



# THORLABS

## R1DF400 - JUN 5, 2019

Item # R1DF400 was discontinued on JUN 5, 2019. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

### ANNULAR APERTURE OBSTRUCTION TARGETS

- ▶ Obstruction Diameters Ranging from 42.5  $\mu\text{m}$  to 1700  $\mu\text{m}$
- ▶ Pinhole Diameters Ranging from 50  $\mu\text{m}$  to 2000  $\mu\text{m}$
- ▶ Blocking Region with Optical Density  $\geq 6$
- ▶ 0.5 mm Thick Quartz Substrate in  $\varnothing 1$ " Aluminum Housing



**R1DF200**  
Annular Aperture Target  
Obstruction Diameter = 200  $\mu\text{m}$   
Pinhole Diameter = 1000  $\mu\text{m}$

**Application Ideas**  
R1CA2000 Obstruction  
Target Mounted in  
CXY1Q Translation Mount  
with Quick-Release Plate



#### OVERVIEW

##### Features

- Increase Contrast when Imaging Biological Systems
- Filter Out Lower Order Spatial Modes
- 0.5 mm Thick Quartz Substrate
- Blocking Region (OD  $\geq 6$ ) Created Using a Chrome Mask
- AR Coating Over Chrome Mask to Minimize Back Reflections
- Aluminum Housing with a 1" Outer Diameter

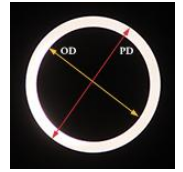
Thorlabs' Annular Aperture Obstruction Targets (AAOTs) are ideal for increasing the contrast when imaging biological systems or filtering out lower order modes. Each AAOT is characterized by the ratio ( $\epsilon$ ) between the obstruction diameter (OD) and the pinhole diameter (PD). Thorlabs offers Annulus Aperture targets that are designed with either a constant 1 mm pinhole diameter for high-pass spatial filtering applications, or a constant  $\epsilon$  ratio for confocal microscopy applications.

They are fabricated from 0.5 mm thick quartz glass substrate that has high transmission in the 400 - 2200 nm wavelength range. The clear aperture annulus is created using a chrome mask with an optical density  $\geq 6$  that blocks light from being transmitted through the inner obstruction target and outer obstruction region. The AAOT is then mounted within a housing that has a 1" outer diameter for mounting within our translation mounts for  $\varnothing 1$ " optics, as shown in the image above. The glass substrate is mounted with the chrome mask facing towards the engraved side of the housing. To minimize back reflections, we recommend having the AR-coated chrome mask facing the light source when used.

**Obstruction Targets: Annular Aperture, Ratios from 0.05 to 0.40**

- ▶ Constant Pinhole Diameter of 1 mm
- ▶ Obstruction Diameters Range from 50  $\mu\text{m}$  to 400  $\mu\text{m}$
- ▶  $\varnothing$ 1" Housing can be Mounted in Many of our Translation Mounts for Fine Alignment
- ▶ Ideal for High-Pass Spatial Filtering Applications
- ▶ Can be Used in Our Pre-Assembled Spatial Filter System

$$\epsilon = \frac{\text{Obstruction Diameter}}{\text{Pinhole Diameter}}$$



Click to Enlarge  
Close-Up Photo of an  
Obstruction Pinhole  
OD: Obstruction  
Diameter  
PD: Pinhole Diameter

These Annular Aperture Obstruction Targets have an obstruction-to-pinhole ratio ( $\epsilon$ ) between 0.05 and 0.40, making them ideal for use as high-pass or edge-enhancement filters. When the Fourier plane is imaged onto the filter, the center region, which contains Gaussian light ( $\text{TEM}_{00}$ ), will become blocked by the center obstruction. This allows the higher order modes of the Fourier plane, which contain diffraction information, to pass through and form the image. This will cause an overall loss of light intensity and generalized, smooth features, but it will enhance any sharp lines or boundaries.

Shown to the right is a close up photo of an obstruction pinhole with the pinhole diameter (PD) and obstruction diameter (OD) labeled. The chrome-masked area appears black, and light is transmitted through the clear aperture.

Item #	$\epsilon$ Ratio <sup>a</sup>	Obstruction Diameter	Pinhole Diameter	Annular Aperture Concentricity		Glass Thickness
				with Respect to Housing <sup>b</sup>	with Respect to Substrate <sup>c</sup>	
R1DF50	0.05	50 $\mu\text{m}$	1 mm	<0.41 mm	$\leq 216 \mu\text{m}$	0.5 mm
R1DF100	0.10	100 $\mu\text{m}$				
R1DF150	0.15	150 $\mu\text{m}$				
R1DF200	0.20	200 $\mu\text{m}$				
R1DF300	0.30	300 $\mu\text{m}$				
R1DF400	0.40	400 $\mu\text{m}$				

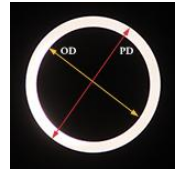
- Ratio of the Obstruction Diameter to the Pinhole Diameter (See Photo to the Above Right)
- Concentricity of the Annulus with Respect to the Outer Diameter of the Quartz Glass Substrate
- Concentricity of the Annulus with Respect to the Outer Diameter of the Aluminum Housing

Part Number	Description	Price	Availability
R1DF50	Customer Inspired! Annular Obstruction Target, $\epsilon = 0.05$ , $\varnothing 50 \mu\text{m}$ Obstruction	\$160.74	Today
R1DF100	Customer Inspired! Annular Obstruction Target, $\epsilon = 0.10$ , $\varnothing 100 \mu\text{m}$ Obstruction	\$160.74	Today
R1DF150	Customer Inspired! Annular Obstruction Target, $\epsilon = 0.15$ , $\varnothing 150 \mu\text{m}$ Obstruction	\$160.74	Today
R1DF200	Customer Inspired! Annular Obstruction Target, $\epsilon = 0.20$ , $\varnothing 200 \mu\text{m}$ Obstruction	\$160.74	Today
R1DF300	Customer Inspired! Annular Obstruction Target, $\epsilon = 0.30$ , $\varnothing 300 \mu\text{m}$ Obstruction	\$160.74	Today
R1DF400	Customer Inspired! Annular Obstruction Target, $\epsilon = 0.40$ , $\varnothing 400 \mu\text{m}$ Obstruction	\$160.74	Lead Time

**Obstruction Targets: Annular Aperture, 0.85 Ratio**

- ▶ Constant  $\epsilon$  Ratio of 0.85
- ▶ Ø1" Housing can be Mounted in Many of our Translation Mounts for Fine Alignment
- ▶ Ideal for Confocal Microscopy Applications
- ▶ Can be Used in Our Pre-Assembled Spatial Filter System

$$\epsilon = \frac{\text{Obstruction Diameter}}{\text{Pinhole Diameter}}$$



Click to Enlarge  
Close-Up Photo of an  
Obstruction Pinhole  
OD: Obstruction  
Diameter  
PD: Pinhole Diameter

These Annular Aperture Obstruction Targets have a constant obstruction-to-pinhole ratio ( $\epsilon$ ) of 0.85, making them ideal for increasing the lateral spatial resolution within confocal imaging systems. These filters are designed to be placed directly in front of the output of a light source such as a fiber-coupled laser. The system should be aligned so that the first bright diffraction spot of the light source is larger than the pinhole diameter of the annular aperture.

These annular apertures are often used in confocal and two-photon excitation microscopy to increase the lateral resolution of the imaging system or in confocal theta fluorescence microscopy to increase the lateral and axial resolution of the imaging system.

Shown to the right is a close up photo of an obstruction pinhole with the pinhole diameter (PD) and obstruction diameter (OD) labeled. The chrome-masked area appears black, and light is transmitted through the clear aperture.

Item #	$\epsilon$ Ratio <sup>a</sup>	Obstruction Diameter	Pinhole Diameter	Concentricity		Glass Thickness
				with Respect to Housing <sup>b</sup>	with Respect to Substrate <sup>c</sup>	
R1CA50	0.85	42.5 $\mu\text{m}$	50 $\mu\text{m}$	<0.41 mm	$\leq 216 \mu\text{m}$	0.5 mm
R1CA100		85 $\mu\text{m}$	100 $\mu\text{m}$			
R1CA200		170 $\mu\text{m}$	200 $\mu\text{m}$			
R1CA300		255 $\mu\text{m}$	300 $\mu\text{m}$			
R1CA500		425 $\mu\text{m}$	500 $\mu\text{m}$			
R1CA1000		850 $\mu\text{m}$	1000 $\mu\text{m}$			
R1CA2000		1700 $\mu\text{m}$	2000 $\mu\text{m}$			

- Ratio of the Obstruction Diameter to the Pinhole Diameter (See Photo to the Above Right)
- Concentricity of the Annulus with Respect to the Outer Diameter of the Quartz Glass Substrate
- Concentricity of the Annulus with Respect to the Outer Diameter of the Aluminum Housing

Part Number	Description	Price	Availability
<b>R1CA50</b>	<b>Customer Inspired! Annular Obstruction Target, <math>\epsilon = 0.85</math>, Ø42.5 <math>\mu\text{m}</math> Obstruction</b>	<b>\$160.74</b>	<b>Today</b>
<b>R1CA100</b>	<b>Customer Inspired! Annular Obstruction Target, <math>\epsilon = 0.85</math>, Ø85 <math>\mu\text{m}</math> Obstruction</b>	<b>\$160.74</b>	<b>Today</b>
<b>R1CA200</b>	<b>Customer Inspired! Annular Obstruction Target, <math>\epsilon = 0.85</math>, Ø170 <math>\mu\text{m}</math> Obstruction</b>	<b>\$160.74</b>	<b>Today</b>
<b>R1CA300</b>	<b>Customer Inspired! Annular Obstruction Target, <math>\epsilon = 0.85</math>, Ø255 <math>\mu\text{m}</math> Obstruction</b>	<b>\$160.74</b>	<b>Today</b>
<b>R1CA500</b>	<b>Customer Inspired! Annular Obstruction Target, <math>\epsilon = 0.85</math>, Ø425 <math>\mu\text{m}</math> Obstruction</b>	<b>\$160.74</b>	<b>Today</b>
<b>R1CA1000</b>	<b>Customer Inspired! Annular Obstruction Target, <math>\epsilon = 0.85</math>, Ø850 <math>\mu\text{m}</math> Obstruction</b>	<b>\$160.74</b>	<b>Today</b>
<b>R1CA2000</b>	<b>Customer Inspired! Annular Obstruction Target, <math>\epsilon = 0.85</math>, Ø1700 <math>\mu\text{m}</math> Obstruction</b>	<b>\$160.74</b>	<b>Today</b>

Visit the *Annular Aperture Obstruction Targets* page for pricing and availability information:

[https://www.thorlabs.com/newgrouppage9.cfm?objectgroup\\_id=8531](https://www.thorlabs.com/newgrouppage9.cfm?objectgroup_id=8531)