Bullseye® Apodizing Filters

Eliminates undesirable intensity variations

$$D = \frac{e^{-(\frac{R}{a})^2}}{e^{-(\frac{x}{a})^2}} \qquad D = e^{-(\frac{x}{a})^2}$$

Bullseye® Normal Apodizing filter, Dark in center

Bullseye® Inverse Apodizing filter, Clear in center

KEY FILTER BENEFITS

PERFORMANCE

Filters can be designed to be used from the UV to the far IR.

ABSORPTION

10% to 35% absorption, depending on coating materials.

FLEXIBILITY

Density gradients can be customized to suit any application.

SIMPLICITY

The filter can be applied to a number of different substrate types & sizes.

UNIFORMITY

Corrects for non-uniformity in illuminations systems.

SIZE

Standard 25mm or 50mm. Customize to your system requirements.

DESCRIPTION:

Bullseye® Apodizing filters are customizable density gradient filters that change radially from the center to the outside of the optical component. These filters are used to eliminate undesirable intensity variations in optical systems or to modify the wavefront of an illumination source.

Standard, catalog Gaussian density distribution filters change in a radial direction from the center to edge or from the edge to the center of the substrate. These filters are manufactured on high quality BK-7 substrates, are available with an optical density from 0.04 to OD3, and come in diameters of 25mm or 50mm.

Reynard Corporation also offers customized Bullseye® Apodizing Filters which can be designed for any mathematical function regardless of the size of the beam. These filters are produced on a custom basis to meet any distribution function, available on any substrate material and size, and can be designed to operate at any wavelength from the UV to the far infrared.

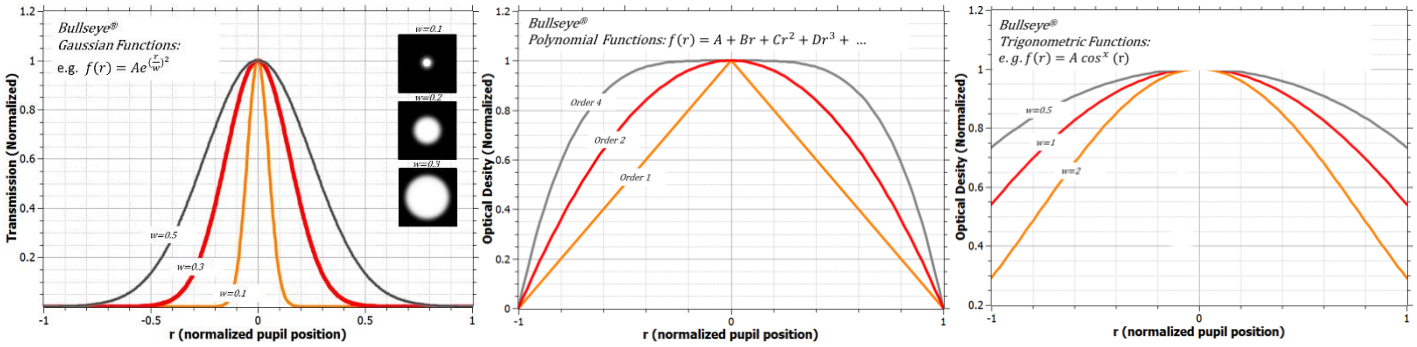
Bullseye® filters come in two configurations, normal and inverse apodizing:

Normal: The Bullseye® normal apodizing filter function decreases in density radially from a dark center, where light is usually at its peak intensity, to the outside edge, where it can become completely transparent. Normal apodizing filters are used to modify a Gaussian light source into a 'top-hat' type of output with a flat wavefront.

Inverse: The Bullseye® inverse apodizing filter function increases density from a clear or light center to a darker outside edge. These filters are typically used to create a well-defined Gaussian wavefront or can be used to eliminate unwanted intensity variations in an optical system.

Contact us to see how we can help your system achieve the high levels of performance of your application.
We will assist you in specifying the Bullseye® Apodizing filter for your needs.

The distribution functions can be defined by either density (D) or transmission (T). These functions can range from a simple linear equation to much more complex algebraic, exponential, or geometric functions as shown below:



Examples of Custom Bullseye® Apodizing density and transmission gradients

SPECIFICATIONS

Property	Value
Substrate Material	BK-7 or equivalent
Dimensions	25mm to 50mm diameter and custom
Optical Density (OD)	0.04 to 5
Surface Quality	80-50 Scratch & Dig
Bevel	45°
Clear Aperture (CA)	90%
Transmitted Wavefront Error	< 2 Waves Per 25mm
Beam Deviation	< 3 Arcminutes
Wavelength	375nm to IR
Calibrated Wavelength	632.8nm
Environmental/Durability	MIL-PRF-13830B, MIL-C-48497A, MIL-C-675C, or similar
Laser Damage	< 30 W/cm^2 CW, typical Not recommended for Pulse Laser Use

APPLICATIONS

- Astronomy: to reduce high intensity light sources around the featured object.
- Entertainment: to make light distribution uneven for cosmetic applications.
- Imaging: to break up diffraction patterns by the introduction of soft edges.
- Industrial: to eliminate detector saturation that occurs in automatic welding machines.
- Military: to eliminate IR detector saturation in ground-to-air and air-to-air missiles.
- Photography: to create soft edges in photos & reduce over exposed areas.
- Scientific: used as a variable phase plate when the gradient coating material has the same index of refraction as the substrate.
- Semiconductor: used in exposing systems to obtain perfect illumination distribution.

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