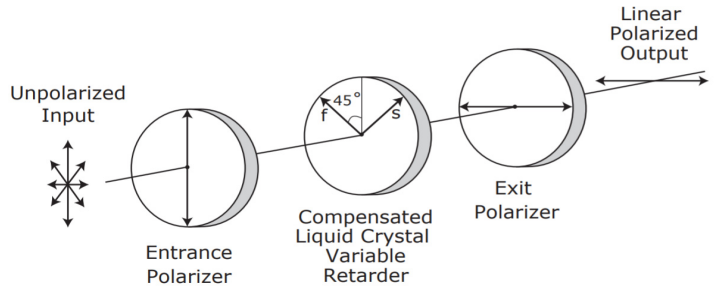
Liquid Crystal Variable Attenuator

Meadowlark Optics' Liquid Crystal Variable Attenuator (LCVA) offers real-time, continuous control of light intensity. Our attenuator consists of an LC Variable Retarder (with attached compensator) operating between crossed linear polarizers. With crossed polarizers, light transmission is maximized by applying the correct voltage to achieve half-wave retardance from the LC cell. Half-wave operation rotates the incoming polarization direction by 90°, so that light is passed by the second polarizer. Minimum transmission is obtained with the retarder operating at zero (or a whole number of) waves.

Transmission decreases as the applied AC voltage amplitude increases (half- to zero-waves retardance). The relationship between transmittance T and retardance (in degrees) for crossed polarizer configuration is given by: $T(\Theta) = 1/2\ [1 - \cos(\Theta)]$ Tmax where Tmax is the maximum transmittance when retardance is exactly one-half wave (or 180°).

Maximum transmission is dependent upon properties of the LC Variable Retarder as well as the polarizers used in your system.

Extinction ratio is defined as the maximum transmission (LC cell at half-wave) divided by the minimum transmission (LC cell at zero waves). Values exceeding 1000:1 can be obtained for a single wavelength by optimizing the applied voltage levels for minimum and maximum transmission. We guarantee a minimum extinction ratio of 500:1 at your specified wavelength.



Standard Liquid Crystal Variable Attenuator design uses crossed linear polarizers



Key Features

- High contrast ratio
- Computer control capabilities
- Continuous control of light intensity

Liquid Crystal Suite

Variable Retarders
Liquid Crystal Variable Retarder
UV Variable Retarder
MWIR Variable Retarder
OEM LCVR

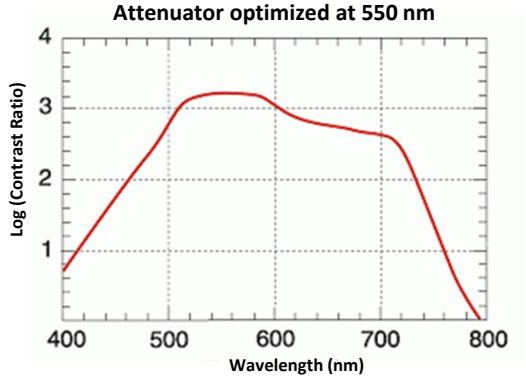
Rotators
Achromatic High Speed Rotator
Binary Rotator
Polarization Rotator

Shutters / Attenuators
Achromatic High Speed Shutter
High Contrast Shutter
Variable Attenuator

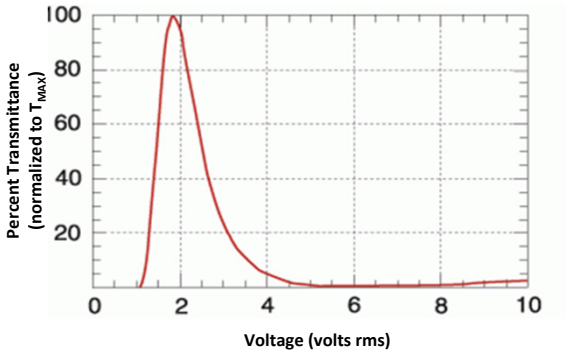
Controllers
Analog Controller
FLC Controller
LC Digital Interface Controller
Temperature Controller
Two Channel High Voltage Controller

A Liquid Crystal Variable Attenuator can be configured with high efficiency calcite or beamsplitting polarizers to maximize light transmittance and increase damage threshold. With a linearly polarized input beam and a calcite polarizer, transmittance values exceed 90% at most wavelengths. Very high extinction ratios, in excess of 5000:1, can be achieved with custom double attenuators. In this design, two Liquid Crystal Variable Retarders are combined with three polarizers.

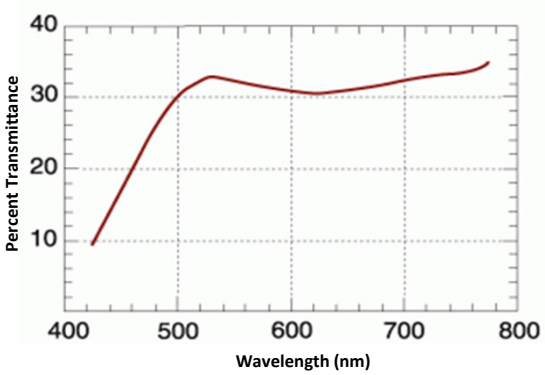
Typical Contrast Ratio of a Liquid Crystal Variable Attenuator optimized at 550 nm



Normalized transmittance of Liquid Crystal Variable Attenuator with crossed linear polarizers at a single wavelength



Unpolarized Transmittance as a function of wavelength for LC Variable Attenuator, optimized for 550 nm, with polarizers and unpolarized input



SPECIFICATIONS

Retarder Material	Nematic liquid crystal with Birefringent polymer
Polarizer Material	Dichroic polymer
Substrate Material	Optical quality synthetic fused silica
We offer standard liquid crystal variable attenuators to cover four spectral regions: VIS: 450 – 700 nm IR 1: 650 – 950 nm IR 2: 900 – 1250 nm IR 3: 1200 – 1700 nm	
Contrast Ratio	500:1 at single wavelength
Transmitted Wavefront Distortion (at 632.8 nm)	≤ λ/4 (each component)
Surface Quality	40 – 20 scratch-dig
Beam Deviation	≤ 2 arc min
Reflectance (per surface)	≤ 0.5% at normal incidence
Diameter Tolerance	±0.005 in.
Temperature Range	0˚C to + 50˚C
Recommended Safe Operating Limit	1 W/cm², CW (with dichroic polarizers)

ORDERING INFORMATION

Diameter in. (mm)	*Clear Aperture in. (mm)*	*Thickness in. (mm)*	*Part Number*
1.00 (25.4 mm)	0.37 (9.4 mm)	1.23 (31.24 mm)	LVA – 100 – λ
2.00 (50.8 mm)	0.70 (17.8 mm)	0.75 (19.05 mm)	LVA – 200 – λ
3.00 (76.2 mm)	1.60 (40.64 mm)	1.00 (25.4 mm)	LVA – 300 – λ

Please specify operating wavelength λ in nanometers when placing your order
Custom sizes are available.

meadowlark optics

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