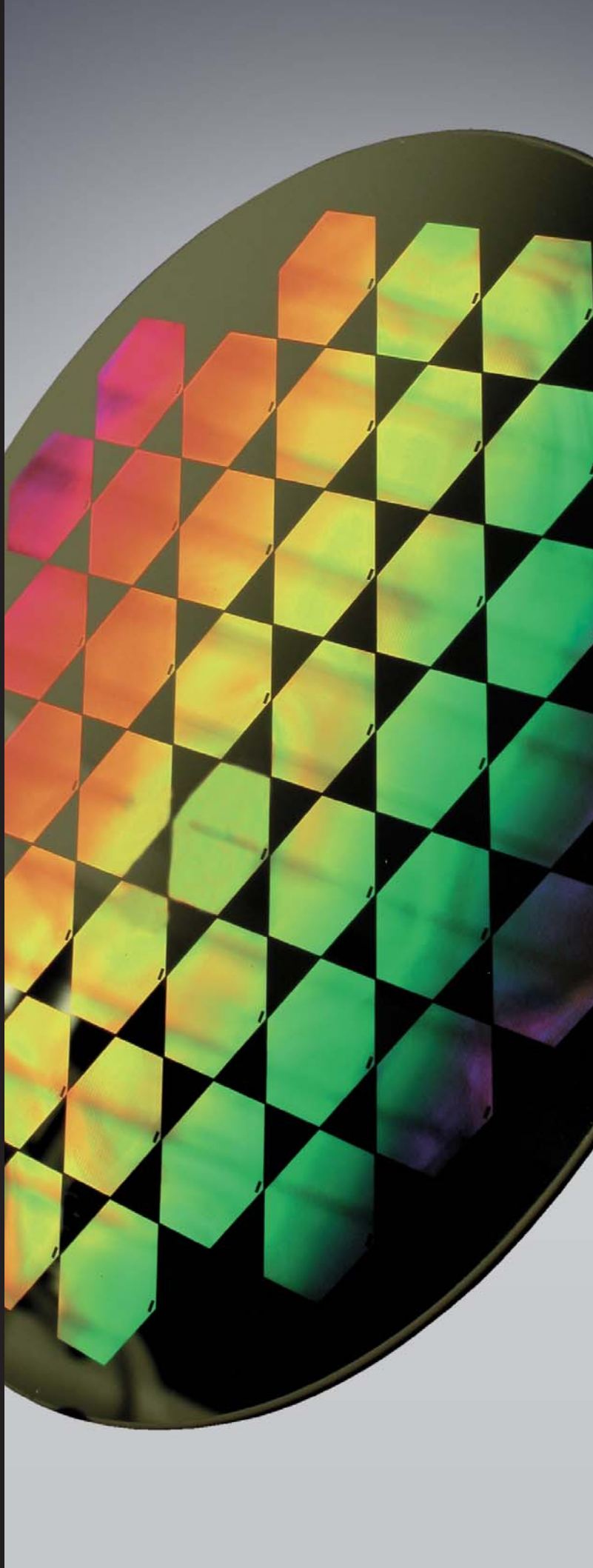
a::etris
Company of the Leister Group

Micro-Optics

Products and Services



Corporate Headquarters of the Leister Group, Switzerland

About Axetris AG

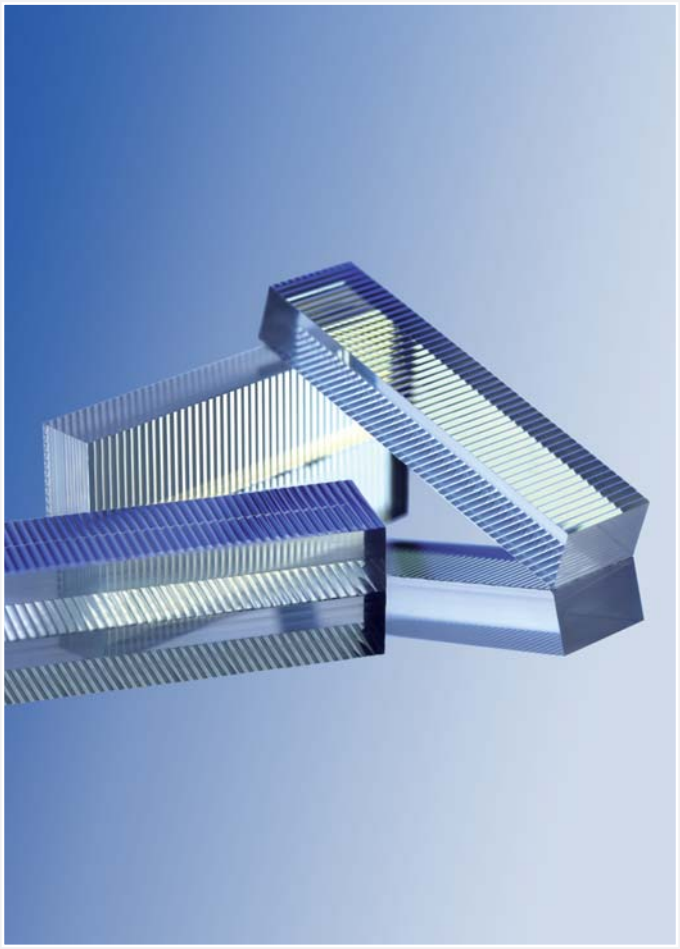
Axetris AG, a company of the Leister group, is serving OEM customers with micro technology based (MEMS) infrared light sources, laser gas sensors, mass flow sensors and controllers and micro-optical components used in industrial, process control, environmental, medical automotive and telecom applications.
Axetris supports its customers in many industries with in-depth application know-how. Our engineering and manufacturing teams combine broad experience in simulation, design, manufacturing and metrology from microchip level to advanced electronic and electro-optic modules. Customers benefit from excellent product value, consistent high product quality and outstanding customer support. OEMs rely on Axetris as a competent and sub-system partner for a wide range of high-quality off-the shelf products as well as customer specific solutions from concept to volume production.
Axetris is ISO 9001 certified and ISO TS 16949 compliant and operates its own 6” to 8” wafer MEMS foundry in Central Switzerland for its own products and external customers.

Micro-optics product range overview

Axetris' micro-optics offering ranges from refractive micro-optical lenses and lens arrays to diffractive optical elements in silicon and fused silica, covering the entire wavelength range from UV to mid IR. Axetris serves customers from various industries such as optical fiber communications, optical sensing, metrology, laser systems, medical applications etc.

Axetris' standard micro-optics products include fast and slow axis collimators for high power laser diode bars, micro-lens arrays and aspheric micro-lenses and arrays for fiber coupling, laser diode and VCSEL collimation.

Axetris' custom solutions include binary and multilevel diffraction gratings, Shack-Hartmann micro-lens arrays, custom micro-lenses and arrays in Silicon and Fused Silica. Our optical engineering and manufacturing teams support OEM customers from prototyping to volume production to meet their specific design requirements.



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Custom Micro-Lens Arrays

Description

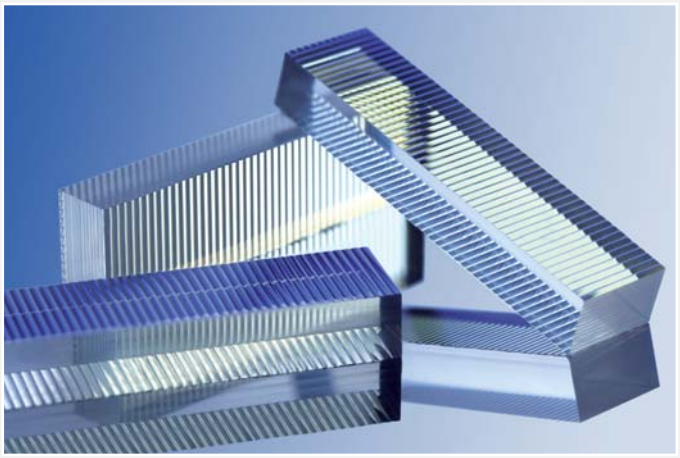
Axetris offers custom micro-lens arrays within a wide range of parameters designed and manufactured to customer requirements. Our optics engineers will support you from concept to volume production.

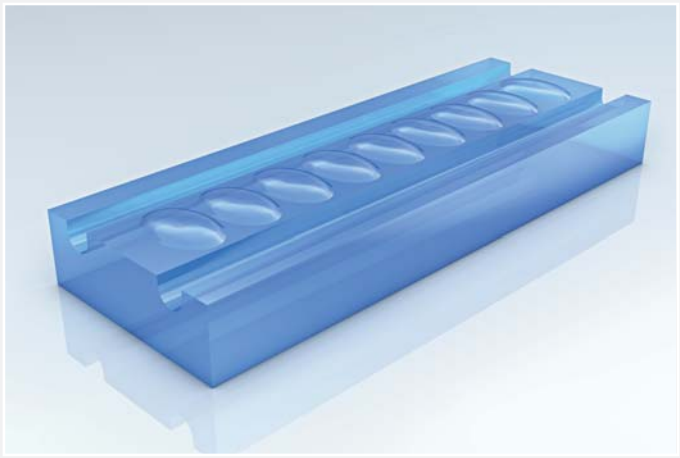
Features

- High uniformity of ROC, conic, pitch
- Optimized lens surface profile
- Low lens surface roughness
- Excellent pitch control
- Ultra compact size, lightweight

Applications

- Fiber optical communication
- Laser / fiber coupling
- Solid state laser pumping
- Optical fill factor enhancement
- Optical encoders
- Imaging and (micro) camera lenses
- Beam shaping, steering and homogenizing





Specifications	
Parameter	**Value / Comment**
Array Size	up to 130 mm diameter
Lens aperture sizes	10 µm to 1.5 mm, depending on material and F - number
Lens aperture shapes	circular, cylindrical, elliptical, hexagonal, custom
Lens surface profiles	spherical / aspherical
F-number	Silicon: F/0.5 to F/10 Fused Silica: F/2.0 to F/100
Wavelength range	UV to IR
Metallization	masking, alignment structures, soldering pads, etc.
Materials	Fused Silica
	Silicon
Technical data and specifications are subject to change without prior notice	

Micro lens arrays custom made to your specifications

Custom Diffraction Gratings & Diffractive Optical Elements

Description

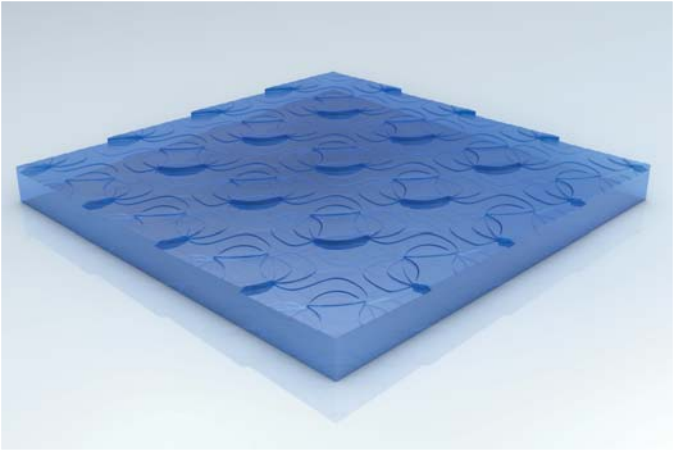
Axetris offers high quality binary & multilevel diffraction gratings in a wide parameter range. Excellent etch depth control, low surface roughness and a high uniformity are key advantages. Applications range from sensors to metrology, spectroscopy and many more.

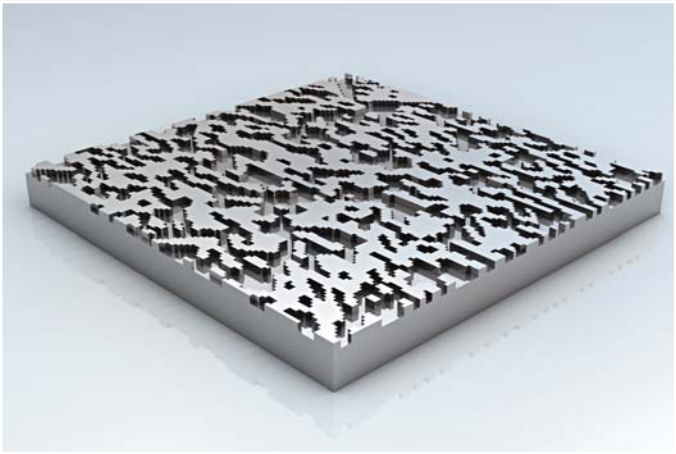
Features

- Binary and multi-level gratings
- Phase and amplitude gratings
- Transmissive and reflective gratings
- Controlled 0^{th} order
- Chirped gratings

Applications

- Optical sensors
- Metrology
- Beam homogenizing, shaping & sampling
- IR spectroscopy





Specifications		
Parameter	**Value**	**Comment**
Operating mode	Transmissive or reflective	
Grating periods	3 µm to > 1 mm	minimum feature size = 1.5 µm
Period accuracy	± 0.25 µm	no cumulative errors
Levels	up 2 to 16	
Groove shape	Binary, rectangular	
Surface roughness	< 5 nm	rms
AR coatings	0.5% per side	double sided
Structured metallization	optional	Au, Cr, Al and others
Substrate thickness	Fused Silica: 0.60 mm, 1.0 mm, 1.6 mm Silicon 0.38 mm, 1.0 mm	custom thicknesses available
Materials	Fused Silica	
	Silicon	
Technical data and specifications are subject to change without prior notice		

Diffraction gratings & diffractive optical elements custom made to your specifications

Fiber Coupling Micro-Lens Arrays

Description

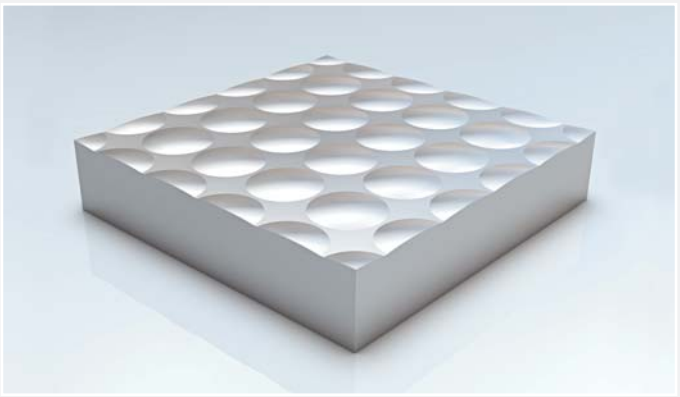
Axetris' fiber coupling micro-lens arrays are optimized for coupling light efficiently to single mode fiber arrays for optical communication applications.

Features

- Ultra compact size
- Low insertion loss
- High uniformity of ROC, conic, pitch
- Telcordia compliant

Applications

- Fiber array coupling
- Optical communications
- R/OADM, WSS
- DEMUX / MUX, OXC



Specifications

Parameter	FCA 250FS	FCA 1000Si	Comment
Array pitch	250 µm	1000 µm	Tolerance: ± 0.25 µm
Number channels per array	1 × 4 Article no. 600.178 1 × 8 Article no. 600.303 1 × 16 Article no. 600.408	1 × 4 Article no. 600.383 4 × 4 Article no. 600.499	other dimensions available
Lens array dimensions	1 × 4: 1.5 × 1.0 × 1.0 1 × 8: 2.5 × 1.0 × 1.0 1 × 16: 4.5 × 1.0 × 1.0	1 × 4: 4.93 × 1.93 × 1.0 4 × 4: 4.93 × 4.93 × 1.0	length x width x thicknes in mm^3
Lens diameter	240 µm	950 µm	
Lens surface profile	aspherical	aspherical	
Surface profile deviation	< 45 nm	< 25 nm	rms
Numerical aperture	N.A. = 0.16	N.A. = 0.19	
Effective focal length	710 µm	2420 µm	at λ =1.55 µm
AR coating	< 0.5 % per side	< 0.5 % per side	double sided; wavelength range λ = 1260 – 1620 nm
Surface roughness	< 5 nm	< 5 nm	rms
Insertion loss	< 1 dB	< 1 dB	Fiber- to-fiber
Metallization	optional	optional	masking, alignment marks, soldering pads, etc.
Material	Fused Silica	Silicon	

Technical data and specifications are subject to change without prior notice

Custom fiber coupling micro-lens arrays are available upon request

Laser Diode Collimation Micro-Lenses

Description

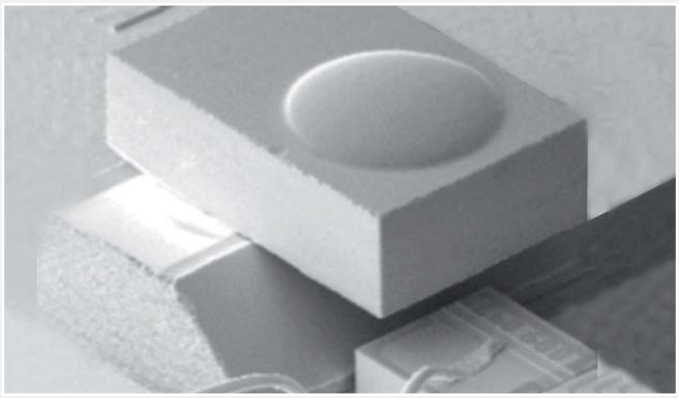
Axetris' laser diode collimation micro-lenses are designed and optimized for efficient collimation of edge emitting laser diodes (LDs) and vertical cavity surface emitting lasers (VCSELs). Applications include collimation of laser diodes and focussing onto photodiodes for optical fiber communications and optical sensing.

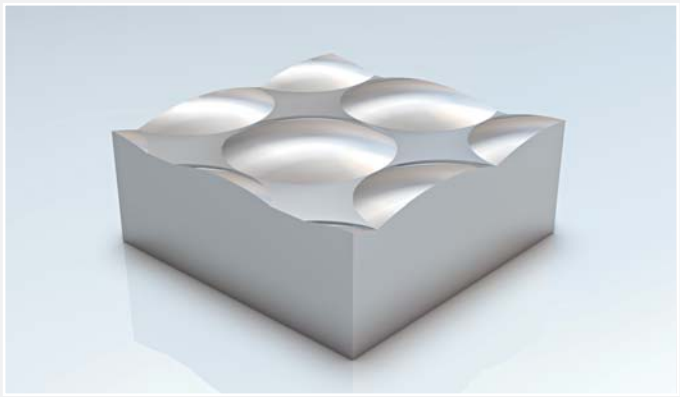
Features

- High coupling efficiency
- High N.A.
- Diffraction limited
- Telcordia compliant

Applications

- Optical communications
- Laser diode collimation
- ROSA / TOSA
- Tunable diode lasers





Specifications		
Parameter	**LDC 500Si** (Article no. 600.385)	**Comment**
Lens surface profile	aspherical	
Lens diameter	480 µm	other diameters possible
Numerical aperture	> 0.6	other NA possible
Radius of curvature	700 µm	
Back focal distance	~ 170 µm	
Laser divergence	≤ 35° ($1/e^2$ half angle)	
Working distance	100 µm to 300 µm	custom working distances available
Wavelength range	> 1.1 µm	
AR coating	< 0.5 % per side	double sided, wavelength range λ = 1280 – 1620 nm
Surface roughness	< 5 nm	rms
Mechanical dimensions	0.94 mm × 0.94 mm × 0.38 mm	length × width × thickness; other dimensions available
Metallization	optional	masking, alignment marks, soldering pads, etc.
Material	Silicon	
Technical data and specifications are subject to change without prior notice		

Custom laser diode collimation micro-lenses and micro-lens arrays are available upon request, designed for your specific mechanical dimensions, alignment marks, numerical aperture and working distance

Fast Axis Collimators

Description

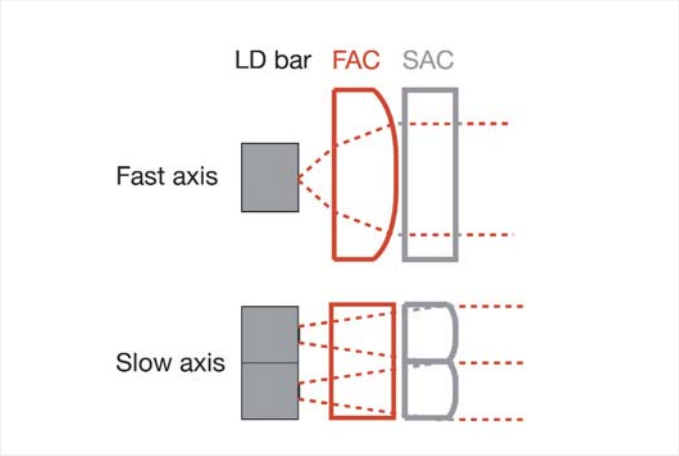
Axetris' fast axis collimators are acylindrical micro-lenses designed for collimating the «fast axis» of high-power laser diodes and laser diode bars. They can be used in combination with our slow axis collimators.

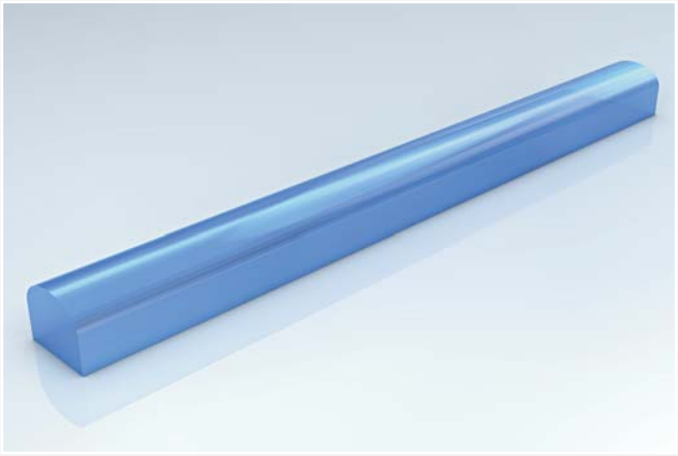
Features

- Diffraction limited collimation of the «fast axis»
- Minimized beam divergence
- Optimized acylindrical lens profile
- Matched to slow axis collimators

Applications

- Solid state laser pumping
- Material processing
- High power lasers
- Medical lasers





Specifications			
Parameter	**FAC1000/f0.6** (Article no. 600.908)	**FAC1500/f0.9** (Article no. 600.909)	**Comment**
Focal length	0.6 mm	0.9 mm	
Numerical aperture (NA)	> 0.8	> 0.8	
Lens profile	acylindrical	acylindrical	
Surface profile deviation	< 1 µm	< 1 µm	peak-to-valley
Collimation	< 2 mrad	< 2 mrad	
Lens size	11.5 mm × 1 mm × 0.8 mm	11.5 mm × 1.5 mm × 1.5 mm	length × width × thickness
Back focal length	150 µm	70 µm	
Collimated beam height	0.66 mm	0.99 mm	for 35° half angle source
Transmission	> 98%	> 98%	wavelength range 770 – 1000 nm
Technical data and specifications are subject to change without prior notice			

Custom fast axis collimators are available upon request

Slow Axis Collimators

Description

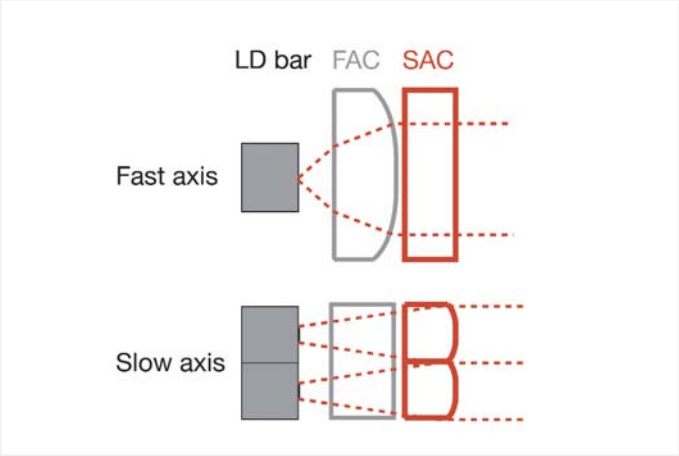
Axetris' slow axis collimators are cylindrical micro-lenses designed for collimating the «slow axis» of high-power laser diodes and bars. They can be used in combination with our fast axis collimators.

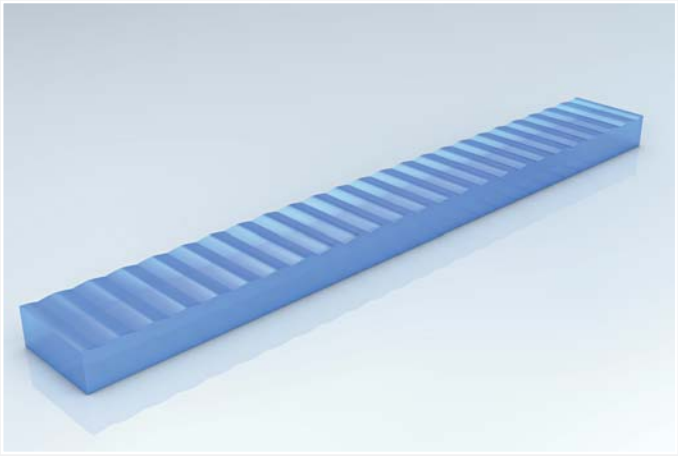
Features

- Collimation of the «slow axis»
- Compensation of beam astigmatism
- Compatible with high power laser diodes and bars
- Minimal scattering losses, low surface roughness
- Matched to fast axis collimators

Applications

- Solid state laser pumping
- Material processing
- High power lasers
- Medical lasers





Specifications		
Parameter	**SAC 500FS**	**Comment**
Array pitch (emitter spacing)	500 µm	other pitches possible
Number of lenses per array	21	
Lens arrays substrate size	12.0 × 1.5 × 0.6	length × width × thickness in mm^3
Lens surface profile	cylindrical	
Effective focal length	1.8 mm Article no. 600.251 2.0 mm Article no. 600.250 2.2 mm Article no. 600.202	other focal lengths available upon request
AR coating	< 0.5 % per side	double sided; wavelength range 770 –1080 nm
Surface roughness	< 5 nm	rms
Material	Fused Silica	
Technical data and specifications are subject to change without prior notice		

Custom slow axis collimators are available upon request

Shack-Hartmann Lens Arrays

Description

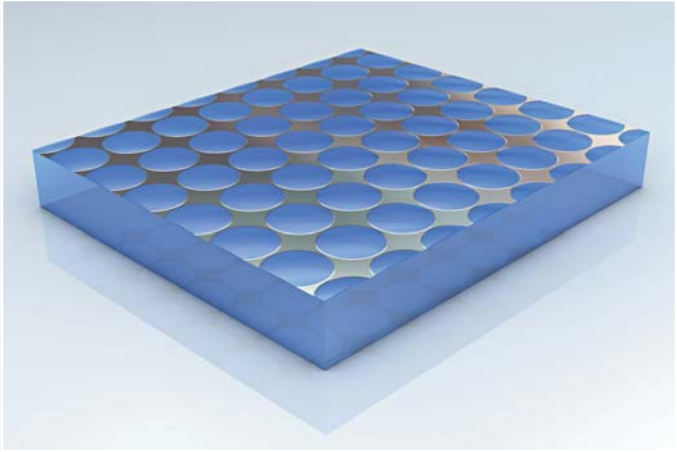
Axetris' Shack-Hartmann lens arrays are the heart of Shack-Hartmann wavefront-sensors. These micro-lens arrays are available in a variety of focal lengths.

Features

- Diffraction limited
- Superior surface quality
- Interstitial masking (optional)
- Long focal lengths

Applications

- Wavefront sensing
- Astronomy
- Material inspection



Specifications

Parameter	**SHL150FS** (Article no. 600.668)	**Comments**
Lens surface profile	spherical	
Array pitch	150 µm	custom pitches available
Focal length	5.6 mm	up to 15 mm
F-number	F/39	up to F/100
Surface roughness	< 5 nm	
Surface profile deviation	< 30 nm	rms, typical
AR coating	< 0.5% per side	optional
Surface Roughness	< 5 nm	rms
Mechanical dimensions	10 mm × 10 mm × 1.6 mm	length × width × thickness
Metallization	optional	masking, alignment structures, soldering pads, etc.
Material	Fused Silica	
Technical data and specifications are subject to change without prior notice		

Custom Shack-Hartmann lens arrays are available upon request

MEMS Services

Micro-technology at its finest

We offer custom solutions to OEM manufacturers ranging from concept to full scale volume manufacturing. Our facilities include a class 100 clean room environment, lithography and thin film processing. Our high standard of quality control is ensured by a suite of metrological systems and the use of modern statistical methods which underpin all of our production processes. As an ISO 9001:2008 certified company, we ensure the highest level of quality at a consistent level.

Axetris standard capabilities

Photolithography

- Photolithography of 1 µm for up to 8" wafers
- Single or double sided alignment
- Thick resist processing (SU8, others)
- Spray coating on severe topographies

Wet Etching

- Anisotropic Silicon etching
- Glass etching
- Metal etching

Metallization

- Sputtering up to 8" wafers

Dielectric coating deposition

- Silicon oxides and nitrides by PECVD
- Oxides or nitrides by reactive sputtering

Reactive Ion Etching

- Fused Silica
- Silicon
- Silicon Nitride / Oxide
- Photoresist

Metrology and characterization

- Interferometric and tactile surface measurements
- Film thickness measurement
- Resistivity & resistance
- Optical microscopy
- Scanning electron microscopy (SEM)

Axetris special capabilities

Micro-optics

- Refractive and diffractive micro-optical elements

Thin membranes

- Thin dielectric membranes for optics, sensors and life science applications

CMOS wafers post processing

- CMOS post processing like back side openings, metallization, thin film deposition

Lift-Off Processes

- Metallization in connection with lift off processes for electrode formation or solder pad definition. Materials include Au, Pt, AuSn, Cr, Ni, Ta, TiW, Cu, Al, other materials upon request

Dicing

- Dicing of Silicon, glass & fused silica wafers
- Dicing of chips with fragile structures such as thin membranes and micro-optic structures

Wet etching of glass

- Wet etching processes for microfluidics, optics and encapsulation

Micro-Optics F40/01.2008/03.2012/Art. Nr. 602.284

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