LASNIX step attenuators are precision instruments to reduce laser beam power. All beam parameters apart from power stay unaffected. The attenuators are designed for simple alignment and ease of use.

The attenuation principle is based on proprietary free-standing metal grid technology introduced by LASNIX in 1984. Originally developed for high-power CO$_2$ lasers, these grids have been tailored to accommodate the complete infrared spectrum from 0.7 to 1200 µm. Remarkably high power handling up to 30 kW c.w. has been achieved.

Since the grids are freely suspended, i.e. have no substrate, they can not deviate or offset the beam—in contrast to usual, substrate-based optical elements. Dispersion and phase effects on femtosecond pulses are negligible.

In the attenuator, precision fabricated metal grids diffract a calibrated percentage of power out of the beam. The rejected power is absorbed in the walls of the water-coolable housing. The attenuated output beam passes undeviated (in diffraction terms, this beam represents the zeroth order). The mode structure and all other beam properties, including the divergence and $M^2$ parameters are fully preserved, as well as the (arbitrary) polarization.

**Applications:**
- easy power setting
- beam quality assurance
- nonlinear interactions
- detector calibration
- heterodyne systems
Standard attenuator models cover wide infrared bands between 0.7 and 1200 µm.

The power loss per grid is between 3 and 10 db, corresponding to a transmittance between 50% and 10%. For several grids the total loss (in db) is exactly the sum of individual losses. The 5 db elements of the basic Mod. 102 thus allow the six different power settings 100%, 31%, 10%, 3%, 1% down to 0.3%. Options A and S allow more settings since the elements have different losses; these options are available with any of the 102-series models. Under option S the lowest transmittance is 0.001%, attainable when all five elements are specified to have 10 db loss.

Input powers up to 300 W c.w. (or quasi-c.w.) are allowed with standard models. The specified limits apply to relatively wide beams which fill at least half the specified aperture area in a smooth manner. This corresponds to a fundamental mode having a $1/e^2$ beam width of about 2/3 of the aperture diameter. For narrower beams the power limits scale down linearly. For example, a limit of 200 W reduces to 100 W when the $1/e^2$ width narrows from 2/3 to 1/3 of the aperture diameter.

The angular alignment within the clear aperture is uncritical. The laser beam input can be from either side. A thread M8 is provided for mounting a standard post. We further supply a transition post which has a thread 1/4-20.

Cooling water flow is necessary only when the input power exceeds 30 W.