Optical Isolators

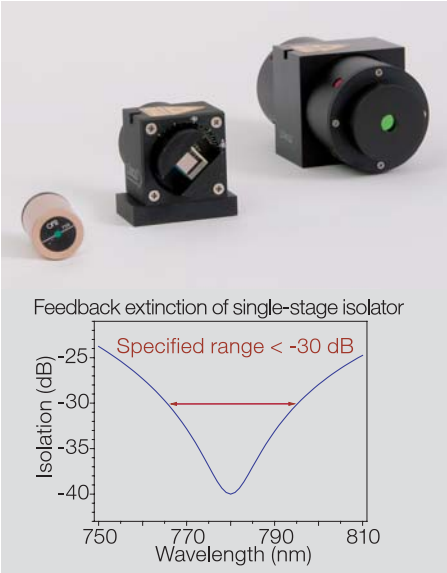
Feedback Protection for Diode Lasers

Optical isolation — why?

Diode lasers, in particular highly coherent, spectrally narrow external-cavity or DFB laser systems, are sensitive to optical feedback from reflective surfaces. Weak back-reflections from lenses, mirrors and optical fibers or from other laser beams (e.g. optical amplifiers) adversely affect the laser's coherence. Even worse, strong feedback may lead to irreversible damage of the laser diode itself. We therefore recommend the use of optical isolators to protect your diode laser from unwanted feedback.

Principle of operation

An optical isolator permits the transmission of polarized light in one direction only. Its principle is based on the Faraday effect, i.e. the rotation of the light polarization axis in a crystal within a strong magnetic field. The main components are an entrance polarizer, then the Faraday rotator – typically a terbium gallium garnet (TGG) crystal inside a permanent magnet – and an exit polarizer oriented at 45° relative to the first polarizer. Since light from diode lasers is usually linearly polarized, the orientation of the entrance polarizer can be made to match the polarization axis. The Faraday element then rotates the polarization axis by 45°, hence the light passes the second polarizer without attenuation. As the Faraday effect is independent of the direction of light propagation, stray light travelling backwards is highly suppressed by the two polarizers.



Optical isolators for different wavelengths and beam sizes.

Typical extinction curve of a single-stage isolator at 780 nm. The maximum extinction ratio is -40 dB. The red arrow indicates a range of approx. 25 nm, where the extinction is still < -30 dB.

Options

Single-stage isolators: extinction ratio > 30 dB

Recommended for fiber coupling of DL100, DL pro, DL DFB lasers into angle polished fibers

Feedback protection during resonator alignment (e.g. FPI)

Double-stage isolators: extinction ratio > 60 dB

Recommended for seed laser protection in MOPA configurations or SHG setups

Fiber coupling of TA, DLX, BoosTA

Fiber coupling of any laser into PC polished fibers or fiber-optic beam splitters

TOPTICA can fine-tune the isolators to provide maximum transmission (> 90 % per stage) and at the same time maximum extinction at any wavelength of interest.

Key features

- Excellent feedback protection by high quality polarization optics
- Wide wavelength range available (UV to NIR)
- Single-stage (isolation > 30 dB) and double-stage (isolation > 60 dB) models
- 3 .. 5 mm aperture
- Fine-tuning to application wavelength upon request