

ARCOptix

Variable Attenuator

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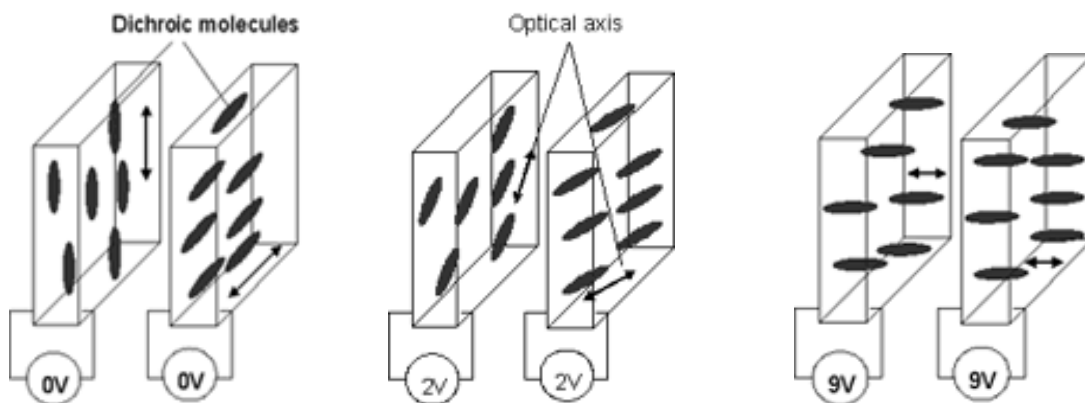
Voltage controlled light beam attenuation

The arcoptix variable attenuator functions as a variable gray filter from 350nm to 700nm. The attenuator can be continuously tuned by setting the amplitude (between 0 and 20V) of a square wave signal (at least 50Hz and with polarity change).

The device offers several advantages:

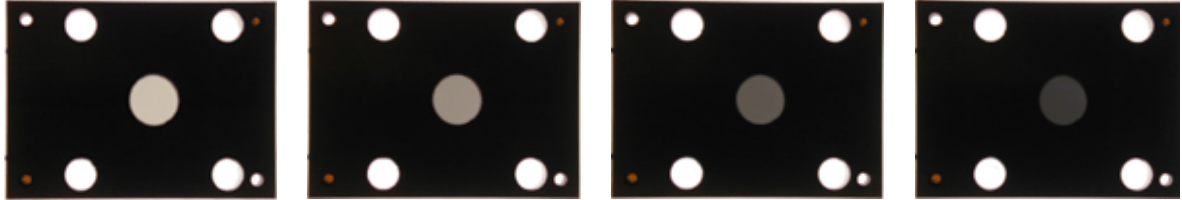
- **voltage tunable**
- **no moving parts**
- **limited wavelength dependency**
- **functions over the whole visible spectrum**
- **polarization independent**
- **polarization maintaining**
- **compact**

The Arcoptix variable attenuator is based on a combination of the LC cells with perpendicular optical axes. The LC cells are filled with a special mixture of liquid crystal and dichroic molecules. The two cells act as a polarizer and analyzer with a kind of variable dichroicity (or specific polarization absorption). By applying a bias the optical axes on these two cells can be tilted and the absorption of the light that propagate normally to the cells is reduced.



The dichroic molecules of the two cells are tilted forward when a bias is applied to the cell

The pictures below shows the white light transmission of the VA65 for increasing applied voltages:

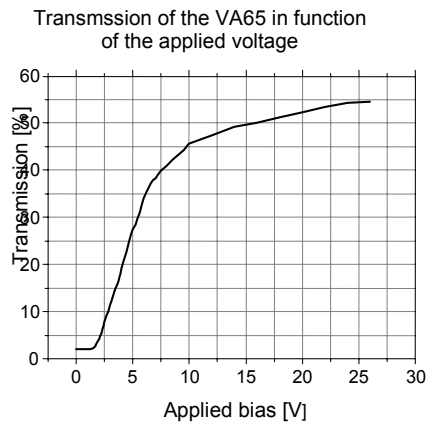
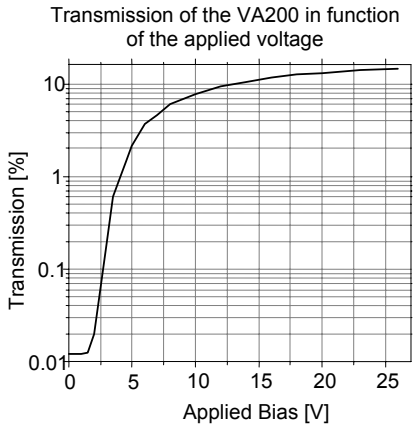


Specifications

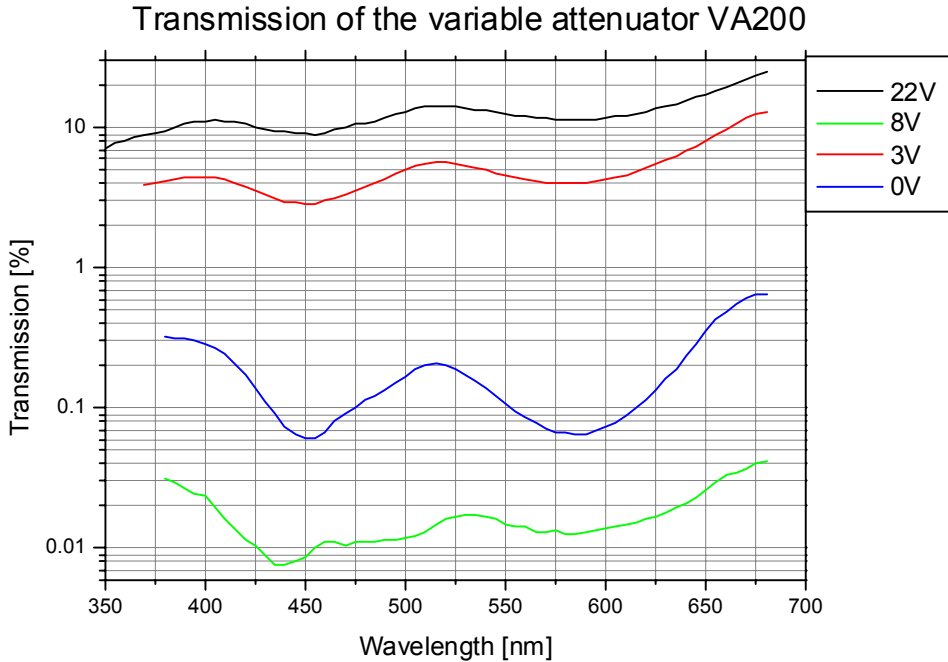
For an attenuator with a 10mm aperture the specs are given by the table below:

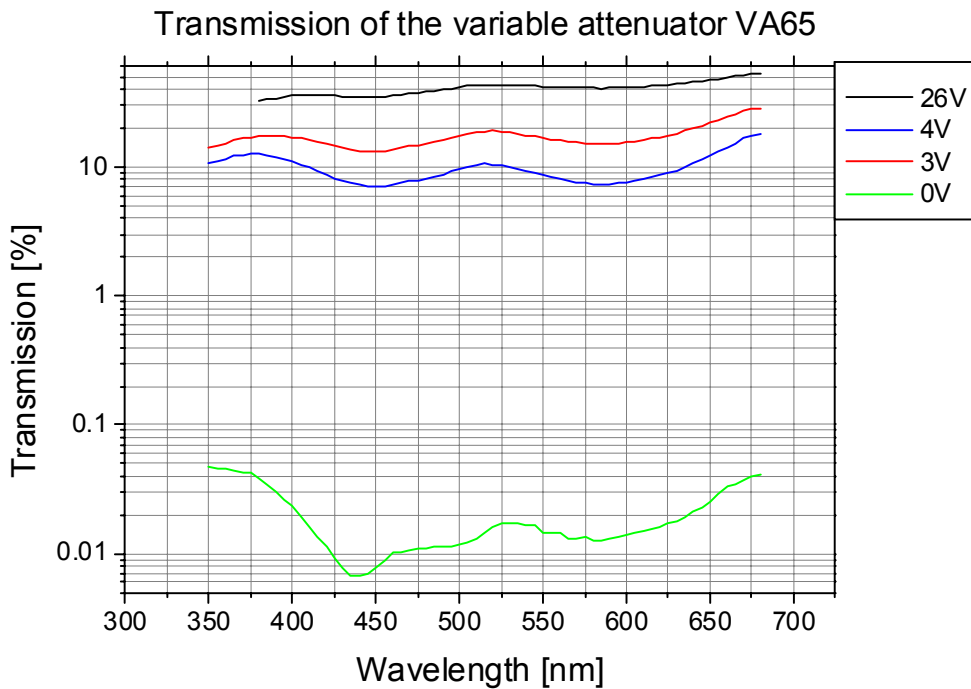
Useable aperture	10 mm
Transmission for Model VA200 Model VA65	From 0.1 to 10^{-4} (at 633nm) From 0.5 to $1.5 \cdot 10^{-2}$ (at 633nm)
Transmission uniformity	Better than 0.3%
Voltage range	0-20 V (square wave)
Wavelength range	350-700 nm (optimal performances between 400 and 650nm)
Temperature range	10° - 50° C
Cell size	27x27x5mm
Total size with housing	40 x 55x8mm

The transmission in function of the driving voltage is given below for the two standard models:



The transmission curves in logarithmic scale of our two standard models VA200 and VA65 are given below:





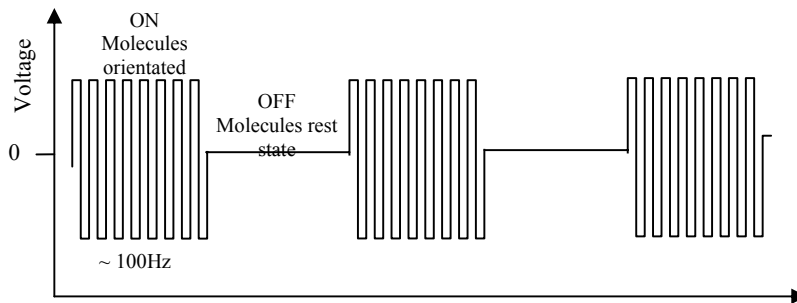
Electrical driving

In principle the phase shifter can be adjusted by simply applying a DC bias on both sides of the cell. Unfortunately this will in practice not work very well. Impurity ions present in the LC material such as alkaline-earth metals cause a leakage current to flow across the cell gap when a voltage is applied to the cell. This ion migration may destroy the helical stacking structure and initiate irreversible degradation chemical reactions. If driven with a DC voltage, impurity ions present may migrate towards the alignment layers under the action of the electric field and become embedded at the cell surfaces. Upon removal of the applied voltage thereafter, an electrical field across the liquid crystal may persist due to the captured charges and hence hinder cell switching.

For this reason, LC cells are usually driven with AC square-wave voltages of between ± 3.0 and ± 10 volt whereby the polarity is rapidly switched at speeds of up to 1KHz (the frequency is not very important, typically more than 10Hz) in order to prevent impurity ion migration from occurring. A priori, it may be expected that activation of the LC cell with AC voltage might cause the molecules to rotate. However in

practice interactions between the LC molecules themselves hinder this and if the polarity change is rapid enough (which is generally the case for a square wave) the molecules “do not have enough time to react”. Polarity reversal (when it is performed quickly) of the driving electronics will therefore have no effect upon the alignment of the molecules and the performance of the device is only dependent upon the root-mean-squared (rms) voltage and not on the polarity of the external field.

Notice that the attenuation stays constant when applying a square shaped function because of the slow reaction time of the LC molecules. Only slowly varying applied voltages below 100HZ may change the phase shift.



LC Driver

Optionally Arcoptix can provide a special dedicated driver for the LC variable phase shifter.

The LC driver provides a stable 10KHz square shaped output AC bias that can be precisely adjusted between 0 and 27 Vrms. A LCD panel indicates the output voltage with a precision of 0.1 V. This allows adjusting the attenuation with a precision of about 10 nm when working between 0 and 10V. The output bias can be additionally computer controlled with a control input. The control input must be supplied with a bias between 0 and 4V.

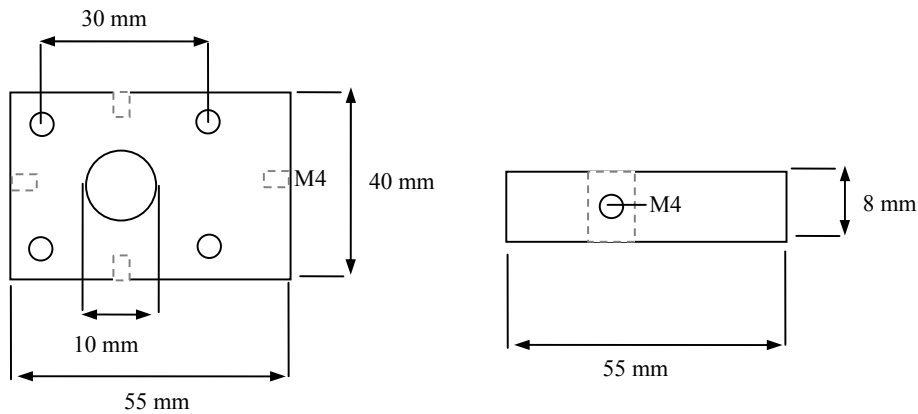
The driver must be supplied with 110V/220V.



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Housing

The Housing is made of anodized aluminum. It has an M4 thread on every side and it is compatible with spidler&hoyer components.



Custom Design

Design and quotes for custom specifications such as attenuation range, switching time, active area, , total size, housing can directly be asked by sending us an email at info@arcoptix.com.

payment Terms

Payment terms are 30 days upon shipment arrival. Prepayment may be occasionally required for international orders (but generally not for universities, research institutes and other governmental institutions). Please ask for a quotation. Arcoptix do in principle not accept credit cards (please ask if this may be a problem).

Specifications

Listed specifications are accurate as of the publication date. Product improvements and design changes may alter product specifications without notice.

Warranty

All products in this catalog are warranted against defects in materials and workmanship for a period of one year from the date of shipment. Liability of Arcoptix is limited to the defective product value only. polarization solution.

Shipping

We will use our best judgment regarding shipping Method (mostly with DHL), unless a specific carrier is requested. Freight charges are paid by the receiver.

Ordering information

Quotes can be asked by
e-mail: info@arcoptix.com.
By phone: ++41 (0)32 731 04 66 or 64
By Fax: ++41 (0)32 731 04 63.

Final order should be placed by sending use a signed fax containing the ordering details.