

**ORIEL  
INSTRUMENTS**

# FAX **BACK**

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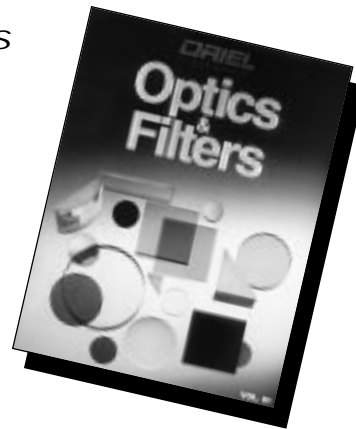
*Thank you for using Oriel's Internet Catalog.*

The following pages describe our Achromatic Lenses. Our complete family of lenses and other optical components is described in the **Optics & Filters Product Guide**. If you'd like to receive this catalog, please fill out the section below and fax this form to us today.

*What else is in the Optics & Filters Product Guide?*

Concave and Convex Lenses • Fresnel Lenses • Cylindrical Lenses • Filters • Polarization Optics • Windows • Mirrors • Beam Splitters • Substrates • Prisms • Optical Coatings, and much more.

Even if you don't have an immediate need, send away for the catalog anyway and keep it accessible for a future need or for the technical articles.



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**COMPLETE THIS FORM & FAX TO (203) 375-0851**

**I WORK IN:**

- A  R & D
- B  Manufacturing
- C  Quality Assurance
- D  University
- E  Consultant
- F  National Labs
- G  Gov't Facility/Military

**I WORK AT THESE**

**WAVELENGTHS:**

- A  100-190 nm
- B  190-320 nm
- C  320-400 nm
- D  400-700 nm
- E  700-1200 nm
- F  1.2-3  $\mu$ m
- G  3-15  $\mu$ m
- H  Over 15  $\mu$ m
- I  380-780 nm
- J  180-1100 nm

**I WORK IN THESE AREAS:**

- A  Spectroscopy
- B  Radiometry
- C  Photobiology
- D  Solar Simulation
- E  Photochemistry
- F  UV Curing

- G  Pharmaceuticals
- H  Material or Chemical Analysis
- I  Process Control
- J  Microscopy
- K  Development/mfg. of semiconductor thin/thick film circuitry, microwave devices
- L  Astronomy
- M  Integrated Optics
- N  Optical Metrology
- O  Machine vision/robotics
- P  Fluorescence
- Q  Environmental Study

**I USE OR MAY USE:**

- A  Optical Tables/Benches
- B  Optical Mounts
- C  Micropositioners
- D  Precision Motorized Drives
- E  Lasers
- F  Arc Lamp Sources
- G  Monochromators/Spectrographs
- H  Spectroscopic Instruments
- I  Radiometers
- J  Detectors

- K  Imaging Systems
- L  Microscopes
- M  Computerized Data Acquisition
- N  Single Fibers, Large Core (>65  $\mu$ m)
- O  Single Fibers, Small Core (<65  $\mu$ m)
- P  Fiber Optics, Bundles
- Q  Fiber Optics, Imaging Bundles
- R  Fiber Sensors
- S  Optical Components
- T  Multichannel Detectors
- U  Quartz Tungsten Halogen Sources
- V  Pulsed Light Sources
- W  Nitrogen Lasers
- X  FFTs (FTIRs)

**I CURRENTLY USE ORIEL PRODUCTS:**

- A  Yes
- B  No

**I WOULD LIKE TO RECEIVE PRODUCT INFORMATION VIA FAX OR E-MAIL:**

- A  Yes

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**Please have a Sales Engineer call me.**

# Oriel ACHROMATIC LENSES

- Useful from 400 to 2000 nm
- Corrected for chromatic and spherical aberrations
- Coated with broadband anti-reflection coating
- 1.0 to 3.0 inch diameters available

These lenses are computer optimized spherical doublets. The lenses are carefully cemented together. They focus collimated light with negligible chromatic and spherical aberrations and coma. We offer them in 1.0 to 3.0 inch (25.4 to 76.2 mm) diameters.

## NEGLECTIBLE CHROMATIC ABERRATION

With a single positive lens, such as the plano convex or bi-convex, there is appreciable chromatic aberration, i.e. the behavior of the lens depends on the wavelength of the light. Shorter wavelengths are focused at a point closer to the lens than longer wavelengths. The cause of this chromatic aberration is that common glass materials exhibit an increase in index of refraction with decreasing wavelength. The lens formula (on page 1-14 of the *Optics & Filters* catalog) shows how the focal length is related to refractive index.

Our achromats focus light of all wavelengths (over the specified spectral range) very close to the same point. As no single lens can have a wavelength independent index of refraction, we make our achromats from two independent lenses; one with a low and the other with a high index of refraction. The achromatic aberrations produced by one lens element are compensated by the other. Fig. 1 compares the chromatic aberration in a plano convex lens and an achromat.

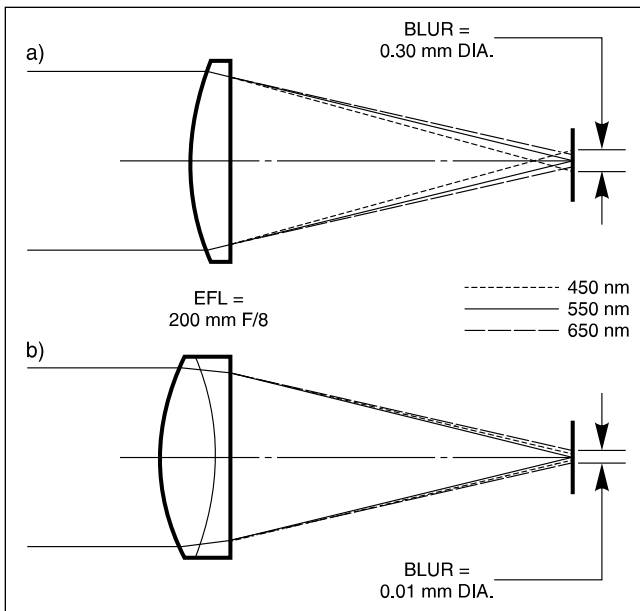
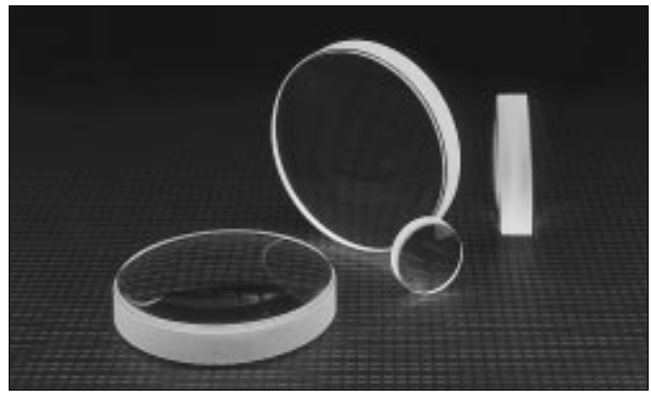


Fig. 1 Chromatic aberration in a simple lens (a) and in an achromatic (b) of identical focal length and F/#.



Various Achromatic Lenses.

## CONSTRUCTION

Our achromatic lenses are composed of two lens elements, typically a low index of refraction ( $n = 1.52$ , BK 7/A crown glass) bi-convex lens and a high index of refraction ( $n = 1.61$ , flint glass) meniscus lens. Each lens element is laser centered and bonded together with a durable optical cement. For optimum performance, these achromats should be oriented so the surface with the lower radius of curvature faces the focus point.

## COMPUTER DESIGNED

These lenses are computer designed to have zero chromatic aberration at two extreme wavelengths: 486.13 nm (blue) and 656.27 nm (red). At intermediate wavelengths the chromatic aberration is extremely low.

Oriel Achromats are practically free from coma and spherical aberration. This gives significant performance advantages even for narrow band applications where the chromatic correction is not needed. The coma correction provides excellent off-axis performance and the spherical aberration correction results in smaller focal spots than obtainable from a single lens of similar aperture.

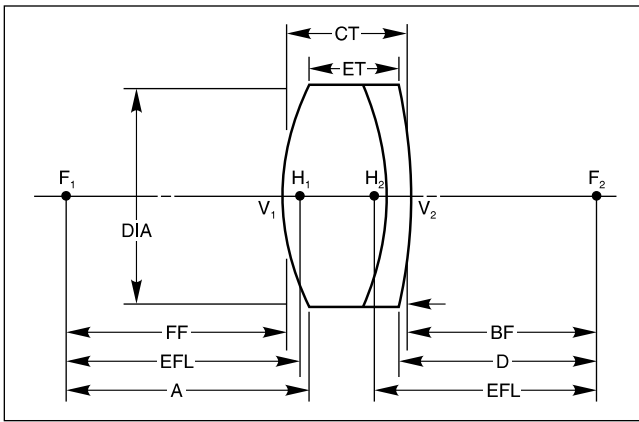
## COATED WITH ANTI-REFLECTION COATING

These lenses are coated with a single layer  $MgF_2$  anti-reflection coating on both sides. The coating is optimized for 400 to 700 nm, reducing surface reflections to 1.5 to 2.0% per surface.

## LENS HOLDERS

A wide selection of lens holders are offered to support these lenses. The simple general purpose mounts hold the lens on a rod. The variety of rod holders and matching hardware give you tremendous mounting versatility. Rod mounted self-centering lens mounts allow quick insertion and removal of the lens in the middle of an optical train. See our Optical Mounts catalog for complete details, or browse through our Electronic Catalog at URL: <http://www.oriel.com/WWW/adv/oriel.html> for a summary.

# Oriel ACHROMATIC LENSES



## SPECIFICATIONS

Effective Focal Length (EFL):	±2%
Diameter (DIA):	+0/- .8
Center Thickness (CT):	±.25
Cosmetics:	60/40
Surface Quality:	2½ x ½ waves @ 546.1 nm
Clear Aperture:	90% of diameter
Centering Accuracy:	2 arc minutes TIA
Designed Wavelengths:	486.1 nm, 587.6 nm, 656.3 nm

All dimensions are in millimeters.

All information is based on a wavelength of 587.6 nm.

## ORDERING INFORMATION



Prices are for U.S. and Canadian customers only, and include U.S./Canadian warranty support. For customers outside these countries, please seek pricing from your local representative. Call the International Sales Department at (203) 377-8282 for a list of authorized Oriel representatives.

EFL	DIA in (mm)	ET	BF	V <sub>1</sub> H <sub>1</sub>	V <sub>2</sub> H <sub>2</sub>	FF	A	D	Glass Type Code*	R <sub>1</sub>	CT Lens #1	R <sub>2</sub>	CT Lens #2	R <sub>3</sub>	Model No.
60.0	1.0 (25.4)	5.8	55.0	1.1	-5.0	58.9	61.3	55.8	A	34.78	7.0	-24.62	2.0	-101.36	42520
80.0	1.0 (25.4)	4.9	76.3	0.6	-3.7	79.5	81.2	76.9	A	46.91	5.9	-32.62	1.4	-132.81	42530
100.0	1.0 (25.4)	5.6	95.9	0.8	-4.1	99.2	100.6	96.4	A	58.25	5.9	-41.09	1.6	-170.28	42540
120.0	1.0 (25.4)	7.9	115.2	0.7	-3.8	119.4	120.5	115.6	A	70.66	7.6	-49.78	2.0	-201.94	42550
160.0	1.0 (25.4)	4.8	156.9	0.8	-3.1	159.2	160.1	157.2	A	93.98	4.0	-65.25	2.0	-267.75	42560
200.0	1.0 (25.4)	4.7	197.1	0.6	-3.9	199.4	200.1	197.3	A	114.73	3.6	-81.92	2.0	-357.21	42570
250.0	1.0 (25.4)	4.6	247.3	0.6	-2.7	249.4	249.9	247.5	A	145.51	3.3	-101.70	2.0	-428.88	42580
400.0	1.0 (25.4)	4.5	397.6	0.5	-2.4	399.5	399.8	397.7	A	233.56	3.0	-163.33	2.0	-684.09	42590
100.0	2.0 (50.8)	10.7	89.6	1.9	-10.4	98.1	103.9	91.6	A	58.39	16.5	-40.83	2.0	-164.44	42629
120.0	2.0 (50.8)	11.1	110.6	2.1	-9.4	117.9	122.6	112.3	A	70.69	13.5	-49.70	4.0	-195.94	42630
160.0	2.0 (50.8)	9.3	152.5	1.4	-7.5	158.6	162.1	153.7	A	93.98	11.4	-65.25	2.6	-264.81	42640
200.0	2.0 (50.8)	9.2	192.9	1.3	-7.1	198.7	201.5	193.8	A	114.73	9.8	-81.92	3.3	-354.28	42650
250.0	2.0 (50.8)	9.6	243.3	1.3	-6.7	248.7	250.9	244.1	A	145.51	9.4	-101.70	3.3	-426.02	42660
300.0	2.0 (50.8)	7.5	295.0	1.3	-5.0	298.7	300.6	295.6	A	175.93	6.0	-123.03	4.0	-506.20	42665
400.0	2.0 (50.8)	10.1	393.8	1.2	-6.2	398.9	400.2	394.3	A	233.56	9.0	-163.33	3.0	-681.45	42670
500.0	2.0 (50.8)	8.5	494.8	0.8	-5.2	499.2	500.3	495.2	A	291.05	8.0	-203.50	2.0	-858.75	42675
600.0	2.0 (50.8)	8.1	595.4	1.4	-4.6	598.6	599.5	595.7	A	357.32	5.3	-246.08	4.0	-980.88	42680
750.0	2.0 (50.8)	8.3	745.5	0.4	-4.5	749.6	750.3	745.7	A	435.57	7.3	-305.25	2.0	-1297.83	42685
1000.0	2.0 (50.8)	8.6	996.2	0.1	-3.8	999.9	1000.4	996.4	A	568.41	5.3	-408.94	4.0	-1837.04	42690
250.0	3.0 (76.2)	11.7	240.1	2.1	-9.9	247.9	252.9	241.8	A	145.51	13.5	-101.70	5.0	-423.39	42740
400.0	3.0 (76.2)	10.8	392.3	1.8	-7.7	398.3	401.4	393.4	A	233.56	10.0	-163.33	5.0	-679.74	42750
600.0	3.0 (76.2)	9.8	594.0	1.6	-6.0	598.5	600.5	594.7	A	357.32	7.6	-246.08	5.0	-979.45	42760

* Glass Type Code	Lens #1	Lens #2
A	BK7	F4

## COATINGS

Oriel supplies standard doublets, as listed above, with MgF<sub>2</sub> antireflection coating on both outside surfaces.

## Lens Sets

All Lens Sets are supplied with a foam filled hard shell case to protect the lenses. (Prices are in USD.)

<b>42450</b>	Set of all eight 1.0 inch (25.4 mm) Lenses	<b>\$ 822.00</b>
<b>42460</b>	Set of all eleven 2.0 inch (50.8 mm) Lenses	<b>\$ 2,066.00</b>
<b>42461</b>	Set of all three 3.0 inch (76.2 mm) Lenses	<b>\$ 781.00</b>