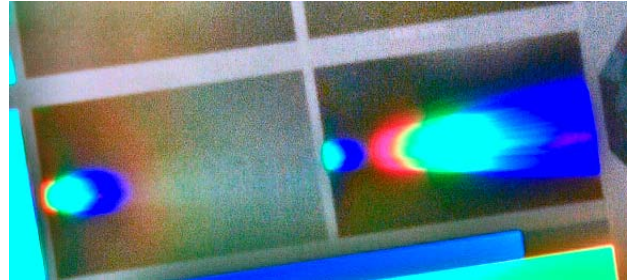


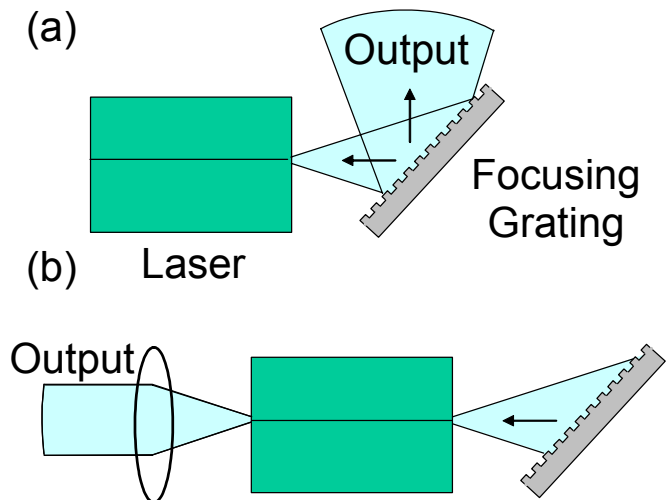
LightSmyth Technologies' family of flat-substrate focusing gratings image and focus optical input signals while simultaneously spectrally dispersing them. The focusing function is incorporated into the gratings via holographic design principles using curved and variably-spaced grating lines. Integrating focus function with spectral dispersion by use of holographic design rather than by use of curved substrates or lenses reduces system component count and facilitates miniaturization. Flat-substrate focusing gratings are relevant to a broad range of applications in spectroscopy and general photonics.



Flat-substrate focusing gratings on wafer

LightSmyth flat-substrate focusing gratings are optimized for implementation in external-cavity diode laser (ECDL) systems where they provide frequency-selective feedback and thus laser frequency stabilization and linewidth narrowing. The gratings are designed for ECDLs employing the Littrow configuration and focus the first-order diffracted beam back toward the laser providing locking feedback. Grating focal lengths are short in order to facilitate large longitudinal mode spacing and to enable convenient wide range single-mode tuning.

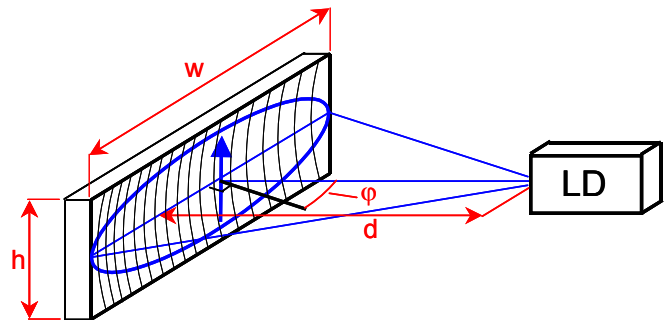
Grating groove depth and duty cycle are optimized to provide maximal diffraction efficiency. Each grating is a master, free from replication flaws. Grating surfaces are cleanable and abrasion-resistant.



Application examples illustrating use of LightSmyth flat-substrate focusing gratings in external-cavity diode lasers. a, the grating functions as both outcoupler and to provide feedback. b, the grating provides feedback via the diode back facet.

Standard Flat-Substrate Focusing Gratings

Wave length	Input Polarization	Incident Angle ϕ	Density (lines/mm)	Coating
405 nm	s	40°	3175	Al
405 nm	p	45°	3640	Al
635 nm	s	40°	2028	Al
635 nm	p	65°	2857	Al
780 nm	s	30°	1282	Al
780 nm	p	60°	2222	Al
1310 nm	p	30°	763	Au
1550 nm	p	30°	645	Au



Schematic exemplifying grating layout for s-input polarization (parallel to the grating lines). d, working distance, h, grating height, w, grating width.

Please refer to www.light Smyth.com for technical details, available sizes and ordering information.

Exemplary Performance

Feedback Efficiency

Design Wavelength	Diffraction Efficiency	
	Configured for S Polarization	Configured for P Polarization
405 nm	34 %	66 %
635 nm	25 %	73 %
780 nm	78 %	70 %
1310 nm	N/A	94 %
1550 nm	N/A	93 %

Note: Efficiency values are absolute and were computed using rigorous electromagnetic theory for central position of the grating. Values are representative only and do not constitute grating specification. Measured grating performance may vary depending on measurement approach and layout.

Custom Flat-Substrate Focusing Gratings

Our optical engineers will be happy to discuss a custom flat-substrate focusing grating solution for your specific application. Our general capabilities are :

- up to 12-inch diameter substrates
- up to 7000 lines/mm line density
- variable duty cycle
- arbitrary line curvature
- line widths as thin as 100 nm
- groove depths up to 400 nm.