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DVA
Diffractive Variable Laser Beam Attenuators

PRODUCT FEATURES

- High power attenuator for either pulsed or continuous (cw) laser beams

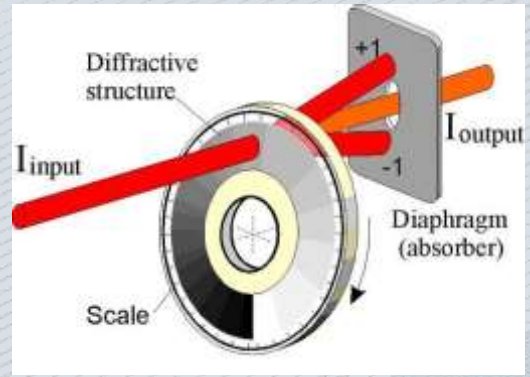
  - for Nd:YAG-, Excimer-, Argon-, Femtosecond- Lasers, etc.

- Attenuation not depending on polarization, thus suitable for s-, p- or random polarized beams

- No wavefront aberrations, no influence on beam profile or beam direction (in zero diffr. order)

  - for beam diagnostic/ monitoring: viewing directly with CCD cameras

  - for holography to modulate



Principle operation scheme of high power attenuator based on non-absorbing phase diff. gratings (etched in quartz).

Diffractive attenuators control the power of laser radiation using diffraction gratings. Since phase diffraction gratings do not absorb light they can be used to attenuate also high-power laser radiation (cw, pulsed). Variation of grating parameters along the attenuator results in variable transmission at a given wavelength. Diffractive attenuators can be designed for UV till IR.

PRINCIPLE OF OPERATION

Light beam passing through a diffractive grating is partially deflected into several diffractive orders which are blocked by diaphragm. Subsequently zero order beam along optical axis is attenuated. The diffraction efficiency and thus the intensity of output radiation I_{out} depends on the grating parameters. With variation of the grating parameters along the attenuator the transmission changes from T_{max} to T_{min} by 340° rotation of attenuator wheel (with $T = I_{out}/I_{in}$). Although diffractive attenuators are optimized for its design wavelength λ_0, they will operate over a larger spectral range ($\lambda_0 \pm 15\%$) with minor attenuation range decreasing. The functional dependence of transmission function -e.g. its linearity- remains the same. Notice that the attenuator works also at $\lambda_0/3$ of design wavelength, but has nearly zero effect at $\lambda_0/2$.

DESIGN AND OPERATION

Attenuator includes grating wheel mounted in a special encapsulated housing with entrance and exit tubes. Housing and tubes are intended for blocking parasitic diffractive orders and absorbing of laser radiation. Tubes are suitable for less than 20 Watt average power dissipation. Special finned radiators are required for higher laser power.

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SPECIFICATIONS

Substrate material	UV grade fused silica (UVFS)
Surface flatness, wedge	$\lambda/4$ @ 532nm over clear aperture, ≤ 30arcsec
Diameter/thickness quartz substr.	60mm, 3mm
Width grating area/clear aperture	15mm / 14mm (11mm with tubes)
Front side	2-dimensional binary phase grating
Back side	AR-coating, $R(\lambda_0) < 0.3\%$ (effective for design wavelength)
Transmission range	$T_{linear} \geq 2\%–96\%$ over 340° (deviation from linearity ≤ 5%)
Damage threshold	≥ 500 W/cm² -cw ≥ 3 J/cm² with 10ns pulses 1,0 J/cm² with 150 fs pulses (800nm, 1 kHz)

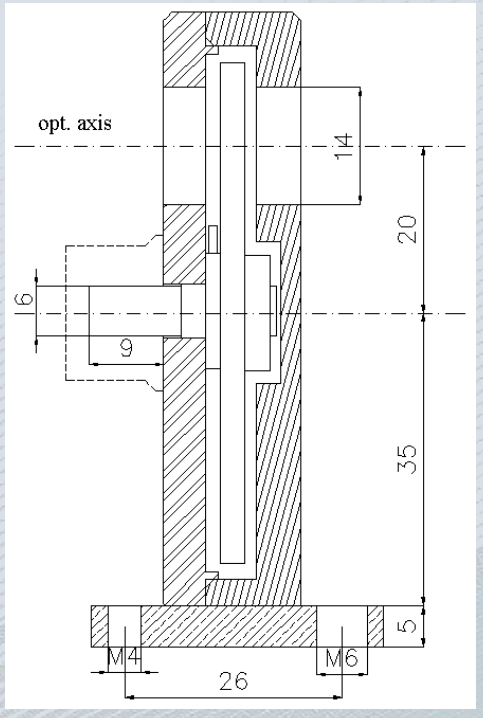
ORDER INFORMATION

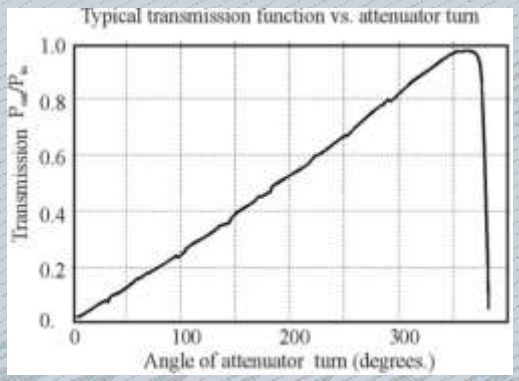
Each attenuator set includes Attenuator disc within encapsulated housing, 2 radiator tubes (for blocking of diffracted light at entrance-/exit beam ports)

Design wavelength λ_0 (also suitable for $\lambda_0/3$)	Cat.-No.
1064nm (355nm*)	DVA1064
800nm (266nm*)	DVA0800
532nm	DVA0532
355nm	DVA0355

*reduced transmission range
Other wavelengths on request.

ATTENUATOR OUTLINE





Typ. attenuation of DVA

DVA, includes encapsulated housing, 2 radiator tubes and adapter plate for mounting