

DIOPTAR™ Adaptive Lenses

DP10™



DP15™



The DP™ is the newest family of our adaptive lenses, constructed from injection-molded polycarbonate, enabling a light-weight and rugged solution for numerous imaging applications. To enable low power actuation, the DP lens family utilizes an all-capacitive-load actuation subsystem. This feature makes the DP™ lenses ideal for mobile applications where electrical power is limited.

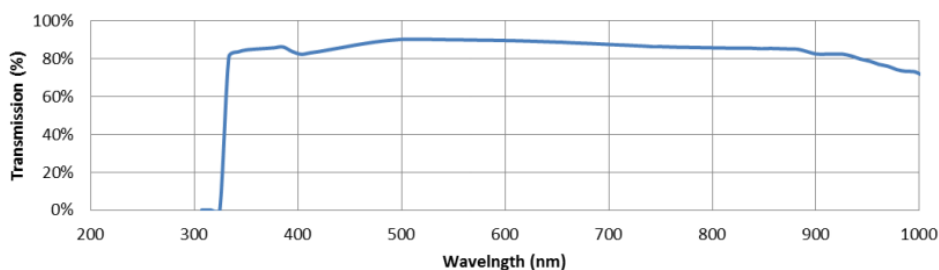
POWER CONSUMPTION :

The DP™ is an electrically-actuated adaptive fluidic lens whose focal length is controlled by the application of voltage. The lens exhibits its longest focal length when no voltage is applied; and shortest when the maximum voltage is applied. Lens actuation may be achieved by the application of 0 to +440 VDC (peak-to-peak) from any power supply intended to drive a purely capacitive load (high voltage low current). The lens draws a small amount of power when the focal length is changed, and nearly no power (< 1 mW) to maintain a specific focal length. Current draw is a function of actuation frequency and total power draw scales linearly.

SPECTRAL RANGE

The DP™ exhibits approximately 90% transmission across the visible and near-IR spectral range. Custom options are available for high transmission across other spectral bands..

Transmission vs Wavelength





Features:

- Low aberrations independent of orientation
- Wide range of dioptric power
- Low power consumption
- Wide temperature range
- Large aperture
- Light weight
- Compact

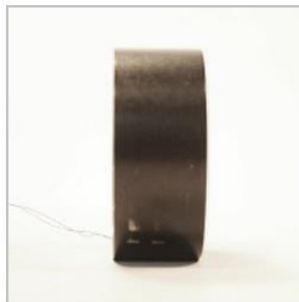
Applications:

- Surveillance cameras
- Targeting systems
- UAVs
- Helmet-mounted or visor displays
- Machine vision
- 2D and 3D display systems
- LED and illumination and more...

SPECIFICATION:

	DP10™	DP15™
OPTICAL		
Focal Length Range	50 to 1800 mm	180 to 1800 mm
Clear Aperture	10 mm	15 mm
Wavefront Error at 633nm	300 nm (RMS)	300 nm (RMS)
Transmittance	>90% (with AR coating, vis spectrum standard, others available)	
Frequency Range	0 - 60 Hz	
PHYSICAL		
Dimensions	50.5 mm Diameter 12.5 mm Thickness	
Weight	40 g	
Mounting	fits standard 2" lens tube	
ELECTRICAL		
Control Method	0 to 5 volts to Holochip power supply (0 to 440 volts to lens)	
Holding Power	<1 Mw	

MAGNITAR™ Adaptive Lenses



MAGNITAR™

The MAGNITAR™ is a large aperture, high resolution adaptive lens with high laser power handling capabilities. The lens has a large aspect ratio (aperture to bezel) and is easily integrated into imaging systems where space is at a premium.

Applications

- Adaptive zoom (imaging, scopes/binoculars)
- Display system
- Machine vision
- Laser control
- Ophthalmology

Competitive advantage

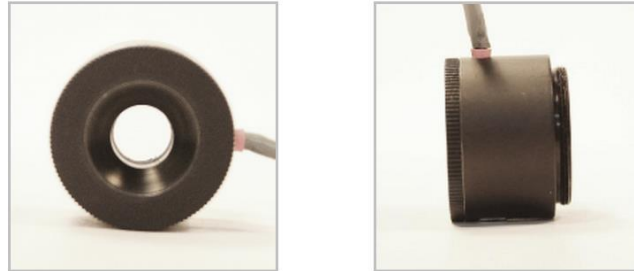
- Performance comparable to glass singlets
- Low power
- Large aperture
- High frequency response
- High fluence performance

SPECIFICATION

OPTICAL	
Focal length range	3333mm to inf
Clear aperture	40mm
Wavefront error at 633nm	300nm (RMS)
Transmittance	>90%
Focal length variation frequency range	0 - 20kHz
PHYSICAL	
Dimensions	Diameter: 55.9 mm Length: 29.2 mm
Mounting Method	Standard 2" mount threads
Weight	65 g
ELECTRICAL	
Control Method	Current Controlled 0 to 1000 mA
Voltage	5v
Max power	5 W

APX™ Adaptive Lenses

APX1007™



APX™

The APX™ is an electrically actuated lens equally suited for use in lab environments, laser machining, machine vision, and imaging and numerous other applications. The focal length may be altered very rapidly, up to 20 kHz, by delivering a control signal of 0-5v to the system. The APX™ is the first adaptive lens capable of providing optical performance comparable to that of a glass singlet.

Applications

- Adaptive zoom (imaging, scopes/binoculars)
- Display system
- Machine vision
- Laser control
- Ophthalmology

Competitive advantage

- Performance comparable to glass singlets
- Low power
- Large aperture
- High frequency response
- High fluence performance

SPECIFICATION

OPTICAL	
Focal length range	400-1000mm
Clear aperture	10mm
Wavefront error at 633nm	300nm (RMS)
Transmittance	>90%
Focal length variation frequency range	0 - 20kHz
PHYSICAL	
Dimensions	Diameter: 30.5 mm Length: 29.2 mm
Mounting Method	Standard 1" mount threads
Weight	37 g
ELECTRICAL	
Control Method	0 to 5 power supply (0 to 440 volts to lens)
Holding power	<.1 mW

manually-adjustable variable-focal length fluidic lens

APL1050™

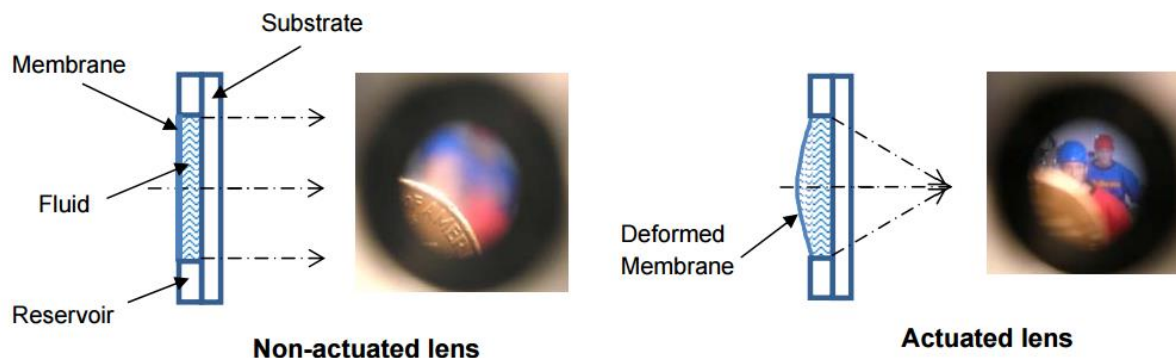


■ APL™

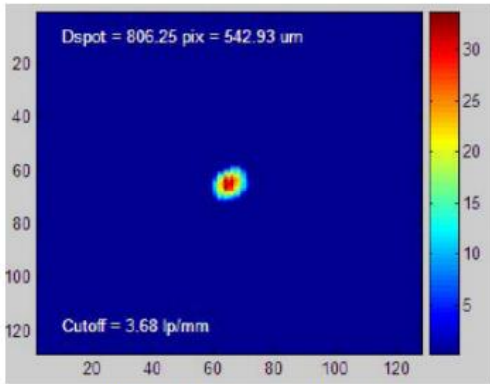
The APL™ was the first product released and provides a useful addition to any optics lab's toolbox of lenses. The APL™ is a manually-adjustable variable-focal length fluidic lens. By rotating the outer ring of the lens, the focal length may be adjusted, allowing the lens to replace a plethora of traditional singlets, making the APL™ ideal for rapidly prototyping new optical systems without the need for host of static lenses.

■ How it work

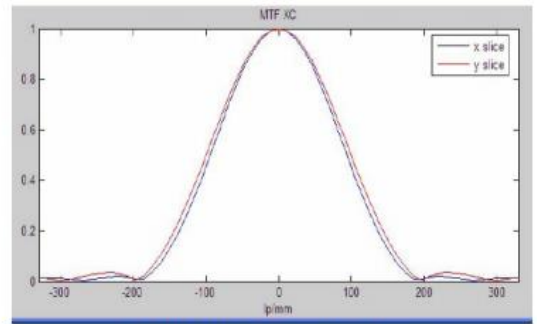
A lens core of the APL™-1050 includes a lens fluid, an AR-coated and polished glass substrate, and a transparent elastomeric membrane. The highly-inert and noncompressed optical fluid is hermetically sealed inside the lens core. The lens core is encased in a housing that includes an actuation mechanism and angular markings. A portion of the lens core extends outside of the housing and has a ring-shaped grip for rotary manual actuation. Rotation of the grip changes pressure in the lens core. The resulting change in the membrane radius of curvature is observed as a change in focal length of the lens.



■ MTF

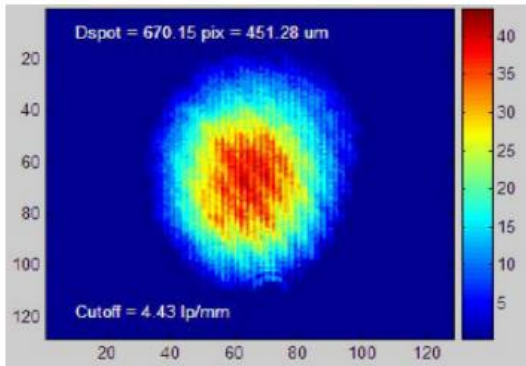


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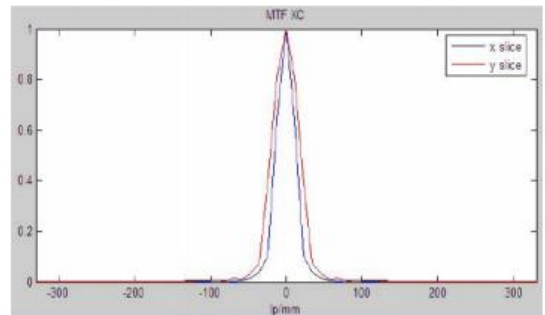


(MTF Data: line/mm)

Fig 1. Actual data of MTF of APL-1050 @ Focal Length 35.6mm, $\lambda=532\text{nm}$



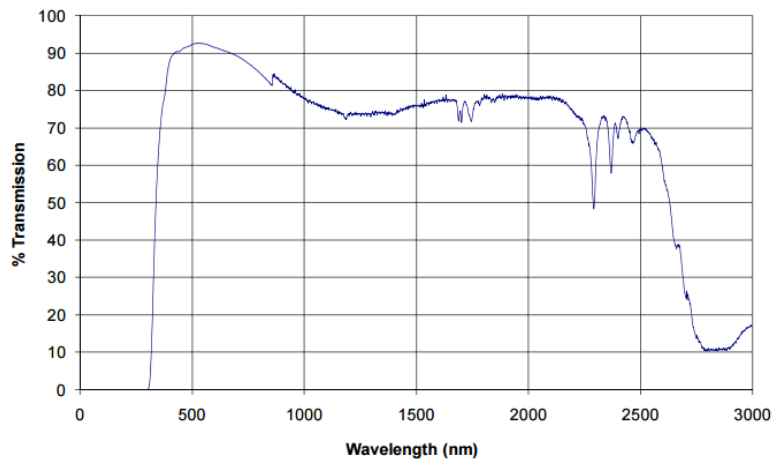
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(MTF Data: line/mm)

Fig 2. Actual data of MTF of APL-1050 @ Focal Length 650mm, $\lambda=532\text{nm}$

■ Transmission Curve

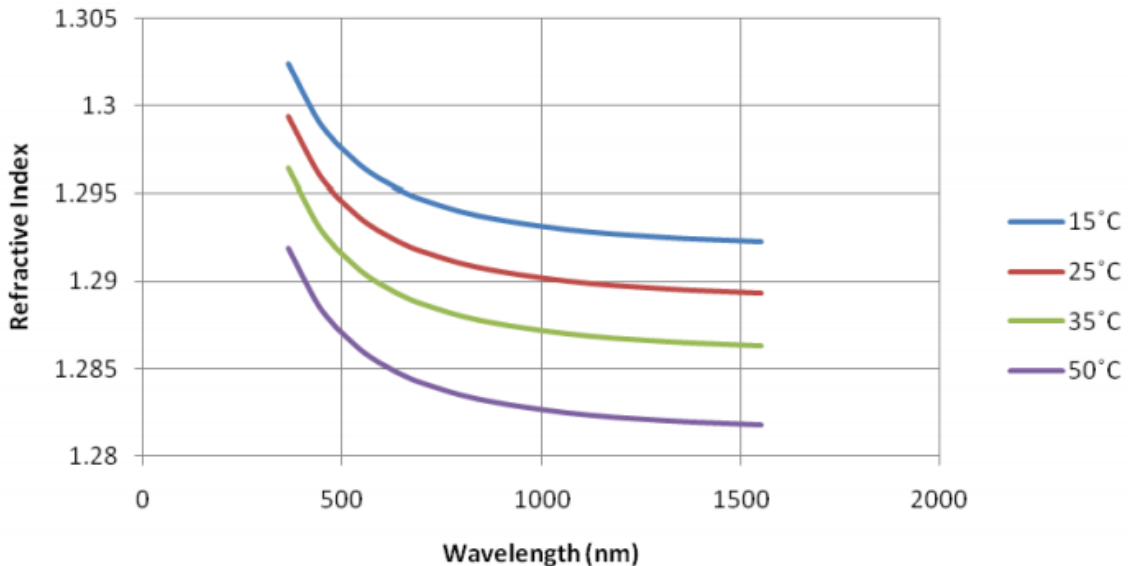


Transmission for the APL-1050. Note, the front window on the APL includes a visible-wavelength anti-reflection coating. Higher transmission at UV and near-IR wavelengths is possible with custom coatings.

■ Refractive Index

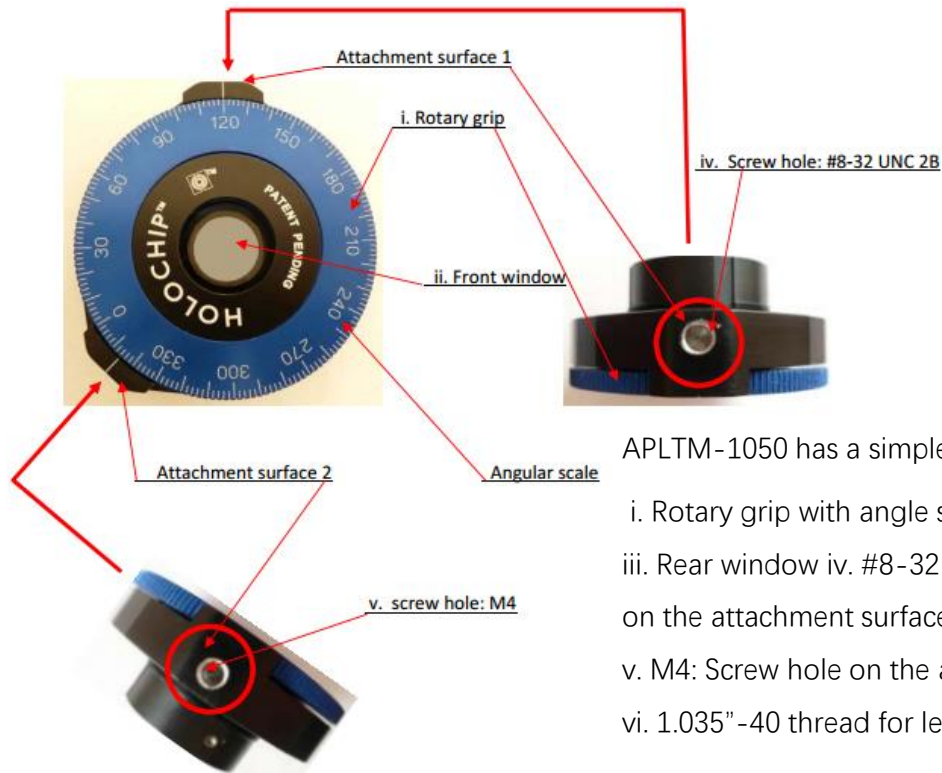
Refractive Index	Source of Spectral Line	Wavelength (nm)	Lens polymer @25°C
	g	g: 435.84	1.29632
	F'	F': 479.99	1.29502
	F	F: 486.13	1.29487
	e	e: 546.07	1.29361
	d	D: 587.562	1.29296
	D	D: 589.3	1.29293
	C'	C': 643.85	1.29225
	C	C: 656.27	1.29212
Abbe #		vd	106.81
		ve	106.16
dn/dT			Liquid 15°C to 50 °C
			-0.0003

Refractive index of the APL lens fluid at typical spectral lines.



Refractive index of the APL lens fluid of at 15, 25, 35 and 50 °C. Fluids with different indexes are available with custom order.

■ Description of Parts



APLTM-1050 has a simple structure as follows:

- i. Rotary grip with angle scale
- ii. Front window
- iii. Rear window
- iv. #8-32 UNC 2B: Screw holes on the attachment surface 1
- v. M4: Screw hole on the attachment surface 2
- vi. 1.035"-40 thread for lens mount

■ Applications

- Replacement for glass singlets
- Adaptive Illumination systems
- Optical system prototyping
- Ophthalmology

■ SPECIFICATION:

OPTICAL	
Focal length range	20 to 1000 mm
Clear aperture	10 mm
Wavefront error at 633nm	300nm (RMS)
Transmittance	>90%
PHYSICAL	
Dimensions	Diameter: 45.7 mm Length: 19.1 mm
Mounting Method	#8-32 screw, M4 screw, 1" lens mount threads
Weight	54 g