NEUTRAL-DENSITY ATTENUATOR
for VISIBLE and INFRARED LASER BEAMS

Expanding our lineup of infrared step attenuators, LASNIX proudly introduces the compact Model 801 Neutral Density Attenuator IR-VIS. This new model provides flat attenuation from 500 nm in the visible to 15 µm in the infrared, featuring four ND filters with optical densities of 0.5, 1, 2, and 3 OD. The filters are quickly interchangable thanks to magnetic centering.

HIGHLIGHTS

- High-power handling
- Non-deviating
- Mode-preserving
- Polarization-preserving
- Phase-maintaining
- Non-dispersive

Based on proprietary **free-standing metal grid** technology (**no substrate**), the attenuator handles beam power up to 100 W continuous wave (c.w.). Incidence can occur from either side, with back reflection being less than -30 dB.

Precision-fabricated metal grids diffract calibrated percentages of power out of the beam, which are then eliminated in the water-cooled absorption tubes. The output beam passes perfectly undeviated (in diffraction terms, it represents the zeroth order). The mode structure and all other beam properties are fully preserved, including divergence, optical phase, and (arbitrary) polarization.

Dimensions: clear aperture 9 mm, weight 200 g, height 60 mm, width 84 mm, length 90 mm.

APPLICATIONS

- Ideal for precise level setting
- Mode analytics
- Detector calibration
- Nonlinear interaction studies

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LASNIX
"... taming light-beam power"

LASNIX MOD. 801 ND ATTENUATOR

The Mod. 801 ND Attenuator features four grids with nominal attenuations of 0.5, 1, 2, and 3 OD, corresponding to laser-beam power transmittances of 30%, 10%, 1%, and 0.1%.

Switching between these four positions (and a fifth one without a grid) is fast and reliably resettable. It requires tipping the handle to near the intended position. Built-in magnets then assist the exact centering.

For mounting, two tapped holes, M4 and 8-32, are provided at the base. Cooling-water flow via user-supplied 3/5 mm tubing is necessary only when the beam power exceeds 30 W for longer than 5 s.

Optical density variations: < 1 % on changing the incidence angle,
< 1 % on changing the polarization,
< 1 % on resetting or remounting the attenuator,
±4 % *vs* wavelength for the visible and infrared up to $\lambda \approx 9$ µm,
±8 % *vs* wavelength for longer-wavelength infrared $\lambda > 10$ µm.

The **power limit** P_c (c.w. or q.-c.w.) increases with wavelength λ, and decreases linearly with the $1/e^2$ beam width:

	VIS			NIR		MIR
$1/e^2$ width	500 nm	550 nm	600 nm	0.7 - 1 µm	1 - 2 µm	2 - 15 µm
≥ 6 mm	**6 W**	**9 W**	**15 W**	**20 W**	**40 W**	**100 W**
3 mm	**3 W**	**4 W**	**7 W**	**10 W**	**20 W**	**50 W**
2 mm	**2 W**	**3 W**	**5 W**	**6 W**	**13 W**	**30 W**
1 mm	**1 W**	**1.5 W**	**2 W**	**3 W**	**6 W**	**15 W**

The **pulse energy limit** E_c of single laser pulses is $E_c = 0.1\text{s} \cdot P_c$ where P_c is the power limit. However, the pulse intensity must not exceed 500 MW/cm² to avoid plasma generation.

Diffractive attenuators produce higher-order **diffracted beams** which are internally eliminated by absorber tubes. These tubes need to be longer when using shorter wavelengths. The "short" tubes of the basic attenuator (shown in the photograph) suppress unwanted diffracted beams for **wavelengths ≥ 4 µm**.

"Long" absorber tubes (supplied, easily exchanged by customer) suppress unwanted diffracted beams for **wavelengths ≥ 2 µm**, thereby increasing the attenuator length to 180 mm.

Separate absorbing apertures (supplied, with 9 mm clear opening) placed at 90 mm distances from the ends of long tubes extend the attenuator range by suppressing unwanted diffracted beams for **wavelengths ≥ 1 µm**. Placing these 9-mm apertures as far as 270 mm from the tubes suppresses unwanted diffracted beams for **wavelengths ≥ 500 nm**.

Alternatively, such separate absorbing apertures and with them, unpractically long attenuator path lengths can be avoided by restricting the beam diameter using end apertures (supplied, both with 4.5 and 2.3 mm clear openings). When these are screwed in by the customer into the ends of the long absorber tubes, they ensure suppression of unwanted diffracted beams for **wavelengths ≥ 1 µm** with the 4.5 mm choice, or respectively **≥ 500 nm** with the 2.3 mm choice, while retaining the attenuator length at 180 mm.

Ordering one Model 801 ND Attenuator comprises:
1 basic attenuator with protecting caps, 2 short tubes, 2 long tubes, 2 absorbing apertures, 2 end apertures 4.5 mm, and 2 end apertures 2.3 mm.

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