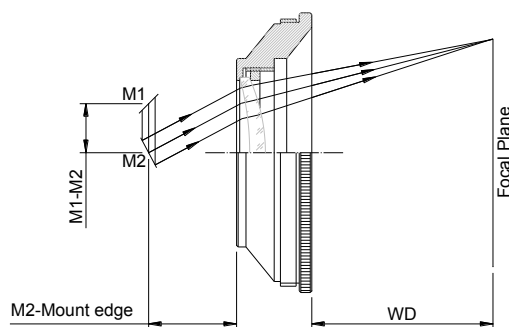
F-Theta Scan Lens

- 10.6 μ m (Single Element)

F-theta lenses are commonly used in conjunction with galvanometer scanning mirrors in laser engraving, cutting, and marking systems. The reason it being named as F-theta is due to the radial image height equals to focal length of the lens multiplied by the angle of the chief ray makes in the object space. Hence, from the image height, the distortion of the image can be calculated at each field of interest. Typically the F-theta distortion of this lens is kept less than 1% so that it produces a precise spot on the flat field on image plane.

Specifications

Diameter Tolerance	+0.0, -0.13mm
Thickness Tolerance	\pm 0.25mm
Paraxial Focal Length	\pm 2%
Centration	3 arc minutes
Clear Aperture	>80%
Surface Figure	$\lambda/2$ per 1" @632.8nm
Surface Quality	40-20 scratch and dig
AR/AR Coating	R<0.5% per surface @10.6 μ m



	Part No.	EFL (mm)	Scan field (mm)	*Spot size (μ m)	En- trance Pupil (mm)	*Mir. Sep. (mm)	2nd mir. to lens edge (mm)	Max. Scan Angle (deg.)	BFL (mm)	Lens Dia. (mm)	ET (mm)
Optical Material	SL1-10.6-F50-25.4	50.0	12x12	53.0	12.0	16.0	15.0	10.0	50.8	25.4	2.0
	SL1-10.6-F52Z-40	52.0	31x31	67.0	10.0	14.0	15.0	25.0	52.7	40.0	3.2
	SL1-10.6-35-52Z1	52.0	35x35	67.0	10.0	14.0	15.0	30.0	52.7	50.0	1.5
Laser Accessories Components	SL1-10.6-35-60G	60.0	35x35	78.0	10.0	14.0	15.0	28.0	59.0	55.0	2.2
	SL1-10.6-F75Z-48	75.0	50x50	97.0	10.0	14.0	15.0	28.0	75.9	48.0	3.0
	SL1-10.6-50-75Z	75.0	50x50	97.0	10.0	14.0	15.0	30.0	75.0	50.0	1.5
	SL1-10.6-F100Z-40	100.0	60x60	129.0	10.0	14.0	15.0	25.0	100.9	40.0	3.0
	SL1-10.6-F100Z-48	100.0	69x69	107.4	12.0	16.0	15.0	28.0	100.9	48.0	2.4
	SL1-10.6-F100Z-48A	100.0	70x70	106.7	12.0	16.0	15.0	29.0	102.8	48.0	3.0
	SL1-10.6-F120Z-44	120.0	75x75	154.6	10.0	14.0	15.0	25.0	124.0	44.0	3.0
	SL1-10.6-F150Z-40	150.0	90x90	193.4	10.0	14.0	15.0	25.0	152.7	40.0	3.6
	SL1-10.6-F150Z-48	150.0	107x107	161.0	12.0	16.0	15.0	29.0	152.7	48.0	3.1
	SL1-10.6-F200Z-48	200.0	140x140	171.0	15.0	16.0	15.0	28.0	204.3	48.0	3.0
SL1-10.6-F200Z-70	200.0	140x140	160.0	20.0	24.0	20.0	28.0	208.8	70.0	2.8	

Part No.	EFL (mm)	Scan field (mm)	*Spot size (um)	En-trance Pupil (mm)	*Mir. Sep. (mm)	2nd mir. to lens edge (mm)	Max. Scan Angle (deg.)	BFL (mm)	Lens Dia. (mm)	ET (mm)
SL1-10.6-F250Z-48	250.0	175x175	214.0	15.0	16.0	15.0	28.0	256.0	48.0	3.2
SL1-10.6-F300Z-48	300.0	210x210	322.0	12.0	16.0	15.0	28.0	308.6	48.0	3.9
SL1-10.6-F300Z-48B	300.0	215x215	322.0	12.0	16.0	15.0	28.0	307.7	48.0	3.0
SL1-10.6-F360Z-48	359.1	250x250	385.0	12.0	16.0	15.0	28.0	369.2	48.0	4.0
SL1-10.6-F420Z-70	420.0	295x295	268.0	20.0	24.0	20.0	28.0	430.0	70.0	3.5
SL1-10.6-F420Z-75	420.0	300x300	268.0	20.0	24.0	20.0	28.0	430.0	75.0	3.4
SL1-10.6-F435Z-48	433.0	300x300	463.5	12.0	16.0	15.0	28.0	444.0	48.0	3.0
SL1-10.6-F450Z-48	448.5	320x320	478.0	12.0	16.0	15.0	28.0	462.0	48.0	2.8
SL1-10.6-F480Z-48	480.0	335x335	515.0	12.0	16.0	15.0	28.0	492.0	48.0	4.2
SL1-10.6-F480Z-70	480.0	350x350	305.0	20.0	24.0	20.0	28.0	496.3	70.0	3.9
SL1-10.6-F573Z-62	573.0	365x365	364.0	20.0	24.0	20.0	25.0	591.0	62.0	4.0
SL1-10.6-F573Z-48	573.0	415x415	614.0	12.0	16.0	15.0	28.0	591.0	48.0	4.2
SL1-10.6-F573Z-62	573.0	365x365	364.0	20.0	24.0	20.0	25.0	591.0	62.0	4.0
SL1-10.6-F574Z-75	574.0	400x400	364.0	20.0	24.0	20.0	28.0	591.0	75.0	3.8
SL1-10.6-F620Z-70	620.0	450x450	396.4	20.0	24.0	20.0	28.0	636.0	70.0	3.9
SL1-10.6-F720Z-75	720.0	500x500	454.6	20.0	24.0	20.0	28.0	741.0	75.0	2.7
SL1-10.6-F720Z-48	720.7	531x531	783.0	12.0	16.0	15.0	28.0	741.0	48.0	3.0
SL1-10.6-F740Z-88	740.0	540x540	476.3	20.0	24.0	20.0	28.0	759.0	88.0	4.2
SL1-10.6-F830Z-75	830.0	600x600	532.4	20.0	24.0	20.0	28.0	848.0	75.0	4.0
SL1-10.6-F934Z-48	934.0	685x685	1000.0	12.0	16.0	15.0	28.0	957.7	48.0	3.1
SL1-10.6-F1100Z-76	1100.0	700x700	558.7	25.0	28.0	20.0	25.0	1138.0	76.0	5.2
SL1-10.6-F1150Z-48	1150.0	800x800	1231.0	12.0	16.0	15.0	28.0	1177.0	48.0	3.0
SL1-10.6-F1191Z-48	1191.6	770x770	1276.0	12.0	16.0	15.0	25.0	1220.0	48.0	3.0
SL1-10.6-F2122Z-48	2128.0	1385x1385	2283.0	12.0	16.0	15.0	25.0	2176.0	48.0	3.5
SL1-10.6-35-60G	60.0	35x35	78.0	10.0	14.0	15.0	28.0	59.0	55.0	2.2
SL1-10.6-50-80G	79.7	50X50	154.0	12.0	16.0	15.0	17.0	78.0	55.0	1.9
SL1-10.6-70-100G	99.9	70X70	163.4	12.0	16.0	15.0	20.0	99.2	55.0	2.8
SL1-10.6-110-173G	172.5	110X110	206.0	12.0	16.0	15.0	18.0	174.7	55.0	3.1
SL1-10.6-175-250G	250.0	175X175	280.0	12.0	16.0	15.0	20.0	254.0	55.0	3.5
SL1-10.6-300-420G	420.0	300X300	335.0	20.0	24.0	20.0	20.0	427.8	80.0	4.3
SL1-10.6-30-75E	75.0	30X30	123.0	24.0	24.0	20.0	12.0	73.0	60.0	1.5

Part No.	EFL (mm)	Scan field (mm)	*Spot size (um)	En-trance Pupil (mm)	*Mir. Sep. (mm)	2nd mir. to lens edge (mm)	Max. Scan Angle (deg.)	BFL (mm)	Lens Dia. (mm)	ET (mm)
SL1-10.6-50-97E	97.0	50x50	121.0	18.0	24.0	20.0	20.0	64.0	96.0	1.7
SL1-10.6-50-105E	105.0	50x50	137.0	12.0	16.0	15.0	20.0	104.0	64.0	1.8
SL1-10.6-50-152E	152.0	50x50	170.0	12.0	16.0	15.0	13.0	153.0	49.0	2.8
SL1-10.6-90-151E	151.0	90x90	205.0	12.0	16.0	15.0	23.0	153.0	70.0	2.1
SL1-10.6-110-178E	178.0	110x110	188.0	18.0	24.0	20.0	25.0	178.0	74.0	2.2

Mounting is available upon request, we provide two types of common mountings for industry application:

R - with M85x1

S - with 3 holes 120 degree apart at diameter 73.2mm

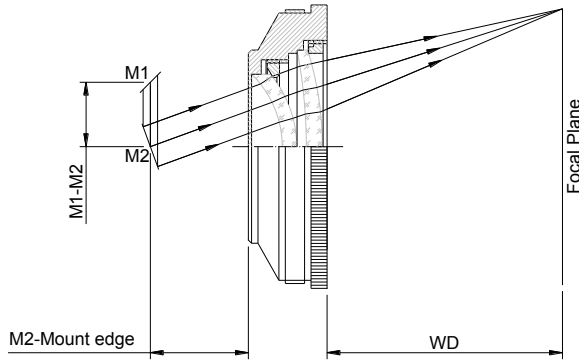
Data Sheet for mounted SL1-10.6 series is available upon request.



- Material: G-GaAs, E-Ge (only transmit 10.6um)
- Material: Z- ZnSe (transmit both 10.6um and visible)
- *Recommended X-Y Mirror separation.
- *Diffraction Limited Spot Size.
- *spot size is not guaranteed, and for reference only.

- 10.6µm (Double Element)

Doublet F-theta Scanning lens provide better performance than singlet. It has more ever spot size and less distortion over the scan field. We use ZnSe or GaAs for this series of scan lens.

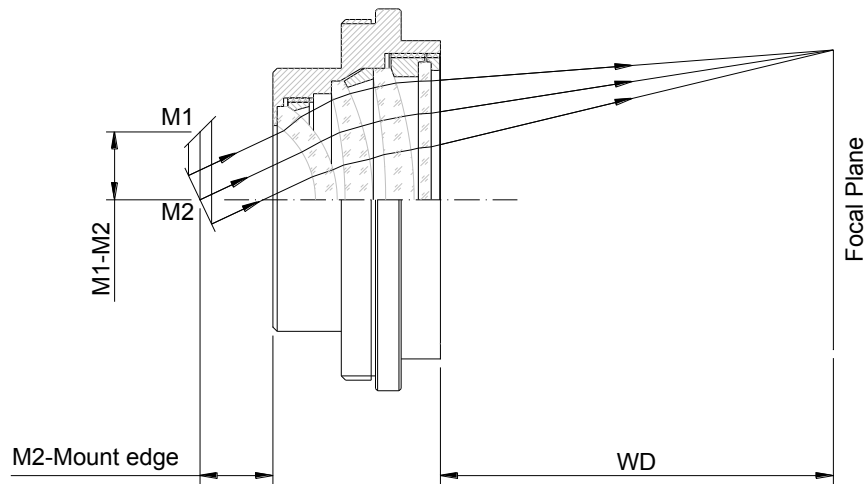


Part No.	EFL (mm)	Scan Field (mm)	Average Spot Size (µm)	En-trance Pupil (mm)	*Mir. Sep. (mm)	2nd Mir. to Mount Edge (mm)	Max. Scan Angle (deg.)	WD (mm)
SL2-10.6-35-60G	60.5	35x35	75.0	12.0	17.0	20.5	25.0	57.8
SL2-10.6-50-80G	80.0	50x50	113.0	14.0	20.0	12.8	25.0	75.7
SL2-10.6-70-122G	122.0	70x70	130.0	14.0	20.0	14.5	23.0	135.9
SL2-10.6-110-170G	170.0	110x110	225.0	10.0	13.0	19.7	23.0	185.0
SL2-10.6-140-220G	220.0	140x140	243.1	14.0	16.0	14.8	25.0	243.7
SL2-10.6-175-275G	275.0	175x175	300.0	14.0	20.0	16.4	28.0	305.0
SL2-10.6-210-300G	300.0	210x210	300.0	14.0	20.0	16.3	28.0	334.9
SL2-10.6-250-360G	360.0	250x250	465.0	14.0	20.0	20.0	20.0	393.0
SL2-10.6-300-420G	420.0	300x300	570.0	14.0	20.0	20.0	20.0	465.0
SL2-10.6-350-485G	485.0	350x350	822.0	14.0	20.0	30.0	20.0	528.0
SL2-10.6-F420G-20	420.0	300x300	505.0	20.0	30.0	30.0	20.0	470.0
SL2-10.6-110-150Z	150.0	105x105	171.7	14.0	20.0	11.6	28.0	161.7
SL2-10.6-F200Z	200.0	140x140	193.5	14.0	16.0	15.3	28.8	229.4
SL2-10.6-F250Z	250.0	175x175	252.5	14.0	20.0	22.3	28.4	285.5
SL2-10.6-F300Z-20	300.0	210x210	260.0	20.0	20.0	10.2	28.0	327.8
SL2-10.6-250-360Z	360.0	250x250	489.0	14.0	20.0	20.0	20.0	393.0
SL2-10.6-300-420AZ	420.0	305x305	349.6	16.0	20.0	17.0	28.0	466.0
SL2-10.6-400-560Z	560.0	400x400	905.0	14.0	20.0	26.0	20.0	590.0

- Material: G-GaAs (transmit 10.6µm only)
- Material: Z- ZnSe (transmit both 10.6µm and visible)
- *Recommended X-Y Mirror separation.
- *spot size is not guaranteed, and for reference only.

- 9.4µm (Triple Element Made of ZnSe)

Triplet F-theta scan lens is developed to achieve minimum spot size and F-theta distortion. These give diffraction limited performance and further improved over doublet scan lens.

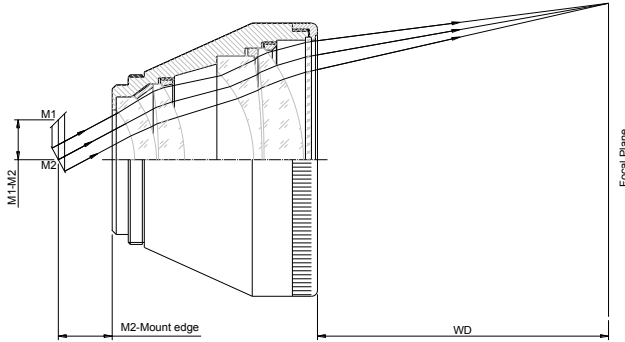


Part No.	EFL (mm)	Scan Filed (mm ²)	Average spot size (µm)	Entrance pupil (mm)	*Mirrors separation (mm)	2nd mirror to mount edge (mm)	Max scan angle	WD (mm)
SL3-9.4-50-80W	80.0	50X50	84.5	14.0	18.0	8.0	+/- 25°	89.4
SL3-9.4-60-105Z	105.0	60X60	114.0	12.0	16.0	13.5	+/- 23°	130.5

*Recommended X-Y Mirror separation.
 *Material: ZnSe
 *spot size is not guaranteed, and for reference only.



- 1550nm,1064nm,532nm,355nm,266nm



Aperture Stop is set at center point of X-Y mirror in case of two-axis scanning system.

Eye Safe Laser (Wavelength 1550nm)

Part No.	EFL (mm)	Scan Angle (±°)	Scan Field (mm)	Aperture Stop (mm)	Ent. Pupil (mm)	Average spot size (um)	Total Length (mm)	WD (mm)
SL-1550-100-160	160.0	25.0	100×100	19.5	9.0	43.0	47.0	175.6

Nd:YAG LASER (Wavelength 1064 nm)

Part No.	EFL (mm)	Scan Angle (±°)	Scan Field (mm)	Aperture Stop (mm)	Ent. pupil (mm)	Average spot size (um)	Total Length (mm)	WD (mm)
SL-1064-45-80	80.0	23.0	45x45	21.5	10.0	11.9	29.2	91.4
SL-1064-70-100	100.0	25.0	70x70	17.5	14.0	11.0	49.5	98.8
SL-1064-105-152	152.0	25.0	105x105	19.3	14.0	28.0	48.0	175.0
SL-1064-50-160	160.0	18.0	50x50	16.2	8.0	35.8	27.0	182.3
SL-1064-100-160A	160.0	25.0	100x100	16.8	10.0	27.5	52.1	178.4
SL-1064-F160-30	160.0	22.5	90x90	33.6	30.0	17.5	84.3	171.6
SL-1064-112-163	163.0	25.0	112x112	21.2	10.0	31.5	49.0	184.0
SL-1064-112-163A	163.0	25.0	112x112	20.3	10.0	27.8	47.0	181.7
SL-1064-114-163R1	163.0	25.0	114x114	25.0	15.0	24.0	53.9	184.0
SL-1064-152-192	192.0	32.0	152x152	22.8	15.0	25.0	63.0	221.8
SL-1064-F201-30	201.0	19.0	90x90	43.0	30.0	12.0	83.0	243.0
SL-1064-140-210	210.0	25.0	140x140	20.2	14.0	24.5	50.0	238.4
SL-1064-175-254	254.0	25.0	175x175	25.5	16.0	43.5	61.7	269.9
SL-1064-F254-30	254.0	20.0	124x124	38.3	30.0	15.5	56.7	302.2
SL-1064-180-260	260.0	25.0	180x180	25.1	10.0	47.0	63.0	297.0
SL-1064-205-330	330.0	25.0	205x205	29.7	14.0	50.0	60.0	385.0
SL-1064-305-338	338.0	36.5	305x305	28.5	15.0	25.5	52.5	362.8
SL-1064-300-420	420.0	29.0	300x300	25.7	14.0	50.5	69.4	492.0
SL-1064-500-815	815.0	25.0	500x500	34.1	24.0	50.0	104.9	962.0

GREEN LASER (Wavelength 532 nm)

Part No.	EFL (mm)	Scan Angle (±°)	Scan Field (mm)	Aperture Stop (mm)	Ent. pupil (mm)	Average spot size (um)	Total Length (mm)	WD (mm)
SL-532-70-100	100.0	25.0	70x70	17.5	14.0	12.0	50.0	100.0
SL-532-90-120A	120.0	25.0	80x80	14.7	8.0	10.8	38.8	134.0
SL-532-115-165	165.0	28.3	115x115	20.8	10.0	18.5	47.0	183.5
SL-532-150-254	254.0	25.0	150x150	17.9	10.0	21.5	51.0	280.0
SL-532-225-410	410.0	25.0	225x225	19.8	15.0	15.0	48.9	443.7
SL-532-350-508	507.0	28.2	350x350	40.1	16.0	29.0	62.5	590.5
SL-532-510-740	740.0	20.0	510x510	41.8	16.0	18.5	65.0	896.5

UV LASER (Wavelength 355 nm)

Part No.	EFL (mm)	Scan Angle (±°)	Scan Field (mm)	Aperture Stop (mm)	Ent. pupil (mm)	Average spot Size (um)	Total Length (mm)	WD (mm)
SL-355-60-100Q	100.0	25.0	61.5x61.5	21.4	6.0	10.0	62.5	133.4
SL-355-112-160Q	160.0	29.0	112x112	20.1	6.0	18.0	50.4	205.8
SL-355-155-250	250.0	25.5	155x155	23.6	10.0	14.0	54.9	299.8
SL-355-212-328	328.0	26.4	212x212	28.6	10.0	17.5	79.6	406.4
SL-355-350-580	580.0	24.5	350x350	33.3	10.0	28.5	65.1	684.8
SL-355-500-810	810.0	28.0	500x500	26.9	10.0	43.0	83.2	976.4
SL-355-650-1000	1000.0	26.5	650x650	32.0	10.0	50.8	91.9	1200.1

UV LASER (Wavelength 266 nm)

Part No.	EFL (mm)	Scan Angle (±°)	Scan Field (mm)	Aperture Stop (mm)	Ent. pupil (mm)	Average spot Size (um)	Total Length (mm)	WD (mm)
SL-266-70-100	101.5	29.2	70x70	14.5	5.0	8.3	52.0	129.4
SL-266-100-160	142.3	25.0	100x100	21.1	5.0	16.5	36.7	198.8
SL-266-90-254	254.0	18.0	90x90	21.0	4.0	16.0	47.0	253.0

1064nm Fiber Scan Lens



Part No.	EFL (mm)	Scan Angle(±°)	Scan Field (mm)	Aperture Stop	Ent. pupil (mm)	Average spot size (um)	Total Length (mm)	WD(mm)
SLF-1064-63-8	63.0	25.5	36x36	11.9	8.0	12.0	26.8	69.0
SLF-1064-160-8	160.0	25.0	100x100	13.4	8.0	30.5	30.8	188.1
SLF-1064-254-8	254.0	25.0	155x155	13.5	8.0	30.5	42.9	293.5

RONAR-SMITH® Laser Optics
Optics for Medical Laser System
Semiconductor Spectroscopy Biomedical Application Laser
Optical Material
Laser Accessories Components

- 1064nm, 940nm (Achromatic)

With CCD camera been equipped into laser scanning system, Achromatic scan lens is developed to color correct different wavelengths images.

The focal length, working distance and focus spot are identically for both laser working wavelength and visible wavelength, it will help CCD to capture the actual image through F-theta scan lens, generally low dispersion crown glass and high dispersion flint glass are jointly used to correct the chromatic aberration.

Nd:YAG Laser (wavelength 1064/532nm, 1064/635nm)

Part No.	EFL (mm)	Wave-length	Scan Angle (±°)	Scan Field (mm)	Ent. pupil (mm)	Average spot size (um)	Total Length (mm)	WD (mm)	Screw Thread
SL-1064-532-100-163	163.0	1064/532	25.0	100x100	12.0	21.0	78.2	159.7	M85x1
SL-1064-532-175-254	254.0	1064/532	28.0	175x175	15.0	25.0	101.8	262.8	M85x1
SL-1064-635-100-163	163.0	1064/635	25.5	100x100	12.0	22.5	87.6	157.6	M85x1
SL-1064-635-180-260	260.0	1064/635	28.3	180x180	15.0	28.0	102.3	261.4	M85x1

Achromatic Lens (wavelength 808/940nm)

Part No.	EFL (mm)	Wave-length	Scan Angle (±°)	Scan Field (mm)	Ent. pupil (mm)	Average spot size (um)	Total Length (mm)	WD (mm)	Screw Thread
SL-940-808-102-163AC	163.0	940/808	26.4	102x102	20.0	11.0	90.5	153.6	M85x1

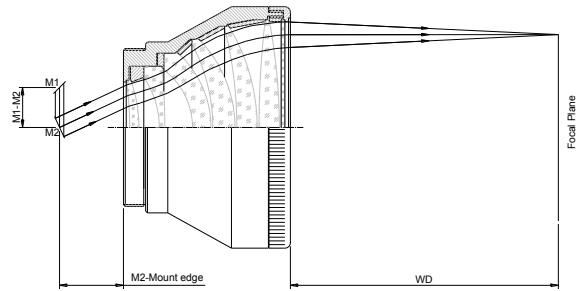


*spot size is not guaranteed, and for reference only.

Telecentric Scan Lens

- 10.6µm, 9.6µm, 1064nm, 670nm, 633nm, 532nm, 405nm, 355nm, 266nm

Telecentric scanning lenses are a special configuration in which the arrangement of optics is designed to focus down the beam such that it is always perpendicular to the flat field. This is accomplished by ensuring that the system 'stop' is located at the front focal point of the lens system. The 'stop' is located at the position where the beam is deflected from the axis. In a single-axis scanning system, this location is at the scanning mirror. For two-axis scanning, the stop is mid-way between the mirrors.



TELECENTRIC SCAN LENS (Wavelength 10.6µm)

Part No.	Material	EFL (mm)	Scan Angle (±°)	Scan Field (mm)	Ent. pupil (mm)	Average spot size (µm)	Total Length (mm)	WD (mm)
TSL-10.6-50-100G	Ge	100.0	20.0	50x50	25.0	60.0	93.0	106.0

TELECENTRIC SCAN LENS (Wavelength 9.6µm)

Part No.	Material	EFL (mm)	Scan Angle (±°)	Scan Field (mm)	Ent. pupil (mm)	Average spot size (µm)	Total Length (mm)	WD (mm)
TSL-9.6-43-100Z	ZnSe	100.0	20.0	43x43	14.0	96.0	99.0	95.0
TSL-9.6-50-100Z	ZnSe	100.0	14.5	50x50	15.0	140.0	99.0	97.0
TSL-9.6-50-110Z	ZnSe	110.0	20.0	50x50	15.0	107.0	110.0	108.0
TSL-9.6-70-140Z	ZnSe	140.0	20.0	70x70	15.0	135.0	143.0	124.4

- Material: G-Ge (only transmit 10.6µm)
- Material: Z-ZnSe (transmit both 10.6µm and visible)



TELECENTRIC SCAN LENS (Wavelength 1064nm)

Part No.	EFL (mm)	Scan Angle (±°)	Scan Field (mm)	Ent. pupil (mm)	Average spot size (um)	Total Length (mm)	WD (mm)
TSL-1064-20-56	56.0	13.0	20x20	10.0	10.0	40.0	59.9
TSL-1064-40-100	100.0	18.0	40x40	25.0	4.7	139.1	73.0
TSL-1064-50-210	210.0	10.0	50x50	25.0	15.8	158.0	270.0
TSL-1064-69-107	107.0	22.0	69x69	12.0	10.0	84.5	142.0
TSL-1064-65-115	115.0	25.0	65x65	12.0	14.5	91.0	136.4
TSL-1064-73-163A	163.0	18.0	73x73	15.0	18.0	138.6	214.1
TSL-1064-90-190	190.0	14.0	90x90	18.0	24.5	195.5	166.4
TSL-1064-126-216A	216.0	24.3	126x126	15.0	23.1	212.8	298.0

TELECENTRIC SCAN LENS (Wavelength 670nm)

Part No.	EFL (mm)	Scan Angle (±°)	Scan Field (mm)	Ent. pupil (mm)	Average spot size (um)	Total Length (mm)	WD (mm)
TSL-670-34-88	88.0	15.8	34x34	7.0	13.5	55.0	116.3
TSL-670-77-157	157.3	20.0	77x77	10.0	16.5	92.0	223.0

TELECENTRIC SCAN LENS (Wavelength 633nm)

Part No.	EFL (mm)	Scan Angle (±°)	Scan Field (mm)	Ent. pupil (mm)	Average spot size (um)	Total Length (mm)	WD (mm)
TSL-633-19-75	74.8	10.4	19x19	10.0	8.5	45.0	100.0
TSL-633-34-87	87.5	15.8	34x34	7.0	12.5	55.0	115.6
TSL-633-36-89	89.0	17.0	36x36	16.0	7.3	62.1	113.4
TSL-633-30-100	100.4	12.5	30x30	10.0	9.5	80.0	99.1
TSL-633-77-156	156.0	20.0	77x77	10.0	17.0	96.2	229.2
TSL-633-75-204	203.6	15.0	75x75	20.0	10.3	94.0	236.0

TELECENTRIC SCAN LENS (Wavelength 532nm)

Part No.	EFL (mm)	Scan Angle (±°)	Scan Field (mm)	Ent. pupil (mm)	Average spot size (um)	Total Length (mm)	WD (mm)
TSL-532-15-58	58.0	10.4	15x15	10.0	4.5	65.0	52.6
TSL-532-45-80	80.0	23.0	45x45	12.0	10.0	83.0	79.0
TSL-532-36-90	90.0	17.0	36x36	20.0	7.0	62.0	113.0
TSL-532-60-105	105.0	23.5	60x60	10.0	9.5	92.6	129.1
TSL-532-75-163A	163.0	18.9	75x75	10.0	13.2	155.1	167.2
TSL-532-70-200	200.0	14.5	70x70	20.0	15.0	103.0	254.8
TSL-532-140-200	10.4	30.0	140x140	10.0	15.5	245.5	216.9

TELECENTRIC SCAN LENS (Wavelength 405nm)

Part No.	EFL (mm)	Scan Angle (±°)	Scan Field (mm)	Ent. pupil (mm)	Average spot size (um)	Total Length (mm)	WD (mm)
TSL-405-29-55	55.0	22.8	29x29	7.5	5.2	52	67.2

TELECENTRIC SCAN LENS (Wavelength 355nm)

Part No.	EFL (mm)	Scan Angle (±°)	Scan Field (mm)	Ent. pupil (mm)	Average spot size (um)	Total Length (mm)	WD (mm)
TSL-355-8-32	32.0	10.6	8x8	10.0	2.5	40.0	28.9
TSL-355-18-56	56.0	15.0	18x18	6.0	5.0	35	73.8
TSL-355-60-100Q	100.0	23.0	60x60	6.0	10.8	93.7	150.4
TSL-355-63-109	109.4	24.2	63x63	6.0	11.0	86.0	151.2
TSL-355-60-167A	167.0	14.4	60x60	10.0	7.7	117.8	222.6
TSL-355-85-254	254.0	14.0	85x85	6.0	18.0	173.5	145.0

TELECENTRIC SCAN LENS (Wavelength 266nm)

Part No.	EFL (mm)	Scan Angle (±°)	Scan Field (mm)	Ent. pupil (mm)	Average spot size (um)	Total Length (mm)	WD (mm)
TSL-266-10-30	30.1	14.6	10x10	6.0	3.5	55.5	28.9
TSL-266-18-52	52.0	15.0	18x18	6.0	5.0	39.0	69.0
TSL-266-60-100	100.0	22.0	60x60	6.0	6.0	86.2	140.0
TSL-266-55-158	158.0	17.0	55x55	10.0	6.0	133.0	250.0



*spot size is not guaranteed, and for reference only.

- 532nm, 450nm (Achromatic Telecentric Scan Lens)

With CCD camera been equipped into laser scanning system, Achromatic Telecentric scan lens is developed to color correct different wavelengths images.

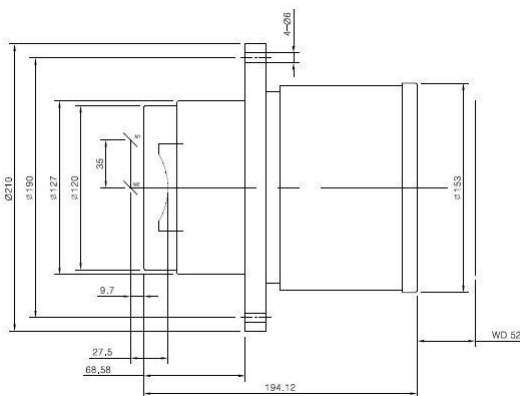
The focal length, working distance and focus spot are identically for both laser working wavelength and visible wavelength, it will help CCD to capture the actual image through F-theta scan lens, generally low dispersion crown glass and high dispersion flint glass are jointly used to correct the chromatic aberration.

Wavelength 532/625nm

Part No.	EFL (mm)	Wave-length	Scan Angle (±°)	Scan Field (mm)	Ent. pupil (mm)	Average spot size (um)	Total Length (mm)	WD (mm)
TSL-532-50-120A	120	532/625	17.0	50x50	15.0	8.6	194.1	52.0

Wavelength 450/650nm

Part No.	EFL (mm)	Wave-length	Scan Angle (±°)	Scan Field (mm)	Ent. pupil (mm)	Average spot size (um)	Total Length (mm)	WD (mm)
TSL-650-22-61AC	60.5	450/650	15.0	22x22	5.0	10.5	48.5	75.6



*spot size is not guaranteed, and for reference only.

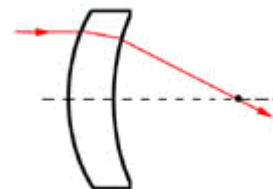
Focusing Lens

Focusing lens are used to focus laser beam. The objective of focusing the laser beam is to use the laser power for material processing.

- 10.6 μ m

ZnSe Lenses are widely used for CO2 laser application because of its low absorption at in-fared wavelengths as well as its visible transmission.

Specifications	
Diameter Tolerance	+0/-0.13mm
Thickness Tolerance	\pm 0.25mm
FL Tolerance	< \pm 2%
Centration	<3 arc minutes
Clear Aperture	>90%
Surface Figure	< λ /2 per 1"Dia@632.8nm
Surface Quality	40-20 scratch and dig
AR/AR coating	R<0.5% per surface @ 10.6um



10.6 μ m ZnSe Singlet Positive Meniscus Lenses

Part No.	Diameter (mm)	EFL (mm)	BFL (mm)	E.T. (mm)
LZM-12-18.8-ET1.4	12.0	18.8	19.0	1.4
LZM-12-18.8-ET2	12.0	18.8	19.0	2.0
LZM-15.8-47-ET2.1	15.8	47.0	48.0	2.1
LZM-0.6-1.5-ET2	15.2	38.1	38.0	2.0
LZM-15.8-47-ET2.1	15.8	47.0	48.0	2.1
LZM-18-23.4-ET1.7	18.0	23.4	24.0	1.7
LZM-18-50-ET2	18.0	50.0	51.0	2.0
LZM-0.75-1.5-ET2	19.1	38.1	38.0	2.0
LZM-0.75-2.5-ET2	19.1	63.5	64.0	2.0
LZM-0.75-3-ET2	19.1	76.2	64.0	2.0
LZM-0.75-3.5-ET2	19.1	88.9	90.0	2.0
LZM-20-2-ET2	20.0	50.8	64.0	2.0
LZM-20-2.5-ET2	20.0	63.5	64.0	2.0
LZM-24-37.1-ET1.5	24.0	37.1	38.0	1.5
LZM-25-3-ET2.3	25.0	74.1	76.2	2.3
LZM-1-1-ET2	25.4	25.4	22.4	2.0
LZM-1-1.5-ET2	25.4	38.1	35.6	2.0
LZM-1-1.5-ET3	25.4	38.1	38.0	3.0

10.6µm ZnSe Singlet Positive Meniscus Lenses

Part No.	Diameter (mm)	EFL (mm)	BFL (mm)	E.T. (mm)
LZM-1-50-ET3	25.4	50.0	51.0	3.0
LZM-1-2-ET2	25.4	50.8	51.0	2.0
LZM-1-2-ET3	25.4	50.8	51.0	3.0
LZM-1-2.5-ET3	25.4	63.5	51.0	3.0
LZM-1-73.8-ET3.2	25.4	73.8	74.0	3.2
LZM-1-3-ET2	25.4	76.2	76.0	2.0
LZM-1-3.75-ET3	25.4	96.5	96.0	3.0
LZM-1-100-ET3	25.4	100.0	102.0	3.0
LZM-1-4-ET3	25.4	101.6	102.0	3.0
LZM-1-102-ET3	25.4	102.0	102.0	3.0
LZM-1-5-ET3	25.4	127.0	128.0	3.0
LZM-1-152-ET3	25.4	152.0	153.0	3.0
LZM-1-6-ET3	25.4	152.4	153.0	3.0
LZM-1-200-ET3	25.4	200.0	201.0	3.0
LZM-1-8-ET3	25.4	203.2	201.0	3.0
LZM-1-10-ET3	25.4	254.0	226.0	3.0
LZM-27-62.4-ET2	27.0	62.4	64.0	2.0
LZM-1.1-54.1-ET1.7	27.9	54.1	55.0	1.7
LZM-1.1-2.5-ET2	27.9	63.5	64.0	2.0
LZM-1.1-2.5-ET3	27.9	63.5	61.0	3.0
LZM-1.1-3.75-ET2.5	27.9	96.5	96.0	2.5
LZM-1.1-3.75-ET3	27.9	96.5	96.0	3.0
LZM-1.1-5-ET2	27.9	127.0	125.0	2.0
LZM-1.1-5-ET3	27.9	127.0	126.0	3.0
LZM-1.1-5-ET4	27.9	127.0	127.7	4.0
LZM-1.1-5-ET5.1	27.9	127.0	123.3	5.1
LZM-1.1-5-ET6	27.9	127.0	122.7	6.0
LZM-1.1-7.5-ET6	27.9	190.5	191.0	6.0
LZM-30-117.6-ET2.6	30.0	117.6	119.0	2.6
LZM-30-118.4-ET3	30.0	118.4	119.0	3.0
LZM-30-150.1-ET3	30.0	150.1	153.0	3.0

RONAR-SMITH®
Laser Optics

Optics for Medical
Laser
System

Optics for
Semiconductor
Biomedical
Application Laser
Spectroscopy

Optical
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Laser
Accessories
Components



Optics Leading the Light

RONAR-SMITH® Laser Optics & IR Imaging



Introduction

10.6µm ZnSe Singlet Positive Meniscus Lenses

RONAR-SMITH®
Laser Optics

Part No.	Diameter (mm)	EFL (mm)	BFL (mm)	E.T. (mm)
LZM-30-69.1-ET2.84	30.0	69.1	70.0	2.8
LZM-32-71-ET2.7	32.0	71.0	72.0	2.7
LZM-1.5-2-ET3	38.1	50.8	47.0	3.0
LZM-1.5-3.75-ET6	38.1	96.5	90.4	6.0
LZM-1.5-5-ET2.4	38.1	127.0	124.7	2.4
LZM-1.5-5-ET3	38.1	127.0	125.0	3.0
LZM-1.5-5-ET6	38.1	127.0	125.0	6.0
LZM-1.5-5-ET7	38.1	127.0	125.0	7.0
LZM-1.5-5-ET7.4	38.1	127.0	121.2	7.4
LZM-1.5-5-ET9	38.1	127.0	126.0	9.0
LZM-1.5-7.5-ET3	38.1	190.5	188.0	3.0
LZM-1.5-7.5-ET6	38.1	190.5	185.0	6.0
LZM-1.5-7.5-ET6.2	38.1	190.5	186.0	6.2
LZM-1.5-7.5-ET7	38.1	190.5	186.0	7.0
LZM-1.5-7.5-ET7.4	38.1	190.5	185.1	7.4
LZM-1.5-7.5-ET9	38.1	190.5	184.1	9.0
LZM-1.5-8.858-ET7.4	38.1	223.5	218.1	7.4
LZM-1.5-10-ET7.4	38.1	254.0	248.7	7.4
LZM-40-150-ET4	40.0	150.0	151.0	4.0
LZM-2-150-ET3	50.8	150.0	147.0	3.0
LZM-2-7.5-ET9.6	50.8	190.5	183.5	9.6
LZM-2-10-ET9.6	50.8	254.0	247.0	9.6
LZM-2-700-ET3	50.8	700.0	698.3	3.0
LZM-2-1300-ET4	50.8	1300.0	1297.4	4.0
LZM-55-122.8-ET3.3	55.0	122.8	119.1	3.3
LZM-60-79.1-ET1.66	60.0	79.1	75.2	1.7
LZM-60-267.7-ET3.3	60.0	267.7	264.7	3.3
LZM-67-92.6-ET3	67.0	92.6	87.7	3.0

Optics for Medical Laser System

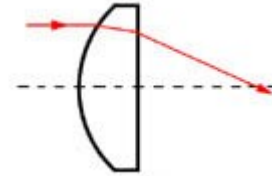
Optics for Semiconductor Spectroscopy Biomedical Application Laser

Optical Material

Laser Accessories Components

10.6µm ZnSe Singlet Plano-Convex Lens

Specifications	
Diameter Tolerance	+0/-0.13mm
Thickness Tolerance	±0.25mm
FL Tolerance	<±2%
Centration	<3 arc minutes
Clear Aperture	>90%
Surface Figure	<λ/2 per 1"Dia@632.8nm
Surface Quality	40-20 scratch and dig
AR/AR coating	R<0.5% per surface @ 10.6um



Part No.	Diameter (mm)	EFL (mm)	BFL (mm)	E.T. (mm)
LZ-0.6-1.5-ET2	15.2	38.1	38.1	2.0
LZ-0.6-2-ET2	15.2	50.6	50.8	2.0
LZ-0.6-2.5-ET2	15.2	63.5	63.5	2.0
LZ-0.6-4-ET2	15.2	101.6	101.6	2.0
LZ-0.75-1-ET2	19.0	25.4	23.0	2.0
LZ-0.75-1.5-ET2	19.0	38.1	38.1	2.0
LZ-0.75-2-ET2	19.0	50.6	50.8	2.0
LZ-0.75-2.5-ET2	19.0	63.5	63.5	2.0
LZ-0.75-3-ET2	19.0	76.2	74.6	2.0
LZ-0.75-4-ET2	19.0	101.6	101.6	2.0
LZ-0.75-5-ET2	19.0	127.0	125.5	2.0
LZ-1-1.5-ET2.1	25.4	38.1	35.6	2.1
LZ-1-1.5-ET3	25.4	38.1	35.0	3.0
LZ-1-2-ET3	25.4	50.8	48.3	3.0
LZ-1-2-ET2	25.4	50.8	48.6	2.0
LZ-1-2.5-ET3	25.4	63.5	61.0	3.0
LZ-1-3-ET3	25.4	76.2	73.7	3.0
LZ-1-4-ET3	25.4	101.6	99.2	3.0
LZ-1-5-ET3	25.4	127.0	124.7	3.0
LZ-1-7.5-ET3	25.4	190.5	185.0	3.0
LZ-1.1-1-ET3	27.9	25.4	21.4	3.0
LZ-1.1-1.5-ET3	27.9	38.1	34.8	3.0
LZ-1.1-2.5-ET3	27.9	63.5	60.7	3.0
LZ-1.1-3-ET3	27.9	76.2	73.6	3.0
LZ-1.1-3.5-ET3	27.9	88.9	86.4	3.0
LZ-1.1-3.75-ET3	27.9	95.2	92.7	3.0
LZ-1.1-4-ET3	27.9	101.6	99.1	3.0
LZ-1.1-5-ET3	27.9	127.0	124.3	3.0
LZ-30-3-ET3	30.0	76.2	73.6	3.0
LZ-1.5-1.5-ET3	38.1	38.1	33.7	3.0



Optics Leading the Light

RONAR-SMITH® Laser Optics & IR Imaging



Introduction

Part No.	Diameter (mm)	EFL (mm)	BFL (mm)	E.T. (mm)
LZ-1.5-2-ET3	38.1	50.8	47.0	3.0
LZ-1.5-2.5-ET3	38.1	63.5	60.0	3.0
LZ-1.5-2.5-ET6	38.1	63.5	58.2	6.0
LZ-1.5-2.5-ET2	38.1	65.2	63.5	2.0
LZ-1.5-3-ET3	38.1	76.2	73.0	3.0
LZ-1.5-3.5-ET3	38.1	90.5	88.9	3.0
LZ-1.5-3.75-ET3	38.1	95.2	92.3	3.0
LZ-1.5-5-ET3	38.1	128.1	127.0	3.0
LZ-2-100-ET3	50.8	100.0	96.6	3.0
LZ-2-150-ET3	50.8	150.0	146.2	3.0

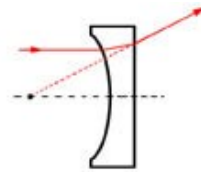
RONAR-SMITH® Laser Optics

Optics for Medical Laser System

- 10.6µm Diverging Lens (Negative)

Specifications

Diameter Tolerance	+0/-0.13mm
Thickness Tolerance	±0.25mm
FL Tolerance	<+/-2%
Centration	<3 arc minutes
Clear Aperture	>90%
Surface Figure	<λ/2 per 1"Dia@632.8nm
Surface Quality	40-20 scratch and dig
AR/AR Coating	R<0.5% per surface @10.6um



ZnSe Singlet Plano-Concave Lens

Part No.	Diameter (mm)	EFL (mm)	E.T. (mm)
LZ-5+10-ET2	5.0	-10.0	2.0
LZ-8+16-ET2	8.0	-16.0	2.0
LZ-10+1.4-ET1.25	10.0	-35.6	1.3
LZ-12.5+7-ET3-9.4	12.5	-7.0	3.0
LZ-12.5+8-ET1.3	12.5	-8.0	1.3
LZ-12.5+0.38-ET3	12.5	-9.7	3.0
LZ-12.5+0.45-ET2.8	12.5	-11.4	2.8
LZ-12.5+0.5-ET2.6	12.5	-12.7	2.6
LZ-12.5+0.55-ET2.1	12.5	-14.0	2.1
LZ-12.5+0.6-ET2.6	12.5	-15.2	2.6
LZ-12.5+0.75-ET2.3	12.5	-19.1	2.3
LZ-12.5+1-ET2.3	12.5	-25.4	2.3
LZ-12.5+1.2-ET2.5	12.5	-30.5	2.5
LZ-12.5+1.5-ET2	12.5	-38.1	2.0
LZ-12.5+2.2-ET2.3	12.5	-55.9	2.3
LZ-0.5+18.5-ET3	12.7	-18.5	3.0
LZ-0.5+1.48-ET2	12.7	-37.6	2.0
LZ-15+0.6-ET3.3	15.0	-15.2	3.3

Optics for Semiconductor Spectroscopy Biomedical Application Laser

Optical Material

Laser Accessories Components



Optics Leading the Light

RONAR-SMITH® Laser Optics & IR Imaging



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Part No.	Diameter (mm)	EFL (mm)	E.T. (mm)
LZ-15+11.6-ET3.68	15.0	-11.6	3.7
LZ-15+13.97-ET3.6	15.0	-14.0	3.6
LZ-15+19.1-ET3.3	15.0	-19.1	3.3
LZ-15+1-ET3.3	15.0	-25.4	3.3
LZ-15+26.06-ET3	15.0	-26.1	3.0
LZ-15+30-ET3	15.0	-30.0	3.0
LZ-15+1.5-ET3	15.0	-38.1	3.0
LZ-15+38.71-ET2.57	15.0	-38.7	2.6
LZ-15+2-ET2	15.0	-50.8	2.0
LZ-15+56-ET2.86	15.0	-56.0	2.9
LZ-15+60-ET3	15.0	-60.0	3.0
LZ-0.6+1-ET4.6	15.2	-25.4	4.6
LZ-0.6+2-ET2	15.2	-50.8	2.0
LZ-17+30.3-ET3	17.0	-30.3	3.0
LZ-17.5+0.55-ET3.5	17.5	-14.0	3.5
LZ-17.5+0.75-ET3	17.5	-19.1	3.0
LZ-17.5+1-ET3	17.5	-25.4	3.0
LZ-17.5+1.2-ET2.5	17.5	-30.5	2.5
LZ-17.5+1.5-ET3	17.5	-38.1	3.0
LZ-19+25.714-ET3.15	19.0	-25.7	3.2
LZ-0.75+25-ET3	19.1	-25.0	3.0
LZ-0.75+1-ET3	19.1	-25.4	3.0
LZ-0.75+30-ET3	19.1	-30.0	3.0
LZ-0.75+1.5-ET3	19.1	-38.1	3.0
LZ-0.75+50-ET3	19.1	-50.0	3.0
LZ-0.75+2-ET3	19.1	-50.8	3.0
LZ-20+94.74-ET2.9	20.0	-94.7	2.9
LZ-25+0.55-ET5.74	25.0	-14.0	5.7
LZ-25+0.6-ET4.3	25.0	-15.2	4.3
LZ-25+0.75-ET4.9	25.0	-19.1	7.9
LZ-25+1-ET4.4	25.0	-25.4	4.4
LZ-25+56-ET3.6	25.0	-56.0	3.6
LZ-25+406-ET3	25.0	-406.0	3.0
LZ-1+18-ET4.5	25.4	-18.0	4.5
LZ-1+35-ET3.5	25.4	-35.0	3.5
LZ-1+2-ET3	25.4	-50.8	3.0
LZ-1+2.5-ET3	25.4	-63.5	3.0
LZ-44+118-ET3.1	44.0	-118.0	3.1
LZ-3+100-ET10	76.2	-100.0	10.0

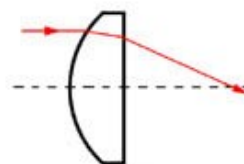
- 1064nm,532nm,355nm Focusing Lens (Positive)

**RONAR-SMITH®
Laser Optics**

Focusing lens are used to focus laser beam. The objective of focusing the laser beam is to use the laser power for material processing.

Specifications

Diameter Tolerance	+0/-0.13mm
Thickness Tolerance	±0.25mm
FL Tolerance	<±2%
Centration	<3 arc minutes
Clear Aperture	>80%
Surface Figure	λ/4 Per 1" Dia @632.8nm
Surface Quality	60-40 scratch and dig
AR/AR coating	R<0.5% Per surface



Part No.	Diameter (mm)	EFL (mm)	ET (mm)	Material
LFS-25-75-ET2	25.0	75.0	2.0	Fused Silica
LFS-25-80-ET2	25.0	80.0	2.0	Fused Silica
LFS-25-100-ET2	25.0	100.0	2.0	Fused Silica
LFS-1-50-ET2	25.4	50.0	2.0	Fused Silica
LFS-1-100-ET2	25.4	100.0	2.0	Fused Silica
LFS-1-150-ET2	25.4	150.0	2.0	Fused Silica
LFS-1-200-ET2	25.4	200.0	2.0	Fused Silica
LFS-1-250-ET2	25.4	250.0	2.0	Fused Silica
LFS-1-300-ET2	25.4	300.0	2.0	Fused Silica
LFS-1-500-ET2	25.4	500.0	2.0	Fused Silica
LFS-1-1000-ET2	25.4	1000.0	2.0	Fused Silica
LFS-38-100-ET3	38.0	100.0	3.0	Fused Silica
LFS-38-150-ET3	38.0	150.0	3.0	Fused Silica
LFS-38-200-ET3	38.0	200.0	3.0	Fused Silica
LFS-38-350-ET3	38.0	350.0	3.0	Fused Silica
LFS-38-500-ET3	38.0	500.0	3.0	Fused Silica
LFS-45-4-ET1.5	45.0	101.6	1.5	Fused Silica
LFS-45-5-ET1.5	45.0	127.0	1.5	Fused Silica
LFS-45-6-ET1.5	45.0	152.4	1.5	Fused Silica

*Meniscus focusing lens is available upon request.



Optics Leading the Light

RONAR-SMITH® Laser Optics & IR Imaging



Introduction

RONAR-SMITH®
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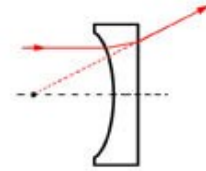
Optical
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Part No.	Diameter (mm)	EFL (mm)	ET (mm)	Material
LBK-10.5-27.8-ET2.5	10.5	27.8	2.5	BK7
LBK-0.5-15-ET2	12.7	15.0	2.0	BK7
LBK-0.5-20-ET2	12.7	20.0	2.0	BK7
LBK-0.5-31-ET2	12.7	31.0	2.0	BK7
LBK-0.5-50-ET2	12.7	50.0	2.0	BK7
LBK-0.5-75-ET2	12.7	75.0	2.0	BK7
LBK-0.5-100-ET2	12.7	100.0	2.0	BK7
LBK-0.5-120-ET2	12.7	120.0	2.0	BK7
LBK-0.5-140-ET2	12.7	140.0	2.0	BK7
LBK-0.5-160-ET2	12.7	160.0	2.0	BK7
LBK-14-37.8-ET2.5	14.0	37.8	2.5	BK7
LBK-15-20-ET2	15.0	20.0	2.0	BK7
LBK-15-35-ET2.5	15.0	35.0	2.5	BK7
LBK-1-25.4-ET2	25.4	25.4	2.0	BK7
LBK-1-35-ET2	25.4	35.0	2.0	BK7
LBK-1-40-ET2.16	25.4	40.0	2.2	BK7
LBK-1-50-ET2	25.4	50.0	2.0	BK7
LBK-1-60-ET2	25.4	60.0	2.0	BK7
LBK-1-70-ET2	25.4	70.0	2.0	BK7
LBK-1-75-ET2	25.4	75.0	2.0	BK7
LBK-1-100-ET2	25.4	100.0	2.0	BK7
LBK-1-125-ET2	25.4	125.0	2.0	BK7
LBK-1-150-ET2	25.4	150.0	2.0	BK7
LBK-1-152-ET2	25.4	152.0	2.0	BK7
LBK-1-175-ET2	25.4	175.0	2.0	BK7
LBK-1-200-ET2	25.4	200.0	2.0	BK7
LBK-1-250-ET2	25.4	250.0	2.0	BK7
LBK-1-300-ET2	25.4	300.0	2.0	BK7
LBK-1-500-ET2	25.4	500.0	2.0	BK7
LBK-1-1000-ET2	25.4	1000.0	2.0	BK7
LBK-30-80-ET2	30.0	80.0	2.0	BK7
LBK-30-100-ET2	30.0	100.0	2.0	BK7
LBK-30-120-ET2	30.0	120.0	2.0	BK7
LBK-50-100-ET3	50.0	100.0	3.0	BK7
LBK-50-150-ET3	50.0	150.0	3.0	BK7
LBK-50-200-ET3	50.0	200.0	3.0	BK7
LBK-50-250-ET2	50.0	250.0	3.0	BK7
LBK-50-300-ET2	50.0	300.0	3.0	BK7
LBK-50-400-ET2	50.0	400.0	3.0	BK7
LBK-50-450-ET2	50.0	450.0	3.0	BK7
LBK-50-500-ET2	50.0	500.0	3.0	BK7
LBK-50-600-ET2	50.0	600.0	3.0	BK7
LBK-50-800-ET2	50.0	800.0	3.0	BK7
LBK-50-1000-ET2	50.0	1000.0	2.5	BK7

- 1090nm,1064nm,532nm,355nm Diverging Lens (Negative)

Specifications	
Diameter Tolerance	+0/-0.13mm
Thickness Tolerance	±0.25mm
FL Tolerance	<±2%
Centration	<3 arc minutes
Clear Aperture	>80%
Surface Figure	λ/4 per 1" Dia @632.8nm
Surface Quality	60-40 scratch and dig
AR/AR coating	R<0.5% per surface



1090nm Singlet Diverging Lenses

Part No.	Diameter (mm)	EFL (mm)	ET (mm)	Material
LFS-10+33.5-ET3.3FB	10.0	-33.5	3.3	Fused Silica
LFS-10+33.8-ET3.3FB	10.0	-33.8	3.3	Fused Silica

1064nm Singlet Diverging Lenses

Part No.	Diameter (mm)	EFL (mm)	ET (mm)	Material
LFS-12+16-ET3.2	12.0	-16.0	3.2	Fused Silica
LFS-12+1-ET3.2	12.0	-25.4	3.2	Fused Silica
LFS-12+25-ET3.1	12.0	-25.0	3.1	Fused Silica
LFS-12+2.5-CT2	12.0	-63.5	2.4	Fused Silica
LFS-12+34.3-ET2.7	12.0	-34.3	2.7	Fused Silica
LFS-12+39.2-ET3	12.0	-39.2	3.0	Fused Silica
LFS-12+64.2-ET2.4	12.0	-64.2	2.4	Fused Silica
LFS-12.5+0.375-ET4	12.5	-9.5	4.0	Fused Silica
LFS-12.5+0.5-ET4	12.5	-12.7	4.0	Fused Silica
LFS-12.5+16-ET4.3	12.5	-16.0	4.3	Fused Silica
LFS-15+50-ET2.5	15.0	-50.0	2.5	Fused Silica
LFS-17.5+36.75-ET3.4	17.5	-36.8	3.4	Fused Silica
LFS-17.5+65.4-ET3	17.5	-65.4	3.0	Fused Silica
LFS-1+1.13-ET12.7	25.4	-28.7	12.7	Fused Silica
LFS-28+252.7-ET3.2	28.0	-252.7	3.2	Fused Silica
LFS-36+189.7-ET4.67	36.0	-189.7	4.7	Fused Silica
LFS-36+192.79-ET4.6	36.0	-192.8	4.6	Fused Silica
LFS-36+383.95-ET4.7	36.0	-384.0	4.7	Fused Silica
LBK-0.5+15-ET2	12.7	-15.0	2.0	BK7
LBK-0.5+20-ET2	12.7	-20.0	2.0	BK7
LBK-0.5+25-ET2	12.7	-25.0	2.0	BK7
LBK-0.5+30-ET2	12.7	-30.0	2.0	BK7
LBK-0.5+40-ET2	12.7	-40.0	2.0	BK7

532nm Singlet Diverging Lenses

Part No.	Diameter (mm)	EFL (mm)	ET (mm)	Material
LFS-8+7.35-ET2.85G	8.0	-7.4	2.9	Fused Silica
LFS-10+8.46-ET4.1G	10.0	-8.5	4.1	Fused Silica
LFS-10+14.9-ET3.7G	10.0	-14.9	3.7	Fused Silica
LFS-10+18.78-ET2.5G	10.0	-18.8	2.5	Fused Silica
LFS-10+24.7-ET2.6G	10.0	-24.7	2.6	Fused Silica
LFS-10+35.65-ET2G	10.0	-36.7	2.0	Fused Silica
LFS-20+54.5-ET4.2G	20.0	-54.5	4.2	Fused Silica
LFS-10+73.31-ET2.38G	10.0	-73.3	2.4	Fused Silica

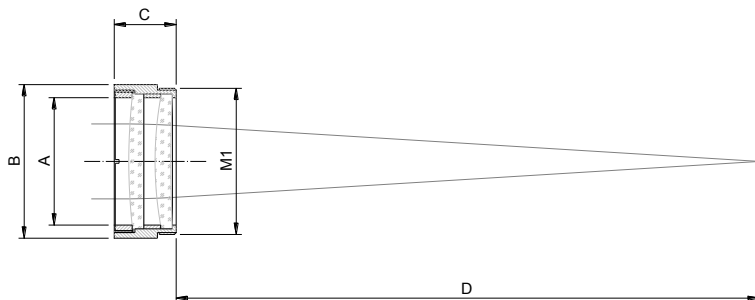
355nm Singlet Diverging Lenses

Part No.	Diameter (mm)	EFL (mm)	ET (mm)	Material
LFS-10+5.11-ET5U	10.0	-5.1	5.0	Fused Silica
LFS-10+15.94-ET2.6U	10.0	-16.0	2.6	Fused Silica
LFS-12+34.3-ET2.7U	12.0	-34.3	2.7	Fused Silica
LFS-12.5+6.57-ET5U	12.5	-6.6	5.0	Fused Silica
LFS-12.5+0.5-T5.6U	12.5	-12.7	5.6	Fused Silica
LFS-12.5+12.7-3.5U	12.5	-12.7	3.5	Fused Silica
LFS-18+58.9-ET2.7U	18.0	-58.9	2.7	Fused Silica
LFS-18+89.1-ET2.5U	18.0	-89.1	2.5	Fused Silica
LFS-20+45.02-ET4U	20.0	-45.0	4.0	Fused Silica
LFS-1+50-ET5.8U	1.0	-50.0	5.8	Fused Silica

The lens listed above is only part of our product, please contact us for your customized optics.

- 10.6 μ m,1064nm,532nm,355nm (Air Spaced Doublet)

The purpose of developing doublet air spaced focusing lens is to minimize aberration and achieve smallest spot size.



10.6 μ m Air-spaced Doublet Focusing Lenses

Part No.	EFL (mm)	A (mm)	B (mm)	C (mm)	D (mm)
CO2FL25	25.0	23.0	40.0	25.3	10.8
CO2FL50	50.0	23.0	32.0	12.8	35.2
CO2FL63.5	63.5	23.0	30.0	16.0	45.3

1064nm Air-spaced Doublet Focusing Lenses

Part No.	EFL (mm)	A (mm)	B (mm)	C (mm)	D (mm)	Remark
YAGFL30	30.0	14.0	20.0	11.0	26.5	-
YAGFL35	35.0	16.0	20.0	11.0	32.0	-
YAGFL40	40.3	20.0	23.0	14.0	29.8	-
YAGFL60	60.0	20.0	23.0	14.0	54.5	-
YAGFL66	65.8	24.0	34.0	20.5	53.4	-
YAGFL71	70.8	26.0	28.0	22.5	64.9	-
YAGFL81	80.6	41.0	48.0	22.0	70.1	-
YAGFL85	85.3	26.0	28.0	22.5	80.0	-
YAGFL100W	100.2	23.0	29.0	18.0	86.9	Protective
YAGFL101	100.6	40.0	48.0	22.5	87.3	-
YAGFL120	120.1	34.0	41.0	17.0	112.5	-
YAGFL149	148.9	45.0	50.0	59.0	152.7	-
YAGFL153	153.4	68.0	75.0	43.0	129.3	-
YAGFL163	162.6	34.0	41.0	16.5	155.4	-
YAGFL170	170.3	45.0	50.0	43.0	169.8	-
YAGFL200	200.1	68.0	75.0	23.0	185.9	-
YAGFL201	201.4	48.0	54.0	15.0	193.7	-
YAGFL250A	249.8	48.0	57.0	14.5	237.6	Achromatic

532nm Air-spaced Doublet Focusing Lenses

Part No.	EFL (mm)	A (mm)	B (mm)	C (mm)	D (mm)
532nmFL30	29.8	14.0	20.0	11.0	25.0
532nmFL89	88.9	30.0	41.0	26.0	64.3
532nmFL115	114.5	30.0	40.0	17.0	107.8
532nmFL170	170.3	30.0	41.0	27.0	124.8
532nmFL200	200.0	28.0	38.0	15.5	193.8
532nmFL271	270.6	30.0	41.0	27.0	255.1

355nm Air-spaced Doublet Focusing Lenses

Part No.	EFL (mm)	A (mm)	B (mm)	C (mm)	D (mm)
355nmFL48	48.2	24.0	34.0	34.5	33.6
355nmFL86	86.4	28.0	40.0	23.2	65.1
355nmFL115	115.0	30.0	40.0	20.0	106.4

266nm Air-spaced Doublet Focusing Lenses

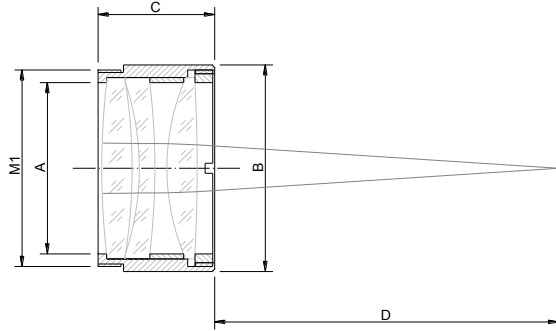
Part No.	EFL (mm)	A (mm)	B (mm)	C (mm)	D (mm)
266nmFL46	46.3	23.0	40.0	20.0	43.1
266nmFL82	82.4	30.0	40.0	20.0	73.8
266nmFL115	115.0	30.0	40.0	20.0	101.1



- 1064nm,532nm,355nm,266nm(Air Spaced Triplet)

The purpose of developing triplet air spaced focusing lens is to minimize aberration and achieve smallest spot size.

The achromatic triplet focus lens is color corrected, both working laser beam and inspection visible beam will focus on the same or closest focus point.



1064nm Air-spaced Triplet Focusing Lenses

Part No.	EFL (mm)	A (mm)	B (mm)	C (mm)	D (mm)	Remark
YAGFL25	25.2	18.0	26.0	18.0	19.5	-
YAGFL40A	40.1	26.0	36.0	22.0	29.8	Achromatic
YAGFL47	46.4	34.0	41.0	30.0	32.5	-
YAGFL47A	47.0	34.0	42.0	30.0	31.9	Achromatic
YAGFL50	50.0	26.0	36.0	19.0	29.3	-
YAGFL50W	50.0	26.0	36.0	26.0	32.3	-
YAGFL58	58.2	34.0	41.0	23.0	49.0	-
YAGFL58A	58.0	34.0	41.0	23.0	48.5	Achromatic
YAGFL77	77.0	34.0	41.0	23.0	67.9	-
YAGFL77A	77.0	34.0	41.0	23.0	63.5	Achromatic
YAGFL80	80.0	48.0	54.0	36.0	58.8	-
YAGFL90	90.0	35.0	41.0	32.0	90.1	-
YAGFL122	121.6	35.0	41.0	24.0	110.7	-
YAGFL125	125.1	43.0	52.0	29.0	113.1	-
YAGFL135	134.8	45.0	52.0	22.0	125.0	-

532nm Air-spaced Triplet Focusing Lenses

Part No.	EFL (mm)	A (mm)	B (mm)	C (mm)	D (mm)
532nmFL47	47.0	34.0	41.0	30.0	29.8
532nmFL77	76.6	35.0	41.0	24.0	64.1
532nmFL80	80.0	34.0	45.0	27.9	63.1
532nmFL89	89.4	35.0	41.0	32.0	88.8
532nmFL100	99.8	20.0	41.0	16.0	86.7

355nm Air-spaced Triplet Focusing Lenses

Part No.	EFL (mm)	A (mm)	B (mm)	C (mm)	D (mm)
355nmFL25	25.4	18.0	25.0	21.5	16.1
355nmFL47	47.0	34.0	41.0	28.0	32.7
355nmFL60	60.0	28.0	40.0	27.0	47.8

266nm Air-spaced Triplet Focusing Lenses

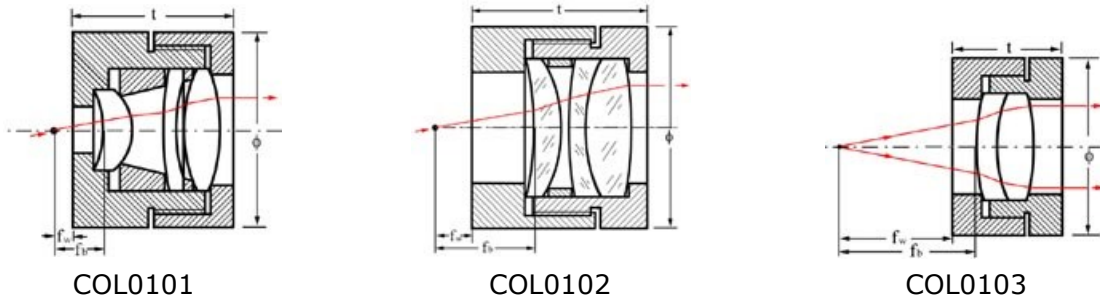
Part No.	EFL(mm)	A (mm)	B (mm)	C (mm)	D (mm)
266nmFL24	24.1	18.0	27.0	20.0	13.8
266nmFL57	57.3	28.0	40.0	23.5	44.6



- Collimating and Focusing Lenses Assemblies

Specifications

- Wavelength Range: 635nm-980nm
- Clear Aperture: 8.0±0.3mm
- Surface Quality: 60/40 scratch and dig
- Design Wavelength: 780nm
- Coatings: Broadband AR-Coatings @ 635nm-980nm
- Paraxial Focal length: ±1% @ 780nm
- Wavefront Distortion: $\lambda/2$ (p-v, over clear aperture, @ 632.8 nm)
- Housing Material: Black anodized aluminum



Collimating and Focusing Lenses

Part No	f(mm)	N.A.	f(mm)	t(mm)	f _w (mm)	f _b (mm)	Spot size(mm)
COL0101	8.0	0.500	15.0	12.0	1.0	3.1	2.0
COL0102	15.0	0.267	15.0	12.0	6.8	12.7	3.0
COL0103	25.4	0.157	20.0	8.0	20.0	23.9	5.0

Focal Length in Millimeters

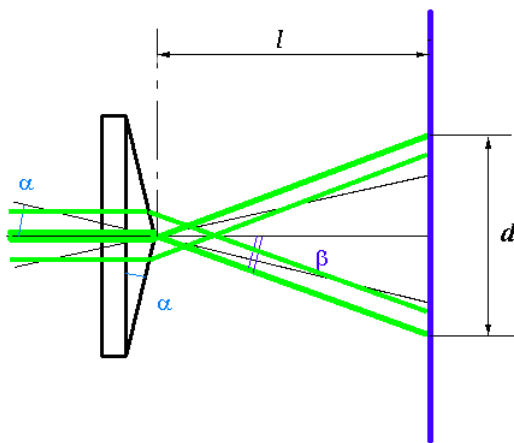
Wavelength	635nm	650nm	670nm	780nm	830nm	980nm
COL0101	7.96	7.97	7.97	8.00	8.01	8.04
COL0102	14.94	14.95	14.96	15.00	15.03	15.08
COL0103	25.40	25.40	25.39	25.40	25.41	25.46

Special Lens

-Axicon Lens

Axicon lens is a lens that has one flat face and one conical face. If it is combined with a lens, then a ring focus will be produced. Following is ZnSe Axicon Lens and the conical face is diamond cut-machined. Commonly, the conical face has a shallow angle of a few arc minutes or degrees.

BK7 and Fused Silicon Axicon lens for UV-NIR application is available upon request.



Standard Axicons

Axicon cone angle equal to $180^\circ - 2\alpha$

Cone angle (°)	α (°)
140	20
160	10
165	7.5
170	5
175	2.5
178	1
179.5	0.25 = 15'

Part No.	Material	Dia. (inch)	ET (mm)	SAG
LZAX-0.5-ET3	ZnSe	0.5	3.0	TBA
LZAX-1-ET3	ZnSe	1.0	3.0	TBA
LZAX-1.5-ET4	ZnSe	1.5	4.0	TBA

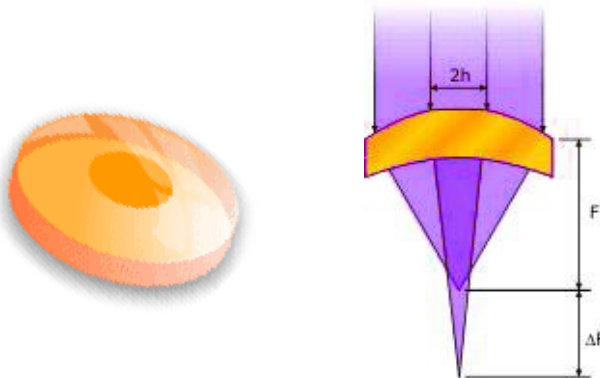
- Deep Focus Lens

Deep focus lens is a lens that has two focus points with one focus is positioned deeper compared with the other. By distributing a calculated fraction of the laser energy into a secondary (lower) focus, the lenses provide faster, cleaner cuts, with easier initiation and the elimination of sub-surface dross. Dual-Focus lenses also allow much thicker materials to be cut at a given laser power. Additional advantages come from the fact that assist gas requirements are significantly reduced.

ZnSe Deep-Focus lenses are designed for CO2 laser.

Part No.	Material	Dia (inch)	FL(inch)	ET(mm)
LZDF-1.1-5/7.5	ZnSe	1.1	5.0/7.5	4.0
LZDF-1.5-5/7.5/10	ZnSe	1.5	5.0/7.5/10.0	6.0/7.4
LZDF-2-5/7.5/10	ZnSe	2.0	5.0/7.5/10.0	8.0/9.6

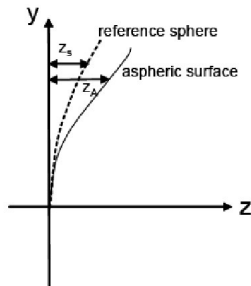
BK7 or Fused Silicon deep focus lens for UV to NIR application is available upon request.



- Aspheric lens

Aspheric lens can be applied to reduce spherical aberration and other optical aberrations, especially in complex lens system, one single aspheric lens will replace multiple lenses, it will make optical system more compact and cost reduced.

we provide aspheric lens made by crystal material ZnSe , ZnS, Ge, Si and glass material as well.



$$Z_{A,E} = \frac{cr^2}{1 + \sqrt{1 - (1+k)c^2r^2}} + \alpha_1 r^2 + \alpha_2 r^4 + \alpha_3 r^6 + \alpha_4 r^8 + \dots$$

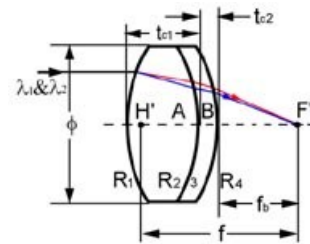
Specification	Tolerance	Comment
Diameter	Up to +0 / -.05mm	
Center thickness	Up to ± .05mm	
Form error/Irregularity (peak to valley)	Up to 1 micron	
Base radius (In addition to form error) *	Up to 1 micron	* Tolerance given in terms of the <u>sag difference</u> across the aperture.
Centration	Up to 1'	
Surface quality	Up to 40/20	

Achromatic Lens

- Positive Achromatic Lenses

Specifications

Design Wavelength: 480.0nm, 546.1nm, 643.8nm
 Diameter Tolerance: +0.0, -0.15mm
 Paraxial Focal Length: $\pm 2\%$ @546.1nm
 Centration: 3 arc minutes
 Clear Aperture: >80%
 Surface Figure: $\lambda/4$ @632.8nm
 Surface Quality: 60-40 scratch and dig
 Coating: Single layer MgF2 broadband AR coating
 Protective Bevel



Part No.	f (mm)	Φ (mm)	R ₁ (mm)	R ₂ =R ₃ (mm)	R ₄ (mm)	T _c (mm)	T _{c1} (mm)	T _{c2} (mm)	f _b (mm)	Lens A	Lens B
ACD-6-10-CT4.4	10.0	6.0	6.5	-4.1	-23.2	4.4	3.6	0.8	7.5	SK9	SF15
ACD-6-15-CT3.7	15.0	6.0	8.8	-6.5	-19.8	3.7	2.7	1.0	13.1	BK7	SF5
ACD-6-20-CT3.6	20.0	6.0	12.4	-8.5	-24.4	3.6	2.6	1.0	18.3	BK7	SF5
ACD-6-25-CT2.9	25.0	6.0	15.7	-10.7	-30.0	3.3	2.3	1.0	23.5	BK7	SF5
ACD-6-30-CT2.9	30.0	6.0	18.9	-12.9	-36.5	2.9	1.9	1.0	28.7	BK7	SF5
ACD-8-25-CT3.9	25.0	8.0	15.6	-10.9	-30.5	3.9	2.9	1.0	23.1	BK7	SF5
ACD-8-30-CT3.7	30.0	8.0	18.9	-12.9	-36.2	3.7	2.7	1.0	28.3	BK7	SF5
ACD-10-20-CT4.8	20.0	10.0	12.3	-9.0	-25.2	4.8	3.8	1.0	17.6	BK7	SF5
ACD-12-25-CT5.5	25.0	12.0	15.3	-11.4	-31.9	5.5	4.2	1.3	22.3	BK7	SF5
ACD-12.7-25-CT5.6	25.0	12.7	15.6	-11.4	-31.1	5.6	4.3	1.3	22.3	BK7	SF5
ACD-12.7-30-CT5.3	30.0	12.7	18.5	-13.5	-37.8	5.3	4.0	1.3	27.4	BK7	SF5
ACD-12.7-40-CT4.7	40.0	12.7	25.2	-17.5	-48.8	4.7	3.4	1.3	37.8	BK7	SF5
ACD-12.7-50-CT4.4	50.0	12.7	31.3	-21.3	-62.4	4.4	3.1	1.3	48.0	BK7	SF5
ACD-12.7-60-CT4.1	60.0	12.7	37.3	-26.4	-75.9	4.1	2.8	1.3	58.1	BK7	SF5
ACD-12.7-75-CT3.9	75.0	12.7	46.8	-33.0	-94.6	3.9	2.6	1.3	73.2	BK7	SF5
ACD-13-40.5-CT4.3	40.5	13.0	25.4	-18.1	-50.5	4.3	3.0	1.3	38.5	BK7	SF5
ACD-14-44-CT4.6	44.0	14.0	27.5	-19.5	-55.0	4.6	3.3	1.3	41.8	BK7	SF5
ACD-17-73-CT5.2	73.0	17.0	47.2	-31.0	-256.1	5.2	3.5	1.7	70.1	SK9	SF5
ACD-18-40-CT6.9	40.0	18.0	24.3	-18.4	-53.1	6.9	5.4	1.5	36.5	BK7	SF5
ACD-18-50-CT6.3	50.0	18.0	31.7	-22.0	-60.6	6.3	4.8	1.5	47.0	BK7	SF5
ACD-18-60-CT5.6	60.0	18.0	37.8	-26.5	-73.8	5.6	4.1	1.5	57.3	BK7	SF5
ACD-18-80-CT4.9	80.0	18.0	49.6	-36.8	-165.6	4.9	3.4	1.5	77.4	BaK1	SF8
ACD-19-56-CT6.23	56.0	19.0	37.2	-29.1	-83.2	6.2	4.6	1.6	53.2	BaK4	SF4
ACD-25-65-CT8.3	65.0	25.0	40.1	-29.6	-84.0	8.3	6.3	2.0	60.9	BK7	SF5
ACD-25.4-50-CT9.8	50.0	25.4	34.6	-24.2	-179.1	9.8	7.8	2.0	44.5	BaF53	SF4
ACD-25.4-60-CT9.0	60.0	25.4	33.0	-29.0	-102.6	9.0	7.0	2.0	54.9	BK7	SF5
ACD-25.4-80-CT7.5	80.0	25.4	49.1	-37.9	-95.9	7.5	5.5	2.0	76.5	K7	SF1
ACD-25.4-100-CT6.5	100.0	25.4	60.7	-44.7	-122.2	6.5	4.5	2.0	97.1	BK3	SF5
ACD-25.4-120-CT6.2	120.0	25.4	73.3	-54.3	-160.0	6.2	4.2	2.0	117.1	BK7	SF5
ACD-26.5-100-CT5.2	100.0	26.5	60.7	-44.6	-121.6	7.4	5.2	2.2	96.5	BK3	SF5
ACD-30-140-CT7.4	140.0	30.0	84.9	-62.2	-170.6	7.4	4.9	2.5	136.0	BK3	SF5



Optics Leading the Light

RONAR-SMITH® Laser Optics & IR Imaging



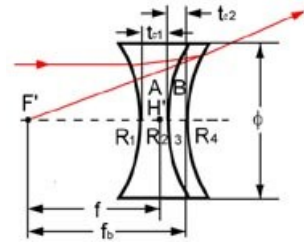
Introduction

RONAR-SMITH®
Laser Optics

- Negative Achromatic Lenses

Specifications

Design Wavelength: 480.0nm, 546.1nm, 643.8nm
 Diameter Tolerance: +0.0, -0.15mm
 Paraxial Focal Length: $\pm 2\%$ @546.1nm
 Centration: 3 arc minutes
 Clear Aperture: >80%
 Surface Figure: $\lambda/4$ @632.8nm
 Surface Quality: 60-40 scratch and dig
 Coating: Single layer MgF2 broadband AR coating
 Protective Bevel



Part No.	f (mm)	Φ (mm)	R ₁ (mm)	R ₂ =R ₃ (mm)	R ₄ (mm)	T _{C1} (mm)	T _{C1} (mm)	T _{C2} (mm)	f _b (mm)	Lens A	Lens B
ACD-12.7+25-ET5.7	-25.0	12.7	-15.6	13.1	44.2	5.7	3.0	2.7	-27.5	BK7	F2
ACD-12.7+40-ET5.3	-40.0	12.7	-24.5	18.0	66.6	5.3	3.0	2.3	-42.5	BK7	F2
ACD-25.4+50-ET7.2	-50.0	25.4	-31.2	24.9	85.3	7.2	3.0	4.2	-53.3	BK7	F2

Optics for Medical Laser System

Optics for Semiconductor Spectroscopy Biomedical Application Laser

Optical Material

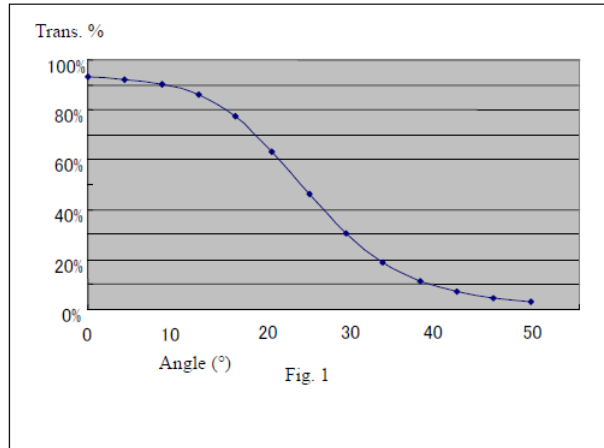
Laser Accessories Components



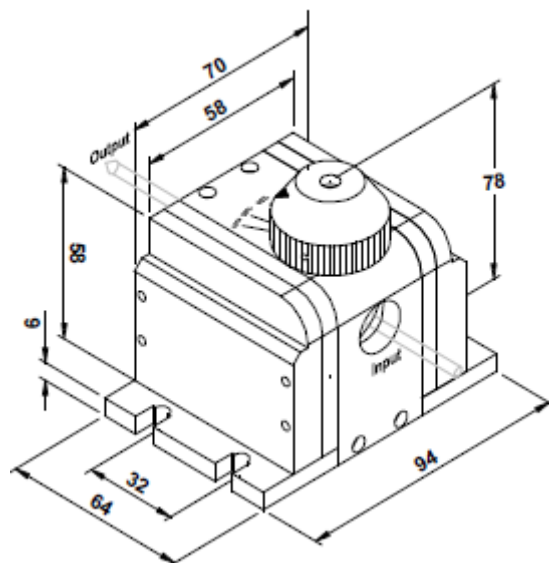
Attenuator

This Laser Attenuator is based on optical thin film coating technology. It enables to change the entire laser energy, and serves the purpose of continuous adjustment. This product has exquisite contour, the structure is compact, it is very easy to install and use.

Through the revolving of a specially coated lens in the Laser Attenuator, the transmission will change with the turned angle, thus achieving continuous adjustment settings. Moreover two pieces of internal lens adopt symmetrical positioning; they help to eliminate the optical axis deviation issue.



Part No.	Wavelength (nm)	Input CA (mm)	Transmission Variable Range
ATT-355	355	5.0	10%-92%
ATT-532	532	5.0	10%-92%
ATT-1064	1064	5.0	10%-92%
ATT-10600	10600	5.0	10%-92%



Beam Combiner

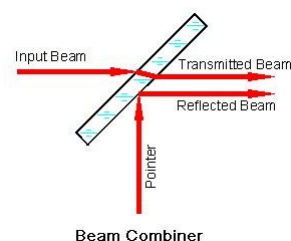
Beam Combiner merges the two beams into a collinear beam. Two beams enter the beam combiner and emerge as a single beam.

By using Beam Combiner, it is possible to merge two different wavelengths, whether ultraviolet, visible, or infrared. For example, certain applications require the alignment of infrared beams. Beam combiner allows users to mix infrared and visible wavelengths for an easy means of alignment.

Additional applications include HUD (Head-up-Display), fluorescence, bio-analysis, spectroscopy, flow cytometry, interferometry, microscopy, and measurements requiring wavelength difference.

Beam Combiner for CO2 Laser (Wavelength 10.6um)

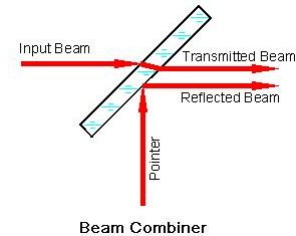
Specifications	
Diameter Tolerance	+0/-0.13mm
Thickness	±0.25mm
Side1	T>99%@10.6um,45AOI
Side2	T>99%@10.6um R>85%@650nm,45AOI
Surface Figure	$\lambda/2$ per 1" Dia @632.8nm



Part No.	Material	Diameter (mm)	Thickness (mm)	Wavelength (nm)
BCZ-0.5-2	ZnSe	12.7	2	10.6umT650R
BCZ-0.5-3	ZnSe	12.7	3	10.6umT650R
BCZ-0.75-2	ZnSe	19.1	2	10.6umT650R
BCZ-0.75-3	ZnSe	19.1	3	10.6umT650R
BCZ-20-2	ZnSe	20.0	2	10.6umT650R
BCZ-1-3-9.4	ZnSe	25.4	3	10.6umT650R
BCZ-1.0-3	ZnSe	25.4	3	10.6umT650R
BCZ-1.1-3	ZnSe	27.9	3	10.6umT650R
BCZ-1.5-3	ZnSe	38.1	3	10.6umT650R
BCZ-2-3	ZnSe	50.8	3	10.6umT650R
BCZ-2-5	ZnSe	50.8	5	10.6umT650R
BCZ-3-5	ZnSe	76.2	5	10.6umT650R

Beam Combiner for Nd:YAG Laser (Wavelength 1064nm)

Specifications	
Diameter Tolerance	+0/-0.13mm
Thickness	±0.25mm
Side1	T>99%@1064nm,45AOI
Side2	T>99%@1064nm,R>85%@650nm,45AOI
Surface Figure	λ/4 @632.8nm per 1" Dia



Part No.	Material	Diameter (mm)	Thickness (mm)	Wavelength (nm)
BCBK-0.5-2	BK7	12.7	2.0	1064T650R
BCBK-15-2.5	BK7	15.0	2.5	1064T650R
BCBK-0.75-2	BK7	19.1	2.0	1064T650R
BCBK-0.75-3	BK7	19.1	3.0	1064T650R
BCBK-1.0-3	BK7	25.4	3.0	1064T650R
BCBK-1.0-3.4	BK7	25.4	3.4	1064T650R
BCBK-1.1-3	BK7	27.9	3.0	1064T650R
BCBK-30-2.5	BK7	30.0	2.5	1064T650R
BCBK-1.5-3	BK7	38.1	3.0	1064T650R

Beam Combiner for Green Laser (Wavelength 532nm)

Specifications	
Diameter Tolerance	+0/-0.13mm
Thickness	±0.25mm
Side1	T>99%@532nm,45AOI
Side2	T>99%@532nm,R>85%@650nm,45AOI
Surface Figure	λ/4 @632.8nm per 1" Dia

Part No.	Material	Diameter (mm)	Thickness (mm)	Wavelength (nm)
BCBK-1-3-532T650R	BK7	25.4	3.0	532T650R

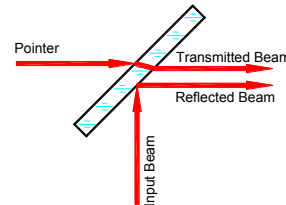
Various beam combiner

Part No.	Material	Diameter (mm)	Thickness (mm)	Wavelength (nm)
BCF-1-3.2-355T650R	BK7/FS	25.4	3.2	355T650R
BCBK-30*50-600T1550R	BK7/FS	30.0x50.0	5.0	600T1550R
BCF-30*50*5-600T355R	BK7/FS	30.0x50.0	5.0	600T355R
BCBK-50-5-650T532R	BK7/FS	50.0	5.0	650T532R
BCF-50-5-650T266R	BK7/FS	50.0	5.0	650T266R
BCF-50-5-650T355R	BK7/FS	50.0	5.0	650T355R
BCF-0.5-2-808T1064R	BK7/FS	12.7	2.0	808T1064R
BCF-25*20*3-808T1064R	BK7/FS	25.0x20.0	3.0	808T1064R
BCF-0.5-3-1064T808R	BK7/FS	12.7	3.0	1064T808R

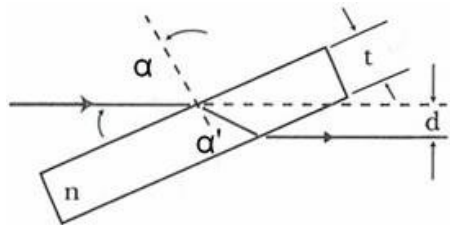
Reverse Beam Combiner—BCBK series

Reverse YAG Beam Combiner refers to an optic component used to transmit a short wavelength beam (eg. 650nm) at an angle of incidence of 45° while reflecting a long wavelength 1064nm.

Specifications	
Diameter Tolerance	+0/-0.13mm
Thickness	±0.25mm
Side1	T>99%@650nm,45AOI
Side2	T>99%@650nm R>99%@1064nm,45AOI
Surface Figure	λ/4 @632.8nm per 1" Dia



Part No.	Material	Diameter (mm)	Thickness (mm)	Wavelength (nm)
BCBK-1-3.5-1064R	BK7	25.4	3.5	1064R650T
BCBK-1-7-1064R	BK7	25.4	7.0	1064R650T
BCBK-2-6.35-1064R	BK7	50.8	6.4	1064R650T



$$d = t \sin \alpha \left(1 - \frac{\cos \alpha}{n \cos \alpha'} \right)$$

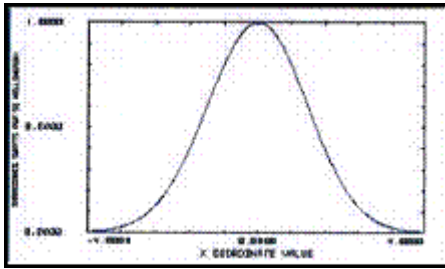
Where,

- α is angle of incidence
- n is index of refraction
- t is thickness
- d is displacement of the beam

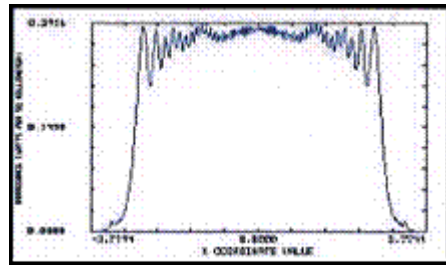
For example: BCZ-1-3, d=1.5mm @10.6um;
BCBK-1-3, d=1.0mm @1064nm.

Beam Shaper

The beam shaper is functioned to change the Gaussian profile of a light source (commonly laser) to become a Top-Hat profile. It is commonly used for drilling and marking applications.



Original Gaussian Profile

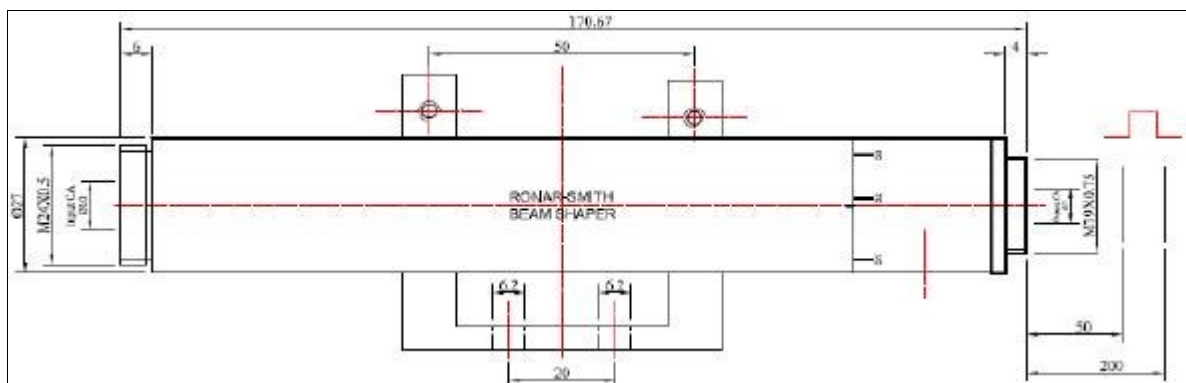


Top Hat profile after Beam Shaper

The beam shaper is based on transmissive design for 266nm, 355nm, 532nm, 1064nm, 10.6um.

The output beam is collimated. Thus it can be used with normal lenses after the beam shaper. We are open for other wavelength requirement, depends on your specific applications.

Part no.	Wavelength (nm)	Input Beam Size (mm)	Output Beam Size (mm)	Max. outer Dia (mm)	Total Length (mm)	Working Distance (mm)
BS-XXX	1064/532/355/266	4.6-5.0	6.0	27.0	170.7	25-200
BS-XXX-6-W600	1064/532/355	5.8-6.0	5.0-5.5	30.0	175.5	100-600
BS-10.6	10600	3.0-4.0	3.0-4.0	28.0	109.0	25-100
BS-10.6-6-W600	10600	6.0-7.0	6.0-7.0	38.0	270.0	25-600



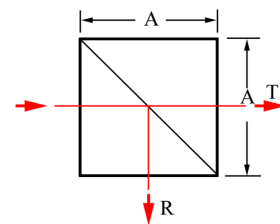
Beam splitter

- Cube Beam splitter

Non-Polarizing Cube Beam splitter

Polarizing Beam Splitter consists of 2 right angle prisms. One of them is coated with dielectric multi-layer polarizing coating on the hypotenuse face. The polarizing beam splitters split monochromatic beam entering at zero degree into p-polarization as transmitted and s-polarization as reflected. For the surface of the cube are coated with narrowband multi-layer antireflection coatings. Since there is no absorption of dielectric coating the losses of input beam of these products are minimized.

Specifications	
Dimension Tolerance	±0.2mm
Surface figure	$\lambda/4@632.8\text{nm}$
Surface Quality	60-40 scratch and dig
Beam Deviation	<3 arc minutes
Transmittance	45% ± 5%
Absorption	<10%
Polarization	6%



Part No.	Dimension (inch)	Wavelength (nm)
BSC-0.5-1064NP	0.5	1064
BSC-1-1064NP	1.0	1064

Polarizing Cube Beam splitter

Non-polarizing Cube Beam splitter 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 5% of each other. They will not change the state of polarization of the incident beam.

Specifications	
Dimension Tolerance	±0.2mm
Flatness	$\lambda/4@632.8\text{nm}$
Surface Quality	60-40 scratch and dig
Beam Deviation	<3arc minutes
Extinction ratio	>100:1
Principal Transmittance	$T_p > 95\%$ and $T_s < 1\%$
Principal Reflectance	$R_s > 99\%$ and $R_p < 5\%$

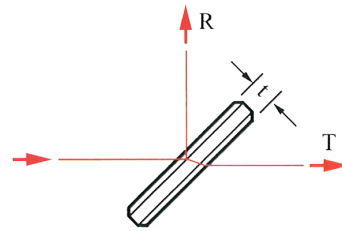
Coating:
Hypotenuse Face: Polarization Beam splitter
All input & output Faces: AR

Part No.	Dimension (inch)	Wavelength (nm)
BSC-0.5-1064P	0.5	1064
BSC-1-1064P	1.0	1064

- Beam splitter Plate –10.6µm

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

Specifications	
Diameter Tolerance:	+0/-0.13 mm
Thickness Tolerance:	±0.25 mm
Flatness	$\lambda/2$ per 1" Dia at 632.8 nm
Parallelism:	3 arc minute
Surface Quality:	60/40 scratch and dig



Part No.	Material	Diameter (mm)	Thickness (mm)	Side 1 Reflectivity (%R)	Polarization
BSZ1.0-3-27%R-S	ZnSe	25.4	3.0	27%	S-Pol
BSZ1.0-3-50%R-S	ZnSe	25.4	3.0	50%	S-Pol
BSZ1.0-3-50%R-P	ZnSe	25.4	3.0	50%	P-Pol
BSZ1.0-3-50%R-PIS	ZnSe	25.4	3.0	50%	Insensitive
BSZ1.1-3-27%R-S	ZnSe	27.9	3.0	27%	S-Pol
BSZ1.1-3-50%R-S	ZnSe	27.9	3.0	50%	S-Pol
BSZ1.1-3-50%R-P	ZnSe	27.9	3.0	50%	P-Pol
BSZ1.1-3-50%R-PIS	ZnSe	27.9	3.0	50%	Insensitive
BSZ1.5-3-27%R-S	ZnSe	38.1	3.0	27%	S-Pol
BSZ1.5-3-50%R-S	ZnSe	38.1	3.0	50%	S-Pol
BSZ1.5-3-50%R-P	ZnSe	38.1	3.0	50%	P-Pol
BSZ1.5-3-50%R-PIS	ZnSe	38.1	3.0	50%	Insensitive



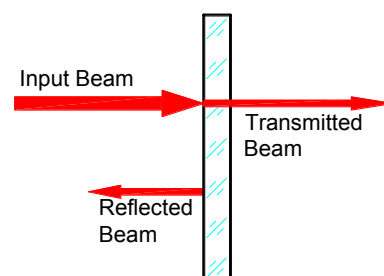
Cavity Optics

Output Coupler-10.6um

Partial reflectors are commonly used as laser output couplers or beam attenuators. Laser output couplers often require a slightly wedged substrate to eliminate interference from multiple reflections inside the component.

Specifications

Diameter Tolerance	+0/-0.13mm
Thickness Tolerance	±0.25mm
FL Tolerance	< +/-2%
Centration	<3 arc minutes
Clear Aperture	>90%
Surface Figure	<λ/2 per 1" Dia@632.8nm
Surface Quality	40-20 scratch and dig
Reflection Tolerance	Up to ±3% @10.6um



Part No.	Material	Diameter (mm)	Thickness (mm)	Side 1 Radius	Side 1 Reflectivity (%R)
OCZ-0.5-2-99.5%R	ZnSe	12.7	2.0	Plano	99.50%
OCZ-0.5-3-50%R	ZnSe	12.7	3.0	Plano	50%
OCZ-0.5-3-64%R	ZnSe	12.7	3.0	Plano	64%
OCZ-0.5-3-70%R	ZnSe	12.7	3.0	Plano	70%
OCZ-0.5-3-80%R	ZnSe	12.7	3.0	Plano	80%
OCZ-0.5-3-85%R	ZnSe	12.7	3.0	Plano	85%
OCZ-0.5-3-90%R	ZnSe	12.7	3.0	Plano	90%
OCZ-0.5-3-95%R	ZnSe	12.7	3.0	Plano	95%
OCZ-0.75-2-85%R	ZnSe	19.1	2.0	Plano	85%
OCZ-0.75-3-50%R	ZnSe	19.1	3.0	Plano	50%
OCZ-0.75-3-70%R	ZnSe	19.1	3.0	Plano	70%
OCZ-0.75-3-75%R	ZnSe	19.1	3.0	Plano	75%
OCZ-0.75-3-80%R	ZnSe	19.1	3.0	Plano	80%
OCZ-0.75-3-85%R	ZnSe	19.1	3.0	Plano	85%
OCZ-0.75-3-90%R	ZnSe	19.1	3.0	Plano	90%
OCZ-0.75-3-95%R	ZnSe	19.1	3.0	Plano	95%
OCZ-1-3-17%R	ZnSe	25.4	3.0	Plano	17%
OCZ-1-3-50%R	ZnSe	25.4	3.0	Plano	50%
OCZ-1-3-60%R	ZnSe	25.4	3.0	Plano	60%
OCZ-1-3-70%R	ZnSe	25.4	3.0	Plano	70%
OCZ-1-3-75%R	ZnSe	25.4	3.0	Plano	75%
OCZ-1-3-80%R	ZnSe	25.4	3.0	Plano	80%
OCZ-1-3-85%R	ZnSe	25.4	3.0	Plano	85%
OCZ-1-3-95%R	ZnSe	25.4	3.0	Plano	95%

Part No.	Material	Diameter (mm)	Thickness (mm)	Side 1 Radius	Side 1 Reflectivity (%R)
OCZ-1-3-99.5%R	Ge	25.4	3.0	10MCC	99.50%
OCZ-1.1-5.6-60%R	ZnSe	27.9	5.6	Plano	60%
OCZ-1.1-5.6-70%R	ZnSe	27.9	5.6	Plano	70%
OCZ-1.1-6-50%R	ZnSe	27.9	6.0	Plano	50%
OCZ-1.1-6-70%R	ZnSe	27.9	6.0	Plano	70%
OCZ-1.1-6-99.5%R	Ge	27.9	6.0	20MCC	99.50%
OCZ-1.18-3-50%R	ZnSe	30.0	3.0	Plano	50%
OCZ-1.5-3-50%R	ZnSe	38.1	3.0	Plano	50%
OCZ-1.5-3-70%R	ZnSe	38.1	3.0	Plano	70%
OCZ-1.5-3-75%R	ZnSe	38.1	3.0	Plano	75%
OCZ-1.5-3-80%R	ZnSe	38.1	3.0	Plano	80%
OCZ-1.5-3-85%R	ZnSe	38.1	3.0	Plano	85%
OCZ-1.5-3-90%R	ZnSe	38.1	3.0	Plano	90%
OCZ-1.5-3-95%R	ZnSe	38.1	3.0	Plano	95%
OCZ-1.5-5-40%R	ZnSe	38.1	5.0	20MCC	40%
OCZ-1.5-5-57%R	ZnSe	38.1	5.0	20MCC	57%
OCZ-1.5-6-17%R	ZnSe	38.1	6.0	10MCC	17%
OCZ-1.5-6-30%R	ZnSe	38.1	6.0	10MCC	30%
OCZ-1.5-6-40%R	ZnSe	38.1	6.0	Plano	40%
OCZ-1.5-6-99%R	ZnSe	38.1	6.0	20MCC	99%
OCZ-1.5-8-40%R	ZnSe	38.1	8.0	Plano	40%
OCZ-1.5-8-50%R	ZnSe	38.1	8.0	Plano	50%
OCZ-1.5-8-60%R	ZnSe	38.1	8.0	Plano	60%
OCZ-1.75-6.35-35%R	ZnSe	44.5	8.0	Plano	35%
OCZ-2-5-50%R	ZnSe	50.8	5.0	Plano	50%
OCZ-2-5-70%R	ZnSe	50.8	5.0	Plano	70%
OCZ-2-5-75%R	ZnSe	50.8	5.0	Plano	75%
OCZ-2-5-80%R	ZnSe	50.8	5.0	Plano	80%
OCZ-2-5-85%R	ZnSe	50.8	5.0	Plano	85%
OCZ-2-5-90%R	ZnSe	50.8	5.0	Plano	90%
OCZ-2-5-95%R	ZnSe	50.8	5.0	Plano	95%

Ge/ZnSe Rear Mirror-10.6um

Part No.	Material	Diameter (mm)	Thickness (mm)	Remark	Reference	OEM
PRZ-1-6/65%R	ZnSe	25.4	6.0	30MCC, 65%R	2785	-
RGE-1-6/15M	Ge	25.4	6.0	15MCC, 99.5%R	2786	Bystronic
RGE-1.1-6	Ge	27.9	6.0	99.5%R@10.6um	-	Fanuc
RGE-1.1-5.6	Ge	27.9	5.6	99.5%R@10.6um	-	Mazak
RGE-1.5-8	Ge	38.1	8.0	99.5%R@10.6um	-	Fanuc



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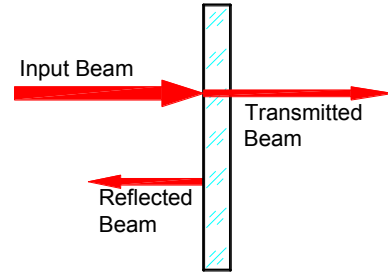


Introduction

RONAR-SMITH® Laser Optics

Specifications

Diameter Tolerance	+0/-0.13mm
Thickness Tolerance	±0.25mm
FL Tolerance	< +/-2%
Centration	<3 arc minutes
Clear Aperture	>90%
Surface Figure	<λ/2 per 1" Dia@632.8nm
Surface Quality	40-20 scratch and dig
Reflection Tolerance	Up to ±3% @1064nm



Optics for Medical Laser System

Output Coupler-1064nm

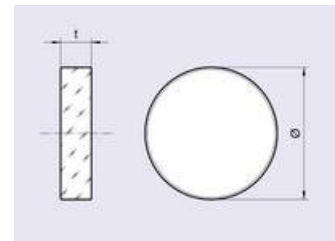
Part No.	Diameter (mm)	Thickness (mm)	Reflectivity (%R)
RFS-0.5-6.35-65%R	12.7	6.4	65%
RFS-0.5-6.35-80%R	12.7	6.4	80%
RFS-0.5-6.35-85%R	12.7	6.4	85%
RFS-0.5-6.35-90%R	12.7	6.4	90%
RFS-0.5-6.35-95%R	12.7	6.4	95%
RFS-0.75-9.5-30%R	19.1	9.5	30%
RFS-0.75-9.5-70%R	19.1	9.5	70%
RFS-0.75-9.5-80%R	19.1	9.5	80%
RFS-0.75-9.5-85%R	19.1	9.5	85%
RFS-20-5-80%R	20.0	5.0	80%
RFS-20-5-85%R	20.0	5.0	85%
RFS-1.0-9.5-17%R	25.4	9.5	17%
RFS-1.0-9.5-20%R	25.4	9.5	20%
RFS-1.0-9.5-25%R	25.4	9.5	25%
RFS-1.0-9.5-50%R	25.4	9.5	80%
RFS-1.0-9.5-85%R	25.4	9.5	85%

Optics for Semiconductor Spectroscopy Biomedical Application Laser

Optical Material

Rear Mirror –1064nm

Rear mirrors are partially reflectors with a very high reflection-to-transmission ratio and key optical components in laser resonators or laser cavities. Rear mirrors are a part of lasing process. Therefore high reflectivity is desired.



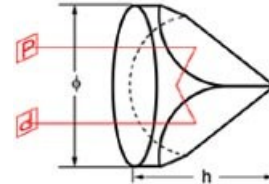
Laser Accessories Components

Part No.	Diameter (mm)	Thickness (mm)
RFS-0.5-6.4	12.7	6.4
RFS-0.5-9.5	12.7	6.4
RFS-0.75-6.4	19.1	9.5
RFS-0.75-9.5	19.1	9.5
RFS-20-5	20.0	5.0
RFS-1-6.4	25.4	9.5
RFS-1-9.5	25.4	9.5

Corner Cube Retroreflector

Specifications

Material: BK7 Grade A or equivalent Optical Glass
 Dimension Tolerance: +0.0, -0.2 mm
 Clear Aperture: >80%
 Deviation: $180^\circ \pm 3$ arc sec (best)
 Flatness: $\lambda/4$ @632.8 nm on big surface
 $\lambda/10$ @632.8 nm on other surface
 Surface Quality: 60-40 scratch and dig
 Wavefront Distortion: $\lambda/2$ @632.8 nm
 Protective Bevel



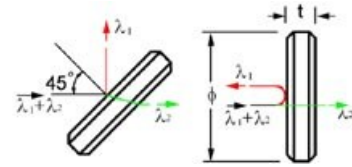
Part No.	Φ (mm)	h (mm)
RCN-15-11.3	15.0	11.3
RCN-25.4-19	25.4	19.0
RCN-38-28.5	38.0	28.5
RCN-50.8-37.5	50.8	37.5



Dichroic Mirror

Specifications

- Substrate Material: BK7
- Diameter Tolerance: +0,-0.2mm
- Thickness Tolerance: ±0.2mm
- Clear Aperture: >80%
- Flatness: $\lambda/10@632.8\text{nm}$
- Parallelism: < 1 arc minute
- Surface Quality: 20-10 scratch and dig



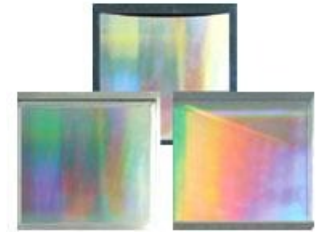
Part No.	Incident Angle	@1064nm	@532nm	Φ(mm)	t(mm)
Coating: HR1064 & HT532					
HSBK-1-6.35-1064R/532T	0°	R>99.5%	R<15%	25.4	6.35
HSBK-1-6.35-1064R/532T-45	45°	R>99.5%	R<15%	25.4	6.35
Coating: HT1064&HR532					
HSBK-1-6.35-532R/1064T	0°	R<15%	R>99.5%	25.4	6.35
HSBK-1-6.35-532R/1064T-45	45°	R<15%	R>99.5%	25.4	6.35

Note: 45° incidence, R for random polarization.



Gratings

Grating can form any kinds of wavefronts, with many characters of integrated multifunction, small size, light weight etc. During the research and development of past many years, We can manufacture many types of gratings, wavelength range is from infrared to ultraviolet, application fields includes: optical spectrum instruments, analytical instruments, laser and telecommunications equipments, stage lighting etc. We can make them according to clients' demands.



Holographic Gratings

Features:

Low stray points, high diffraction efficiency

Specifications:

Ruled Area = 70*70mm

Wavelength Range 0.2-0.8um

Grooves Per mm 1200L/mm-3600L/mm

Diffraction > 70%



Holographic Gratings

Features:

Exact, high efficiency and low stray light, diffraction efficiency is not lower than the efficiency of international market' gratings.

Ruled Area = 70*70mm

Wavelength Range 0.2-15um

Grooves Per mm 50L/mm-2400L/mm

Diffraction > 70%



Concave Gratings

Features:

This kind of grating can focus light beam, simplify the system's design and structure of the instrument, obviously decrease its volume and cost.

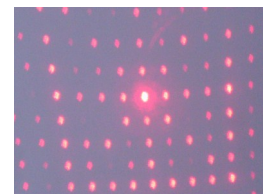
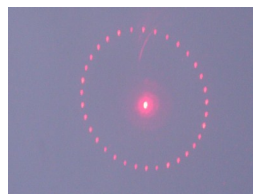
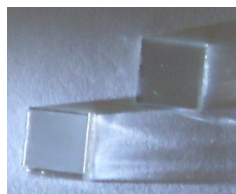
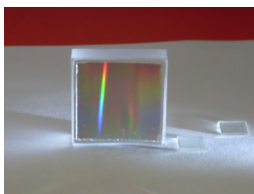
Specification:

Ruled Area ≤ 70*70mm

Wavelength Range 200-900um

Grooves Per mm 490L/mm-1200L/mm

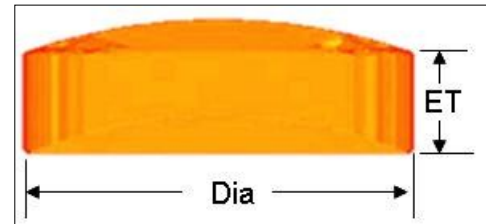
Diffraction > 70%



High Power CO₂ Laser Optics

ZnSe FOCUSING LENS

Specifications	
Diameter Tolerance	+0/-0.13mm
Thickness Tolerance	±0.25mm
FL Tolerance	<±2%
Centration	<3 arc minutes
Clear Aperture	>90%
Surface Figure	<λ/2 per 1"Dia@632.8nm
Surface Quality	40-20 scratch and dig
AR/AR coating	R<0.15% per surface @ 10.6um



	Part No.	Type	Diameter (mm)	FL (inch)	ET (mm)
Optics for Medical Laser System	LZM-1-5-ET2.5	Meniscus	25.4	5.0	2.5
	LZM-1.1-1.5-ET5	Meniscus	27.9	1.5	5.0
	LZM-1.1-2.5-ET2.3	Meniscus	27.9	2.5	2.3
	LZM-1.1-2.5-ET3	Meniscus	27.9	2.5	3.0
	LZM-1.1-2.5-ET4.2	Meniscus	27.9	2.5	4.2
	LZM-1.1-2.5-ET6	Meniscus	27.9	2.5	6.0
	LZM-1.1-3.75-ET2	Meniscus	27.9	3.8	2.0
	LZM-1.1-3.75-ET4.2	Meniscus	27.9	3.8	4.2
	LZM-1.1-5-ET2.7	Meniscus	27.9	5.0	2.7
Optics for Semiconductor Spectroscopy Biomedical Application Laser	LZM-1.1-5-ET4.2	Meniscus	27.9	5.0	4.2
	LZM-1.1-5-ET5.1	Meniscus	27.9	5.0	5.1
	LZM-1.1-5-ET6	Meniscus	27.9	5.0	6.0
Optical Material	LZM-1.1-7.5-ET6	Meniscus	27.9	7.5	6.0
	LZM-1.1-10-ET2.9	Meniscus	27.9	10.0	2.9
	LZM-1.5-2.5-ET3	Meniscus	38.1	2.5	3.0
Laser Accessories Components	LZM-1.5-2.5-ET6	Meniscus	38.1	2.5	6.0
	LZM-1.5-2.5-ET7.3	Meniscus	38.1	2.5	7.3
	LZM-1.5-3.75-ET6	Meniscus	38.1	3.8	6.0
	LZM-1.5-3.75-ET7	Meniscus	38.1	3.8	7.0
	LZM-1.5-3.75-ET7.4	Meniscus	38.1	3.8	7.4
	LZM-1.5-3.75-ET9	Meniscus	38.1	3.8	9.0
	LZM-1.5-5-ET2.4	Meniscus	38.1	5.0	2.4
	LZM-1.5-5-ET3	Meniscus	38.1	5.0	3.0
	LZM-1.5-5-ET4	Meniscus	38.1	5.0	4.0
	LZM-1.5-5-ET6	Meniscus	38.1	5.0	6.0
	LZM-1.5-5-ET7.3	Meniscus	38.1	5.0	7.3



Optics Leading the Light

RONAR-SMITH® Laser Optics & IR Imaging



Introduction

Part No.	Type	Diameter (mm)	FL (inch)	ET (mm)
LZM-1.5-5-ET7.4	Meniscus	38.1	5.0	7.4
LZM-1.5-5-ET7.8	Meniscus	38.1	5.0	7.9
LZM-1.5-5-ET9	Meniscus	38.1	5.0	9.0
LZM-1.5-7.5-ET3	Meniscus	38.1	7.5	3.0
LZM-1.5-7.5-ET6	Meniscus	38.1	7.5	6.0
LZM-1.5-7.5-ET7.3	Meniscus	38.1	7.5	7.3
LZM-1.5-7.5-ET7.4	Meniscus	38.1	7.5	7.4
LZM-1.5-7.5-ET7.9	Meniscus	38.1	7.5	7.9
LZM-1.5-7.5-ET9	Meniscus	38.1	7.5	9.0
LZM-1.5-7.5-ET10	Meniscus	38.1	7.5	10.0
LZM-1.5-8.85-ET7.4	Meniscus	38.1	8.9	7.4
LZM-1.5-10-ET7.36	Meniscus	38.1	10.0	7.4
LZM-1.5-10-ET9	Meniscus	38.1	10.0	9.0
LZM-2-3.75-ET9.6	Meniscus	50.8	3.8	9.6
LZM-2-5-ET7.8	Meniscus	50.8	5.0	7.8
LZM-2-5-ET8	Meniscus	50.8	5.0	8.0
LZM-2-5-ET9.6	Meniscus	50.8	5.0	9.6
LZM-2-5-ET11	Meniscus	50.8	5.0	11.0
LZM-2-7.5-ET3.5	Meniscus	50.8	7.5	3.5
LZM-2-7.5-ET8	Meniscus	50.8	7.5	8.0
LZM-2-7.5-ET9.6	Meniscus	50.8	7.5	9.6
LZM-2-10-ET9.6	Meniscus	50.8	10.0	9.6
LZM-2-12.5-ET9.65	Meniscus	50.8	12.5	9.7
LZM-2.5-7.5-ET11	Meniscus	63.5	7.5	11.0
LZ-1-1.5-ET3	PO/CX	25.4	1.5	3.0
LZ-1-2-ET3	PO/CX	25.4	2.0	3.0
LZ-1-2.5-ET3	PO/CX	25.4	2.5	3.0
LZ-1-3-ET3	PO/CX	25.4	3.0	3.0
LZ-1-4-ET3	PO/CX	25.4	4.0	3.0
LZ-1-5-ET3	PO/CX	25.4	5.0	3.0
LZ-1-10-ET3	PO/CX	25.4	10.0	3.0
LZ-1-12.5-ET4.8	PO/CX	25.4	12.5	4.8
LZ-1-15-ET4.8	PO/CX	25.4	15.0	4.8
LZ-1.1-5-ET3	PO/CX	27.9	5.0	3.0
LZ-1.1-5-ET4	PO/CX	27.9	5.0	4.0
LZ-1.1-5-ET6	PO/CX	27.9	5.0	5.0
LZ-1.1-7.5-ET4	PO/CX	27.9	7.5	4.0
LZ-1.1-7.5-ET6	PO/CX	27.9	7.5	6.0

RONAR-SMITH®
Laser Optics

Optics for Medical
Laser
System

Optics for
Semiconductor
Biomedical
Spectroscopy
Application Laser

Optical
Material

Laser
Accessories
Components



Optics Leading the Light

RONAR-SMITH® Laser Optics & IR Imaging

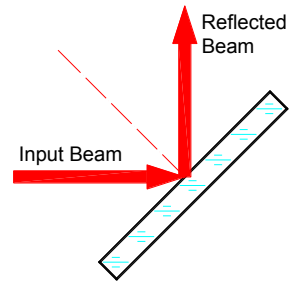


	Part No.	Type	Diameter (mm)	FL (inch)	ET (mm)
RONAR-SMITH® Laser Optics	LZ-1.5-2.5-ET7.4	PO/CX	38.1	2.5	7.4
	LZ-1.5-3.5-ET3	PO/CX	38.1	3.5	3.0
	LZ-1.5-3.63-ET7.2	PO/CX	38.1	3.6	7.2
	LZ-1.5-3.75-ET3	PO/CX	38.1	3.8	3.0
	LZ-1.5-3.75-ET7.4	PO/CX	38.1	3.8	7.4
	LZ-1.5-5-ET4	PO/CX	38.1	5.0	4.0
Optics for Medical Laser System	LZ-1.5-5-ET6	PO/CX	38.1	5.0	6.0
	LZ-1.5-5-ET7.4	PO/CX	38.1	5.0	7.4
	LZ-1.5-5-ET7.6	PO/CX	38.1	5.0	7.6
	LZ-1.5-5-ET7.8	PO/CX	38.1	5.0	7.8
	LZ-1.5-5-ET8	PO/CX	38.1	5.0	8.0
	LZ-1.5-5.13-ET7.1	PO/CX	38.1	5.1	7.1
Optics for Semiconductor Spectroscopy Biomedical Application Laser	LZ-1.5-7.5-ET2.5	PO/CX	38.1	7.5	2.5
	LZ-1.5-7.5-ET4	PO/CX	38.1	7.5	4.0
	LZ-1.5-7.5-ET6	PO/CX	38.1	7.5	6.0
	LZ-1.5-7.5-ET7.4	PO/CX	38.1	7.5	7.4
	LZ-1.5-7.5-ET7.6	PO/CX	38.1	7.5	7.6
	LZ-1.5-7.5-ET7.8	PO/CX	38.1	7.5	7.8
	LZ-1.5-7.5-ET8	PO/CX	38.1	7.5	8.0
	LZ-1.5-7.63-ET8	PO/CX	38.1	7.6	8.0
	LZ-1.5-15-ET8	PO/CX	38.1	15.0	8.0
	LZ-2-5-ET7.9	PO/CX	50.8	5.0	7.9
	LZ-2-5-ET8	PO/CX	50.8	5.0	8.0
Optical Material	LZ-2-5-ET9.6	PO/CX	50.8	5.0	9.6
	LZ-2-5.18-ET9.65	PO/CX	50.8	5.2	9.7
	LZ-2-7.5-ET7.4	PO/CX	50.8	7.5	7.4
Laser Accessories Components	LZ-2-7.5-ET7.8	PO/CX	50.8	7.5	7.8
	LZ-2-7.5-ET8	PO/CX	50.8	7.5	8.0
	LZ-2-7.5-ET9.6	PO/CX	50.8	7.5	9.6
	LZ-2-7.5-ET9.65	PO/CX	50.8	7.5	9.7
	LZ-2-8.75-ET7.8	PO/CX	50.8	8.8	7.8
	LZ-2-8.75-ET8.5	PO/CX	50.8	8.8	8.5
	LZ-2-10-ET7.8	PO/CX	50.8	10.0	7.8
	LZ-2-10-ET7.9	PO/CX	50.8	10.0	7.9
	LZ-2-10-ET9.6	PO/CX	50.8	10.0	9.6
	LZ-2-10.08-ET9.9	PO/CX	50.8	10.1	9.9
LZ-2.5-8.75-ET9.7	PO/CX	63.5	8.8	9.7	
LZ-2.5-10-ET9.6	PO/CX	63.5	10.0	9.6	
LZ-2.5-10-ET9.9	PO/CX	63.5	10.0	9.9	

Si/Cu Total Reflector

Silicon total reflector is the most common used mirror for CO2 laser system, it has good durability, thermal stability and relatively low cost.
Copper mirror is typically used for high-power CO2 laser system, it has high thermal conductivity.

Specifications	
Diameter Tolerance	+0,-0.13mm
Thickness Tolerance	±0.25mm
Clear Aperture	>80%
Flatness	$\lambda/4@632.8\text{nm}$
Parallelism	< 3 arc minute
Surface Quality	40/20 Scratch and dig

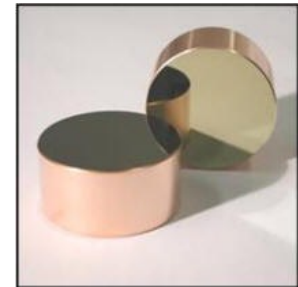


Part No.	Type	Diameter (mm)	Thickness(mm)	OEM
RSI-1.5-4	Si High Reflector	38.1	4.1	Trumpf
RSI-2-9.5	Si High Reflector	50.8	9.5	Amada
RSI-2-4	Si High Reflector	50.8	4.0	-
RSI-2-5	Si High Reflector	50.8	5.1	Amada
RSI-3-10	Si High Reflector	76.2	10.0	-
RSI-3-10-10MCC	Si High Reflector	76.2	10.0	-
RSI-3-10-4.5MCC	Si High Reflector	76.2	10.0	-
RCU-25-10	Cu High Reflector	25.0	10.0	-
RCU-25-10-10MCC	Cu High Reflector	25.0	10.0	-
RCU-38-6	Cu High Reflector	38.0	6.0	-
RCU-50-25WC	Cu High Reflector	50.0	25.0	-
RCU-60-10	Cu High Reflector	60.0	10.0	-
MRCU-50-10	MaxR Cu High Reflector	50.0	10.0	Bystronic
MRCU-50-25WC	MaxR Cu High Reflector	50.0	25.0	-



Si/Cu Zero Phase Retarder

Reflective Phase Retarders are used as beam bending mirrors external to the laser cavity to establish and maintain circular polarization. This requirement is particularly vital for laser material processing applications where cut or scribed edge quality, or weld penetration, is critical to the consistency and precision of the final part. Zero degree Phase Retarder maintain control over the circularly polarized beam.



Part No.	Type	Diameter (mm)	Thickness(mm)	OEM
0RSI-25-3	Si Zero Phase Retarder	25.0	3.0	-
0RSI-1-3	Si Zero Phase Retarder	25.4	3.0	-
0RSI-1-4	Si Zero Phase Retarder	25.4	4.1	-
0RSI-1.5-4	Si Zero Phase Retarder	38.1	4.0	-
0RSI-1.5-5	Si Zero Phase Retarder	38.1	5.0	-
0RSI-1.75-5	Si Zero Phase Retarder	44.5	5.0	-
0RSI-1.75-9.5	Si Zero Phase Retarder	44.5	9.5	-
0RSI-2-5	Si Zero Phase Retarder	50.8	5.0	Amada
0RSI-2-9.5	Si Zero Phase Retarder	50.8	9.5	-
0RSI-2-10	Si Zero Phase Retarder	50.8	10.2	-
0RSI-68-20	Si Zero Phase Retarder	68.0	20.3	Trumpf
0RSI-3-6.35	Si Zero Phase Retarder	76.2	6.4	-
0RSI-3-9.5	Si Zero Phase Retarder	76.2	9.5	-

Si/Cu 90 Phase Retarder

90 degree Phase Retarder, also commonly called circular polarizer, are used to transform the laser's linear polarization into a circular polarization. It is generally used as last mirror prior to focusing lens.

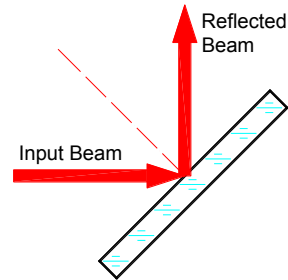
Part No.	Type	Diameter (mm)	Thickness (mm)	Reference	OEM
90RSI-1-3	Si 90 Phase Retarder	25.4	3.0	-	-
90RSI-1.5-4	Si 90 Phase Retarder	38.1	4.0	-	-
90RSI-2-5	Si 90 Phase Retarder	50.8	5.1	20043	Amada
90RSI-2-9.5	Si 90 Phase Retarder	50.8	9.5	0809	-
90RSI-68-20	Si 90 Phase Retarder	68.0	20.3	-	Trumpf
90RCU-1.5-7.5	Cu 90 Phase Retarder	38.1	7.5	-	Mazak
90RCU-2-5	Cu 90 Phase Retarder	50.8	5.1	-	-
90RCU-50-10	Cu 90 Phase Retarder	50.0	10.0	4011	Bystronic
90RCU-50-25WC	Cu 90 Phase Retarder	50.0	25.0	-	-
90RCU-60-10	Cu 90 Phase Retarder	60.0	10.0	-	Bystronic

Mirror

- Mirror & Reflector

Total Reflectors are used either within a laser cavity as rear mirrors or folding mirrors, or external to the laser as bending mirrors to deliver the beam to the work.

Specifications	
Diameter Tolerance	+0,-0.13mm
Thickness Tolerance	±0.25mm
Clear Aperture	>80%
Flatness	$\lambda/4@632.8\text{nm}$
Parallelism	< 3 arc minutes
Surface Quality	40/20 scratch and dig
Coating:	HR coating, 45AOI



Total reflector for CO2 laser (Wavelength 10.6um)

Silicon total reflector is the most common used mirror for CO2 laser system, it has good durability, thermal stability and relatively low cost.

Copper mirror is typically used for high-power CO2 laser system, it has high thermal conductivity.

Molybdenum mirror is normally polished only, without coating, used for tough environments. it has extremely tough surface.

Part No.	Material	Diameter (mm)	Thickness (mm)	Side 1 Radius	Side 1 Reflectivity (%R)
RSI-0.75-3	Silicon	19.1	3.0	Plano	>99.2
RSI-1-3	Silicon	25.4	3.0	Plano	>99.2
RSI-1.5-4	Silicon	38.1	4.0	Plano	>99.2
RSI-1.5-9.6	Silicon	38.1	9.7	Plano	>99.2
RSI-2-5	Silicon	50.8	5.1	Plano	>99.2
RSI-2-9.5	Silicon	50.8	9.5	Plano	>99.2
RCU-0.5-3	Copper	12.7	3.0	Plano	>99.5
RCU-1.1-6	Copper	27.9	6.0	Plano	>99.5
RCU-38-6	Copper	38.0	6.0	Plano	>99.5
15RCU-38-6	Copper	38.0	6.0	15MCC	>99.5
RCU-10.6-50-9	Copper	50.0	9.0	Plano	>99.5
RCU-50-25	Copper	50.0	25.0	Plano	>99.5
RCU-50-25-WC	Copper	50.0	25.0	Plano(Water Cool)	>99.5
RCU-2-54	Copper	50.8	54.0	Plano	>99.5
RCU-4.25-38.1	Copper	108.0	38.1	Plano	>99.5
RMO-0.75-3	Mo Mirror	19.1	3.0	Polished	>97
RMO-0.75-3-2MCC	Mo Mirror	19.1	3.0	2MCC polished	>97
RMO-1-3	Mo Mirror	25.4	3.0	polished	>97
RMO-1.1-6	Mo Mirror	27.9	6.0	polished	>97
RMO-2-0.276	Mo Mirror	50.8	7.0	Polished	>97



Optics Leading the Light

RONAR-SMITH® Laser Optics & IR Imaging



Introduction

Total Reflector for Nd:YAG Laser (wavelength 1064nm)

Part No.	Diameter (mm)	Thickness (mm)	AOI
RBK-19-3	19.0	3.0	45°
RBK-25-3	25.0	3.0	45°
RBK-1-9.5	25.4	9.5	45°
RBK-30-5	30.0	5.0	45°
RBK-1.5-4	38.1	4.0	45°
RBK-1.5-6.35	38.1	6.4	45°
RBK-50-5	50.0	5.0	45°
RBK-2-6.3	50.8	6.3	45°
RBK-2-9.5	50.8	9.5	45°
RBK-9×11×1	9.0×11.0	1.0	45°
RBK-5.2×11.5×1	5.2×11.5	1.0	45°

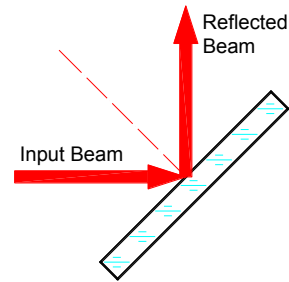
Total Reflector for 1064/650/532nm

Part No.	Diameter (mm)	Thickness (mm)	Side 1 Reflectivity (%R)
RBK-19-3-YGR	19.0	3.0	>99.5%@1064nm >99.2%@532nm
RBK-25-3-YGR	25.0	3.0	>90%@650nm, 45° AOI

Total Reflector for Green Laser (wavelength 532nm)

Part No.	Diameter (mm)	Thickness (mm)	AOI
RBK-19-3G	19.0	3.0	45°
RBK-25-3G	25.0	3.0	45°
RBK-30-5G	30.0	5.0	45°
RBK-1.5-4G	38.1	4.0	45°
RBK-50-5G	50.0	5.0	45°
RBK-2-6.3G	50.8	6.3	45°

Specifications	
Diameter Tolerance	+0,-0.2mm
Thickness Tolerance	±0.2mm
Clear Aperture	>80%
Flatness	$\lambda/4@632.8\text{nm}$
Parallelism	< 3 arc minute
Surface Quality	20/10 Coating:
Coating:	HR coating, 45AOI



Total Reflector for UV Laser (wavelength 355nm)

Part No.	Diameter (mm)	Thickness (mm)	AOI
RBK-19-3U	19.0	3.0	45°
RBK-25-3U	25.0	3.0	45°
RBK-30-5U	30.0	5.0	45°
RBK-1.5-4U	38.1	4.0	45°
RBK-50-5U	50.0	5.0	45°
RBK-2-6.3U	50.8	6.3	45°

Total Reflector for UV Laser (wavelength 266nm)

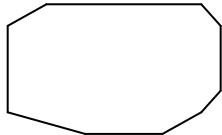
Part No.	Diameter (mm)	Thickness (mm)	AOI
RBK-19-3V	19.0	3.0	45°
RBK-25-3V	25.0	3.0	45°
RBK-30-5V	30.0	5.0	45°
RBK-1.5-4V	38.1	4.0	45°
RBK-50-5V	50.0	5.0	45°
RBK-2-6.3V	50.8	6.3	45°

- Scanning Mirror

The scanning mirrors are light weight rectangular mirrors that used for high speed two-axis laser scanning system. The dimensions for each mirror have been calculated accordingly with the laser beam size. The mirror has high reflectivity of 99.5% or above. The scanning mirror usually mounted on to a galvanometer for scanning purposes. For two axis scan mirror, commonly the Y mirror has a bigger size compared with the X mirror. This is due to the fact that the X mirror is used to scan the Y mirror rather than the object directly.

- Surface figure: $\lambda/4$ @633nm per 1" Dia
- Scratch/Dig: 40/20,
- Reflective coating:
 - Silicon, Gold or Silver coating for CO2 Laser (10.6um)
 - Si/BK7/FS, Dielectric or Silver coating for Nd:YAG Laser (1064nm/650nm/532nm)
 - Si/BK7/FS, Dielectric coating for Green & Visible Laser (650nm/355nm)
- Mounted scanning mirror are available upon request.
- Wavelength: 10.6um/1064nm/532nm/355nm

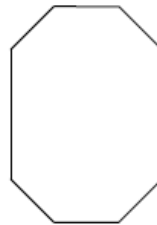
UNMOUNTED SCANNING MIRRORS



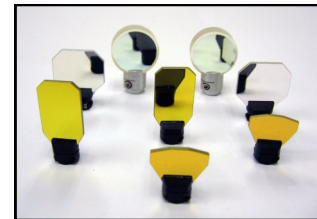
ASYMMETRIC MIRROR



X-MIRROR



Y-MIRROR



Part No.	Dimension L x W x T (mm)	Substrate	Beam Size	X/Y
SCM-8.4x11.5x1.05	8.4x11.5x1.05	Si/BK7/FS	5	X1
SCM-10.1x15.1x1.05	10.1x15.1x1.05	Si/BK7/FS	8	Y1
SCM-10.6x25.4x1.7	10.6x25.4x1.7	Si/BK7/FS	8	X2
SCM-12.6x15x1.7	12.6x15x1.7	Si/BK7/FS	8	Y2
SCM-13.69x20.32x1.5	13.69x20.32x1.5	Si/BK7/FS	10	X3
SCM-17.78x24.43x1.5	17.78x24.43x1.5	Si/BK7/FS	12	Y3
SCM-13.7x20.3x2	13.7x20.3x2	Si/BK7/FS	10	X4
SCM-17.7x24.4x2	17.7x24.4x2	Si/BK7/FS	12	Y4
SCM-14.7x19.4x1.7	14.7x19.4x1.7	Si/BK7/FS	10	X5
SCM-16.4x28x1.7	16.4x28x1.7	Si/BK7/FS	10	Y5

Part No.	Dimension L x W x T (mm)	Substrate	Beam Size	X/Y
SCM-15.7x20.2x2.5	15.7x20.2x2.5	Si/BK7/FS	12	X6
SCM-17.7x31.5x2.5	17.7x31.5x2.5	Si/BK7/FS	12	Y6
SCM-16x21x2	16x21x2	Si/BK7/FS	10	X7
SCM-19x32x2	19x32x2	Si/BK7/FS	12	Y7
SCM-17.2x22.5x1.2	17.2x22.5x1.2	Si/BK7/FS	12	X8
SCM-18.85x30.5x2.4	18.85x30.5x2.4	Si/BK7/FS	12	Y8
SCM-18.3x24.6x3.2	18.3x24.6x3.2	Si/BK7/FS	12	X9
SCM-21.3x38.9x3.2	21.3x38.9x3.2	Si/BK7/FS	12	Y9
SCM-19x29x2	19x29x2	Si/BK7/FS	12	X10
SCM-23x34x2	23x34x2	Si/BK7/FS	15	Y10
SCM-20x25x2	20x25x2	Si/BK7/FS	12	X11/Y14
SCM-23x30x2	23x30x2	Si/BK7/FS	15	Y11
SCM-25x30x2	25x30x2	Si/BK7/FS	20	X14
SCM-22.1x28.8x3.2	22.1x28.8x3.2	Si/BK7/FS	15	X12
SCM-24.8x39.4x3.2	24.8x39.4x3.2	Si/BK7/FS	15	Y12
SCM-24x37x4	24x37x4	Si/BK7/FS	15	X13
SCM-30x42x4	30x42x4	Si/BK7/FS	20	Y13
SCM-25x35x2	25x35x2	Si/BK7/FS	15	X15/X16/X17
SCM-30x35x2	30x35x2	Si/BK7/FS	20	Y15
SCM-35x45x2	35x45x2	Si/BK7/FS	25	Y16/X20
SCM-32x39x2	32x39x2	Si/BK7/FS	20	Y17
SCM-25x38x2	25x38x2	Si/BK7/FS	15	-
SCM-27x32x2	27x32x2	Si/BK7/FS	20	X18
SCM-21x30x2	21x30x2	Si/BK7/FS	15	Y18
SCM-34x55x4	34x55x4	Si/BK7/FS	25	X19
SCM-43x63x4	43x63x4	Si/BK7/FS	30	Y19
SCM-42x65x2	42x65x2	Si/BK7/FS	30	Y20
SCM-40.1x54.9x4	40.1x54.9x4	Si/BK7/FS	30	X21
SCM-46.7x70.1x4	46.7x70.1x4	Si/BK7/FS	30Y	Y21
SCM-45x35x2	35x45x2	Si/BK7/FS	30	-
SCM-40x64x5	40x64x5	Si/BK7/FS	30	X22
SCM-47x76x5	47x76x5	Si/BK7/FS	30	Y22
SCM-45x70x4	45x70x(1.5-4)	Si/BK7/FS	30	X23
SCM-60x80x4	60x80x(1.5-4)	Si/BK7/FS	40	Y23

RONAR-SMITH®
Laser Optics

Optics for Medical
Laser System

Optics for
Semiconductor
Biomedical
Spectroscopy
Application Laser

Optical
Material

Laser
Accessories
Components

Penta Prism

Penta Prism has 90° deviation angle independent of the orientation of the prism. This will benefit for applications in which prism orientation can not be controlled precisely. The reflecting surfaces must be coated with metallic or dielectric coating due to the geometry. The standard Penta Prism reflecting surfaces are coated with aluminum or enhanced aluminum. Sometimes, the coated surfaces are with black painting.



Specifications

Material: BK7 Grade A or equivalent optical glass

Dimension Tolerance: $\pm 0.25\text{mm}$

90° Deviation Tolerance:

Standard series: < 30 arc seconds

Precision series: up to 10 arc seconds

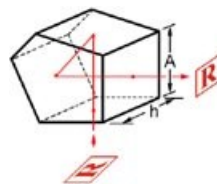
Flatness:

Standard series: $\lambda/2$ at 632.8 nm

Precision series: up to $\lambda/4$ at 632.8 nm

Reflectivity: $R > 95\%$ per face from 630 to 680 nm

Surface Quality: 60-40 scratch and dig



A x h (mm)	1 min. deviation Part No.	30 sec. deviation Part No.	10 sec. deviation Part No.
7 x 6	PP-7X6-DEV60	PP-7X6-DEV30	PP-7X6-DEV10
10 x 10	PP-10X10-DEV60	PP-10X10-DEV30	PP-10X10-DEV10
15 x 15	PP15x15-DEV60	PP-15x15-DEV30	PP-15x15-DEV10
20 x 20	PP20x20-DEV60	PP-20x20-DEV30	PP-20x20-DEV10

Precision Penta Prism

Precision Penta Prism is a standard Penta Prism but with wedge added. It is often used in Plumb Level, Surveying, Alignment, Range-Finding and Optical Tooling.

Specifications

Material: BK7 Grade A or equivalent optical glass

Dimension Tolerance: $\pm 0.25\text{mm}$

90 Deviation Tolerance:

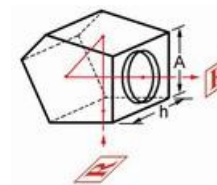
Precision series: up to 2 arc seconds

Flatness:

Precision series: $\lambda/4$ at 632.8 nm

Reflectivity: $R > 95\%$ per face from 630 to 680 nm

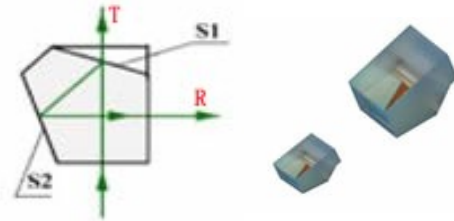
Surface Quality: 60-40 scratch and dig



A x h (mm)	2.5 sec. deviation Part no.
18 x 18	PP-18X18-DEV2.5

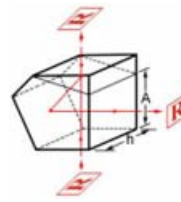
Beam Splitter Penta Prism

Beam splitter Penta Prism is a standard Penta Prism but with wedge and partial reflective coating on surfaces S1 added. Transmission/reflection (T/R) ratio of 20/80, 50/50 or others for Beam splitter Penta Prism is available upon request.



Specifications

Material: BK7 Grade A or equivalent optical glass
 Dimension (h) Tolerance: ±0.1mm
 Dimension (A) Tolerance: ±0.2mm
 90° , 180° Deviation Tolerance:
 Standard series: < 30 arc seconds
 Precision series: up to 15 arc seconds
 Flatness:
 Standard series: λ/2 at 632.8 nm
 Precision series: up to λ/4 at 632.8 nm
 Surface Quality :60-40 scratch and dig
 Beam splitter Ratio Transmission/Reflection: @630-680nm, T/R:20/80±5



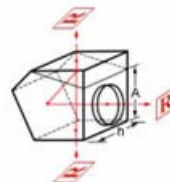
A x h (mm)	1 min. deviation Part no.	30 sec. deviation Part no.	15 sec. deviation Part no.
7 x 6	PP-7X6-DEV60-SP	PP-7X6-DEV30-SP	PP-7X6-DEV15-SP
10 x 10	PP-10x10-DEV60-SP	PP-10x10-DEV30-SP	PP-10x10-DEV15-SP
15 x 15	PP-15x15-DEV60-SP	PP-15x15-DEV30-SP	PP-15x15-DEV15-SP
20 x 20	PP-20x20-DEV60-SP	PP-20x20-DEV30-SP	PP-20x20-DEV15-SP

Precision Beam Splitter Penta Prism

By adding a wedge and with partial refractive coating on surfaces S1, it can be used as a beam splitter. The other wedge can increase precision of right angle beam. It is often used in Plumb Level, Surveying, Alignment, Range-Finding and Optical Tooling.

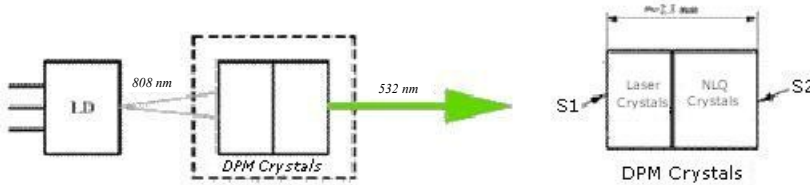
Specifications

Material: BK7 Grade A or equivalent optical glass
 Dimension (h) Tolerance: ±0.25mm
90° Deviation Tolerance:
 Precision series: up to 2 arc seconds
 180° Deviation Tolerance:
 Precision series: up to 4 arc seconds
Flatness:
 Precision series: up to λ/4 at 632.8 nm
 Reflectivity: R>95% per face @633nm
 Surface Quality : 60-40 scratch and dig
 Working Wavelength : 633nm



A x h (mm)	2.5 sec. deviation Part no.
18 x 18	PP-18X18-DEV2.5-SP

Power DPM Crystal



Diode-Pumped Solid State (DPSS) lasers are the ideal laser tools of machining, material processing, spectroscopy, wafer inspection, light show, medical diagnostics and other applications. DPM (Diode-Pumped Microchip laser) crystals, which combine Nd:YVO4 and KTP, has been developed. The DPM crystals are mainly used for low power applications, for example, the Green Laser Pointers.

The pump power for the Low Power DPM crystals is suggested to be less than 300mW, and the generated green output power could be less than 10mW. And a heat deposit mechanics is needed.

DPM Efficiency Curve



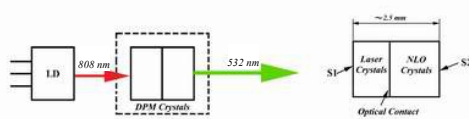
Specification

Parallellism	Less than 5 arc second
Coatings	Incident Surface: HR R>99.8% @1064nm HT R<5% @808nm HR R>99% @532nm Output Surface: HR R>99.8% @1064nm HT R<5% @532nm
Output Wavelength	532nm
Beam Mode	TEM ₀₀
Output Power	Less than 10mW

Standard products

P/N	Clear Aperture (mm)	Length (mm) (Nd: YVO4 + KTP)	Total Size (mm)
DPM-1-2.5	1x1	0.5 + 2	1x1x2.5
DPM-1.5-2.5	1.5x1.5	0.5 + 2	1.5x1.5x2.5

High Power DPM Crystal



Another type of DPM (Diode-Pumped Microchip laser) crystal is now available for high power Diode Pumped Green Lasers. It consists of Nd:YVO4 and KTP, can be used for high pump power, and generated high power green laser output. The typical pump power is suggested to be less than 500mW, and the generated green output power could be about 60mW. And a heat deposit mechanics is needed.

This DPM microchip lasers could be used in some laser display systems, for example: Green Laser Module, 3D lasers, Club lasers and Disco lasers.

DPM Efficiency Curve



Specification

Parallellism	Less than 5arc second
Coatings	Incident Surface: HR R>99.8% @1064nm HT R<5% @808nm HR R>99% @532nm Output Surface: HR R>99.8% @1064nm HT R<5% @532nm
Output Wavelength	532nm
Beam Mode	TEM00
Output Power	5mW ~ 60mW

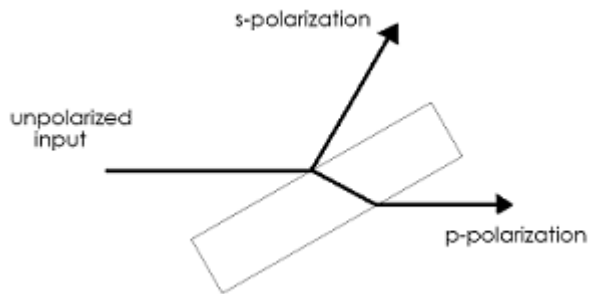
Standard products

P/N	Clear Aperture (mm)	Length (mm) (Nd: YVO4 + KTP)	Total Size (mm)
DPM-1-2.5H	1x1	0.5 + 2	1x1.5x2.5
DPM-1.5-2.5H	1.5x1.5	0.5 + 2	1.5x2x2.5

Thin Film Polarizer

Thin Film Polarizers (TFP's) is used to split a laser beam into two parts with S and P Polarizations. Conversely, TFP's can be used to combine two beams with S and P polarizations. TFP's consist of a coated plate, which is oriented at Brewster's angle with respect to the incoming beam. The thin film coating will enhance the reflectivity of the s-polarized component of the beam, while maintaining high transmission of the p-polarized component.

Part No.	Dimension (mm × mm)	Thickness (mm)	Material
TFP-Z-0.75×1.5×3M	19.1×38.1	3.0	ZnSe
TFP-Z-40×15×3M	50.0 ×15.0	3.0	ZnSe



Waveplate

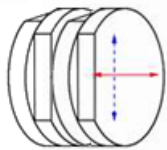
- Achromatic Waveplate

Achromatic waveplate (AWP) is similar to zero order waveplate except that the two plates are made from different birefringent crystals (such as crystal quartz and magnesium fluoride plates.). Since the dispersion of the birefringence of two materials is different, it is possible to specify the retardation values at a broad wavelength range. So, the retardation will be less sensitive to wavelength change. In other words, it can be used at a broadband wavelength range.

Achromatic waveplates play one of the central roles in constructing universal birefringent filters (UBF).

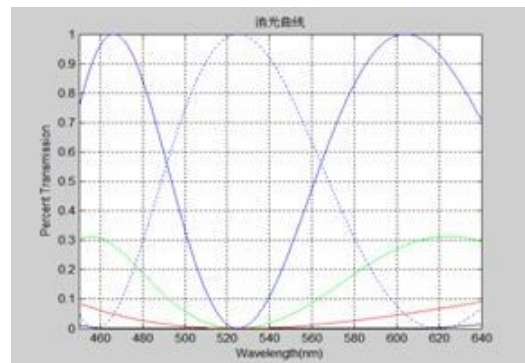
For tunable sources or lasers with large spectral widths, you will want an AWP - one whose performance is nearly independent of wavelength.

Our AWP's are designed to effectively eliminate the wavelength dependence over a wide spectral range, typically several hundred nanometers. The standard versions are air-spaced. Custom assemblies, including cemented versions, are available to meet your specific requirements. Send us your drawing for a quote on a custom AWP.



Specifications:

Material: Quartz
 Wavelength bandwidth: 420-640nm
 Type: Cemented
 Dimension Tolerance: +0.0, -0.1
 Wavefront distortion: $\lambda/8@633\text{nm}$
 Retardation Tolerance: $\lambda/30$
 Parallelism: <1 arc second
 Surface Quality: 20-10 scratch/dig
 Clear Aperture: Central 90%
 AR coating: $R_{\text{avg}} < 0.5\%$ 420-640nm



Quarter Waveplates P/N#	Half Waveplates P/N#	Diameter(mm)
WPB210Q	WPB210H	10.0x10.0
WPB212Q	WPB212H	12.7x12.7
WPB215Q	WPB215H	15.0x15.0
WPB220Q	WPB220H	20.0x20.0
WPB225Q	WPB225H	25.4x25.4

Call for OEM quantity pricing.

A wide variety of custom zero waveplates are available, please contact us with your custom requirement.

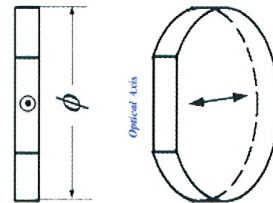
Other Specification products are upon requirement.

- Waveplate

Zero Order Waveplates

The zero order waveplate is designed to give a retardance of zero full waves, plus the desired fraction. Zero order waveplate shows better performances than multiple order waveplates, it has broad bandwidth and a lower sensitivity to temperature and wavelength changes.

Specifications	
Material:	Quartz
Dimension Tolerance:	+0.0, -0.13 mm
Wavefront Distortion:	$< \lambda/8$ @ 632.8 nm
Retardation Tolerance:	$< \lambda/500$ (typical)
Parallelism:	< 3 arc second
Surface Quality:	20-10 scratch and dig
Clear aperture:	Central 90%
AR/AR Coating:	R $< 0.2\%$ at central wavelength



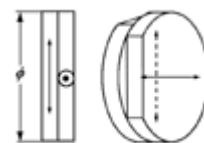
We provides standard waveplate wavelengths (nm) listed as below:
266 355 532 632.8 780 808 850 980 1064 1310 1480 1550

Note: Other wavelengths within the ranger of 200-2300nm are also available upon request.

Cemented Zero Order Waveplate

This type of zero order waveplate is constructed of two multiple order waveplates with their axes crossed. Thus, the effect of the first plate is canceled by the second, except for the residual difference between them.

Zero Order Waveplate s-Optically Contacted
Optically Contacted
AR Coated, R $< 0.2\%$
High Damage Threshold
Better Temperature Bandwidth
Wide Wavelength Bandwidth



Diameter (mm)	Quarter Waveplates P/N#	Half Waveplates P/N#
10.0	WPO210-4	WPO210-2
12.7	WPO212-4	WPO212-2
15.0	WPO215-4	WPO215-2
20.0	WPO220-4	WPO220-2
25.4	WPO225-4	WPO225-2
30.0	WPO230-4	WPO230-2

Zero Order Waveplate Air-spaced

Double Retardation Plates
AR Coated, R<0.2% and Mounted
High Damage Threshold
Better Temperature Bandwidth
Wide Wavelength Bandwidth

Mount Diameter (mm)	Wave-plate Diameter (mm)	Thickness (mm)	Quarter Waveplates P/N #	Half Waveplates P/N #
25.4	10.0	8.0	WPA210-4	WPA210-2
25.4	12.7	8.0	WPA212-4	WPA212-2
25.4	15.0	8.0	WPA215-4	WPA215-2
30.0	20.0	8.0	WPA220-4	WPA220-2
30.0	25.4	8.0	WPA225-4	WPA225-2

True Zero Order Waveplates-Cemented

This type of zero order waveplate is constructed of a true zero order waveplate and a BK7 substrate. As the waveplate is very thin and easy to be damaged, the Bk7 plate's function is to strengthen the

Cemented by Epoxy
Wide Angle Acceptance
Better Temperature Bandwidth
Wide Wavelength Bandwidth
AR Coated, R<0.2%



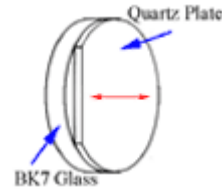
Standard Wavelength Applied:
Quarter: 532nm, 632.8nm, 780nm, 808nm, 850nm, 980nm, 1064nm, 1310nm, 1480nm, 1550nm
Half : 532 nm, 632.8nm, 780nm, 808nm, 850nm, 980nm, 1064nm, 1310nm, 1480nm, 1550nm

Diameter (mm)	Quarter Waveplates P/N#	Half Waveplates P/N#
10.0	WPF210-4	WPF210-2
12.7	WPF212-4	WPF212-2
15.0	WPF215-4	WPF215-2
20.0	WPF220-4	WPF220-2
25.4	WPF225-4	WPF225-2
30.0	WPF230-4	WPF230-2

Zero Order Waveplates-Cemented by Epoxy

This type of zero order waveplate is constructed of two multiple order waveplate with their axes crossed. Thus, the effect of the first plate is canceled by the second, except for the residual difference between them.

Cemented by Epoxy
 Better Temperature Bandwidth
 Wide Wavelength Bandwidth
 AR Coated, R<0.2%



Diameter (mm)	Quarter Waveplates P/N#	Half Waveplates P/N#
10.0	WPF210-4	WPF210-2
12.7	WPF212-4	WPF212-2
15.0	WPF215-4	WPF215-2
20.0	WPF220-4	WPF220-2
25.4	WPF225-4	WPF225-2
30.0	WPF230-4	WPF230-2



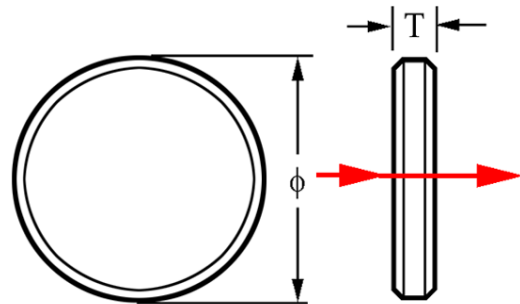
Window

- Protective Window

NOTE: Windows of special sizes and materials are available upon request.

Silicon, Germanium, and ZnSe are three popular and useful IR materials. Si can be used from 1.2 to 7um. It has peak performance in the 3-5um region. Ge is ideal for thermal imaging applications and is popular for its high refraction index at about 4.0 from 2 to 14um. ZnSe is commonly used in thermal resistance application. ZnSe has wide usage in high power CO2 laser systems.

Specifications	
Diameter Tolerance:	+0.0, -0.13 mm
Thickness Tolerance:	±0.25mm
Clear Aperture:	>80%
Parallelism:	<3 arc min
Surface Quality:	40-20 scratch and dig
Flatness	$\lambda/4$ per 1"Dia @632.8nm



Protection Window for 9.4/10.6 um

Part No.	Material	Ø (mm)	Thk. (mm)
WZ-0.5-2	ZnSe	12.7	2.0
WZ-0.75-3	ZnSe	19.1	3.0
WZ-1-3	ZnSe	25.4	3.0
WZ-1.1-3	ZnSe	27.9	3.0
WZ-1.5-3	ZnSe	38.1	3.0
WZ-1.5-5	ZnSe	38.1	5.0
WZ-50-4	ZnSe	50.0	4.0
WZ-2-5	ZnSe	50.8	5.0
WZ-55-3	ZnSe	55.0	3.0
WZ-75-3	ZnSe	75.0	3.0
WZ-88-3	ZnSe	88.0	3.0
WZ-90-3	ZnSe	90.0	3.0
WZ-110-5	ZnSe	110.0	5.0
WZ-65x85x3	ZnSe	65x85	3.0
WZ-60x90x3	ZnSe	60x90	3.0
WZ-95X95X3	ZnSe	95x95	3.0
WGE-75-2.5	Ge	75.0	2.5
WGE-90-2.5	Ge	90.0	2.5
WGA-60-1	GaAs	60.0	1.0
WGA-109.5-4	GaAs	109.5	4.0

Protection Window for Broad Band

Part No.	Material	Ø (mm)	Thk. (mm)	Wavelength (um)
WZ-15-1-BB	ZnSe	15.0	1.0	3-13
WZ-84X27X3.4-BB	ZnSe	84X27	3.4	8-14
WZ-84X27X3.4-BB1	ZnSe	84X27	3.4	3-5
WGE-25-3-BB	Ge	25.0	3.0	8-12
WGE-1.5-3-BB	Ge	38.1	3.0	8-12
WGE-42-2-BB	Ge	42.0	2.0	8-12
WGE-55-5-BB	Ge	55.0	5.0	8-12
WGE-100-3-BB	Ge	100.0	3.0	8-12
WGE-120-4-BB	Ge	120.0	4.0	8-12
WGE-124-4-BB	Ge	124.0	4.0	8-12

Protection Window for 755 nm

Part No.	Material	Ø (mm)	Thk. (mm)	Wavelength (nm)
WBK-15.97-1.6-A	BK7	15.9	1.6	755
WBK-16-1-A	BK7	16.0	1.0	755

Protection Window for 2940/1064/532/355/266 nm

Part No.	Material	Ø (mm)	Thk. (mm)	Used in Scan Lens
WFS-3.5-1-E	Fused Silicon	3.5	1.0	2940nm
WFS-15-2	Fused Silicon	15.0	2.0	1064nm
WFS-18-3	Fused Silicon	18.0	3.0	1064nm
WFS-20-2	Fused Silicon	20.0	2.0	1064nm
WFS-1-3	Fused Silicon	25.4	3.0	1064nm
WFS-36-2	Fused Silicon	36.0	2.0	1064nm
WFS-1.5-5	Fused Silicon	38.1	5.0	1064nm
WFS-74-2.5	Fused Silicon	74.0	2.5	SL-532-70-100, SL-532-115-165
WFS-76-3	Fused Silicon	76.0	3.0	SL-1064-70-100, SL-1064-112-163
WFS-80-2.5	Fused Silicon	80.0	2.5	SL-1064-114-163R1
WFS-97-2.5	Fused Silicon	97.0	2.5	SL-1064-175-254, SL-1064-180-260
WFS-98-2.5	Fused Silicon	98.0	2.5	SL-1064-205-330
WFS-110-2.5	Fused Silicon	110.0	2.5	SL-1064-300-420

- ZnSe/Ge Brewster Window

Brewster windows are uncoated substrate used in an optical system at Brewster Angle. It is used to separate the S polarization from the P polarization.

Specifications	
Diameter Tolerance:	+0.0, -0.13 mm
Thickness Tolerance:	±0.25mm
Clear Aperture:	>80%
Parallelism:	<3 arc min
Surface Quality:	40-20 scratch and dig
Flatness	$\lambda/4$ per 1" Dia @632.8nm



Part No.	Material	Width x Length (mm)	Thickness (mm)
WZB-0.5x1.3-2	ZnSe	12.7x33.0	2.0
WZB-0.6x1.5-2	ZnSe	15.2x38.1	2.0
WZB-0.7x1.8-2	ZnSe	17.8x45.7	2.0
WZB-1.0x2.6-3	ZnSe	25.4x66.0	3.0
WZB-1.5x3.9-4	ZnSe	38.1x99.1	4.0
WZB-2.0x5.2-5	ZnSe	50.8x132.1	5.0
WBG-0.5x2-2	Ge	12.7x50.8	2.0
WBG-0.6x2.5-2	Ge	15.2x63.5	2.0
WBG-0.7x2.9-2	Ge	17.8x73.7	2.0
WBG-1.0x4.1-3	Ge	25.4x104.1	3.0
WBG-1.5x3.9-4	Ge	38.1x99.1	4.0
WBG-2.0x5.2-5	Ge	50.8x132.1	5.0

The angle which p reflectance drops to zero, termed brewster's Angle, can be calculated from:

$$\Theta_b = \tan^{-1}(n)$$

Where Θ_b is Brewster's Angle and n is the material's index of refraction.

ZnSe, brewster angle 67.4 degree @ 10.6um

GaAs, brewster angle 73 degree @10.6um

Ge, brewster angle 76 degree @10.6um

3-Axis Dynamic

3-Axis Dynamic Scanning System

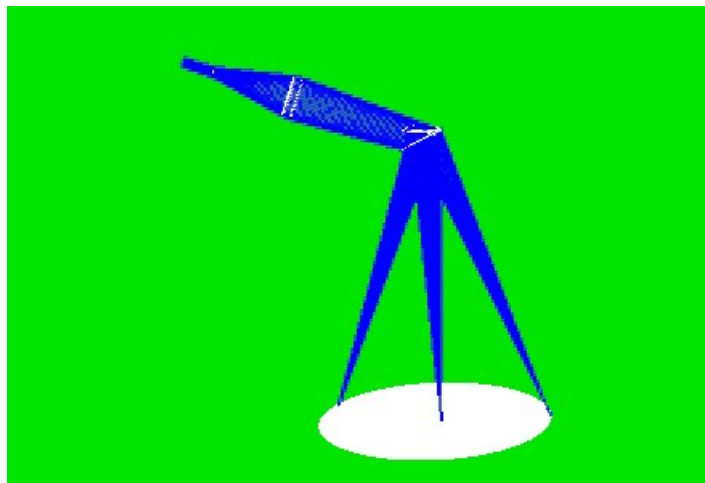
As a perfect combination of post-objective scanning system and motorized translator, 3-Axis dynamic scanning system has been widely used in modern laser processing realm (cutting, marking and 3D prototyping, etc.) .

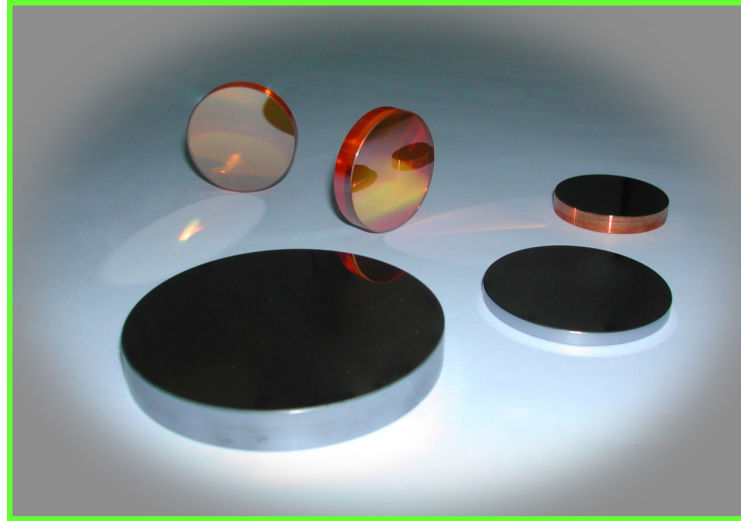
Different from the pre-objective scanning system, in a 3-Axis dynamic scanning system, the scanning mirrors are placed after the objective lens. This lens system is made of a movable expanding lens and focusing lens unit. The laser beam first enters an expander lens; the expanded beam will enter the focusing lens unit, then go through the scanning mirrors and reach the focal plane finally. Moving the expander lens with a motorized translator induces the change of the distance between the expander lens and the focusing lens, which makes the focused laser spot move within a two or three-dimensional space, so called "3-Axis scanning".

A 3-Axis dynamic scanning system normally offers the following advantages:

- * Adjustable range of scanning field size from 100mmX100mm to 2000mmX2000mm;
- * Achieve smaller focused spot size compared to the pre-object scanning systems;
- * Enhanced uniformity of the focused spot size from the center to the edge of the scanning field.

Part No.	Wavelength (um)	Scan area (mm×mm)	D (mm)	Input Beam (mm)	WD (mm)	Spot Size (um)
3D-10.6-500×500-8	10.6	500×500	97.419	8.0	700	240
3D-10.6-800×800-15	10.6	300×300-800×800	98.9-114.5	15.0	582.8-1554.2	210-500
3D-10.6-2000×2000-9	10.6	100×100-2000×2000	93.5-166.0	9.0	137.4-2747.5	140-1440
3D-1064-1000×1000-4	1064nm	100×100-1000×1000	91.6	4.0	609	110
3D-355-1000×1000-0.6	355nm	1000×1000	110.0	0.6	1300	200





4. OPTICS FOR MEDICAL LASE SYSTEMS

- ◆ Medical Laser Lenses
- ◆ Medical Laser Windows
- ◆ Mirrors and Partial Reflectors

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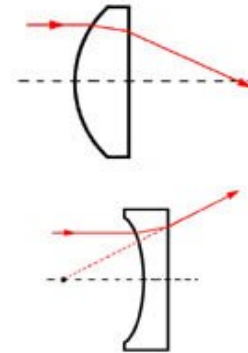
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Medical Laser Lenses

We provide full range of Focusing Lens for varieties of Medical Laser System such as CO₂, Q-switched Nd:YAG, ER: YAG, Ruby and Alex Laser system. These optics have been used as replacement in most well-known medical system such as Continuum-Biomedical, ESC, Sharplan, Candela and Coherent.

Specifications

Diameter Tolerance	+0/-0.13mm
Thickness Tolerance	±0.25mm
Paraxial Focal Length	±2%
Centration	3 arc minutes
Clear Aperture	>80%
Surface Figure	λ/4 per 1" Dia @632.8nm
Surface Quality	60-40 scratch and dig



Part No.	Diameter (mm)	FL (mm)	ET (mm)	Wavelength (nm)	Applications
LFS-13+33.26-ET4.3-R	13.0	-33.3	4.3	694.3 / 633	Ruby
LFS-13+46.96-ET4.3-R	13.0	-47.0	4.3	694.3 / 633	Ruby
LFS-15+75-ET2.5-R	15.0	-75.0	2.5	694.3 / 633	Ruby
LFS-16-160-ET2-R	16.0	160.0	2.0	694.3 / 633	Ruby
LFS-12.7-50-ET2.5-N	12.7	50.0	2.5	1064 / 532	Nd:YAG
LFS-12.7-100-ET2.5-N	12.7	100.0	2.5	1064 / 532	Nd:YAG
LFS-15+50-ET2,5-N	15.0	-50.0	2.5	1064 / 532	Nd:YAG
LFS-15-60-ET2.5-N	15.0	60.0	2.5	1064 / 532	Nd:YAG
LFS-15-200-ET2.5-N	15.0	200.0	2.5	1064 / 532	Nd:YAG
LFS-15-250-ET2.5-N	15.0	250.0	2.5	1064 / 532	Nd:YAG
LFS-1-1.5-ET2-N	25.4	38.1	2.0	1064 / 532	Nd:YAG
LFS-1-2-ET2.5-N	25.4	50.8	2.5	1064 / 532	Nd:YAG
LFS-12.5-75-ET3-A	12.5	75.0	3.0	755 / 633	Alex Laser
LFS-13-75-ET3-A	13.0	75.0	3.0	755 / 633	Alex Laser
LFS-0.75-400-ET2.5-E	19.1	400.0	2.5	2940 / 633	Er:YAG
LFS-0.75-600-ET2.5-E	19.1	600.0	2.5	2940 / 633	Er:YAG
LZ-5.5-9.8-ET1.72E	5.5	9.8	1.7	2940	Er:YAG

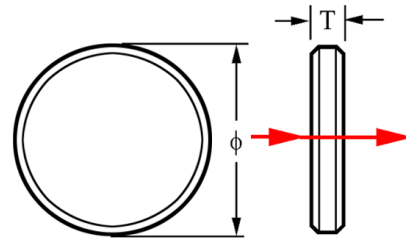
Part No.	Diameter (mm)	FL (mm)	ET (mm)	Wavelength (nm)	Applications
LZ-7.7-32-ET1.8E	7.7	32.0	1.8	2940	Er:YAG
LZ-0.5-1.5-ET2-E	12.7	38.1	2.0	2940	Er:YAG
LZ-15-36.5-ET2-E	15.0	36.5	2.0	2940	Er:YAG
LZ-20+23-ET3-E	20.0	-23.0	3.0	2940	Er:YAG
LZ-20-47-ET2-E	20.0	47.0	2.0	2940	Er:YAG
LZ-20-72-ET3-E	20.0	72.0	3.0	2940	Er:YAG
LBK-10.5-27.8-ET2.5	10.5	27.8	2.8	755 / 633	Alex Laser
LBK-14-37.8-ET2.5	14.0	37.8	2.8	755 / 633	Alex Laser



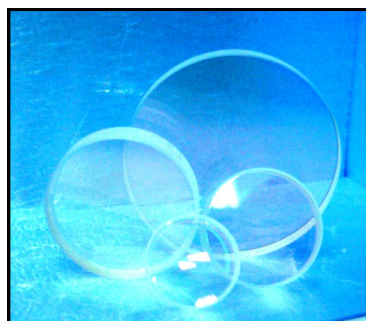
Medical Laser Windows

We provide windows for varieties of Medical Laser System such as CO₂, Q-switched Nd:YAG, ER: YAG, Ruby and Alex Laser. These optics have been used as replacement in most well-known medical system such as Continuum-Biomedical, ESC, Sharplan, Candela and Coherent.

Specifications	
Diameter Tolerance	+0/-0.13mm
Thickness Tolerance	±0.25mm
Centration	3 arc minutes
Clear Aperture	>80%
Surface Figure	λ/4 per 1" Dia @632.8nm
Surface Quality	60-40 scratch and dig



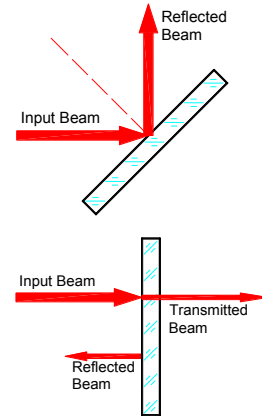
Part No.	Diameter (mm)	Thickness (mm)	Wavelength (nm)	Applications
WD-0.5-2.0-N	12.7	2.0	1064 / 532	Nd:YAG
WD-0.6-2.0-N	15.24	2.0	1064 / 532	Nd:YAG
WD-0.75-2.5-N	19.05	2.5	1064 / 532	Nd:YAG
WD-1-3.0-N	25.4	3.0	1064 / 532	Nd:YAG
WD-1.5-4.0-N	38.1	4.0	1064 / 532	Nd:YAG
WD-0.5-2.0-R	12.7	2.0	694 / 633	Ruby
WD-0.6-2.0-R	15.24	2.0	694 / 633	Ruby
WD-0.75-2.5-R	19.05	2.5	694 / 633	Ruby
WD-1-3.0-R	25.4	3.0	694 / 633	Ruby
WD-1.5-4.0-R	38.1	4.0	694 / 633	Ruby
WD-16-1.0-A	16.0	1.0	755 / 633	Alex Laser
WFS-3.5-1-E	3.5	1.0	2940	Er:YAG



Mirrors & Partial Reflectors

We provide Folding Mirrors and Reflectors for varieties of Medical Laser System such as CO₂, Q-switched Nd:YAG, ER: YAG, Ruby and Alex Laser system. These optics have been used as replacement in most well-known medical system such as Continuum-Biomedical, ESC, Sharplan, Candela and Coherent.

Specifications	
Diameter Tolerance	+0/-0.13mm
Thickness Tolerance	±0.25mm
Centration	3 arc minutes
Clear Aperture	>80%
Surface Figure	λ/4 per 1" Dia @632.8nm
Surface Quality	60-40 scratch and dig



Part No.	Material	Diameter (mm)	Thickness (mm)	Reflective Wavelength (nm)	Applications
RSI-8-1-E	Si	8.0	1.0	2940	Er:YAG
RSI-0.75-3-E	Si	19.1	3.0	2940 / 635	Er:YAG
RSI-15×11×1-E	Si	15×11	1.0	2940	Er:YAG
RSI-15-3-E	Si	15.0	3.0	2940	Er:YAG
RSI-22×11×1-E	Si	22×11	1.0	2940	Er:YAG
RSI-1-3-E	Si	25.4	3.0	2940	Er:YAG
RSI-1-5-E	Si	25.4	5.0	2940 / 635	Er:YAG
RSI-1.1-3-E	Si	27.9	3.0	2940 / 635	Er:YAG
RSI-0.75-3	Si	19.1	3.0	10600	CO ₂
RSI-1-3	Si	25.4	3.0	10600	CO ₂
RSI-1.5-4	Si	38.1	4.0	10600	CO ₂
RBK-0.75-3-N	BK7	19.1	3.0	1064 / 532	Nd:YAG
RBK-1.0-3-N	BK7	25.4	3.0	1064 / 532	Nd:YAG
RBK-0.75-3-R	BK7	19.1	3.0	694 / 633	Ruby
RBK-1.0-3-R	BK7	25.4	3.0	694 / 633	Ruby
RBK-1.1-3-R	BK7	27.9	3.0	694 / 633	Ruby
RZ-0.5-2-0.8MCC-E	ZnSe	12.7	2.0	99.5%R/AR@2940	Er:YAG
RZ-0.5-4-0.8MCC-E	ZnSe	12.7	4.0	99.5%R/AR@2940	Er:YAG
OCZ-15-3-73%R-E	ZnSe	15.0	3.0	73%R/AR@2940	Er:YAG



Optics Leading the Light

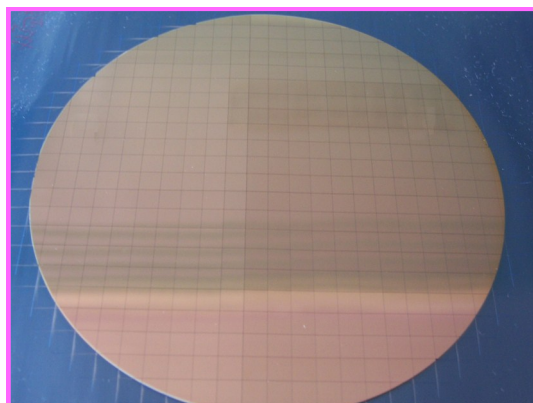
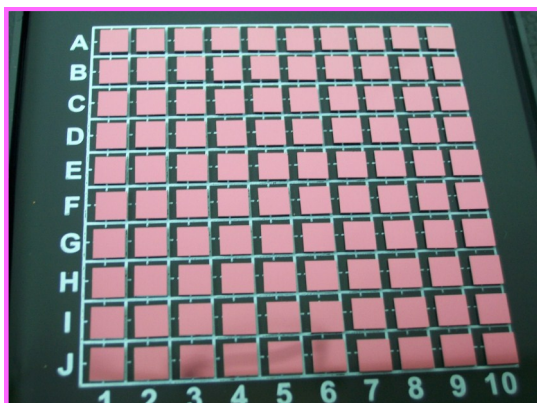
RONAR-SMITH® Laser Optics & IR Imaging



Introduction

RONAR-SMITH®
Laser Optics

Optics for Medical
Laser
System



Optics for
Semiconductor
Spectroscopy
Biomedical
Application Laser

5. Optics for Semiconductor, Spectroscopy, BioMedical application Laser

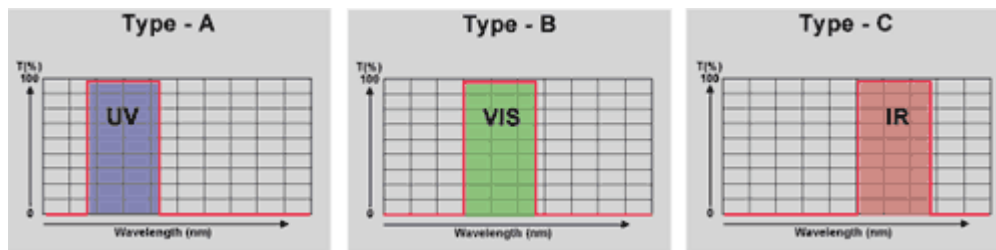
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Laser Accessories Components	◆ IR Filter	114
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	◆ Plastic Lens	121
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Filters

Short Wavepass Filter

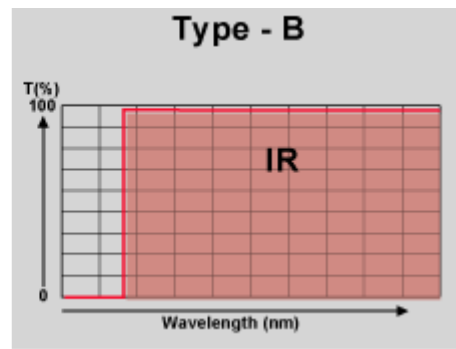
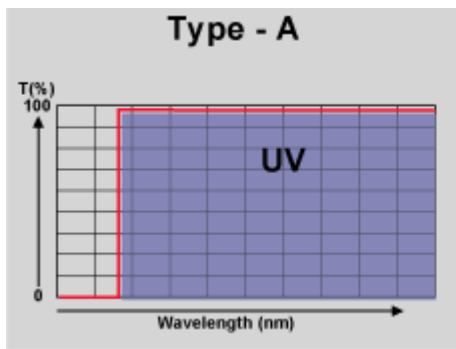
*Shortpass filters are designed to have a sharp transition at each cutoff point. This line can be used for making bandpass filters when you combine with our longpass filter. Substrate material is fused silica which has high durability against heat and high transmittance.



Part No.	Size (mm)	Thickness (mm)	Substrate	Cut/off (nm)
SPF-0250	50*50	1	Fused Silica	250
SPF-X250	25 Dia.	1	Fused Silica	250
SPF-X265	25 Dia.	1	Fused Silica	265
SPF-0265	50*50	1	Fused Silica	265
SPF-X300	25 Dia.	1	Fused Silica	300
SPF-0300	50*50	1	Fused Silica	300
SPF-X325	25 Dia.	1	Fused Silica	325
SPF-0325	50*50	1	Fused Silica	325
SPF-X350	25 Dia.	1	Fused Silica	350
SPF-0350	50*50	1	Fused Silica	350
SPF-X385	25 Dia.	1	Fused Silica	385
SPF-0385	50*50	1	Fused Silica	385
SPF-X400	25 Dia.	1	Fused Silica	400
SPF-0400	50*50	1	Fused Silica	400
SPF-0425	50*50	1	Fused Silica	425
SPF-X425	25 Dia.	1	Fused Silica	425
SPF-0450	50*50	1	Fused Silica	450
SPF-X450	25 Dia.	1	Fused Silica	450
SPF-0460	50*50	1	Fused Silica	460
SPF-X460	25 Dia.	1	Fused Silica	460
SPF-0500	50*50	1	Fused Silica	500
SPF-X500	25 Dia.	1	Fused Silica	500

Long Wavepass Filter

Long bandpass filters are designed to reject energy at all wavelengths shorter than the cut on and to transmit energy over a specified band at wavelengths longer than the cut on. The long wavelength limit of the transmittance band is often determined by the long wavelength limit of the system detector. Long bandpass filters are commonly used as order separators in grating spectrometers, as short wavelength blockers for bandpass filters.



Part No.	Size (mm)	Thickness (mm)	Substrate	Cut/On (nm)
LPF-0250	50*50	1.0	Fused Silica	250
LPF-X250	25 Dia.	1.0	Fused Silica	250
LPF-X275	25 Dia.	1.0	Fused Silica	275
LPF-0275	50*50	1.0	Fused Silica	275
LPF-X300	25 Dia.	1.0	Fused Silica	300
LPF-0300	50*50	1.0	Fused Silica	300
LPF-X325	25 Dia.	1.0	Fused Silica	325
LPF-0325	50*50	1.0	Fused Silica	325
LPF-0350	50*50	1.0	Fused Silica	350
LPF-X350	25 Dia.	1.0	Fused Silica	350
LPF-0385	50*50	1.0	Fused Silica	385
LPF-X385	25 Dia.	1.0	Fused Silica	385
LPF-X400	25 Dia.	1.0	Fused Silica	400
LPF-0400	50*50	1.0	Fused Silica	400
LPF-0422	50*50	1.0	Fused Silica	422
LPF-X422	25 Dia.	1.0	Fused Silica	422

Laser Line Interference Filters

Laser line interference filters controls the spectral composition of transmitted energy partially by the effects of interference. Frequently, these filters are made up of thin layers of metals and dielectrics, resulting in high transmission over narrow spectral bands.

Specifications

Ring Diameter (f): f25.4mm±0.2mm

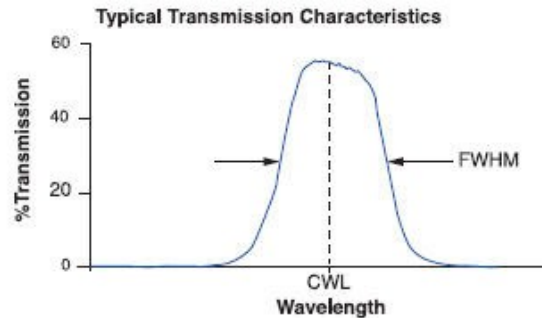
Ring Thickness (t): 6mm

Clear Aperture: >f20

FWHM: 10 nm

Block: 0.01% (±10nm from the peak)

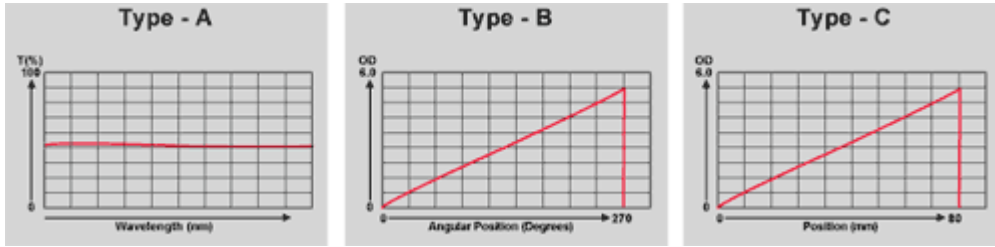
Mounted Material: Black anodized aluminum



Part No.	Laser	Center Wave-length(nm)	Band Width(nm)	Peak Transmittance(%)
FLL-337-11	N2	337.1	11.0	30.0
FLL-352-12	XeF	352.0	12.0	40.0
FLL-441-10	Cd	441.6	10.0	50.0
FLL-488-10	Ar	488.0	10.0	50.0
FLL-488-3	Ar	488.0	3.0	35.0
FLL-514-3	Ar	514.5	3.0	40.0
FLL-514-10	Ar	514.5	10.0	50.0
FLL-532-3	Nd-YAG	532.0	3.0	40.0
FLL-532-10	Nd-YAG	532.0	10.0	50.0
FLL-632-3	HeNe	632.8	3.0	50.0
FLL-632-10	HeNe	632.8	10.0	50.0
FLL-647-10	Kr	647.1	10.0	50.0
FLL-670-10	GaAlAs	670.0	10.0	50.0
FLL-694-10	RuBy	694.3	10.0	50.0
FLL-730-11	GaAlAs	730.0	11.0	55.0
FLL-750-11	GaAlAs	750.0	11.0	55.0
FLL-780-11	GaAlAs	780.0	11.0	55.0
FLL-830-12	GaAlAs	830.0	12.0	55.0
FLL-850-12	GaAlAs	850.0	12.0	55.0
FLL-880-12	GaAlAs	880.0	12.0	55.0
FLL-905-12	GaAlAs	905.0	12.5	55.0
FLL-940-13	GaAlAs	940.0	13.2	55.0
FLL-1060-10	Nd Yag	1060.0	10.0	55.0
FLL-1064-10	Nd Yag	1064.0	10.0	55.0
FLL-1152-11	HeNe IR	1152.0	11.0	55.0
FLL-1310-12	InGaAsP	1310.0	12.0	55.0
FLL-1320-12	Nd Yag	1320.0	12.0	55.0
FLL-1523-10	HeNe IR	1523.0	10.0	55.0
FLL-1550-10	InGaAsP	1550.0	10.0	55.0

Neutral Density Filters

Neutral density filters are used to reduce the amount of light that can pass through the lens.



Part No.	Size (mm)	Thickness (mm)	CWL (nm)	Transmission (%)	FWHM (nm)
NBF-X254	25 Dia.	6.5	254.0	20.0	10.0
NBF-Z254	50*50	6.5	254.0	20.0	10.0
NBF-Y254	50Dia.	6.5	254.0	20.0	10.0
NBF-X260	25 Dia.	6.5	260.0	20.0	10.0
NBF-Y260	50Dia.	6.5	260.0	20.0	10.0
NBF-Z260	50*50	6.5	260.0	20.0	10.0
NBF-Y270	50 Dia.	6.5	270.0	20.0	10.0
NBF-Z270	50x50	6.5	270.0	20.0	10.0
NBF-X270	25 Dia.	6.5	270.0	20.0	10.0
NBF-Y280	50 Dia.	6.5	280.0	20.0	10.0
NBF-Z280	50x50	6.5	280.0	60.0	10.0
NBF-X280	25 Dia.	6.5	280.0	20.0	10.0
NBF-Z290	50x50	6.5	290.0	20.0	10.0
NBF-X290	25 Dia.	6.5	290.0	20.0	10.0
NBF-Y290	50 Dia.	6.5	290.0	20.0	10.0
NBF-Y300	50 Dia.	6.5	300.0	30.0	10.0
NBF-Z300	50x50	6.5	300.0	30.0	10.0
NBF-X300	25 Dia.	6.5	300.0	30.0	10.0
NBF-Z310	50x50	6.5	310.0	35.0	10.0
NBF-Y310	50 Dia.	6.5	310.0	35.0	10.0
NBF-X310	25 Dia.	6.5	310.0	35.0	10.0
NBF-Y313	50 Dia.	6.5	313.0	35.0	10.0
NBF-Z313	50x50	6.5	313.0	35.0	10.0
NBF-X313	25 Dia.	6.5	313.0	35.0	10.0
NBF-Z320	50x50	6.5	320.0	45.0	10.0
NBF-X320	25 Dia.	6.5	320.0	45.0	10.0
NBF-Y320	50 Dia.	6.5	320.0	45.0	10.0

Bandpass Filter

UV-VIS-VIR Narrow Bandpass Filter

Specifications

Central Wavelength Tolerance: $\pm 20\%$ of Nominal Bandwidth

Bandwidth Tolerance: $\pm 20\%$ max

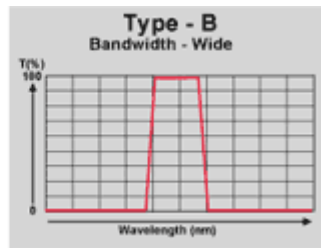
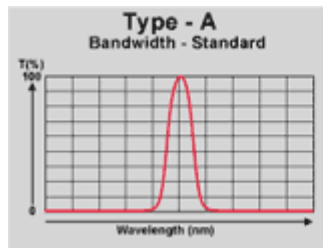
Blocking: $< 0.01\%$

Diameter Sizes(mm): 12, 12.7, 15.0, 25.0, 25.4

Clear Apertures(mm): 8.0, 8.0, 10.5, 20.5, 20.5

Thickness(mm): 8.5 max

Temperature Limits: -50°C to 80°C



Part No.	Center Wavelength (nm)	Band Width (nm)	Peak Transmittance (%)
FBP-214-12	214.0	12.0	10.0
FBP-228-12	228.0	12.0	10.0
FBP-232-12	232.0	12.0	10.0
FBP-253-12	253.7	12.0	12.0
FBP-265-12	265.2	12.0	12.0
FBP-280-12	280.0	12.0	12.0
FBP-289-12	289.4	12.0	12.0
FBP-296-12	296.8	12.0	12.0
FBP-307-12	307.0	12.0	15.0
FBP-312-12	312.6	12.0	15.0
FBP-326-12	326.1	12.0	15.0
FBP-337-11	337.1	11.0	35.0
FBP-340-11	340.0	11.0	40.0
FBP-352-12	352.0	12.0	35.0
FBP-365-12	365.0	12.0	35.0
FBP-380-12	380.0	12.0	35.0
FBP-404-10	404.7	10.0	35.0
FBP-415-10	415.0	10.0	40.0
FBP-435-10	435.8	10.0	35.0
FBP-450-10	450.0	10.0	50.0
FBP-486-10	486.1	10.0	50.0
FBP-488-3	488.0	3.0	50.0
FBP-492-10	492.0	10.0	50.0
FBP-505-10	505.0	10.0	50.0



Optics Leading the Light

RONAR-SMITH® Laser Optics & IR Imaging



Introduction

RONAR-SMITH® Laser Optics

Optics for Medical Laser System

Optics for Semiconductor Spectroscopy Biomedical Application Laser

Optical Material

Laser Accessories Components

Part No.	Center Wavelength (nm)	Band Width (nm)	Peak Transmittance (%)
FBP-508-10	508.5	10.0	50.0
FBP-510-10	510.0	10.0	50.0
FBP-514-3	514.5	3.0	40.0
FBP-535-10	535.0	10.0	50.0
FBP-540-10	540.0	10.0	50.0
FBP-546-10	546.1	10.0	50.0
FBP-550-10	550.0	10.0	50.0
FBP-570-10	570.0	10.0	50.0
FBP-577-10	577.0	10.0	50.0
FBP-578-10	578.0	10.0	50.0
FBP-590-10	590.0	10.0	50.0
FBP-600-10	600.0	10.0	50.0
FBP-620-10	620.0	10.0	50.0
FBP-632-3	632.8	3.0	40.0
FBP-647-11	647.1	11.0	50.0
FBP-650-11	650.0	11.0	50.0
FBP-670-11	670.0	11.0	50.0
FBP-671-11	670.8	11.0	50.0
FBP-694-11	694.3	11.0	50.0
FBP-706-11	706.5	11.0	50.0
FBP-730-11	730.0	11.0	45.0
FBP-766-11	766.5	11.0	45.0
FBP-780-11	780.0	11.0	45.0
FBP-794-11	794.7	11.0	45.0
FBP-830-11	830.0	11.0	45.0
FBP-850-11	850.0	11.0	45.0
FBP-880-11	880.0	11.0	45.0
FBP-905-11	905.0	11.0	45.0
FBP-940-13	940.0	13.0	45.0
FBP-1060-10	1060.0	10.0	45.0
FBP-1152-11	1152.0	11.0	45.0
FBP-1310-12	1310.0	12.0	45.0
FBP-1320-12	1320.0	12.0	45.0
FBP-1523-10	1523.0	10.0	45.0
FBP-1550-10	1550.0	10.0	45.0

- UV: Center Wavelength <=380nm
- VIS: Center Wavelength from 404.7nm to 730nm
- VIR: Center Wavelength >=766.5nm

IR Filter

IR Narrow Bandpass Filter

Substrate Material: Sapphire

Diameter or Width (mm): $\phi 20 \times 1.0, \phi 10 \times 1.0, \phi 10 \times 0.5$

Thickness (mm): 0.5 ± 0.05

Spectrum

Center Wavelength (microns) = 4.26 ± 0.02

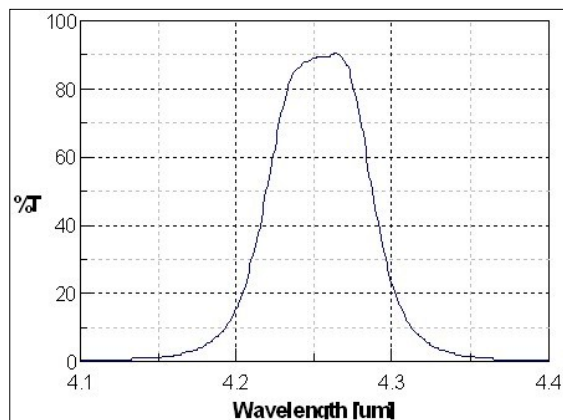
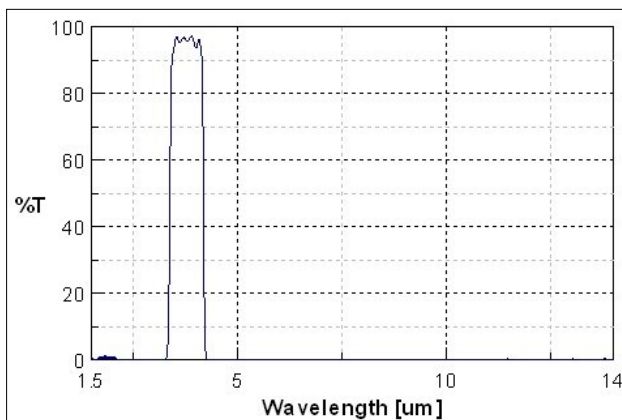
T_{peak} $\geq 80\%$

Nominal FWHM (microns) = 0.08 ± 0.02

Out of band blocking (from UV to detector limit standard): T_{max} $< 1\%$ T_{avg} $< 0.1\%$

Available size of substrate:			
Substrate Material	Substrate Size(mm)	Substrate Material	Substrate Size(mm)
Ge	$\phi 24 \times 2.5$	Si	$\phi 101.6 \times 0.5$
	$\phi 16 \times 1.0$		$\phi 100 \times 0.5$
Gemstone	$\phi 20 \times 1.0$		$\phi 50.8 \times 1.0$
	$\phi 10 \times 1.0$		$\phi 25.4 \times 0.5$
	$\phi 10 \times 0.5$		$\phi 25 \times 0.5$
Bk7	$\phi 30 \times 1.0$		$\phi 20 \times 1.0$
	$\phi 16 \times 1.0$		$\phi 16 \times 1.0$
	$\phi 16 \times 0.5$		$\phi 10 \times 1.0$
Fused Silica	$\phi 10 \times 1.0$	ZnS	$\phi 28 \times 1.4$

Performance





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Laser Accessories Components

IR Wide Bandpass Filter(3.8µm)

Substrate Material: Sapphire

Diameter or Width (mm): φ20x1.0,φ10x1.0,φ10x0.5

Thickness (mm): 0.5±0.05

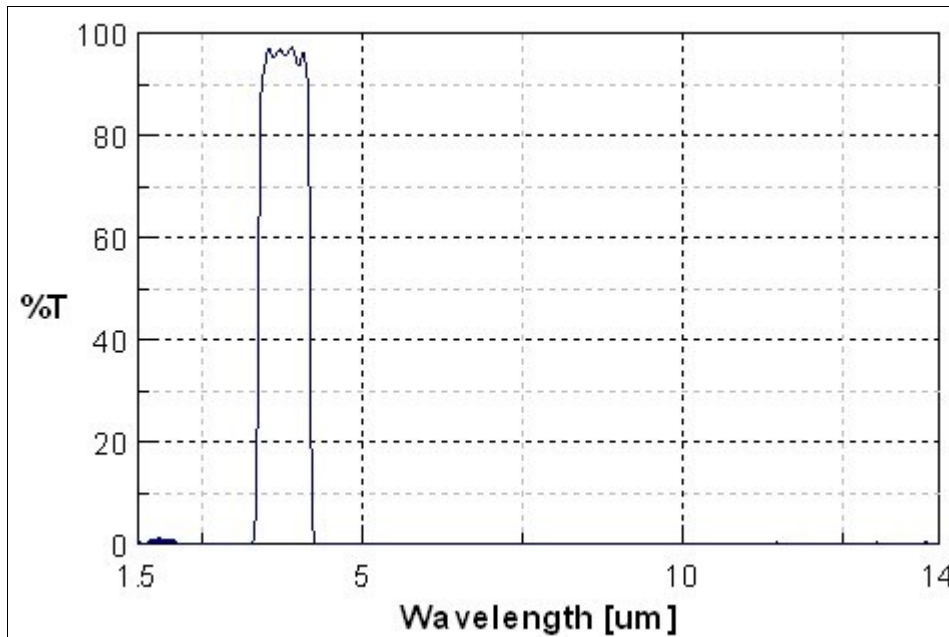
Spectrum

Center Wavelength = 3.8±2%µm

3.45~4.15 µm: Tavg≥90%

Half Power Points = 3.4±2%µm and 4.2±2%µm

Performance



IR Long Pass Filter(7.2μm)

Substrate Material: Germanium

Diameter or Width (mm): φ24x2.5, φ16x1.0

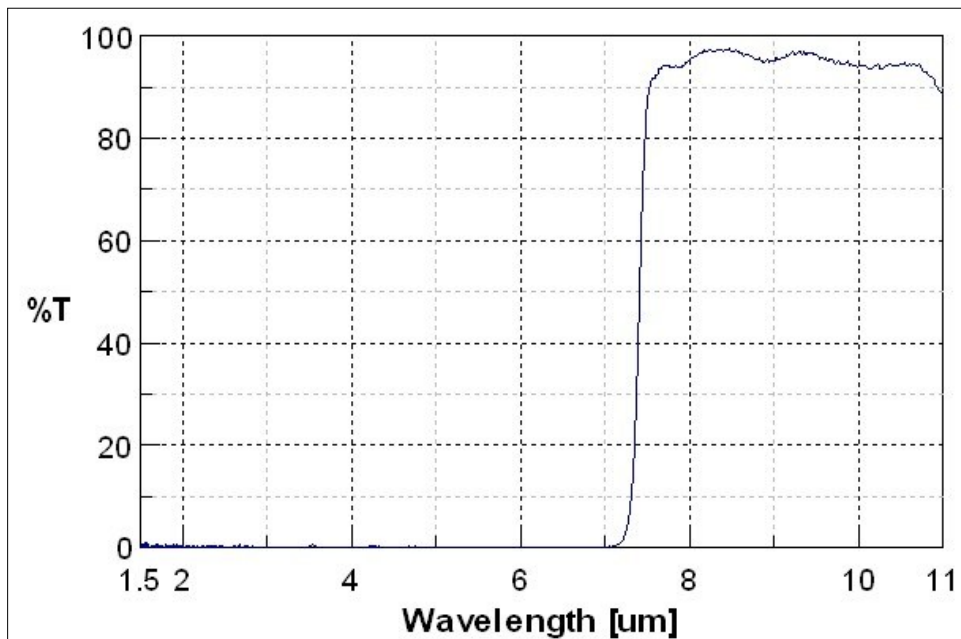
Thickness (mm): 2 ±0.2

Spectrum

7.5~11 μm: Tavg>90%, Tmin>80%

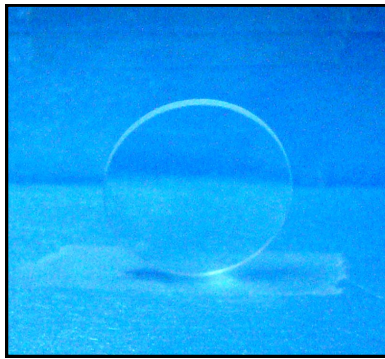
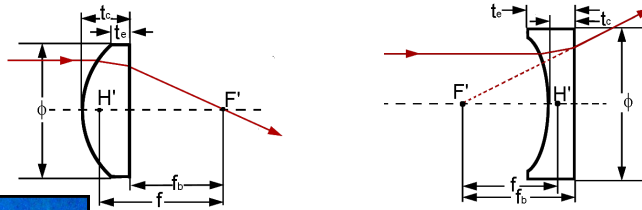
1.5~7.2μm: Tmax<3%

Performance



Lenses - CaF₂

Calcium Fluoride is often used in spectroscopic windows and lenses due to its high transmission from 250nm to 70um. CaF₂ is also commonly found in cryogenically cooled thermal imaging systems. Its low absorption and high damage threshold makes it a popular choice for excimer laser optics. CaF₂'s low refractive index allows it to be used without an antireflective coating. The Knoop Hardness of Calcium Fluoride is 158.3.



Specifications

Materials	Optical Grade CaF ₂ Single Crystal
Paraxial Focal Length	± 2%
Design Index	1.425 @ 1.5um for CaF ₂
Centration	3 arc minutes
Diameter tolerance	+0.0, -0.15mm
Clear Aperture Diameter	90%
Surface Quality	80-50 scratch and dig

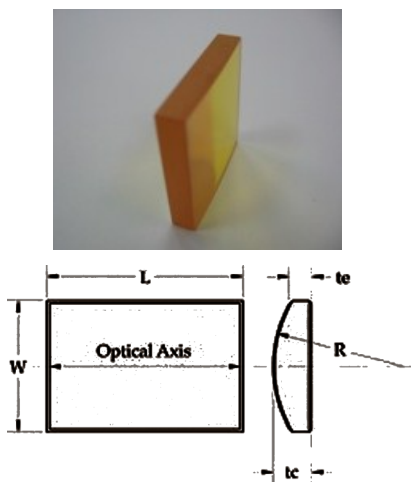
CaF₂ Plano-Convex & Plano-Concave Lenses (Transmission range: 0.2mm to 10mm)

Part No.	f (mm)	Ø (mm)	R ₁ (mm)	t _c (mm)	t _e (mm)	f _b (mm)
LCFX4301	50.0	25.4	21.25	6.2	2.0	45.6
LCFX4302	100.0	25.4	42.50	3.9	2.0	97.3
LCFX4303	150.0	25.4	63.75	3.3	2.0	147.7
LCFX4304	200.0	25.4	85.00	3.0	2.0	197.9
LCFX4305	300.0	25.4	127.50	2.6	2.0	298.2
LCFX4306	500.0	25.4	212.50	2.4	2.0	498.3
LCFX4307	1000.0	25.4	425.00	2.2	2.0	998.5
LCFX4501	100.0	50.0	42.50	11.1	3.0	92.2
LCFX4502	150.0	50.0	63.75	8.1	3.0	144.3
LCFX4503	200.0	50.0	85.00	6.8	3.0	195.2
LCFX4504	500.0	50.0	212.50	4.5	3.0	496.8
LCFV4302	-100.0	25.4	42.50	2.0	3.9	-101.4
LCFV4304	-200.0	25.4	85.00	2.0	3.0	-201.4
LCFV4306	-500.0	25.4	212.50	2.0	2.4	-501.4
LCFV4307	-1000.0	25.4	425.00	2.0	2.2	-1001.4

Lenses - Cylindrical

NOTE: ZnSe Plano-Concave Cylindrical Lenses available upon request

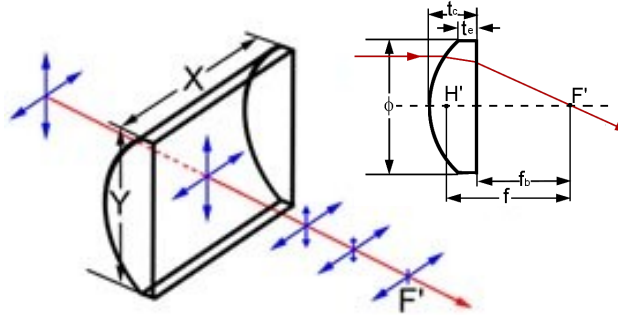
Cylinder lenses are either round or rectangular objects with cylindrically shaped surfaces. They differ from spherical lenses in that they focus a beam to a focal line rather than a focal point. Its application include laser scanners, laser diode systems, spectrophotometers, projectors and optical data storage and retrieval systems.



Specifications	
Materials	Laser Grade CVD ZnSe
Surface Flatness	$\lambda/20$ @ 10.6um
Focal Length Tolerance	$\pm 2\%$ @10.6um
Diameter Tolerance	+0.0, -0.13mm
Thickness Tolerance	± 0.25 mm
Centration	≤ 3 arc minutes
Clear Aperture Diameter	$\geq 85\%$ of Diameter
Surface Quality	80/50

ZnSe Plano-Convex Cylindrical Lens

Part No.	L x W (mm)	f (mm)@10.6um	R (mm)	t _c (mm)
LZCY-25x25Z-25	25.4x25.4	25.4	35.56	5.0
LZCY-25x25Z-38	25.4x25.4	38.1	53.34	5.0
LZCY-25x25Z-50	25.4x25.4	50.8	71.12	5.0
LZCY-25x25Z-63	25.4x25.4	63.5	88.9	5.0
LZCY-25x25Z-76	25.4x25.4	76.2	106.7	5.0
LZCY-25x25Z-88	25.4x25.4	88.9	124.5	5.0
LZCY-25x25Z-95	25.4x25.4	95.3	131.5	5.0
LZCY-25x25Z-101	25.4x25.4	101.6	142.2	5.0
LZCY-25x25Z-127	25.4x25.4	127	177.8	5.0
LZCY-25x25Z-190	25.4x25.4	190.5	266.7	5.0
LZCY-25x25Z-254	25.4x25.4	254	355.6	5.0
LZCY-25x25Z-381	25.4x25.4	381	533.4	5.0



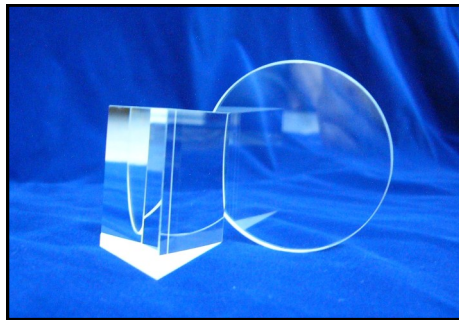
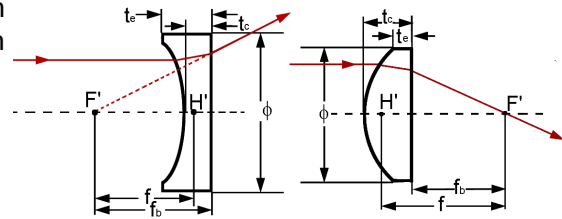
Specifications	
Materials	BK7
Design Wavelength	632.8nm
Paraxial Focal Length	± 2%
Design Index	1.5147
Centration	3 arc minutes
Dimension Tolerance	± 0.2mm
Clear Aperture Diameter	> 80%
Surface Figure	x- λ/2 ; y- λ/2
Surface Quality	60/40 scratch and dig

BK7 Plano-Convex Cylindrical Lens

Part No.	X x Y (mm)	f (mm)	R ₁ (mm)	t _c (mm)	t _e (mm)	f _b (mm)
LBCY0101	10.0x10.0	12.7	6.54	4.3	2.0	9.8
LBCY0102	20.0x10.0	12.7	6.54	4.3	2.0	9.8
LBCY0201	10.0x10.0	20.0	10.29	3.3	2.0	17.8
LBCY0202	20.0x10.0	20.0	10.29	3.3	2.0	17.8
LBCY0301	10.0x10.0	25.0	12.87	3.0	2.0	23.0
LBCY0302	20.0x10.0	25.0	12.87	3.0	2.0	23.0
LBCY0401	20.0x20.0	50.0	25.73	4.0	2.0	47.3
LBCY0402	40.0x20.0	50.0	25.73	4.0	2.0	47.3
LBCY0501	20.0x20.0	75.0	38.60	3.3	2.0	72.8
LBCY0502	40.0x20.0	75.0	38.60	3.3	2.0	72.8
LBCY0601	20.0x20.0	100.0	51.47	4.0	3.0	97.3
LBCY0602	40.0x20.0	100.0	51.47	4.0	3.0	97.3
LBCY0701	20.0x20.0	150.0	77.20	3.7	3.0	147.5
LBCY0702	40.0x20.0	150.0	77.20	3.7	3.0	147.5
LBCY0801	20.0x20.0	200.0	102.93	3.5	3.0	197.7
LBCY0802	40.0x20.0	200.0	102.93	3.5	3.0	197.7
LBCY0901	20.0x20.0	250.0	128.67	3.4	3.0	247.7
LBCY0902	40.0x20.0	250.0	128.67	3.4	3.0	247.7
LBCY1001	20.0x20.0	300.0	154.40	3.3	3.0	297.8
LBCY1002	40.0x20.0	300.0	154.40	3.3	3.0	297.8
LBCY1101	20.0x20.0	500.0	257.33	3.2	3.0	497.9
LBCY1102	40.0x20.0	500.0	257.33	3.2	3.0	497.9

Lenses - Sapphire

Sapphire are ideal for demanding applications (e.g. Laser systems) because of their extreme surface hardness, high thermal conductivity, high dielectric constant and resistance to common chemical acids and alkalis. Sapphire is the second hardest crystal next to diamond and because of their structural strength, sapphire windows can be made much thinner than other common dielectric windows with improved transmittance. Chemically, sapphire is single crystal aluminum oxide (Al₂O₃) and is useful in a transmission range of 0.15 to 5.5 microns.



Specifications	
Materials	Optical Grade Sapphire Crystal
Paraxial Focal Length	± 2%
Design Index	1.771 @ 546.1nm for Sapphire
Centration	3 arc minutes
Diameter tolerance	+0.0, -0.15mm
Clear Aperture Diameter	90%
Surface Quality	80-50 scratch and dig

Part No.	f (mm)	Ø (mm)	R ₁ (mm)	t _c (mm)	t _e (mm)	f _b (mm)
LSPX2101	5.0	5.0	3.86	2.9	2.0	3.4
LSPX2201	10.0	10.0	7.71	3.8	2.0	7.9
LSPX2202	20.0	10.0	15.42	2.8	2.0	18.4
LSPX2203	25.0	10.0	19.28	2.7	2.0	23.5
LSPX2301	50.0	20.0	38.55	3.3	2.0	48.1
LSPX2302	100.0	20.0	77.10	2.7	2.0	98.5
LSPX2303	150.0	20.0	115.65	2.4	2.0	148.6
LSPX2304	200.0	20.0	154.20	2.3	2.0	198.7
LSPV2101	-5.0	5.0	-3.86	2.0	2.9	3.9
LSPV2201	-10.0	10.0	-7.71	2.0	3.8	8.9
LSPV2202	-20.0	10.0	-15.42	2.0	2.8	18.9
LSPV2203	-25.0	10.0	-19.28	2.0	2.7	23.9
LSPV2301	-50.0	20.0	-38.55	2.0	3.3	48.9
LSPV2302	-100.0	20.0	-77.10	2.0	2.7	98.9
LSPV2303	-150.0	20.0	-115.65	2.0	2.4	148.9
LSPV2304	-200.0	20.0	-154.20	2.0	2.3	198.9

Plastic Lens

Business Scope

- ◆ Optical design, production design
- ◆ Design and manufacture of tool and die
- ◆ Precision plastic injection up to 0.3µm surface accuracy
 - ♣ Optical lenses of plane, sphere, aspheric(prisms, focus lenses, mirror, view windows) and so on.
 - ♣ Plastic gear, plastic lens mount and tube
 - ♣ Projection lens, cellphone, DVD pickup and so on.
- ◆ Plastic lens coating: AR.

Product	Optics	Special optics
Camera, PC, cellphone, monitor lens, videophone	Lens, view window, zoom Lens	Aspheric lens
Projector, project TV	Lens, reflector, focus lens	Aspheric lens, Illumination lens, filter lens
Disc, driver	Pickup Lens, Collimator Lens, Spectrometer prism,	Aspheric lens, spectrometer Lens, half-past lens, curvature distributing lens
Image scanner, bar code reader	Scanning lens device	Aspheric lens, curvature distribution lens
Laser printer	Collimator lens, scanning lens device	Curvature distribution lens
Laser meter, measure instrument, machining	Collimator lens	Aspheric lens
telescope, microscope, laser head	Object lens, ocular, collimator lens	Aspheric lens, prism
Fax machine, copier	Magnifier, scanning lens device	Aspheric lens, curvature Distribution lens
Medical appliance	Endoscope lens	Aspheric lens

Size spec:1.5mm-60mm
Diameter tolerance:0.015mm
Surface accuracy:0.15um-0.5um



Comparasion of Plastic and glass lens

Title	Glass	Plastic
Material cost	High	Low
Process procedure	More	Less
Process efficiency	Low	High
Quality stability	Low	High
Yield rate	Low	High
Anti-temperature	High	Low(80°C~140 °C)
Hardness	High	Low
Reflective index	High	Low
Shape	Circle or simple cut	According to design

Current Market

- ◆ Lens of auto control equipment
- ◆ Focus lens for LED
- ◆ Prism, mirror
- ◆ Photoelectric mouse lens
- ◆ Lens for camera and medical
- ◆ Cellphone lens
- ◆ Windows and so on

Potential Market

- ◆ CCTV monitor lens
- ◆ Scanning lens
- ◆ DVD pickup lens
- ◆ Digital lens
- ◆ Projector lens
- ◆ Videophone lens

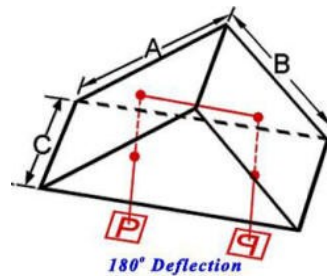
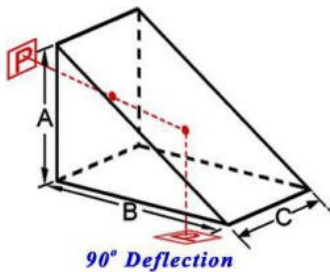
Prisms

There are many types of prism, each having a particular geometry to achieve the desired reflections necessary to perform a specific imaging task. Reflecting prisms may invert, rotate, deviate or displace a beam. Dispersing prisms produce spectral separation for spectroscopic applications or for tuning a laser output.

We provides many kinds of high precision prisms, including Penta-prism, Beam splitter Penta-prism, Right Angle Prism, and Corner Cube. Our micro Penta-prism and Right Angle Prism are widely used in optical communication, such as optical switches. Dove Prism and Roof Prism are also available upon request.



Specifications	
Materials	BK 7, fine annealed
Surface Flatness	$\lambda/4$
Angle	45°, 90° ± 3' or ± 30"
Clear Aperture Diameter	90%
Surface Quality	60-40 scratch and dig

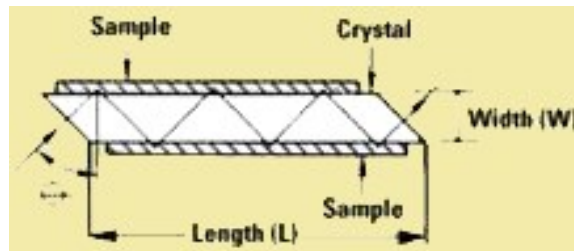


Dimension (mm)	Part No.	
	± 3'	± 30"
5.0	WCL-030104	WCL-030104A
10.0	WCL-030105	WCL-030105A
12.7	WCL-030101	WCL-030101A
20.0	WCL-030106	WCL-030106A
25.4	WCL-030102	WCL-030102A
30.0	WCL-030107	WCL-030107A
40.0	WCL-030108	WCL-030108A
50.8	WCL-030103	WCL-030103A

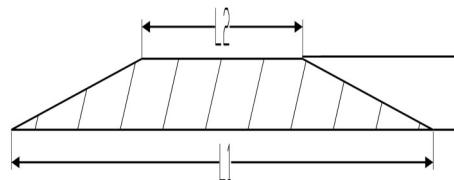
ATR Prism

ATR Prisms for Infrared Spectroscopy

The criteria for selection of prism material to obtain a good FT-IR ATR spectrum is outlined below. For a good spectrum, it is essential to select conditions to achieve optimum depth of penetration (d_p).



- The useful wave number (cm^{-1})/wavelength (λ) range of the material. The wider the useful transmission wavelength range, the better the material for general purpose uses. The depth of penetration increases with decreasing wave number/ increasing wavelength.
- Refractive index of material (n_1). This determines the critical angle (θ_c) of the material at which total internal reflection phenomena begins to occur. The higher the material refractive index, the lower the critical angle. It is desirable for the angle of incidence to far exceed the critical angle to avoid spectrum distortion when working with high refractive index (n_2) samples.
- Angle of incidence (θ_i). Increasing angle of incidence will decrease the depth of penetration and number of reflections. These will decrease effective path length and therefore decrease the absorbance intensity of the spectrum.
- Effective sample contact. It is important to achieve a good sample contact all over the ATR prism sample contact area to obtain a good spectrum. In solid samples it is important to choose an ATR material that will permit sufficient pressure to be applied without causing damage to the prism or sample in order to obtain a good spectrum. The hardness of the material is important.
- Material reactivity. When dealing with liquid samples, careful attention should be paid to solubility in water, the reactivity of the ATR materials to acids, bases, oxidising and reducing agents and complexes.



Part No.	Material	L1 (mm)	L2 (mm)	H (mm)
ATRZ-52.5x20x2	ZnSe	52.5	20.0	2.0

Glan-Laser Prisms

Glan-Laser Prisms

Specifications

Wavelength Range:

190-3500nm(a-BBO),
350-2300nm(Calcite),

Surface Quality: 20-10 Scratch and Dig

Dimensions Tolerance: ±0.1 mm

Beam Deviation: < 3 arc minutes

Transmission Wavefront Distortion:

<λ/4 @632.8nm for a-BBO

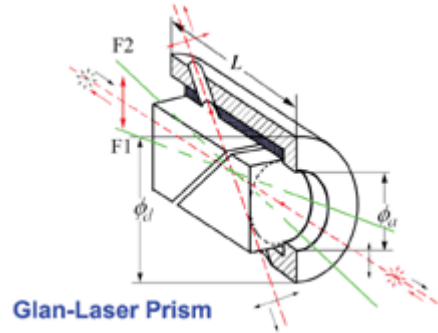
<λ/2 @632.8nm for Calcite

Escape Window: Double

Coating: Single Layer MgF2 on Input and Output Surface

Damage Threshold: >1GW/cm2 at 1064nm for a-BBO

Housing: Black Anodized Aluminum



- High Power Applications
- Wide Wavelength Range
- High UV Transmission
- High Polarization Purity

Part No.	Material	Wavelength Range (nm)	Extinction Ratio	Angular Field	Clear Aperture f_a (mm)	Outside Diameter f_d (mm)	L±0.1 (mm)
GLP8-25.4a	a -BBO	200-270	<1x10 ⁻⁶	6.0°	f 8	25.4	30.6
GLP10-25.4a					f10	25.4	31.0
GLP15-30.0a					f15	30.0	38.6
GLP20-38.0a					f20	38.0	48.9
GLP8-25.4b	a -BBO	400-700	<1x10 ⁻⁶	6.0°	f 8	25.4	25.0
GLP10-25.4b					f10	25.4	26.0
GLP15-30.0b					f15	30.0	33.4
GLP20-38.0b					f20	38.0	41.7
GLP8-25.4c	a -BBO	700-3000	<1x10 ⁻⁶	6.0°	f 8	25.4	24.7
GLP10-25.4c					f10	25.4	25.9
GLP15-30.0c					f15	30.0	33.0
GLP20.38.0c					f20	38.0	43.6
GLP8-25.4d	Calcite	350-2300	<5x10 ⁻⁵	7.7°	f 8	25.4	24.5
GLP10-25.4d					f10	25.4	26.2
GLP15-30.0d					f15	30.0	33.3

Glan-Taylor Prisms

Glan-Taylor Prisms

Specifications

Wavelength Range:

190-3500nm(a-BBO),
350-2300nm(Calcite),
450-5000nm(YVO4)

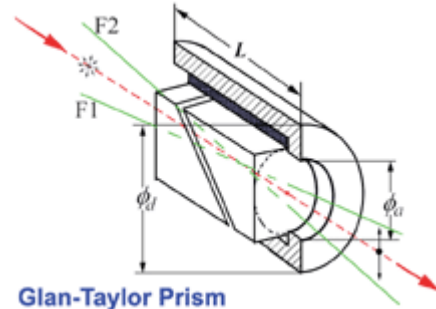
Surface Quality: 20-10 scratch and dig

Dimensions Tolerance: ±0.1 mm

Beam Deviation: < 3 arc minutes

Coating: Single layer MgF2 on Input and output surface

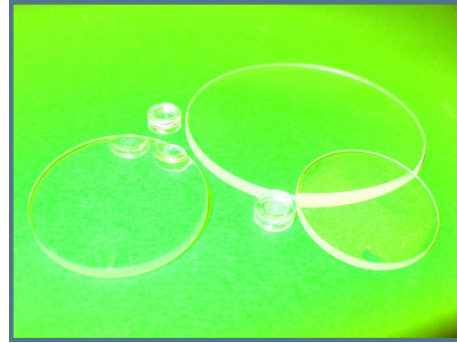
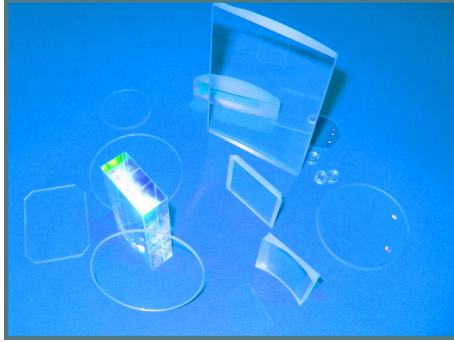
Housing: Black Anodized Aluminum



Glan-Taylor Prism

- High Polarization Purity
- High Total Transmission
- Wide Wavelength Range

Part No.	Material	Wavelength Range (nm)	Extinction Ratio	Angular Field	Clear Aperture f _a (mm)	Outside Diameter f _d (mm)	L±0.1 (mm)		
GTP8-25.4a	a -BBO	200-270	<1x10 ⁻⁶	6.0°	f 8	25.4	17.0		
GTP10-25.4a					f10	25.4	18.5		
GTP15-30.0a					f15	30.0	23.0		
GTP20-38.0a					f20	38.0	27.0		
GTP8-25.4b					f 8	25.4	17.0		
GTP10-25.4b					f10	25.4	18.5		
GTP15-30.0b		f15		30.0	23.0				
GTP20-38.0b		f20		38.0	23.0				
GTP8-25.4c		700-3000		<1x10 ⁻⁶	6.0°	f 8	25.4	17.0	
GTP10-25.4c						f10	25.4	18.5	
GTP15-30.0c						f15	30.0	23.0	
GTP20-38.0c						f20	38.0	27.0	
GTP8-25.4d	Calcite		350-2300			7.7°	f 8	25.4	17.0
GTP10-25.4d							f10	25.4	18.5
GTP15-30.0d		f15		30.0	23.0				



6. OPTICAL MATERIAL

	Pg
◆ Infrared Optical Material	128
◆ Ultraviolet Grade fused Silica	133
◆ Polished Substrate	146

Infrared Optical Material - CaF₂

Calcium Fluoride is used for optical windows, lenses and prisms in the 0.15 μm - 9 μm (ultraviolet to infrared) regions. The low power absorption has made this material attached to wide use in high power laser optics. Polished surfaces are stable and will last several years under normal conditions. Due to its composition, CaF₂ has a much longer usable life-time than most materials operating in fluorine environments.

Calcium Fluoride, which is grown by vacuum Stockbarger technique, has a low refractive index, hence can be used without anti-reflection coating. Material for IR use is grown using naturally mined fluorite, in large quantities at relatively low cost.

Maximum available size: 380 mm Dia x 70 mm Thk

BASE PROPERTIES	
PARAMETER	VALUE
OPTICAL	
Transmission Range	0.13 to 10 microns
Refractive Index	1.39908 at 5 microns
Reflection Loss	5.4% at 5 microns (2 surfaces)
dN/dT	-10.6 x 10 ⁻⁶ e/°C
PHYSICAL	
Density	3.18 g/cm ³
Melting Point	1360 °C
Thermal Conductivity	9.71 W/(m*K)
Thermal Expansion	18.85 x 10 ⁻⁶ e/°C
Hardness	Knoop 158.3 kg/mm ² (100)
Specific Heat Capacity	854J/(kg K)
Dielectric Constant	6.76 at 1MHz
Young's Modulus (E)	75.8 GPa
Shear Modulus (G)	33.77 GPa
Bulk Modulus (K)	82.71 GPa
Elastic Coefficients	C ₁₁ =164 MPa, C ₁₂ =53 MPa, C ₄₄ =33.7 MPa
Apparent Elastic Limit	36.54 MPa
Poisson Ratio	0.26
CHEMICAL	
Solubility	0.0017g/100g water at 20 °C
Molecular Weight	78.08
Class/Structure	Cubic (111) cleavage



Optics Leading the Light

RONAR-SMITH® Laser Optics & IR Imaging

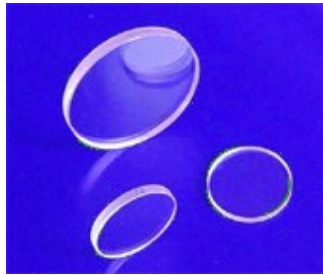


Introduction

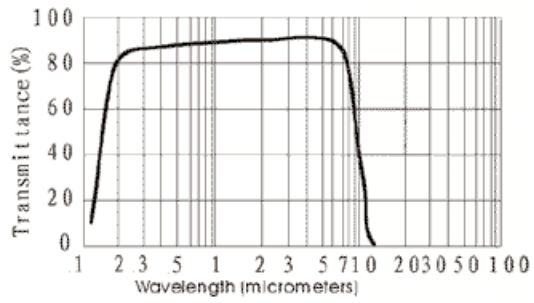
RONAR-SMITH® Laser Optics

REFRACTIVE INDEX						
Wavelength, μm	0.19	0.21	0.25	0.33	0.41	0.88
Refractive Index	1.51	1.49	1.47	1.45	1.44	1.43
Wavelength, μm	2.65	3.90	5.00	6.20	7.00	8.22
Refractive Index	1.42	1.41	1.40	1.38	1.36	1.34

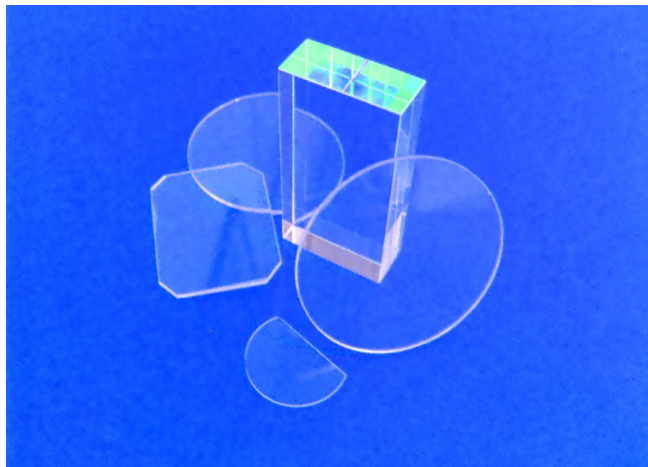
Optics for Medical Laser System



Calcium Fluoride (CaF2)



Optics for Semiconductor Spectroscopy Biomedical Application Laser



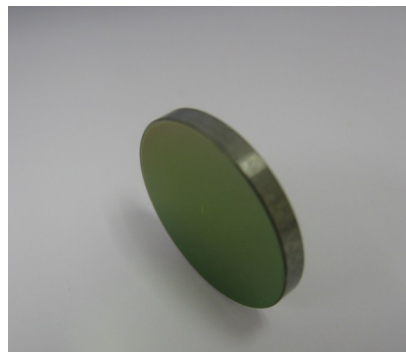
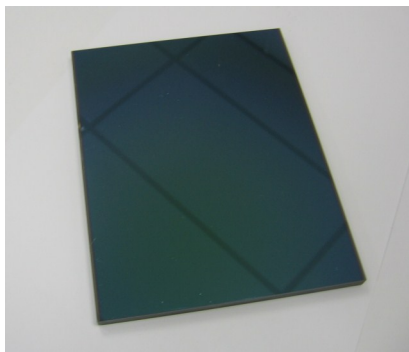
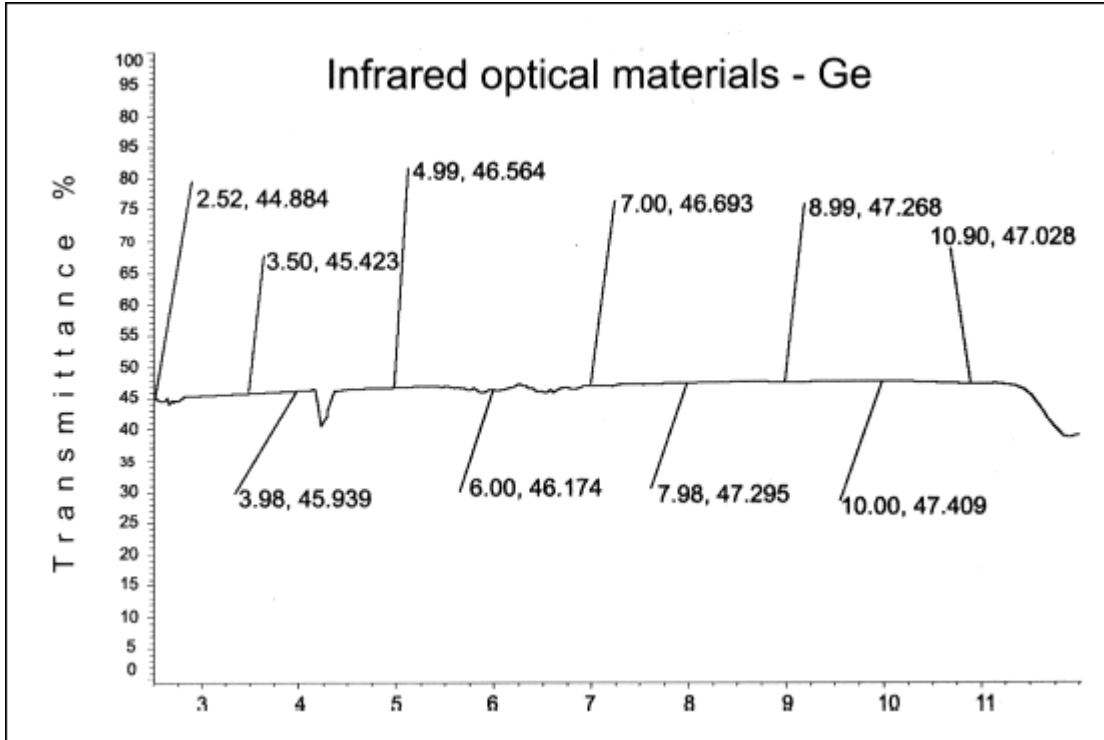
Optical Material

Laser Accessories Components

Infrared Optical Material - Ge

Germanium is a versatile infrared material commonly used in imaging systems and instruments in the 2 to 12 microns spectral region. It is used as a substrate for lenses, windows, and output couplers for low power CW as well as pulsed TEA, CO2 lasers. Ge is non-hygroscopic and non-toxic has good thermal conductivity excellent surface hardness, and good strength.

Basic Properties:	Germanium (Ge)	Chalcogenide glass containing germanium (GG -1)	Chalcogenide glass containing germanium (GG -2)	Chalcogenide glass containing germanium (GG -3)
Transmission band(μm)	1.8-23	1-16	0.9-16	0.9-16
Uniformity index	$\frac{4.89 \times 10^{-5}}{(\phi 250\text{mm})}$	$\frac{1.1 \times 10^{-4}}{(\phi 100\text{mm})}$	$\frac{1.1 \times 10^{-4}}{(\phi 100\text{mm})}$	$\frac{1.1 \times 10^{-4}}{(\phi 100\text{mm})}$
Refractive index(10μm)	4.0032	2.6002	2.4976	2.4347
Temperature coefficient of the refractive index(10 ⁻⁶ /°C)	400	80	72	
Absorption(10μm.cm ⁻¹)	0.03	< 0.02	< 0.07	< 0.07
Hardness(kg/cm ²)	800	150	170	<u>236 virkers</u>
Density(g/cm ³)	5.323	4.67	4.40	4.36
Rupture Modulus (Mpa)	75	18.2	18.2	
Yang's modulus (Gpa)	103	21.8	22.1	18.6
Poisson's ratio	0.28	0.26	0.26	0.26
Melting point(°C)	937			
Thermal conductivity (Wcm-1k-1)	0.7	0.72	0.6	
Thermal expansion coefficient (X10 ⁻⁶ °C ⁻¹)	6.1	16	13	13.7
Specific Heat (Cal/g.k.)	0.074	0.066	0.07	
Permittivity	16			
Conductive models	N			
Resistivity (Ωcm)	5-40			
Maximum diameter (mm)	300	150	150	150

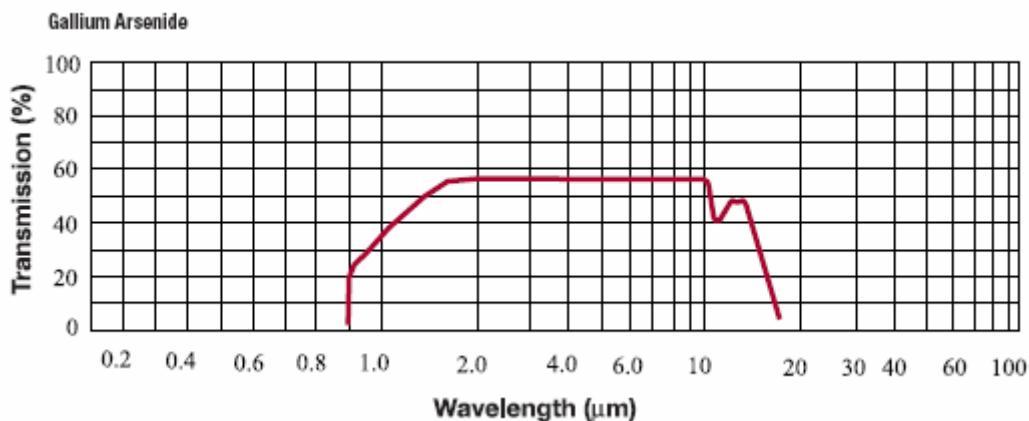


Infrared Optical Material - GaAs

Semi-insulating GaAs provides an alternative to ZnSe in medium and high-power CW CO₂ laser systems for lenses and rear mirrors. GaAs is manufactured for semiconductor applications rather than optical applications, so careful material screening is vital in producing quality GaAs optics. GaAs optics are limited by crystal growth technology to diameters typically less than 10cm. the material is non-hygroscopic, safe to use in laboratory and field applications, and chemically stable except when contacted with strong acids.

Basic Properties:

Specification	GaAs
Transmission Range (um)	1.0-22
Refractive Index@10um	3.277
Temperature Coefficient of Refractive Index, /°C	149 x 10 ⁻⁶
Bulk Absorption Coefficient@10um / cm	<0.01
Melting Point, °C	1600
Hardness (Knoop), Kg/mm ²	750
Density, g/cm ³	5.37
Rupture Modulus, Mpa	13.8
Young's Modulus, Gpa	8.3
Fracture Toughness Mpam ^{-1/2}	0.31



Infrared Optical Material - LaF₃/LiF

– LaF₃ Crystalline Electrodes

LaF₃ is used for optical windows and lenses in the 0.2 μm - 10.5 μm regions.

Physical properties:

Refractive Index	Nd=1.603, Ne=1.597
Melting point	1.493°C
Density	5.936g/cm ³
Hardness, Mohs	4.5
Cleavage plane	[001]
Thermal expansion coefficient	11.9×10 ⁻⁶ /°C
Transmission range	-9μm
Thermal conductivity	51C/g.°C.CM.S
Size	Ø30-Ø50mm



LaF₃ Crystal

– LiF Crystal

Physical properties:

Refractive Index	Nd=1.394, n(5μ)=1.394
Melting point	884°C
Density	2.64g/cm ³
Hardness, Mohs	3
Cleavage plane	[100]
Solubility in water	0.27g/100gH ₂ O
Thermal expansion coefficient	3.195×10 ⁻⁵ /°C
Transmission range	0.11-6.5μm
Thermal conductivity	0.0249c/g.°C.cm.s.
Dispersion	Nf-Nc=0.00393
Diameter	<200mm



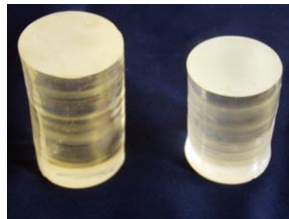
LiF

Infrared Optical Material - LiNbO₃ Crystal

As one of the most important Functional Materials, Lithium Niobate Crystal is widely used as frequency doublers, switch, retarder, frequency multiplier, parametric oscillator.

Physical properties:

Refractive Index	Ne=2.208, Nd=2.297, (λ=632.8nm)
Melting point	1250-1260°C
Density	4.64g/cm ³
Hardness, Mohs	5-6
Extinction Ratio	1000:1
Dual graded-index	10-5/cm
Thermal expansion coefficient	A-axis a800°C=16.7×10-6/°C C-axis a600°C=2×10-6/°C
Dielectric constant	/ 84 / 29 / 43 / 28
Electromechanical Coupling Coefficient	Kt 0.20 K31 0.028



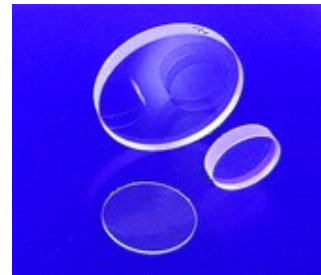
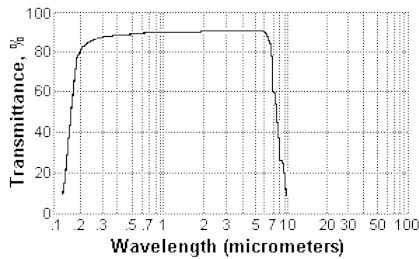
LiNbO₃ Crystal

Specification:

Style	Diameter (mm)	Length (mm)	Remark
C801	20-25	50-80	Growth along the C-axis, used as optical components
A812	20-25	50-80	Growth along the A-axis, used as optical components
C801	30-60	50-100	Growth along the C-axis, used as Piezoelectric devices
C845	80-180	40-80	Growth along the C-axis, used as Piezoelectric devices
[104]847	80-180	40-80	Growth along the 104-axis, used as Piezoelectric devices

Infrared Optical Material - MgF₂

Magnesium fluoride is transparent over an extremely wide range of wavelengths. The effective transmission range is 0.11 μm - 7.5 μm (ultraviolet to infrared). Irradiation does not lead to color centers. Magnesium fluoride is a rugged, hard material which is resistant to thermal and mechanical shock. Considerable mechanical shock is needed to cause cleavage which is near perfect when it occurs. The natural form of MgF₂ is known as Sellaite. Magnesium fluoride is a positive birefringent crystal grown normally to 135 mm diameter by vacuum Stockbager technique, seeding along the C-axis. Thin layers of MgF₂ are frequently applied to the surfaces of optical elements as part of optical coatings such as anti-reflective coatings.

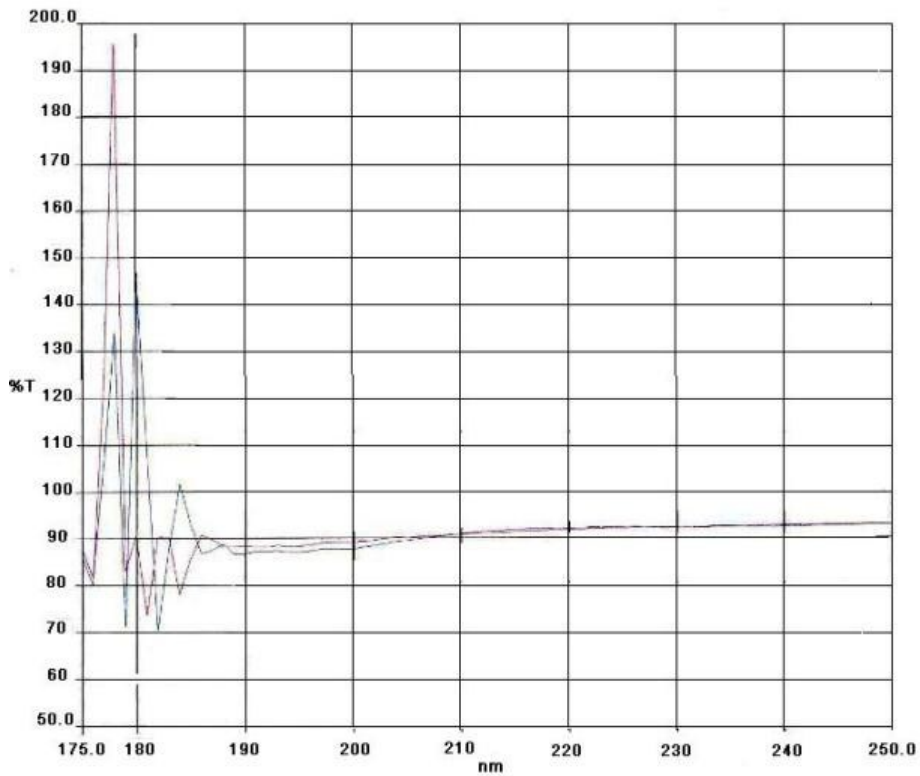


Magnesium Fluoride (MgF₂)

BASE PROPERTIES

PARAMETER	VALUE
OPTICAL	
Transmission Range	0.11 to 7.5 microns
Refractive Index	N ₀ =1.3836 N _e =1.3957 at 0.405 microns
Reflection Loss	11.2% at 0.12 microns (2 surfaces)
dN/dT	+2.3 and +1.7 x 10 ⁻⁶ / °C at 0.4 microns
PHYSICAL	
Density	3.177 g/cm ³
Melting Point	1255 °C
Thermal Conductivity	0.3 W/(m K) at 27 °C
Thermal Expansion	13.7 and 8.48 x 10 ⁻⁶ / °C
Hardness	Knoop 415 kg/mm ²
Specific Heat Capacity, cal/(g K)	
at 298 K	0.24
at 1700 K	0.362
Dielectric Constant	4.87 parallel and 5.45 perpendicular
Young's Modulus (E)	138.5 GPa
Shear Modulus (G)	54.66 GPa
Bulk Modulus (K)	101.32 GPa
Elastic Coefficients	C ₁₁ =140.2 C ₁₂ =89.5 C ₄₄ =56.8 C ₃₃ =204.7 C ₁₃ =62.9 C ₆₆ =95.7
Apparent Elastic Limit	49.64 MPa
Poisson Ratio	0.276
CHEMICAL	
Solubility	<0.0002 g/100g water at 0 °C
Molecular Weight	62.32
Class/Structure	Tetragonal, can cleave on C-axis

REFRACTIVE INDEX					
Wavelength, μm	0.20	0.23	0.27	0.34	0.56
Refractive Index (ne)	1.43	1.42	1.41	1.40	1.39
Refractive Index (no)	1.42	1.41	1.40	1.39	1.38



SCAN024.SP - 06-8-8 Φ 13x1
SCAN023.SP - 06-8-8 Φ 8x1



Optics Leading the Light

RONAR-SMITH® Laser Optics & IR Imaging



Introduction

RONAR-SMITH® Laser Optics

Optics for Medical Laser System

Infrared Optical Material - Sapphire

Sapphire initially refers to gem varieties of the mineral corundum, an aluminium oxide (Al₂O₃), when it is a color other than red. Nowadays, sapphire can be found naturally or manufactured in large crystal boules. Sapphire is highly transparent at wavelengths of 170 nm to 5.3 μm (ultraviolet to infrared), as well as being five times stronger than glass. This leads to use of synthetic sapphire windows in high pressure chambers for spectroscopy. The hardest of the oxide crystals, sapphire retains its high strength at high temperatures and has good thermal properties. It is well known for chemically resistant to common acids and alkali at temperatures up to 1000 °C as well as to HF below 300 °C. Maximum available size for windows, lenses and blanks: 100 mm Dia x 10 mm Thk and 100 mm Square x 10 mm Thk.

BASE PROPERTIES

PARAMETER	VALUE
-----------	-------

OPTICAL

Transmission Range	0.17 to 5.5 microns
Refractive Index	1.75449 (o) 1.74663 (e) at 1.06 microns
Reflection Loss	14% at 1.06 microns (2 surfaces)
Absorption Coefficient	0.3 x 10 ⁻³ e cm ⁻¹ at 2.4μm
dN/dT	13.7 x 10 ⁻⁶ e at 5.4μm
dN/dμ = 0	1.5μm

PHYSICAL

Density	3.97 g/cm ³
Melting Point	2040°C
Thermal Conductivity	27.21 W/(m*K) at 300K
Thermal Expansion	5.6 (paral) & 5.0 (perp) x 10 ⁻⁶ e/K *
Hardness	Knoop 2000 with 2000g indenter
Specific Heat Capacity	419 J/(kg K)
Dielectric Constant	11.5 (paral) 9.4 (perp) at 1MHz
Young's Modulus (E)	335 GPa
Shear Modulus (G)	148.1 GPa
Bulk Modulus (K)	240 GPa
Elastic Coefficients	C11=496 C12=164 C13=115 C33=498 C44=148
Apparent Elastic Limit	275 MPa (40,000 psi)
Poisson Ratio	0.25

CHEMICAL

Solubility	98x10 ⁻⁶ g/100g water
Molecular Weight	101.96
Class/Structure	Trigonal (hex), R3c

Optics for Semiconductor Spectroscopy Biomedical Application Laser

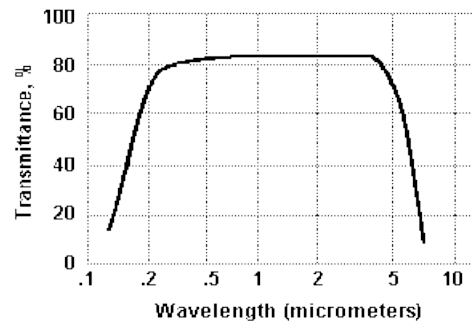
Optical Material

Laser Accessories Components

REFRACTIVE INDEX						
Wavelength, μm	0.308	0.325	0.337	0.351	0.355	0.442
Refractive Index (ne)	1.811	1.805	1.801	1.797	1.796	1.780
Refractive Index (no)	1.802	1.796	1.792	1.788	1.787	1.772
Wavelength, μm	0.458	0.488	0.55	0.532	0.590	0.633
Refractive Index (ne)	1.778	1.775	1.773	1.772	1.768	1.766
Refractive Index (no)	1.770	1.767	1.765	1.764	1.760	1.758
Wavelength, μm	0.670	0.694	0.775	0.780	0.800	0.820
Refractive Index (ne)	1.764	1.763	1.761	1.761	1.760	1.760
Refractive Index (no)	1.756	1.755	1.753	1.753	1.752	1.7528
Wavelength, μm	0.980	1.064	1.320	1.550	2.010	2.249
Refractive Index (ne)	1.756	1.754	1.750	1.746	1.737	1.732
Refractive Index (no)	1.748	1.747	1.742	1.738	1.729	1.724
Wavelength, μm	2.703	2.942	3.333	3.704	4.000	4.348
Refractive Index (ne)	1.719	1.712	1.701	1.687	1.674	1.658
Refractive Index (no)	1.711	1.704	1.693	1.699	1.666	1.65
Wavelength, μm	4.762	5.000	5.263			
Refractive Index (ne)	1.636	1.623	1.607			
Refractive Index (no)	1.628	1.615	1.599			



Sapphire



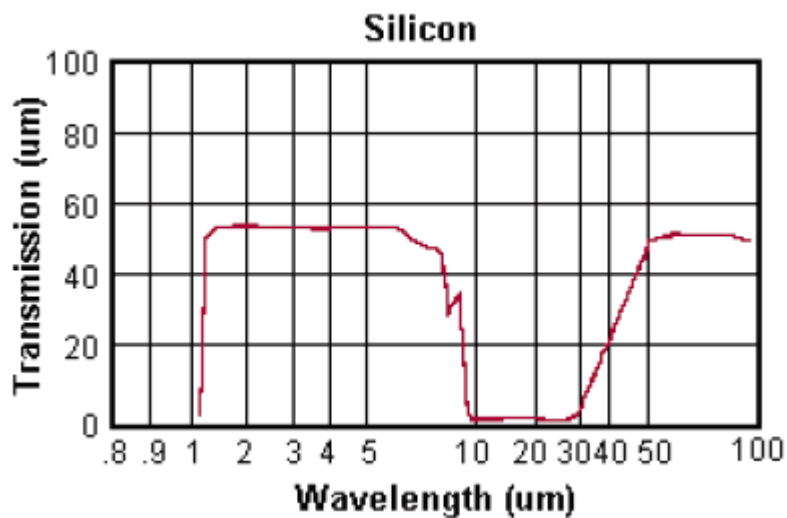
Infrared Optical Material - Si

Si is used as the substrate for IR gold mirrors because it has an extremely large thermal conductivity and gold easily binds to the surface. It is highly durable, has low internal absorption and is commonly used at wavelength region from 1.2 to 6μm.

Optical Properties

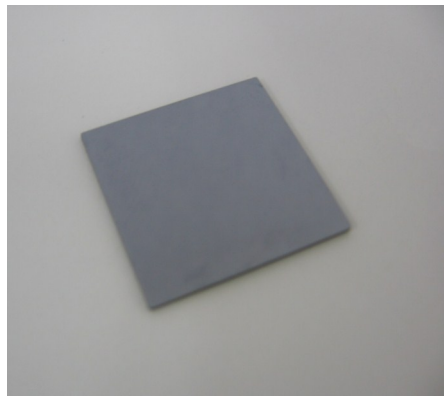
Transmission Range	1.2~8μm
Reflection Loss, for two surfaces at 5μm	46.2%
Reflection Index	See below

Wavelength (μm)	Refractive Index (n)	Wavelength (μm)	Refractive Index(n)
1.357	/	5.500	3.4213
1.3951	3.4975	6.000	3.4202
1.6606	3.4929	6.500	3.4195
1.8131	3.4608	7.000	3.4189
2.1526	3.4476	7.500	3.4186
2.3254	3.443	8.000	3.4184
3.000	3.432	8.500	3.4182
3.500	3.4284	10.00	3.4179
4.000	3.4257	10.50	3.4178
4.500	3.4236	11.04	3.4176
5.000	3.4223		



Physical properties

Density	2.33g/cm ³
Hardness, Mohs	7
Dielectric Constant for 9.37 x 10 ⁹ Hz	13
Melting point, °C	1414
Thermal Conductivity, W/m·K at 313 K	163
Thermal Expansion, 1/K at 293 K	2.6x10 ⁻⁶
Specific Heat Capacity, J (kg·°C)	712.8
Bandgap, eV	1.1
Knoop Hardness, kg/mm ²	1100
Young's Modulus, Gpa	130.91
Shear Modulus, Gpa	79.92
Bulk Modulus, Gpa	101.97
Debye Temperature, K	640
Poisson's Ratio	0.28
Chemical properties	
Solubility in water	None
Molecular Weight	28.09





Optics Leading the Light

RONAR-SMITH® Laser Optics & IR Imaging



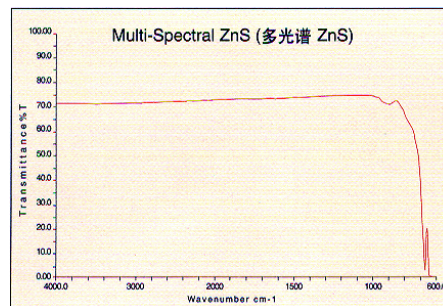
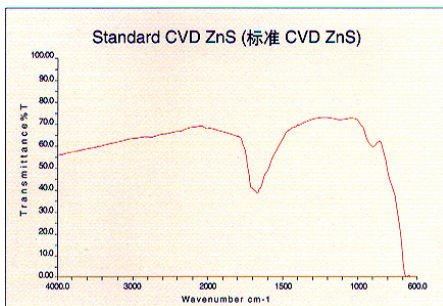
Introduction

Infrared Optical Material - ZnS

Basic Properties:

Specification	Standard CVD ZnS	Multi-spectrum CVD ZnS
Transmission Range (um)	0.6-12.0	0.35-12.0
Refractive Index@10um	2.2002	2.2008
Temperature Coefficient of Refractive Index@10.6um	41 x 10 ⁻⁶ /°C	54 x 10 ⁻⁶ /°C
Bulk Absorption Coefficient@10um / cm	0.096	0.02
Melting Point, °C	1830	1830
Hardness (Knoop), Kg/mm ²	210-230	160
Density, g/cm ³	4.09	4.09
Rupture Modulus, Mpa	103.4	68
Young's Modulus, Gpa	74.5	74.5
Fracture Toughness Mpa ^{-1/2}	1.0	0.8

Wavelength (µm)	Index	Wavelength (µm)	Index	Wavelength (µm)	Index	Wavelength (µm)	Index
0.42	2.516	1.0	2.292	7.0	2.232	13.0	2.152
0.46	2.458	1.4	2.275	7.4	2.228	13.4	2.143
0.50	2.419	1.8	2.267	7.8	2.225	13.8	2.135
0.54	2.391	2.2	2.263	8.2	2.221	14.2	2.126
0.58	2.371	2.6	2.260	8.6	2.217	14.6	2.116
0.62	2.355	3.0	2.257	9.0	2.212	15.0	2.106
0.66	2.342	3.4	2.255	9.4	2.208	15.4	2.095
0.70	2.332	3.8	2.253	9.8	2.203	15.8	2.084
0.74	2.323	4.2	2.251	10.2	2.198	16.2	2.072
0.78	2.316	4.6	2.248	10.6	2.192	16.6	2.059
0.82	2.310	5.0	2.246	11.0	2.186	17.0	2.045
0.86	2.305	5.4	2.244	11.4	2.180	17.4	2.030
0.90	2.301	5.8	2.241	11.8	2.173	17.8	2.015
0.94	2.297	6.2	2.238	12.2	2.167	18.2	1.998
0.98	2.294	6.6	2.235	12.6	2.159	-	-



RONAR-SMITH® Laser Optics

Optics for Medical Laser System

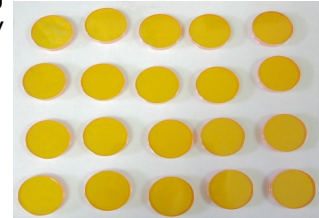
Optics for Spectroscopy Biomedical Application Laser

Optical Material

Laser Accessories Components

Infrared Optical Material - ZnSe

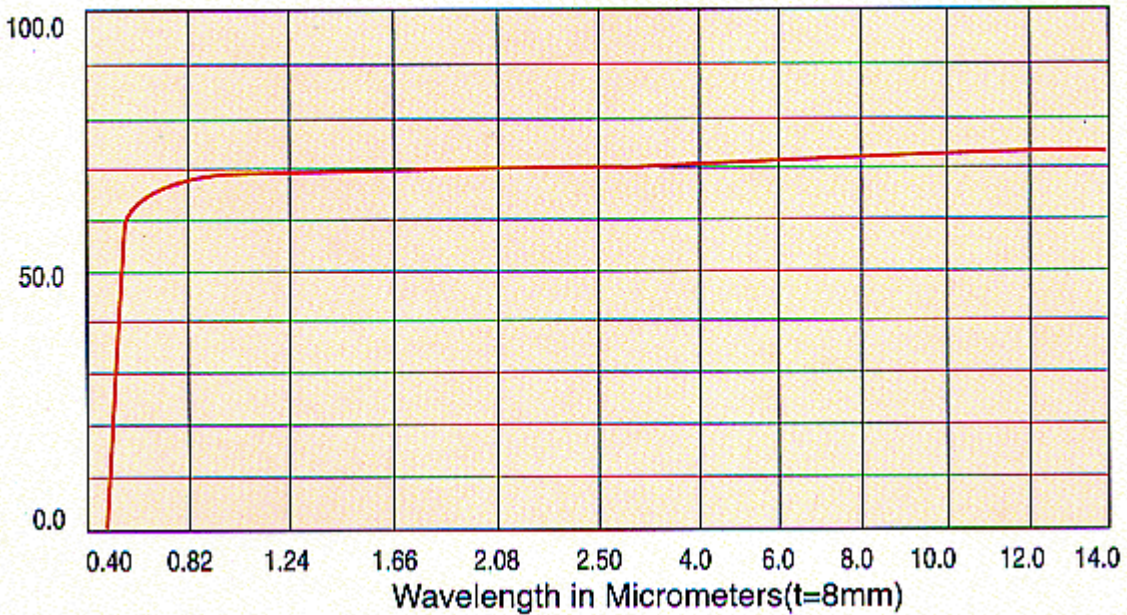
ZnSe is a preferred material for lenses, windows, output couplers and beam expanders for its low absorption at infrared wavelengths and its visible transmission. ZnSe is non-hygroscopic and chemically stable, unless treated with strong acids. It's safe to use in most industrial field and laboratory environment.



Basic Properties:

Specification	ZnSe
Transmission Range (um)	0.5-22
Refractive Index@10um	2.4381
Temperature Coefficient of Refractive Index, /°C	61×10^{-6}
Bulk Absorption Coefficient@10um / cm	0.0004
Melting Point, °C	1520
Hardness (Knoop), Kg/mm ²	112
Density, g/cm ³	5.27
Rupture Modulus, Mpa	55.2
Young's Modulus, Gpa	67.2
Fracture Toughness Mpam ^{-1/2}	0.5

CVD ZnSe





Optics Leading the Light

RONAR-SMITH® Laser Optics & IR Imaging



Introduction

RONAR-SMITH® Laser Optics

Optics for Medical Laser System

Optics for Semiconductor Spectroscopy Biomedical Application Laser

Optical Material

Laser Accessories Components

Ultraviolet Grade Fused Silica

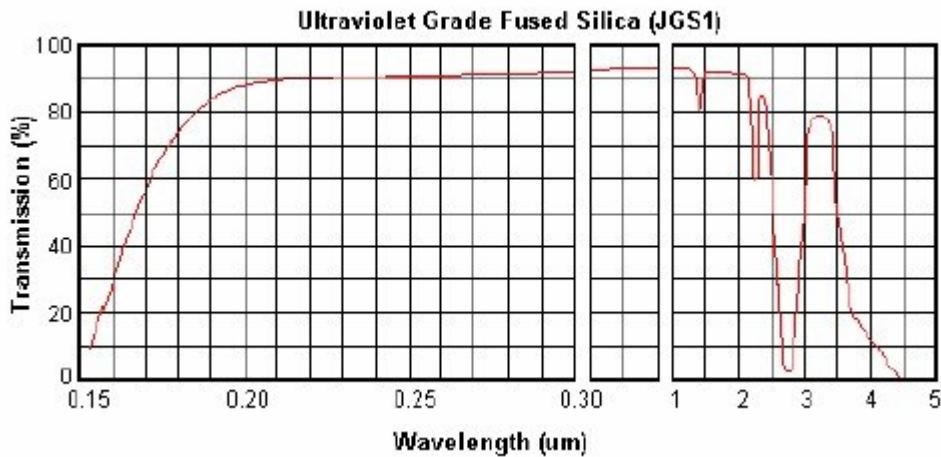
UV grade Fused Silica (JGS1) is synthetic amorphous silicon dioxide of extremely high purity. This non-crystalline, colorless silica glass combines a very low thermal expansion coefficient with good optical qualities, and excellent transmittance in the ultraviolet. Transmission and homogeneity exceed those of crystalline quartz without the problems of orientation and temperature instability inherent in the crystalline form. Fused silica is used for both transmissive and reflective optics, especially where high laser damage threshold is required. JGS1 is transparent in the ultraviolet and visible regions, and has no absorption bands in the 170-250 nm wavelength intervals. It has an intensive OH absorption band in the interval of wavelength 2600-2800 nm. JGS1 is used for optics operating in the deep UV and the visible wavelength range (Laser Lenses, Windows, Prisms, Mirrors, etc.). It is practically free of bubbles and inclusions.

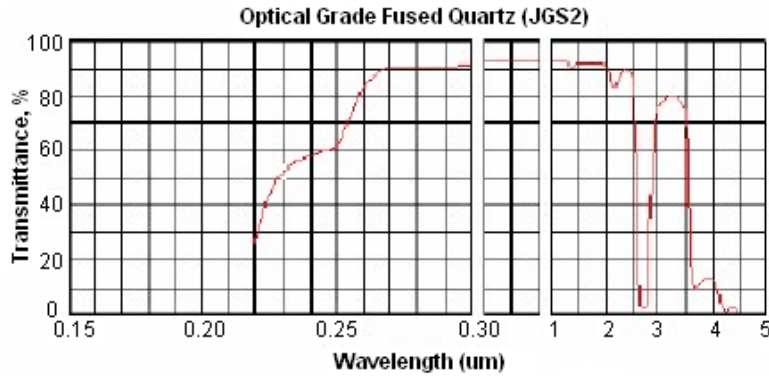
Optical Grade Fused Quartz (JGS2) provides good UV and visible transmission. It has almost the same physical and chemical properties with JGS1. However only in thin & small sheet pieces, JGS2 is virtually bubble-free. Elements built from larger pieces will most likely contain bubbles, so application should not be sensitive to these inclusions. But in cases where simple light gathering and strong mechanical properties are the primary goals, JGS2 grade provides excellent performance at a low price. Ideal Applications for JGS2

Material Specification:

Parameter Value	UV grade Fused Silica
Maximum Size	<Φ200mm
Transmission Range (Medium transmission ratio)	0.17~2.10um (Tavg>90%)
OH- Content	1200 ppm
Fluorescence (ex 254nm)	Virtually Free
Impurity Content	5 ppm
Birefringence Constant	2-4 nm/cm
Melting Method	Synthetic CVD
Applications	Laser substrate: Window, lens, prism, mirror...

Hardness	5.5 - 6.5 Mohs' Scale 570 KHN 100
Design Tensile Strength	4.8x10 ⁷ Pa (N/mm ²) (7000 psi)
Design Compressive Strength	Greater than 1.1x10 ⁹ Pa (160,000 psi)
Bulk Modulus	3.7x10 ¹⁰ Pa (5.3x10 ⁶ psi)
Rigidity Modulus	3.1x10 ¹⁰ Pa (4.5x10 ⁶ psi)
Young's Modulus	7.2x10 ¹⁰ Pa (10.5x10 ⁶ psi)
Poisson's Ratio	0.17
Coefficient of Thermal Expansion	5.5x10 ⁻⁷ cm/cm.°C (20°C-320°C)
Thermal Conductivity	1.4 W/m.°C
Specific Heat	670 J/kg.°C
Softening Point	1683°C
Annealing Point	1215°C
Strain Point	1120°C
Electrical Receptivity	7x10 ⁷ ohm.cm (350°C)
Dielectric Properties (20°C and 1 MHz)	
Constant	3.75
Strength	5x10 ⁷ V/m
Loss Factor	Less than 4x10 ⁻⁴
Dissipation Factor	Less than 1x10 ⁻⁴
Velocity of Sound-Shear Wave	3.75x10 ³ m/s
Velocity of Sound/Compression Wave	5.90x10 ³ m/s
Sonic Attenuation	Less than 11 db/m MHz
Permeability Constants (cm ³ mm/cm ² sec cm of Hg)	(700°C)
Helium	210x10 ⁻¹⁰
Hydrogen	21x10 ⁻¹⁰
Deuterium	17x10 ⁻¹⁰
Neon	9.5x10 ⁻¹⁷
Chemical Stability (except hydrofluoric)	High resistance to water and acids



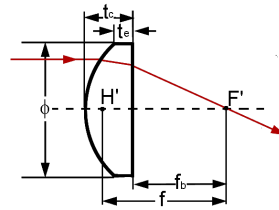


Properties				
Density		2.20g/cm ³		
Abbe Constant		67.6		
Refractive Index (nd) at 588nm		1.4586		
Wavelength (um)	Refractive Index (n)	Wavelength (um)	Refractive Index (n)	
0.200	1.55051	1.000	1.45042	
0.220	1.52845	1.064	1.44962	
0.250	1.50745	1.100	1.44920	
0.300	1.48779	1.200	1.44805	
0.320	1.48274	1.300	1.44692	
0.360	1.47529	1.500	1.44462	
0.400	1.47012	1.600	1.44342	
0.450	1.46557	1.700	1.44217	
0.488	1.46302	1.800	1.44087	
0.500	1.46233	1.900	1.43951	
0.550	1.46008	2.000	1.43809	
0.588	1.45860	2.200	1.43501	
0.600	1.45804	2.400	1.43163	
0.633	1.45702	2.600	1.42789	
0.650	1.45653	2.800	1.42377	
0.700	1.45529	3.000	1.41925	
0.750	1.45424	3.200	1.41427	
0.800	1.45332	3.370	1.40990	
0.850	1.45250	3.507	1.40566	
0.900	1.45175	3.707	1.39936	

Polished Substrate - GaAs Lens

Specifications

Material: Gallium Arsenide
 Design Wavelength: 10.6um
 Design Index: 3.2743@10.6um
 Diameter Tolerance: +0.0 / -0.1mm
 Paraxial Focal Length: ±2%
 Thickness Tolerance: ±0.25mm
 Centration: <3 arc minutes
 Clear Aperture: >80%
 Surface Figure: λ/2@632.8nm
 Surface Quality: 20/10 scratch and dig
 Protective Bevel



GaAs Plano-Convex Lenses

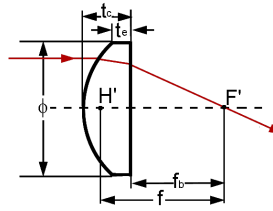
Part Number	Dia (inch)	f (inch)	R ₁ (mm)	t _c (mm)	t _e (mm)
GA1015	1.0"	1.5"	86.65	2.9	2.0
GA1020	1.0"	2.0"	115.53	2.7	2.0
GA1025	1.0"	2.5"	144.42	2.6	2.0
GA1030	1.0"	3.0"	173.30	2.5	2.0
GA1115	1.1"	1.5"	86.65	4.1	3.0
GA1120	1.1"	2.0"	115.53	3.9	3.0
GA1125	1.1"	2.5"	144.42	3.7	3.0
GA1130	1.1"	3.0"	173.30	3.6	3.0
GA1150	1.1"	5.0"	288.83	3.3	3.0
GA1520	1.5"	2.0"	115.53	4.6	3.0
GA1525	1.5"	2.5"	144.42	4.3	3.0
GA1530	1.5"	3.0"	173.3	4.0	3.0
GA1550	1.5"	5.0"	288.83	3.6	3.0
GA1575	1.5"	7.5"	433.25	3.4	3.0
GA2050	2.0"	5.0"	288.83	7.1	6.0
GA2075	2.0"	7.5"	433.25	6.7	6.0
GA20100	2.0"	10.0"	577.67	6.5	6.0

Custom made is available upon request

Polished Substrate - Ge Lens

Specifications

Material: Germanium
 Design Wavelength: 10.6um
 Design Index: 4.0028@10.6um
 Diameter Tolerance: +0.0 / -0.1mm
 Thickness Tolerance: ±0.25mm
 Paraxial Focal Length: ±2%
 Centration: <3 arc minutes
 Clear Aperture: >80%
 Surface Figure: λ/2@632.8nm
 Surface Quality: 20/10 scratch and dig
 Protective Bevel



Ge Plano-Convex Lenses

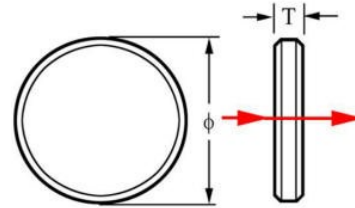
Part Number	Dia (inch)	f (inch)	R ₁ (mm)	t _c (mm)	t _e (mm)
GE1015	1.0"	1.5"	114.40	3.7	3.0
GE1020	1.0"	2.0"	152.54	3.5	3.0
GE1025	1.0"	2.5"	190.68	3.4	3.0
GE1030	1.0"	3.0"	228.81	3.3	3.0
GE1115	1.1"	1.5"	114.40	3.8	3.0
GE1120	1.1"	2.0"	152.54	3.6	3.0
GE1125	1.1"	2.5"	190.68	3.5	3.0
GE1130	1.1"	3.0"	228.81	3.4	3.0
GE1150	1.1"	5.0"	381.35	3.3	3.0
GE1520	1.5"	2.0"	152.54	7.2	6.0
GE1525	1.5"	2.5"	190.68	6.9	6.0
GE1530	1.5"	3.0"	228.81	6.8	6.0
GE1550	1.5"	5.0"	381.35	6.5	6.0
GE1575	1.5"	7.5"	572.03	6.3	6.0
GE2050	2.0"	5.0"	381.35	8.8	8.0
GE2075	2.0"	7.5"	572.03	8.6	8.0
GE20100	2.0"	10.0"	762.71	8.4	8.0

Custom made is available upon request

Polished Substrate - Moly Mirror

Specifications

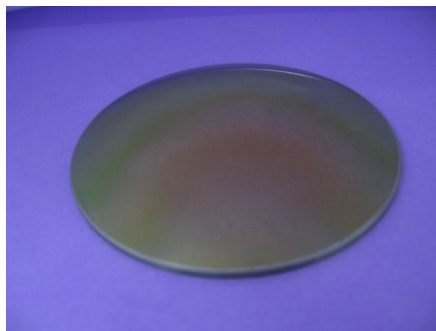
Material: Moly
 Diameter Tolerance: +0.0 / -0.13mm
 Surface: plano / plano
 Thickness Tolerance: ±0.25mm
 Centration: <3 arc minutes
 Clear Aperture: >85%
 Surface Figure: $\lambda/2$ @632.8nm
 Surface Quality: 40-20 scratch and dig
 Protective Bevel



Moly Mirror

Part Number	F (inch)	T (inch)
MM0730	0.75"	0.12"
MM1030	1.0"	0.12"
MM1140	1.1"	0.16"
MM1540	1.5"	0.16"
MM1560	1.5"	0.236"
MM2020	2.0"	0.20"
MM2038	2.0"	0.375"
MM3025	3.0"	0.25"
MM3038	3.0"	0.375"

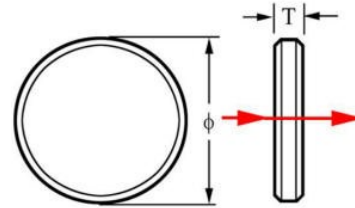
Custom made is available upon request



Polished Substrate - Si Mirror

Specifications

Material: Silicon
 Diameter Tolerance: +0.0 / -0.13mm
 Surface: plano / plano
 Thickness Tolerance: ±0.25mm
 Centration: <3 arc minutes
 Clear Aperture: >85%
 Surface Figure: $\lambda/2$ @632.8nm
 Surface Quality: 20-10 scratch and dig
 Protective Bevel



Silicon Mirror

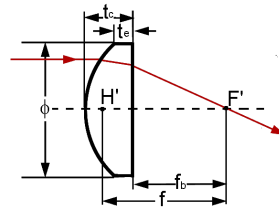
Part Number	f (inch)	T (inch)
SM0730	0.75"	0.12"
SM1030	1.0"	0.12"
SM1140	1.1"	0.16"
SM1540	1.5"	0.16"
SM1560	1.5"	0.236"
SM2020	2.0"	0.20"
SM2038	2.0"	0.375"
SM3025	3.0"	0.25"
SM3038	3.0"	0.375"

Custom made is available upon request

Polished Substrate - ZnSe Lens

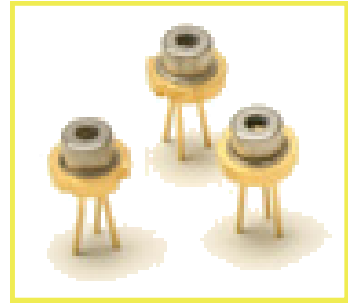
Specifications

Material: Zinc Selenide
 Design Wavelength: 10.6um
 Design Index: 2.4028@10.6um
 Diameter Tolerance: +0.0 / -0.13mm
 Thickness Tolerance: ±0.25mm
 Paraxial Focal Length: ±2%
 Centration: <3 arc minutes
 Clear Aperture: >80%
 Surface Figure: λ/2@632.8nm
 Surface Quality: 20/10 scratch and dig
 Protective Bevel



ZnSe Plano-Convex Lenses

Part Number	Dia (inch)	f (inch)	R ₁ (mm)	t _c (mm)	t _e (mm)
ZN0615	0.6"	1.5"	53.45	2.9	2.0
ZN0620	0.6"	2.0"	71.26	2.9	2.0
ZN0715	0.75"	1.5"	53.45	2.9	2.0
ZN0720	0.75"	2.0"	71.26	2.9	2.0
ZN0725	0.75"	2.5"	89.08	2.9	2.0
ZN1015	1.0"	1.5"	53.45	4.5	3.0
ZN1020	1.0"	2.0"	71.26	4.1	3.0
ZN1025	1.0"	2.5"	89.08	3.9	3.0
ZN1030	1.0"	3.0"	107.93	3.8	3.0
ZN1115	1.1"	1.5"	53.45	4.8	3.0
ZN1120	1.1"	2.0"	71.26	4.4	3.0
ZN1125	1.1"	2.5"	89.08	4.1	3.0
ZN1130	1.1"	3.0"	107.93	3.9	3.0
ZN1150	1.1"	5.0"	178.15	3.5	3.0
ZN1525	1.5"	2.5"	89.08	8.0	6.0
ZN1530	1.5"	3.0"	107.93	7.7	6.0
ZN1550	1.5"	5.0"	178.15	7.0	6.0
ZN1575	1.5"	7.5"	267.23	6.7	6.0
ZN2050	2.0"	5.0"	178.15	9.8	8.0
ZN2075	2.0"	7.5"	267.23	9.2	8.0
ZN20100	2.0"	10.0"	356.31	8.9	8.0



7. LASRACCESSORIES / COMPONENTS




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Fiber

The broad spectrum of products includes three different types of fibers based on: silica glass, Chalcogenide InfraRed glasses of As-S and As-Se-Te compositions (CHALCOGENIDE INFRARED GLASSES - fibers), and Polycrystalline InfraRed Silver Halide fibers (POLYCRYSTALLINE INFRARED - fibers). Wavelength supplies Polymer fiber cables and bundles for different applications, from side glowing and end fiber illumination to various fiber sensors.

Fiber probes of different designs and coherent fiber bundles provide optimal solution for remote process spectroscopy in the 0.2µm -18µm spectral range - when assembled with Silica, CHALCOGENIDE INFRARED and POLYCRYSTALLINE INFRARED Fibers.

POLYCRYSTALLINE INFRARED - and CHALCOGENIDE INFRARED - fiber pig-tailing of IR-detectors and IR-emitters expands their applications range substantially as they provide a platform for the new generation of flexible IR-fiber systems - from IR-fiber spectrometers and process-photometers to cost effective IR-fiber sensors, flexible IR-endoscopes and multi-channel IR-imaging fiber systems.

Products	0.2-2.4 µm	2-6 µm	4-18 µm
 Fiber	<ul style="list-style-type: none"> Silica-Fibers UV-Fibers NIR-Fibers Metal Coated Graded-Index 	<ul style="list-style-type: none"> Chalcogenide InfraRed-Fiber Polycrystalline InfraRed- & Chalcogenide InfraRed-Fiber comparison 	<ul style="list-style-type: none"> Polycrystalline InfraRed-Fiber Polycrystalline InfraRed- & Chalcogenide InfraRed-Fiber comparison
 Industrial Cables	<ul style="list-style-type: none"> High Power (HP) Fiber Cables 		<ul style="list-style-type: none"> High Power (HP) cable for CO2-Laser power delivery
 Medical Fiber Products	<ul style="list-style-type: none"> Fiber Optical Tools for Therapy Fiber Optical Tools for Photodynamic Therapy Fiber Optical Tools for Surgery Intravenous Laser Irradiation of Blood Bladder Balloon Light Diffuser Gullet Balloon Light Diffuser Uterus balloon light diffuser 		

Gem Tester

Gem Tester Refractive index is one of most important optical parameter. Gloss of gem can be estimated by the parameter. The kinds of gem can be precisely determined in accordance with the measured value of refractive index because every kind of gem has its inherent refractive. Besides, index of double refraction can be also measured. Through the parameter you can judge whether a gem is uniaxial or biaxial photopositive or photonegative. The gemological refractometer is characterized by small volume and less weight. It is easy to carry. It is a popular instrument used in jewelry market.



Model	Range	Div.	Accuracy
RHG-181	Refractive Index: 1.30-1.81	Refractive Index: 0.01	0.01

Hand held Fiber Inspection Microscopes



Fiber Inspection microscopes are equipped with potent laser safety filters. It will decrease the dangerous risks to the users. It's widely used in the field such as communication, Fiber wire and so on. it's one of the indispensability inspection equipments .

Model No	Description
CL-100 100X	Fiber Microscope with universal "slip-grip" adapter
CL-200 200X	Fiber Microscope with universal "slip-grip" adapter
CL-400 400X	Fiber Microscope with universal "slip-grip" adapter

Hand Held Refractometers



The Hand Held Refractometers are specially designed for measuring the concentration of many kinds of solution listed as following: Juices, Beverages, Honey, Salt water, Brine, Cleaning fluid, battery fluid, Antifreeze and Industrial fluids etc. And they can also test for the proportion of the water-soluble solution. They can be easily used and they are competitive in price. You only need to drop some water on the prism and then make it towards to the sunlight. Then the reading of the concentration will appear.

Model	Range	Min.Div	Accuracy	Remark
RHB0-80	Brix: 0-80%	Brix: 0.5%	Brix: ±0.5%	Without Atc
RHB-32	Brix: 0-32%	Brix: 0.2%	Brix: ±0.20%	Without Atc
RHB-32ATC	Brix: 0-32%	Brix: 0.2%	Brix: ±0.20%	Atc
RHB-32bpATC	Brix: 0-32%	Brix: 0.2%	Brix: ±0.20%	Atc
RBH-82ATC	Brix: 45-82%	Brix: 0.5%	Brix: ±0.5%	Atc

Model	Range	Min.Div	Accuracy	Remark
RHS-10	Salinity:0-100‰ Specific gravity: 1.000-1.070	Salinity: 1‰ Specific gravity: 0.001	±1‰ Specific gravity:±0.001	Without Atc
RHS-10ATC	Salinity:0-100‰ Specific gravity: 1.000-1.070	Salinity: 1‰ Specific gravity: 0.001	Salinity: ±0.001 Specific gravity:±0.001	Atc

Model	Range	Min.Div	Accuracy	Remark
RHW-80	v/v: 0-80%	v/v: 1%	v/v: ±1%	Without Atc

Goggles

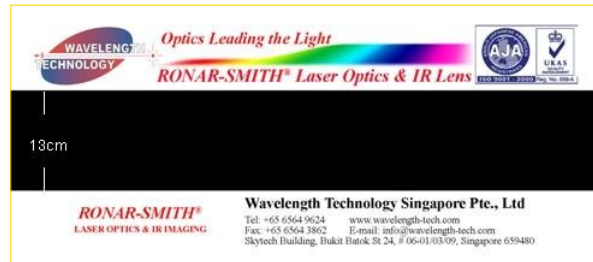


Part No.	Range of Wavelength (nm)	Laser	Typical Wave-length (nm)	Optical Den-sity	VLT (%)
GOGGLE-514/532	200~540	KTP Nd:YAG	532	4+	50
		Argon	514	4+	
GOGGLE-632	600~700	He-Ne	632.8	4+	30
GOGGLE-1064	800~1100	Nd:YAG	1064	4+	40
		Argon	514		
		KTP Nd:YAG	532		
GOGGLE-514/1064	200~540 800~1100	Semi-Conductor	808, 810 904, 980	4+	40
		Nd:YAG	1064		
GOGGLE-10600	10600	CO2	10600	4	98
GOGGLE-694	650~720	Ruby	694	4	30
		Argon	441		
		He-Cd	488		
GOGGLE-266/488	200~450	Excimer	266	4	50
			1510		
GOGGLE-1510/1610	800~1600	Semi-Conductor	1530 1610	4	40
GOGGLE-755	700-820	Semi-Conductor	755	4	40

Laser Testing

Laser Burning Paper

Application: black printed hard paper served as laser burning medium to check the laser beam shape, focused spot size, marking line width, marking field size etc. Applicable for CO₂ laser, Nd:YAG laser, fiber laser etc. It is recommended to use together with Magnifier when measuring spot size and marking line width.

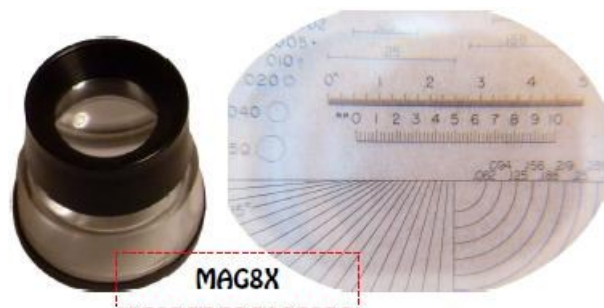


Part No.	Dimension (mm)
BP-1	130*130

Magnifier

The magnification itself is 8X. It is also equipped with Reticles of common measuring scale in inch and metric. This item is very useful to analyze and measure the laser spot size, line width, or even scratch/dig and angle of the bevel of optical components. In short, it is a high quality economic tool. (P/N: MAG8X). It is recommended to use together with Laser Burning Paper.

Part No.	Magnification
MAG8X	8X



Conversion Screens

We carry the world's largest range of conversion screens, covering different power levels and the complete spectral range from UV to NIR. We will gladly assemble a selection of basic equipment for your laser

Part No.	Wavelength (nm)
LDT-007	700-1300
LDT-008	800-1600
LDT-1064B	800-1700
LDT-1064C	780-830 & 870-1070



Laser Lamps

Part No.	Laser Machine
ALPHA LASER GmbH	
LLJK237	Alpha Laser ALS35 (Old Model)
LLK393	Alpha Laser ALS35S (Old Model)
LLK571	Alpha Laser ALW75, ALW100
LLJK574	Alpha Laser ALS35 (New Model)
LLK394	Alpha Laser ALS35S (New Model)
APOGEE	
LLK-S9551	Apogee 6200
BAASEL LASERTECHNIK	
LL200	Baasel Laser 2001, 6000, Starmark, 80750-800
LL512AS	Baasel Laser 600, 80750-005
LL601S	Baasel Laser 601, 80750-006
LL166	Baasel Laser 2001, 6000, Starmark, 80750-009
LL700	Baasel Laser, Starmark 150W, 80750-029
LLXF889	Baasel Laser, Starcut 18, 4001, BLS27, SC18, BLS701, BLS720, BLS710, Starweld, 80750-026
LL1122	Baasel Laser, Starweld 500W, Xenon
LL1123	Baasel Laser, Starweld 500W, Krypton/Xenon 80750-031
CANDELA LASER	
LL5233	Candela lamp part number 05-CAN-12-5
LL4665	Candela lamp part number 05-CAN-24-5
LL5501	Candela lamp part number 05-CAN-24-7
LL-8511	Candela laser model Gentlelase 9908-02-0408
COHERENT/COHERENT GENERAL/LASER INC.	
LLJK71	Coherent Omega 34, Krypton
LL6054	Coherent Omega 34, Xenon
LL7104	Coherent 7900
LL4533	Coherent Antares
LL4669	Coherent Everpulse
LLM14	Coherent M14
LLFDB	Coherent Model 60
LL8588	Coherent Infinity
LL7734	Coherent Versapulse Medical, 0619-450-01, Ultrafine Er:YAG

Part No.	Laser Machine
CONTINUUM	
LLK-S8045	Continuum FL611-06, YG660, YG682, Powerlite 6000, 7000, 8000 and 9000 series (oscillator), Powerlite plus, Surelite I, Macholite, PY61C-10, 203-0019
LLK-S8047	Continuum Surelite III, Powerlite 8000 series Amplifier, Powerlite 9050 Amplifier, Powerlite plus Amplifier, 203-0032
CONTINUUM/QUANTEL U.S.A	
LL5260	Continuum 203-0007
LL5960	Continuum FL408, 203-0022
LL5961	Continuum YG481, FL410, 203-0023
LL5962	Continuum FL406-04, 203-0001
LL6064	Continuum FL-312 Ruby, 203-0026
LL7045	Continuum Minilite I, MiniliteII, 1998 onwards, 203-0039
LL7047	Continuum 203-0041
LL8007	Continuum PC700-10, TO3-008
LL6213	Continuum FL611-09, PY61C-10(Amplifier), PY61C-20, 203-0018
LL6358	Continuum FL-315-09, 203-0009
LL6379	Continuum 203-0027
LL6497	Continuum FL310G, 203-0011
LL6802	Continuum SFL312R
LL7383	Continuum FL-312-Glass, 203-0011
LL7716	Continuum SureliteII, Powerlite 7010, 7020, 7030, 8010 (oscillator), 203-0035
LL7886	Continuum Powerlite 9000 Series Amplifier, Macholite Amplifier, 203-0036
LL8044	Continuum FL611-07, YG517C, YG580, 203-0012
LL8045	Continuum FL611-06, YG660, YG682, Powerlite 6000, 7000, 8000 and 9000 series (oscillator), Powerlite plus, Surelite I, Macholite, PY61C-10-203-0019
LL8046	Continuum FL506-04, PY61-10, 203-0017
LL8047	Continuum Surelight III, Powerlite 8000 series Amplifier, Powerlite 9050 Amplifier, Powerlite plus Amplifier, 203-0032
LL7039	Continuum Minilite 10,20, early models, 203-0037
EPITOUCH	
LLX-S2028	Flashlamp for EXC Alex Epitouch, B/N: WT-EL041018
ERBIUM	
LLX-K1000	Erbium 2J flashlamp 203-0035
FOTONA	
LLK-S7060	Fotona Fidelis (1J)



Optics Leading the Light

RONAR-SMITH® Laser Optics & IR Imaging



Introduction
 RONAR-SMITH® Laser Optics
 Optics for Medical Laser System
 Optics for Spectroscopy Biomedical Application Laser
 Optical Material
 Laser Accessories Components

Part No.	Laser Machine
CONTROL LASER	
LL510S	Control Laser 255, 256, 510, 511
LL512AS	Control Laser 512, 513, Instamark, Script
LL512BS	Control Laser Instamark, Script, Emblem
LL520S	Control Laser 258, 520, H-518, 620
LL4522S	Control Laser 520, Extended arc length
LL532S	Control Laser 531, 532, 534, 536, 630
LL612S	Control Laser 612, Elite, signature, Emblem
LL400S	Control Laser 400, 428, 438, 440-8, 480-16, Huffman, XMR, (Arc Length 101mm)
LL400L	Control Laser 400, 428, 438, 440-8, 480-16; Huffman, XMR, (Arc length 117mm)
LL6645	Control Laser 512 PLUS, Signature 100, Script 100
LL5116	Control Laser, Insignia, Icon
LL264	Control Laser, 258, 520, 620, High stability (30A 117-127V)
CYNOSURE	
LL9551	Cynosure, Apogee
LL9856	Cynosure, LPIR, LCY-7043
LL1158	Cynosure, Photogenica dye lamp
LL1612	Cynosure, Photogenica T10 Alexandrite lamp
ELECTRONIC VALSERIANA	
LLK509	Electronica Valseriana Lamp part number 022500038, Softlight
LL5008	Electronica Valseriana CW Lamp
E.S.I	
LL510S	E.S.I. 25, 44
LL512AS	E.S.I. 44
LL570S	E.S.I. 44, 80, 4000A, 4200, 3570, 3572
LL520S	E.S.I. 44
LL65	E.S.I. Japan
FOTONA	
LLS27	Fotona YAG-22
LL1852(LONG LIFE)	Fotona YAG-22
LL2007	Fotona WL-40 Spotlight, Krypton
LL1448	Fotona WL-40, Laserstar, Xenon
LL2060	Fotona Fidelis, Depilase

Part No.	Laser Machine
KOMATSU	
LLQCW108	Komatsu Q120W, PH15L-1
LL517	Komatsu Q140W
LASER S.O.S	
LL93	Laser SOS 718, compact laser 350 series
LLQCW336	Laser SOS 5530, 6534, 8954, 8955, (35A lamp)
LL218S	Laser SOS 5530, 6534, 854, 8184, 8854 (30A lamp)
LL117E	Laser SOS DSM5000, SOS10TEm3117
LL601S	Laser SOS 6512, 6479, 6612, SOS6512QSS, SOS6479QSS (30A lamp)
LL512S	Laser SOS 6512, 6479, 6612, SOS6512QSS, SOS6479QSS (20A lamp)
LL4462S	Laser SOS 6620, SOS6620QSS
LL854	Laser SOS SOS250W
LL873	Laser SOS compact 330 series
LLXF1045	Laser SOS SOS9525/P120W
LLXF684	Laser SOS sOS9525/P35W, SOS9525/P60W
LASERVALL	
LLPL50	Laservall PL50, PL75, PL100, JL30
LL479	Laservall Vall mark 7,8,10,11
LLK372	Laservall JL15
LLPL50LL(LONG LIFE)	Laservall PL50, PL75, PL100, JL30
LEE LASER	
LL708S	Lee Laser 708, 808, 750, LKA3020
LL4462S	Lee Laser 708, 712, 808, 812, LKA3330
LL93	Lee Laser 715, 718, 818, 815, 825, LKA4030
LL8090LL(LONG LIFE)	Lee Laser 715, 718, 818, 815, 825, LKA4030
LL5206	Lee Laser, LKA5340
LL1689	Lee Laser LKF-650
LUMENIS	
LLX-F531	Laser Lamp for Lumenis 4020 Er:YAG Laser (B/N: M116345)
LLX-F531	Laser Lamp for Lumenis 4020 Er:YAG Laser (Batch: W021901)
LLX-S737	Lumenis Erbium Derma K or Derma 20



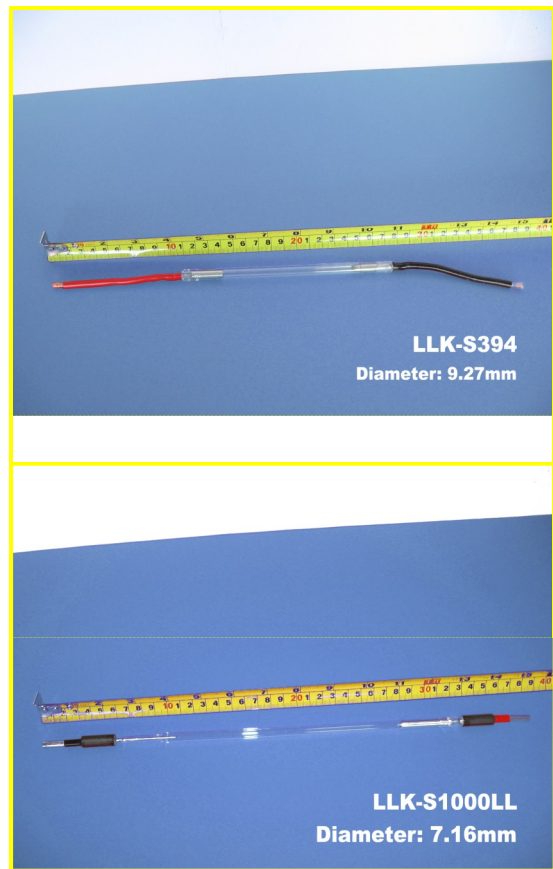
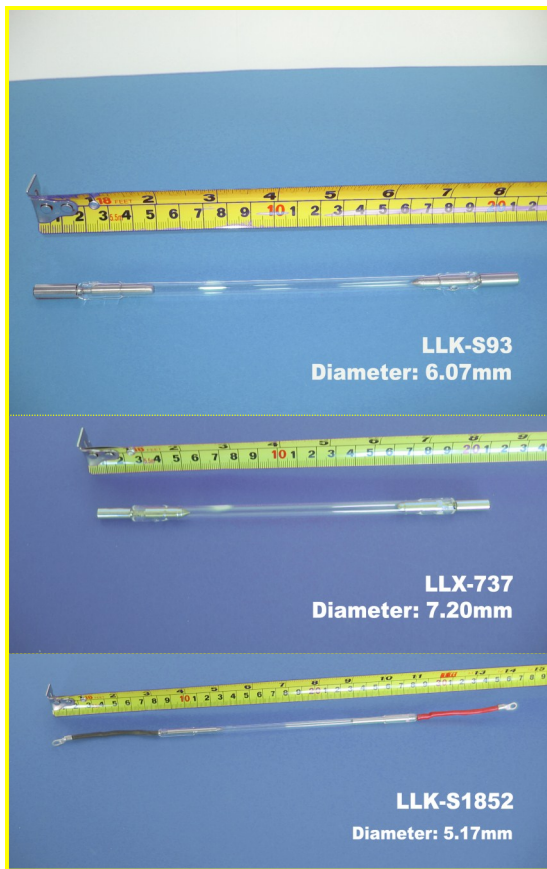
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RONAR-SMITH® Laser Optics & IR Imaging



Part No.	Laser Machine
LUMONICS/JK LASER	
LLJK1	JK MS800, MS330, MS830LD, 12280090A
LLJK26	JK 700, 701, 702, 706, 12280180A, P55B6770B
LLXF69	JK 704, 12280200A, P55F3830B
LLQXF54	JK 2000, HY52, MS25, HY200, HY450, 12280070A
LLXF63	JK MS20, MS35, YM-800 12280020A
LLXF65	JK 2000, HL52, GSG1/6, Derma Ruby Laser, 12280030A
LLXF2	JK MS10, 12280050A
LLJK23	JK MS300, 12280060A
LL5913	JK MS810, 12280100A
LL259	Lumonics Multiwave
LL9153	Lumonics Luxstar LXTR50, P61R4980X, 1228025A, 50W laser
LLX634	Lumonics Luxstar LXTR30, P61Y6980X, 30W laser
LLJK214	Lumonics Screencut P55Y4051B
LL116E	Lumonics Lightwriter Spe
LL93	Lumonics HM series
LL1010	Lumonics Screencut 4000, F410-4
LL2202	Lumonics AM356 Multiwave
N.E.C	
LL545	NEC SL114A, 114F, 114G, SL475H, SL 5 & 5ZA, P2002D
LL547	NEC SL1150G, 1150H, 1150J, 1150K, 116A, 116B, SL475E, SL436G, P2008E
LL546	NEC SL115A, YL452
LL7003	NEC SL117-2C, 3C, 4C
LLQXF337	NEC SL476A2, P2015A
LL5416	NECP2013
LL3171	NEC YL451, P2007
LLQXF345	NEC SL124E, YL478IS, M801B,C, M802C, P2014, P2019
PALOMAR	
LLK-S6962	Palomar Spektrum Ruby
ROFIN SINAR	
LL767	Rofin sinar Evermark 8070, 815, 860, Powerline, 751-015
LL726	Rofin Sinar RSY90Q, RSY120Q,
LL9601	Rofin Sinar RSY300 Pulsed, 710-430, 710-780, 710-799, 710-824
LL1445	Rofin Sinar RSY500, 710-798

Part No.	Laser Machine
SHARPLAN	
LLK-S2028	Sharplan 5100 Alexandrite laser, Epitouch, New version
LLX-S1311	Flashlamp for sharplan Ruby 5000
SHARPLAN, LUMENIS	
LL8586	Epi-Light Hair Removal Laser, Photoderm
LL95	Toshiba LAY618, 652, Sharplan 2100, 3000
LL6790	Sharplan 5100 long pulse Alexandrite laser, Old version
LL2028	Sharplan 5100 Alexandrite laser, Epitouch, New version
LLXF390	Sharplan 2000 Ruby
LL1311	Sharplan 5000 Ruby
SIRO LASERTEC	
LLK394	Siro Laser ALC35, ALO35, SL50, SL75, thunder, Tornado
LLK574	Siro Laser ALS35S, SL50P, LS75P, thunderstorm, Hurricane
LLK571	Siro Laser AL75



Laser Module - RD series

130-250W CW Module

The RD Series Laser Module delivers the reliability and performance of diode pumping to high power industrial and scientific laser systems, virtually eliminating the downtime experienced by older lamp-based laser technologies. Drive your laser system to greater than 250 watts of CW power.

You can use this reliable and efficient pump cavity to serve as the "engine" in new laser system development and production, or to convert your existing lamp-based designs to state-of-the-art diode pumping. The module efficiently pumps a Nd:YAG laser rod by radial arrays of efficiently coupled long lifetime laser diode bars, and delivers good pump uniformity and stable lensing performance. The laser module is powered with low voltage from a reliable solid-state driver, and cooled by re-circulating filtered water from a simple chiller system. Installations need only single phase input power, and central cooling water is not required.

The pump head is excellently suited for high power multi-mode laser installations, such as deep engraving, drilling and micro welding, and can also provide the high stability and beam quality required for higher power TEM₀₀ installations.



Model	Rod Diameter ¹	Output Power ²	Diode Bias Voltage ³	Drive Current ²
RD40-1C2	4 mm	> 130 W	60 VDC	0-38A (25A nominal)
RD50-1C2	5 mm	> 140 W	60 VDC	0-38A (25A nominal)
RD50-2C2	5 mm	> 250 W	120 VDC	0-38A (25A nominal)
RD63-1C2	6 mm	> 150 W	60 VDC	0-38A (25A nominal)
RD63-2C2	6 mm	> 250 W	120 VDC	0-38A (25A nominal)

1. Rod length is 116 mm with flat/flat faces and 0.6% Nd doping
2. Minimum 1064 nm multi-mode output in a short cavity (280 ± 5 mm flat HR/flat 90%R OC) CW oscillator arrangement at delivery.
3. Max current is 38A. Required voltage at the pump head stated w/o consideration for inefficiencies in the electrical system.

** Pulsed versions available.

Green Laser Module

GLMS-01,05,10

Based on our years experiences of laser crystal, we developed the GLMS series of green laser products. We control the quality and cost better by using our own green laser microchip crystal and optics.

Product Features:

- Compact, reliable and sturdy
- APC circuit inside
- High power stability
- Wide operation temperature window
- Low cost



Applications:

- Green Laser pointer
- Alignment
- Survey
- Test & Measurement

Specifications:

Wavelength	532nm
GLMS-01 output power	1mW
GLMS-05 output power	5mW
GLMS-10 output power	10mW
Beam Mode	TEM00
Beam Diameter	<1.5mm
Beam Divergence	<1mrad
Power Time Stability	<3% over 2 hrs
GLMS-01 Power Temperature Stability	<20%
GLMS-05 Power Temperature Stability	<20%
GLMS-10 Power Temperature Stability	<20%
Residual IR	><0.2%
Warm-up Time	><5min
Operating Current	<300mA
Power Supply	DC2.5-3.2V
Control Circuit	>Auto Power Control
Electrical Connection	+Red, -Black
Storage Temperature	-40 ~80
Life Time	>>3000hrs



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Introduction

RONAR-SMITH® Laser Optics

Mounts & Stages

WAVELENGTH TECHNOLOGY provides Laboratory equipment, devices and accessories in Singapore. We have a series of spectroscopy, manual and motorized positioning stages, optics mount and optical tables to offer. Please contact us for more detailed catalogue.

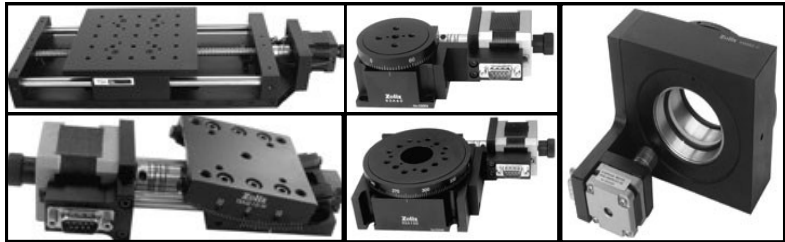
SPECTROSCOPY SERIES

- Emission Spectroscopy
- Absorption Spectroscopy
- Fluorescence Spectroscopy
- Raman Spectroscopy
- LIB Spectroscopy
- LIF Spectroscopy



MANUAL & MOTORIZED POSITIONING STAGES SERIES

- Precision Rotary Stages
- Heavy Duty Translation stages
- Wide Translation stages
- Multi-Axis Translation Stages
- Ultra-High Precision Stages
- Manual Positioning Stages



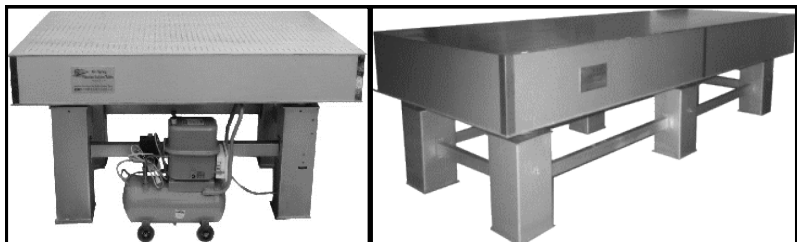
OPTICS MOUNTS SERIES

- Base Plate
- Optics Mount
- Rails & Carriers
- Posts & Holders



OPTICAL TABLE SERIES

- 300X300 to 6000x1500 table area
- Thread Standard M6x25mm



Optics for Medical Laser System

Semiconductor Spectroscopy Biomedical Application Laser

Optical Material

Laser Accessories Components

WAVELENGTH TECHNOLOGY SINGAPORE PTE LTD

Address: Blk 2, Bukit Batok Street 24,
#06-03/09, Skytech Building
Singapore 659480

Tel: 65-65649624

Fax: 65-65643862

Email: info@wavelength-tech.com

Website: www.wavelength-tech.com



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