

VA Series

Variable Attenuators



 **Newport**[®]
Experience | Solutions

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Solutions for ultrafast, high power, fixed wavelength lasers

Newport offers a wide range of highly flexible predesigned solutions for the attenuation and manipulation of laser pulses. The Variable Attenuators – VA-Series can be easily used to control the laser output power of a large variety of lasers ranging from cw to ultrafast lasers with either tunable or fixed wavelengths.

The comprehensive VA-series of variable attenuators is complemented by customized solutions developed by Newport's Technology and Application Center. If the standard VA-Series cannot provide an appropriate solution for your application, contact Newport and take advantage of the in-depth expertise of our internal research and development group.

VA-BB Series

Broadband Ultrafast Variable Attenuators



Motorized VA-BB Broadband Ultrafast Variable Attenuator.
(Post and post holder sold separately).



Manual VA-BB Broadband Ultrafast Variable Attenuator.

Newport's broadband ultrafast variable attenuators (VA-BB) provide continuous attenuation over a series of broad wavelength ranges. The VA-BB series is designed to provide high extinction ratio attenuation of linearly polarized fundamental and harmonic frequencies of light for most ultrafast oscillators. The VA-BB series is available in manual or motorized versions. The motorized version can be used in open or closed-loop operation.

The VA-BB series is based on zero-order half-waveplates and Glan-laser polarizers. For more detail on the principle of operation of these devices, please refer to Newport's Application Note 26 – Variable Attenuator for Lasers. These attenuators are designed to handle average powers up to 100 Watts (see table on opposite side of this datasheet). Specified optics sets are optimized for wavelength ranges of 400–700 nm, 690–1040 nm or 1000–1600 nm.

The optics and high-precision opto-mechanics are incorporated into a compact housing, flexibly designed for post mounting at varying optical axis heights. P-polarized light is transmitted collinear to the input beam path with minimal loss while S-polarized light is rejected into a beam dump on the side of the housing. M4 and 8-32 mounting threads are included on the bottom and one side of the housing. This allows for horizontally and vertically polarized output.

The manual versions of the VA-BB series come with a manual rotary stage containing the half-waveplate. The user manually rotates the stage to control attenuation.

The motorized versions of the VA-BB series come with a motorized rotary stage containing the half-waveplate. Software is included which allows the user to calibrate the VA-BB at a single wavelength. When using Newport family power meters and detectors (purchased separately), this calibration is automated. When using third-party power meters and detectors, software prompts will step the user through building up the calibration curve. The calibration curve is created by rotating the half-waveplate incrementally through a full attenuation

Key Features

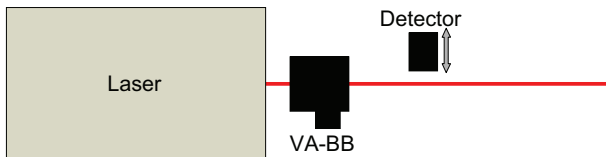
- Compact, robust design comes in manual or motorized version
- Wavelength ranges of 400–700 nm, 690–1040 nm or 1000–1600 nm
- High contrast attenuation (1000:1)
- Minimal stretching for ultrafast pulses >70 fs
- High optical damage threshold over 10 mm clear aperture
- P-polarized collinear output

cycle. The absolute output power at each increment is measured with the power meter and detector, and a calibration curve is fit to the data points.

Once the calibration curve is created, the motorized VA-BB can be used in open-loop mode. The power meter and detector are no longer needed as the desired output power is specified as an absolute or percentage value. The half-waveplate is automatically rotated to the appropriate position matching that value on the calibration curve.

The motorized VA-BB can also be used in closed-loop mode if desired. This option requires a beam sampler assembly (purchased separately) to pick off a portion of the transmitted beam for real-time monitoring by a Newport power meter and detector. The closed-loop control will fine adjust to the position of the half-waveplate to reach the requested absolute power.

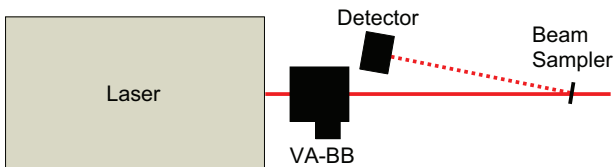
Open Loop Configuration



Maximum Laser Power vs. Beam Diameter

Beam diameter (mm)	5	4	3	2	1
Laser Power (W)	100	64	36	16	4

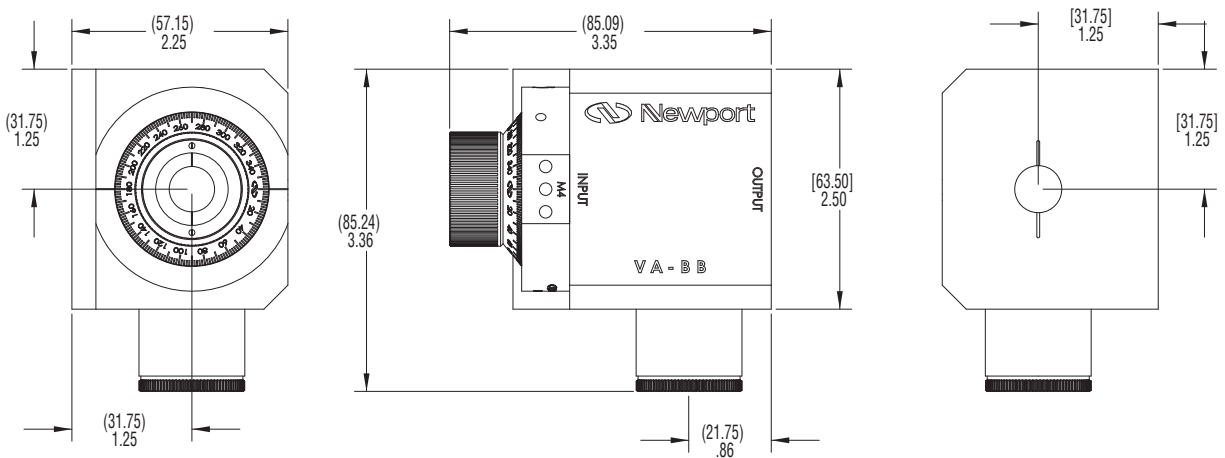
Closed Loop Configuration



Typical Specifications

P-polarization attenuation	1000:1
Clear aperture	10 mm diameter
Damage threshold	500 W/cm ² CW, 2 J/cm ² with 8 ns pulses at 1064 nm, typical

Dimensions



VA-CB Series

Variable Beam Splitters



Motorized VA-CB Series Broadband Ultrafast Variable Attenuator Beam Splitter. (Post and post holder sold separately).



Manual VA-CB Series Broadband Variable Attenuator Beam Splitter. (Beam Dump Shown Installed).

Newport's variable beam splitters (VA-CB) provide continuous beam splitting over a series of broad wavelength ranges and specific laser lines. The VA-CB provides high extinction ratio attenuation of linearly polarized light for many CW and pulsed lasers. The VA-CB series is available in manual or motorized versions. The motorized version can be used in open- or closed-loop operation.

The VA-CB series uses the combination of zero-order half-waveplates and polarizing cube beam splitters to control the attenuation or beam splitting ratio. The efficiency, extinction ratio, damage threshold and pulse stretching, if applicable, will vary depending on the specific wavelength or wavelength range selected. VA-CB options for broadband wavelength ranges of 400–700 nm, 700–1000 nm, 900–1300 nm and 1200–1600 nm. VA-CB versions designed for high power pulsed or Q-switched laser lines are available at 248 nm, 266 nm, 355 nm, 405 nm, 532 nm and 1064 nm wavelengths. VA-CB versions designed for lower power CW lasers are available at wavelengths between 248 and 1550 nm.

The optics and high-precision opto-mechanics are incorporated into a compact housing, flexibly designed for post mounting at varying optical axis heights. P-polarized light is transmitted with minimal loss collinear to the input beam path while S-polarized light is reflected at 90°. A removable beam dump is included on the reflected beam port, transforming the VA-CB into a variable attenuator for the transmitted beam. M4 and 8-32 mounting threads are included on the bottom and one side of the housing. This allows for horizontally or vertically polarized output.

The manual versions of the VA-CB series come with a manual rotary stage to control attenuation or beam splitting. The motorized versions of the VA-CB series come with a motorized rotary stage containing the half-waveplate.

Software is included to calibrate either the transmitted or reflected output from the VA-CB at a single wavelength. When using Newport family power meters and detectors (purchased separately), this calibration is automated. When

Key Features

- Compact, robust design comes in manual or motorized version
- Broad wavelength range, high power pulsed or Q-switched laser line, or low power CW laser line version
- High contrast attenuation/splitting ratios
- High optical damage thresholds over 10 mm clear aperture
- Transmitted P-polarized collinear and 90° reflected S-polarized outputs
- M4 and 8-32 mounting threads for horizontal or vertical polarization transmitted output

using third-party power meters and detectors, software prompts will step the user through the creation of the calibration curve.

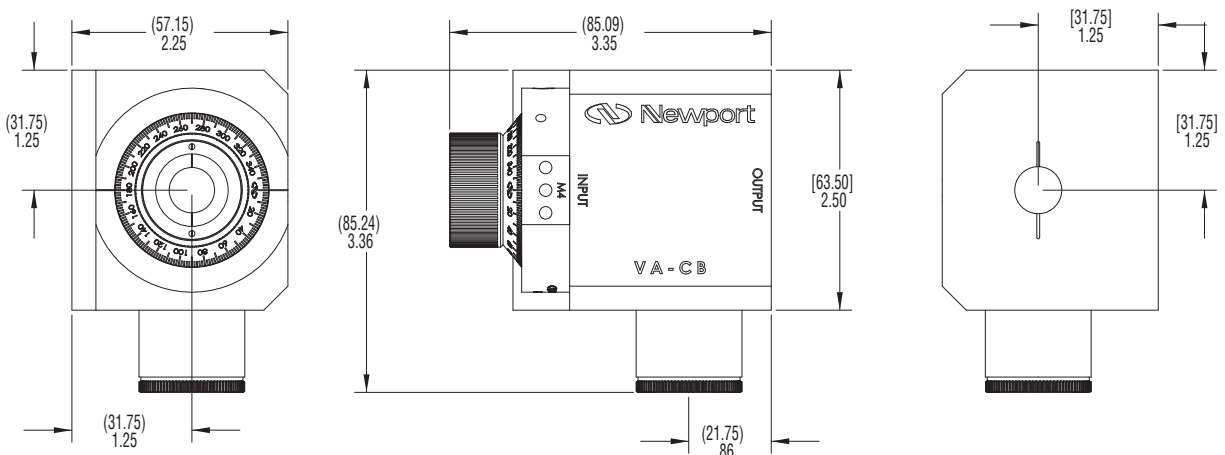
Once the calibration curve is created, the motorized VA-CB can be used in open-loop mode. The power meter and detector are no longer needed as the desired output power is specified as an absolute or percentage value. The half-waveplate is automatically rotated to the appropriate position to match the calibration curve.

The motorized VA-CB can also be used in closed-loop mode if desired. This option requires a beam sampler assembly (purchased separately) to pick off a portion of the transmitted or reflected beam for real-time monitoring by a Newport power meter and detector. The closed-loop control will fine adjust the position of the half-waveplate to reach the requested absolute power.

Typical Specs	Part Number Range	Wavelength (λ)	Efficiency	Attenuation/Splitting Ratio	Damage Threshold
Tunable Laser Source	VA-CB-X ⁽¹⁾	400–700 nm (X = 1)	Tp >80%, >90% average, Rs >99.5% average	Tp/Rs >500:1 1000:1 average	500 W/cm ² CW, 2 J/cm ² with 8 nsec pulses @ 1064 nm
		700–1000 nm (X = 2)			
		900–1300 nm (X = 3)			
		1200–1600 nm (X = 4)			
High Power Pulsed Laser (Single λ)	VA-CB- λ *	248 nm	Tp >90%, Rs >99%	Tp/Rs >200:1	2 J/cm ² with 10 nsec pulses at 1064 nm
		266 nm			
		355 nm			
		405 nm			
		532 nm			
		1064 nm			
CW Laser (Single λ)	VA-CB- λ *	442 nm	Tp >95%, Rs >99.8%	Tp/Rs >1,000:1 (442 nm & 488 nm >500:1)	2 MW/cm ² CW, 1 J/cm ² with a 10 nsec puls @ 532 nm
		488 nm			
		515 nm			
		633 nm			
		780 nm			
		830 nm			
		1300 nm			

¹⁾ For motorized version please add -CONEX; i.e. VA-CB-442-CONEX for CW laser at 442 nm motorized variable beam splitter.

Dimensions



VA Series

Ultrafast Variable Attenuators



Manual and motorized versions of Newport's ultrafast variable attenuator series of products.



Output view of VA-800-CONEX.

Newport's variable attenuators are composed of specially designed thin film polarizers, zero order achromatic waveplates and high-precision opto-mechanics, all incorporated into sealed, shuttered housings. The design is compact, robust and easy to use. Ideal for attenuating ultrafast amplified pulses.

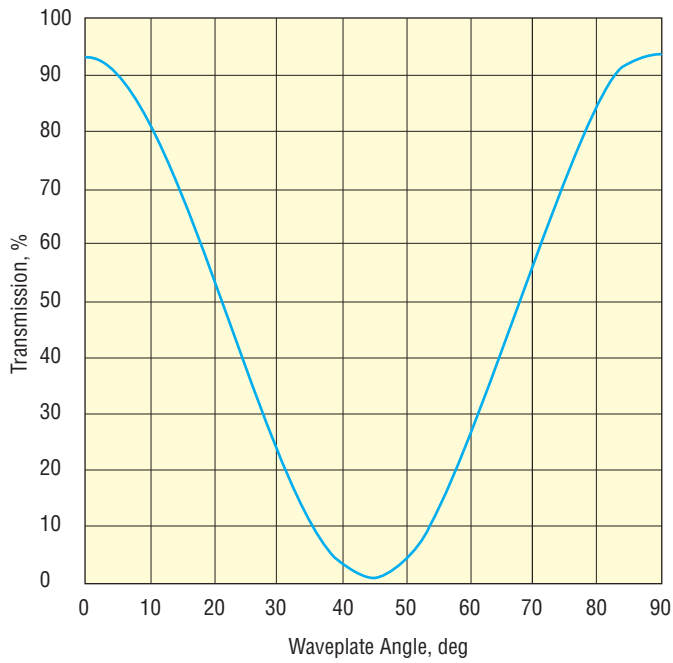
The sealed housing ensures the internal optics are free from dust and other contaminants, and eliminates perturbations of the beam due to ambient air conditions; crucial considerations in ultrafast laser applications. A manual shutter and beam dump are included to control the S- and P-polarized output beams.

Two thin film polarizers are prealigned in the sealed housing and optimized for wavelengths ranging from 780 nm to 820 nm. The P-polarized output passes through the first thin film polarizer and has negligible beam displacement while the S-polarized output is reflected off the two thin film polarizers and displaced in parallel exactly one inch. The waveplate is mounted in either a manual or motorized piezo stage for rotational control of the variable intensity ratio. By rotating the waveplate, the intensity ratio of the two output beams can be continuously varied while maintaining all other beam parameters. The motorized stage has an integrated CONEX controller/driver, which is powered and communicates with your computer via USB port. A free NSTRUCT applet is available for download to control the stage.

Within each output beam, the intensity ratio has a wide dynamic range. For laser pulses centered at 800 nm, the P-(S-)polarized output beam intensity can be adjusted from <0.2% to >94% (>99%). For the entire working range, it becomes <0.2% (<0.3%) to >94% (>98%). Both outputs have high polarization contrast ratios (>1:450). The thin film polarizers require no adjustment over the entire working range.

Key Features

- Input beam split into two parallel S- and P-polarized with adjustable intensity ratio.
- Negligible beam deviation for P-polarized output; parallel displacement (1") of S-polarized output.
- Wide working range of 780–820 nm for pulses >50 fs
- Negligible dispersion over the entire working range
- High optical damage threshold
- Threads for mounting on metric or English posts

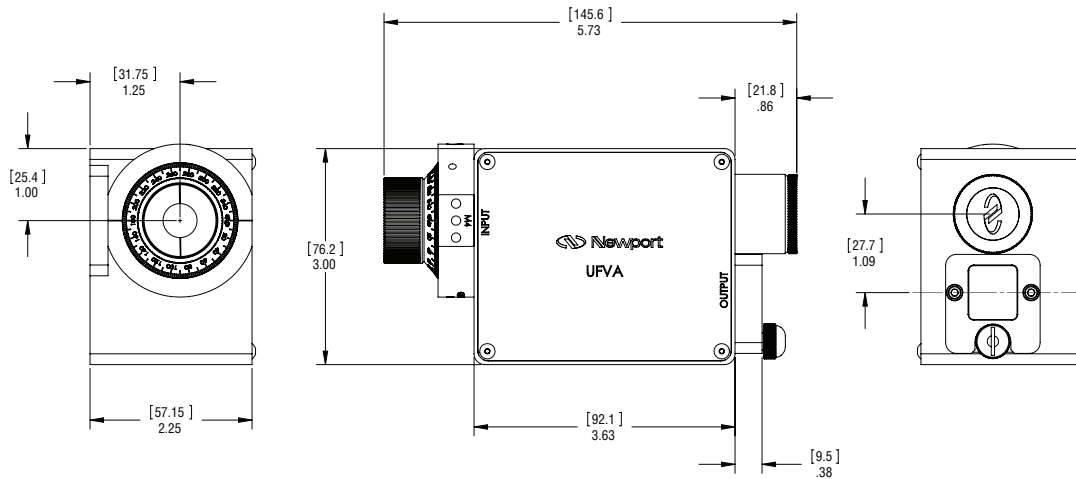


Typical Specifications

S-polarization attenuation range	<0.2–99% ⁽¹⁾
P-polarization attenuation range	<0.2–94% ⁽¹⁾
Clear Aperture	15 mm diameter
Damage threshold	>75 mJ/cm ² , 100 fs at 800 nm
Polarization Contrast after 1st polarizer	>1:450
Polarization Contrast after 2nd polarizer	>1:500

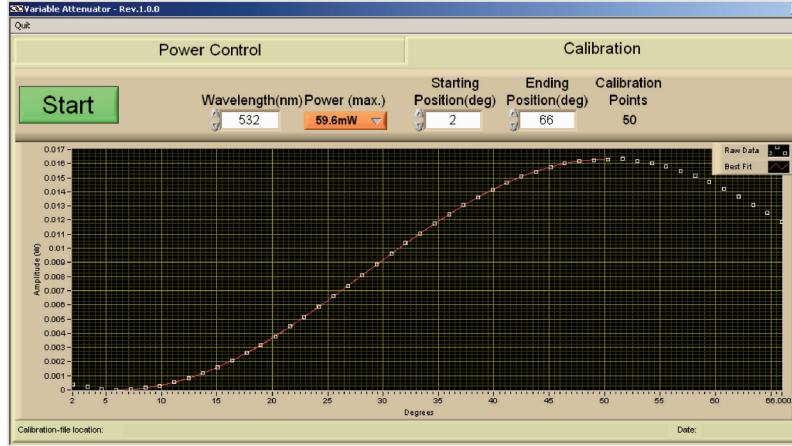
¹⁾ at 800 nm.

Dimensions

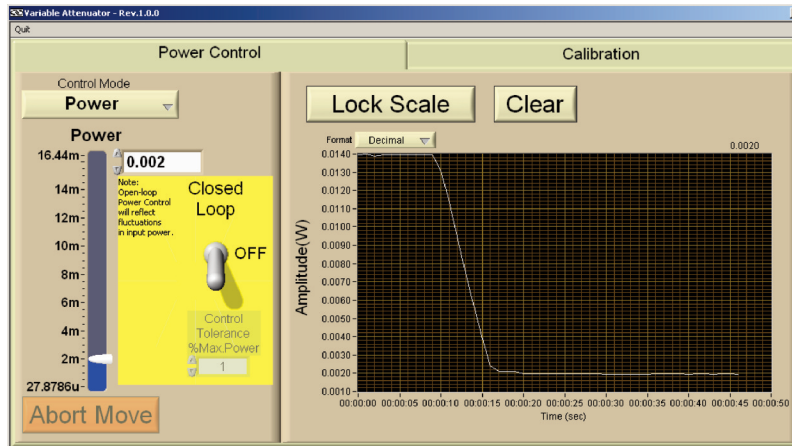


VA Software Features

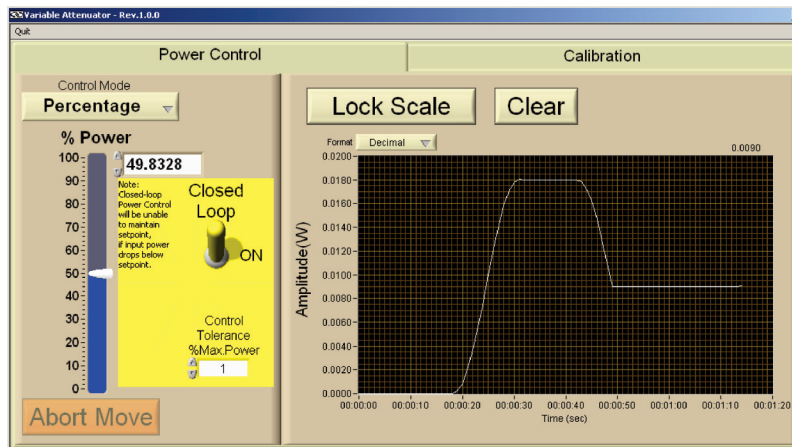
Automatic Calibration Curve with Newport Power Meter



Power Control in Absolute Value or Percentage



Closed Loop Capability with Newport Power Meter



VA Product Overview

Broadband Ultrafast Variable Attenuators

VA-BB-1	Manual Broadband Ultrafast Variable Attenuator, 400–700 nm
VA-BB-1-CONEX	Motorized Broadband Ultrafast Variable Attenuator, 400–700 nm
VA-BB-2	Manual Broadband Ultrafast Variable Attenuator, 690–1040 nm
VA-BB-2-CONEX	Motorized Broadband Ultrafast Variable Attenuator, 690–1040 nm
VA-BB-3	Manual Broadband Ultrafast Variable Attenuator, 1000–1600 nm
VA-BB-3-CONEX	Motorized Broadband Ultrafast Variable Attenuator, 1000–1600 nm

Variable Beam Splitters

VA-CB-1	Manual Broadband Variable Beam Splitter, 400–700 nm
VA-CB-1-CONEX	Motorized Broadband Variable Beam Splitter, 400–700 nm
VA-CB-1064	Manual High Energy Variable Beam Splitter, 1064 nm
VA-CB-1064-CONEX	Motorized High Energy Variable Beam Splitter, 1064 nm
VA-CB-1300	Manual Variable Beam Splitter, 1300 nm
VA-CB-1300-CONEX	Motorized Variable Beam Splitter, 1300 nm
VA-CB-1550	Manual Variable Beam Splitter, 1550 nm
VA-CB-1550-CONEX	Motorized Variable Beam Splitter, 1550 nm
VA-CB-2	Manual Broadband Variable Beam Splitter, 700–1000 nm
VA-CB-2-CONEX	Motorized Broadband Variable Beam Splitter, 700–1000 nm
VA-CB-248	Manual High Energy Variable Beam Splitter, 248 nm
VA-CB-248-CONEX	Motorized High Energy Variable Beam Splitter, 248 nm
VA-CB-266	Manual High Energy Variable Beam Splitter, 266 nm
VA-CB-266-CONEX	Motorized High Energy Variable Beam Splitter, 266 nm
VA-CB-3	Manual Broadband Variable Beam Splitter, 900–1300 nm
VA-CB-3-CONEX	Motorized Broadband Variable Beam Splitter, 900–1300 nm

VA-CB-355	Manual High Energy Variable Beam Splitter, 355 nm
VA-CB-355-CONEX	Motorized High Energy Variable Beam Splitter, 355 nm
VA-CB-4	Manual Broadband Variable Beam Splitter, 1200–1600 nm
VA-CB-4-CONEX	Motorized Broadband Variable Beam Splitter, 1200–1600 nm
VA-CB-405	Manual High Energy Variable Beam Splitter, 405 nm
VA-CB-405-CONEX	Motorized High Energy Variable Beam Splitter, 405 nm
VA-CB-442	Manual Variable Beam Splitter, 442 nm
VA-CB-442-CONEX	Motorized Variable Beam Splitter, 442 nm
VA-CB-488	Manual Variable Beam Splitter, 488 nm
VA-CB-488-CONEX	Motorized Variable Beam Splitter, 488 nm
VA-CB-515	Manual Variable Beam Splitter, 515 nm
VA-CB-515-CONEX	Motorized Variable Beam Splitter, 515 nm
VA-CB-532	Manual High Energy Variable Beam Splitter, 532 nm
VA-CB-532-CONEX	Motorized High Energy Variable Beam Splitter, 532 nm
VA-CB-633	Manual Variable Beam Splitter, 633 nm
VA-CB-633-CONEX	Motorized Variable Beam Splitter, 633 nm
VA-CB-780	Manual Variable Beam Splitter, 780 nm
VA-CB-780-CONEX	Motorized Variable Beam Splitter, 780 nm
VA-CB-830	Manual Variable Beam Splitter, 830 nm
VA-CB-830-CONEX	Motorized Variable Beam Splitter, 830 nm

Ultrafast Variable Attenuators

VA-1064	Manual Variable Attenuator, 1034–1094 nm
VA-1064-CONEX	Motorized Variable Attenuator, CONEX, 1034–1094 nm
VA-355	Manual Variable Attenuator, 350–360 nm
VA-355-CONEX	Motorized Variable Attenuator, CONEX, 350–360 nm
VA-532	Manual Variable Attenuator, 522–542 nm
VA-532-CONEX	Motorized Variable Attenuator, CONEX, 522–542 nm
VA-800	Manual Variable Attenuator, 780–820 nm
VA-800-CONEX	Motorized Variable Attenuator, CONEX, 780–820 nm

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