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THORLABS

AL72512-F, AL72525-F, AL72550-F - February 20, 2015

Items # AL72512-F, AL72525-F, and AL72550-F were discontinued on February 20, 2015. For informational purposes, this is a copy of the website content at that time and is valid only for the stated products.

ZNSE ASPHERES

- **Ø1" Laser-Grade ZnSe Aspheres**
- **2 AR Coatings Available: 3 - 5 µm or 8 - 12 µm**
- **Numerical Apertures from 0.22 - 0.67**

AL72525-F

AL72512-F

AL72550-E

AL72512-E
Shown with SCL03
Self-Centering Lens Mount

Hide Overview

OVERVIEW

Features

- Ø1" CVD Laser-Grade ZnSe Substrate
- 2 AR Coating Options: 3 - 5 µm or 8 - 12 µm
- 3 Focal Lengths Available: 12.7, 25, or 50 mm
- Diffraction-Limited Performance (f = 25 and 50 mm)
- Near Diffraction-Limited Performance (f = 12.7 mm)

Precision Aspheric Lenses	
UV Fused Silica	Unmounted
	Mounted
N-BK7 / S-LAH64	Unmounted
	Mounted
Zinc Selenide	Unmounted
Acylindrical Lenses	Unmounted
Axicons	Unmounted

Common Specifications	
Focal Length Tolerance	±1%
Wavelength Range (E-Coated Lenses)	3 - 5 µm
Wavelength Range (F-Coated Lenses)	8 - 12 µm
Surface Quality	80-50 Scratch-Dig
Diameter Tolerance	+0.0 mm / -0.1 mm
Center Thickness Tolerance	±0.1 mm
Glass Type	ZnSe

Thorlabs' Ø1" Zinc Selenide (ZnSe) Aspheric Lenses offer high transmission over the broad spectral range from 0.6 - 16 µm and are available with one of two broadband AR coatings to minimize surface reflection losses: -E for the 3 - 5 µm range or -F for the 8 - 12 µm range. These coatings greatly reduce the high surface reflectivity of the substrate, yielding an average reflectance of less than 1.5% per surface over the entire AR coating range. See the *Graphs* tab for detailed information.

ZnSe lenses are typically used as collimators for laser applications in the 0.6 - 16.0 µm spectral region, such as biomedical and military applications. When used for collimation, the plano surface should face the laser diode or other point source for best performance.

IR Aspheric Lens Selection	
Low NA (0.22)	Maintains beam shape well; ideal for applications requiring a specific beam shape
High NA (0.42 - 0.67)	Ideal for applications requiring high light-gathering ability where spherical aberration is undesirable.

Zemax Files
Click on the red Document icon next to the item numbers below to access the Zemax file download. Our entire Zemax Catalog is also available.

With a higher index (~2.4), ZnSe aspheres can be designed with shorter focal lengths and lower dispersion than comparable aspheres made from other materials, such as CaF_2. Due to the low absorption coefficient of ZnSe, these lenses, particularly with the -F coating, are also well suited for use with high-power CO_2 lasers.

These lenses are manufactured using diamond turning machines and are tested using a surface profilometer to ensure the correct aspheric profile. As a result, these aspheric lenses offer RMS wavefront errors that are typically 20 to 50 times less than similarly sized molded aspheric lenses.

In contrast to their plano-convex counterparts, these ZnSe aspheric lenses focus or collimate light without introducing spherical aberration into the transmitted wavefront. For monochromatic sources, spherical aberration is often what prevents a single spherical lens from achieving diffraction limited performance when focusing or collimating light. Thus, an aspheric lens is often the best single element solution for many applications including collimating the output of a fiber or laser diode, coupling light into a fiber, spatial filtering, or imaging light onto a detector.

When handling optics, one should always wear gloves. This is especially true when working with zinc selenide, as it is a hazardous material. For your safety, please follow all proper precautions, including wearing gloves when handling these lenses and thoroughly washing your hands afterward. Due to the low hardness of ZnSe, additional care should be taken to not damage these lenses. Click here to download a pdf of the MSDS for ZnSe.

Thorlabs will accept all ZnSe lenses back for proper disposal. Please contact Tech Support to make arrangements for this service.

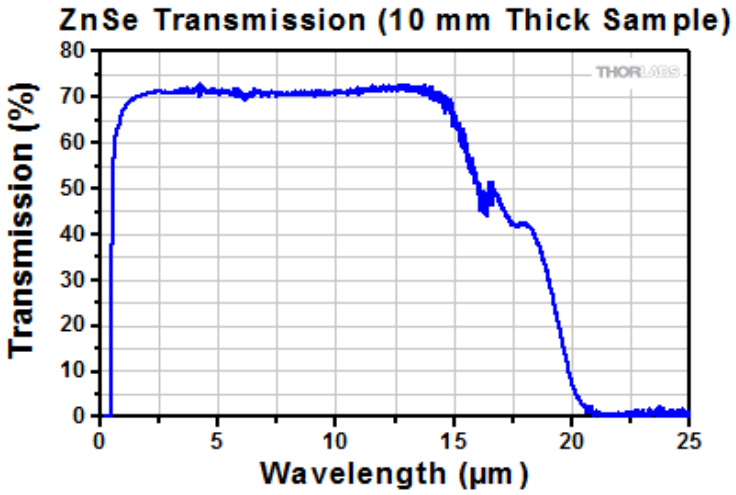
Hide Graphs

GRAPHS

ZnSe Transmission Data

The transmission curve below was obtained using a 10 mm thick, uncoated sample of ZnSe; the incident light was normal to the surface. Please note that this is the measured transmission, including surface reflections.

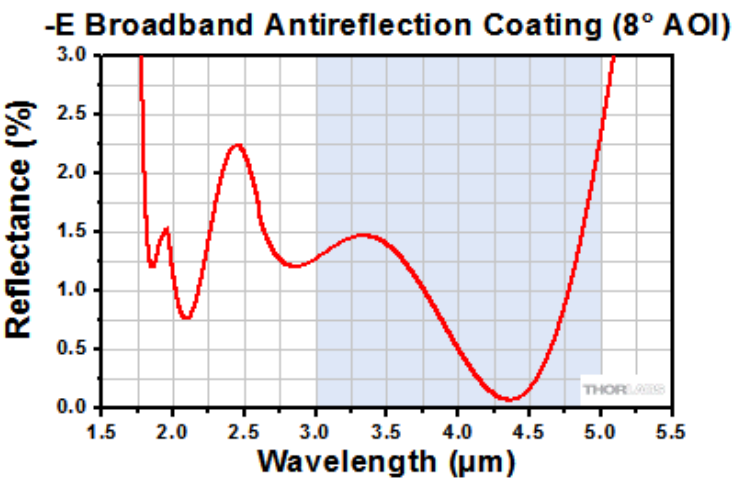
The transmission losses in the 3 - 12 µm wavelength range are primarily due to surface reflections. ZnSe has a high index of refraction (~2.4 at 10.6 µm) in this range. Because of this, our ZnSe aspheric lenses are sold with anti-reflection coatings. To see how these coatings perform, see the reflectance plots below the transmission plot.



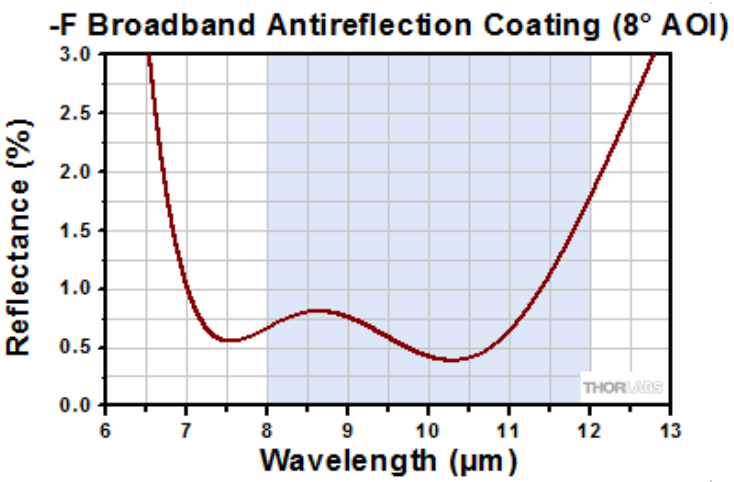
Click to Enlarge

Click Here for Raw Data

ZnSe Reflectance Data



Click to Enlarge
Click Here for Raw Data



Click to Enlarge
Click Here for Raw Data

The plots above show the reflectance (per surface) of AR-coated ZnSe aspheric lenses. The shaded regions represent the range over which the coatings are guaranteed to have an average reflectance of less than 1.5%.

Hide Lens Coefficients

LENS COEFFICIENTS

Aspheric Lens Formula

- Positive radius indicates the center of curvature is to the right of the lens
- Negative radius indicates the center of curvature is to the left of the lens

$$z = \frac{Y^2}{R\left(1 + \sqrt{1 - (1+k)\,Y^2 / R^2}\right)} + A_2 Y^2 + A_4 Y^4 + A_6 Y^6 + A_8 Y^8 + A_{10} Y^{10} + A_{12} Y^{12}$$

Variable Definitions

z	SAG as a function of Y
R	Radius of curvature
k	Conic constant
A_2	2nd order aspheric coefficient
A_4	4th order aspheric coefficient
A_6	6th order aspheric coefficient
A_8	8th order aspheric coefficient
A_{10}	10th order aspheric coefficient
A_{12}	12th order aspheric coefficient

Aspheric Coefficients

Item #	R	k	A_2	A_4	A_6	A_8	A_{10}
AL72512-E	18.252	-0.9809606	0	-1.2305775E-05	-9.0757117E-09	0	0
AL72525-E	35.830	-1	0	-2.0494635E-06	0	0	0
AL72550-E	71.660	-1.07282	0	-2.5228605E-07	0	0	0
AL72512-F	17.804	-1	0	-1.4335797E-05	0	0	0
AL72525-F	35.070	-1	0	-2.0094416E-06	0	0	0

AL72550-F	70.133	-1.439601	0	-1.1330758E-07	0	0	0

Hide ZnSe Aspheric Lenses, AR Coating: 3 -5 µm

ZnSe Aspheric Lenses, AR Coating: 3 -5 µm

Item #	Diameter (mm)	f (mm)	f/d	Clear Aperture (mm)	Numerical Aperture	Working Distance (mm)	Center Thickness (mm)	Refractive Index[a]	Performance	Transmitted Wavefront Error
AL72512-E	25.4	12.7	0.5	>90%	0.67	9.88	7.0	2.4332	Spot Size Cross Section	Near Diffraction Limit
AL72525-E	25.4	25	0.98	>90%	0.42	22.52	6.0	2.4332	Spot Size Cross Section	Diffraction Limited
AL72550-E	25.4	50	1.97	>90%	0.22	47.95	5.0	2.4332	Spot Size Cross Section	Diffraction Limited

- Measured at design wavelength (4.0 µm)

Part Number	Description	Price	Availability
AL72512-E	**Ø1", f=12.7 mm, NA=0.67, ZnSe Aspheric Lens, ARC: 3-5 µm**	**$900.00**	**Today**
AL72525-E	**Ø1", f=25 mm, NA=0.42, ZnSe Aspheric Lens, ARC: 3-5 µm**	**$850.00**	**Today**
AL72550-E	**Ø1", f=50 mm, NA=0.22, ZnSe Aspheric Lens, ARC: 3-5 µm**	**$800.00**	**Today**

Hide ZnSe Aspheric Lenses, AR Coating: 8 - 12 µm

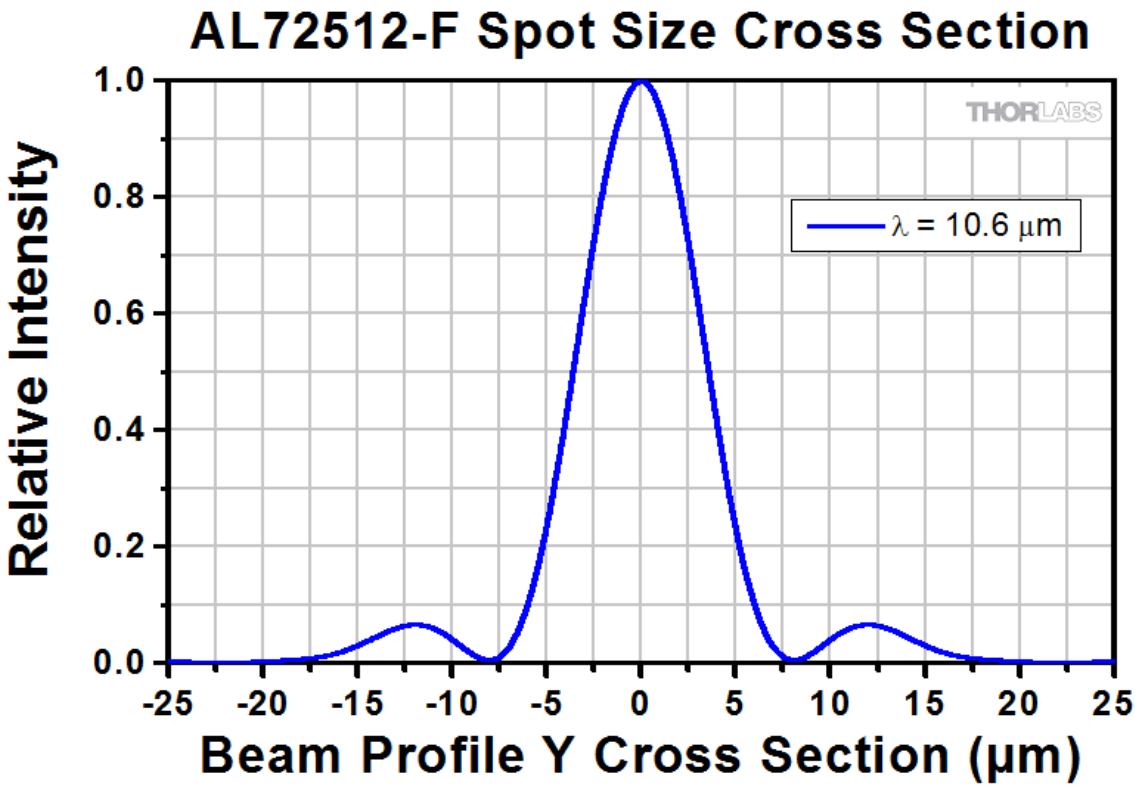
ZnSe Aspheric Lenses, AR Coating: 8 - 12 µm

Item #	Diameter (mm)	f (mm)	f/d	Clear Aperture (mm)	Numerical Aperture	Working Distance (mm)	Center Thickness (mm)	Refractive Index[a]	Performance	Transmitted Wavefront Error
AL72512-F	25.4	12.7	0.5	>90%	0.67	10.22	6.16	2.4027	Spot Size Cross Section	Near Diffraction Limit
AL72525-F	25.4	25	0.98	>90%	0.42	22.51	6.0	2.4027	Spot Size Cross Section	Diffraction Limited
AL72550-F	25.4	50	1.97	>90%	0.22	47.92	5.0	2.4027	Spot Size Cross Section	Diffraction Limited

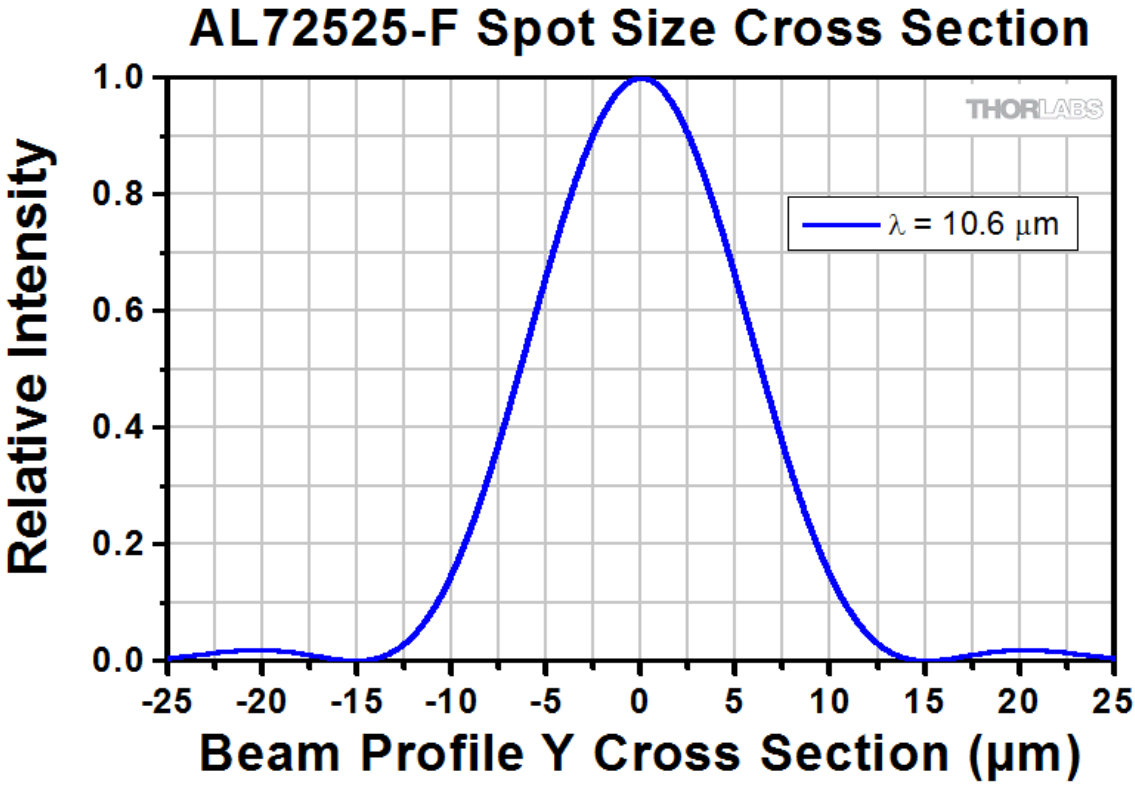
- Measured at design wavelength (10.6 µm)

Part Number	Description	Price	Availability
AL72512-F	**Ø1", f=12.7 mm, NA=0.67, ZnSe Aspheric Lens, ARC: 8-12 µm**	**$900.00**	**Today**
AL72525-F	**Ø1", f=25 mm, NA=0.42, ZnSe Aspheric Lens, ARC: 8-12 µm**	**$850.00**	**Today**
AL72550-F	**Ø1", f=50 mm, NA=0.22, ZnSe Aspheric Lens, ARC: 8-12 µm**	**$800.00**	**Today**

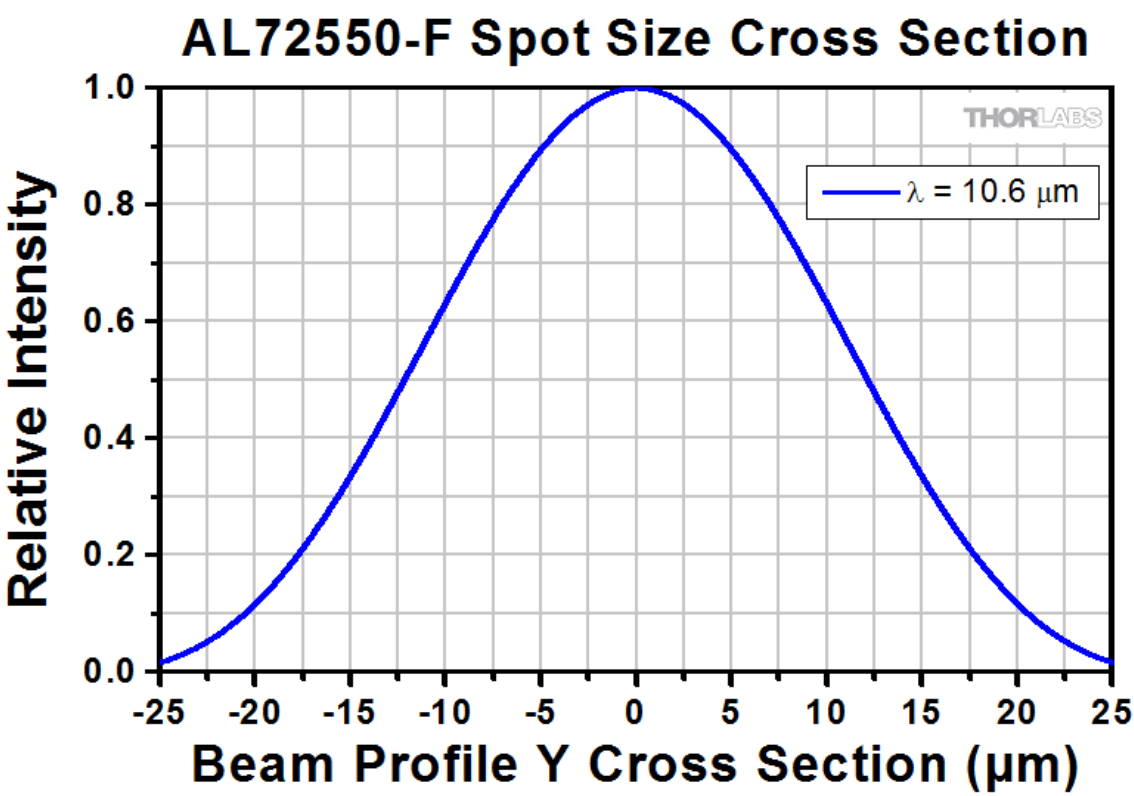
Visit the *ZnSe Aspheres* page for pricing and availability information:
http://www.thorlabs.com/newgrouppage9.cfm?objectgroup_id=5133



The plot above illustrates the spot size distribution for Thorlabs AL72512-F ZnSe Asphere using the Fast Fourier Transform (FFT) algorithm to calculate the point spread function (PSF). This method, while still an approximation, is a much more accurate representation of the spot size than a Geometric PSF, also known as the spot diagram.



The plot above illustrates the spot size distribution for Thorlabs AL72525-F ZnSe Asphere using the Fast Fourier Transform (FFT) algorithm to calculate the point spread function (PSF). This method, while still an approximation, is a much more accurate representation of the spot size than a Geometric PSF, also known as the spot diagram.



The plot above illustrates the spot size distribution for Thorlabs AL72550-F ZnSe Asphere using the Fast Fourier Transform (FFT) algorithm to calculate the point spread function (PSF). This method, while still an approximation, is a much more accurate representation of the spot size than a Geometric PSF, also known as the spot diagram.