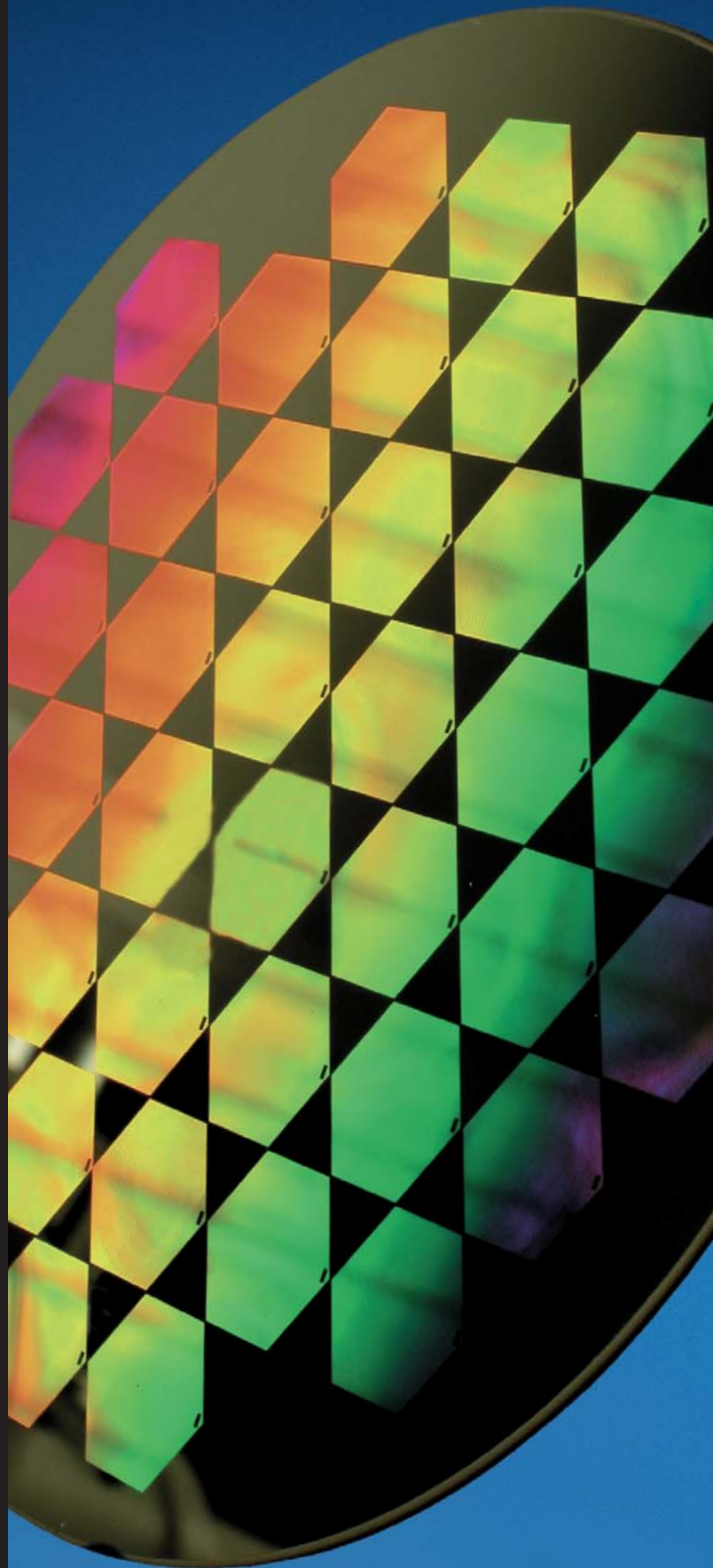




Micro-Optics

**Products and
Services**



a:etris
A Division of Leister



Leister Process Technologies, Switzerland

Leister Overview

Leister Process Technologies has over 60 years experience in the development, production and worldwide distribution of technical products.

The Axetris Division of Leister is a designer and manufacturer of micro-technology (MEMS) based components and modules in the areas of micro-optics, infrared sources for gas detection and mass-flow sensors / controllers.

Axetris offer a wide range of high-quality off-the-shelf products as well as custom solutions for its OEM customers. Our engineering and manufacturing team combines broad experience in design, simulation, fabrication and characterization from chip level to complex integrated electronic modules. Our manufacturing facilities in Switzerland include a world-class class 100 clean room with state-of-the-art micro-technology processing capabilities. As a partner to our OEM customers we support them from concept to volume production.

As an ISO 9001 certified company our production processes, dedicated manufacturing equipment and specialized characterization tools, make us a reliable manufacturer.

Micro-optics product range overview

Axetris micro-optics offering ranges from refractive micro-optic 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 fiber-optic 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, fiber micro-lens arrays and aspheric micro-lenses and arrays for edge emitting laser diodes and VCSEL.

Axetris custom solutions for OEM customers includes binary and multilevel diffraction gratings, Shack-Hartmann micro-lens arrays, custom micro-lenses and arrays in the Silicon, fused Silica and plastics materials. Our optics engineering and manufacturing team will support you from prototyping to volume production helping you to meet your specific design goals.



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Fast axis collimators

Description

Axetris fast axis collimators are acylindrical micro-lenses designed for collimating the «fast axis» of high-power 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 design

Applications

- Solid state laser pumping
- Material processing
- Medical applications
- Fiber coupling



Specifications

Parameter	FAC1000/f0.6	FAC1500/f0.9	Comments
Focal length	0.6 mm Article no. 600.908	0.9 mm Article no. 600.909	
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 x 1 mm x 0.8 mm	11.5 mm x 1.5 mm x 1.5 mm	length x width x thickness
Back focal length	150 μm	70 μm	
Collimated beam height	0.66 mm	0.99 mm	for 35° half angle source
Transmission	> 98% 0	> 98%	wavelength range $\lambda = 770 - 1000 \text{ nm}$
Material	high index glass	high index glass	

Technical data and specifications are subject to change without prior notice

Custom fast axis collimators are available upon request

Slow axis collimators

Description

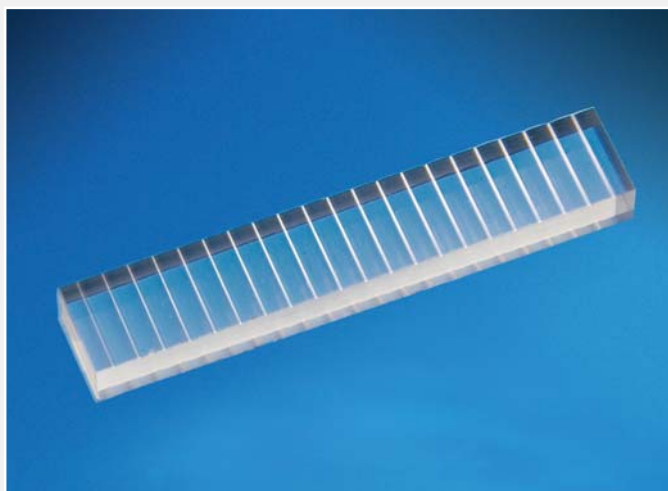
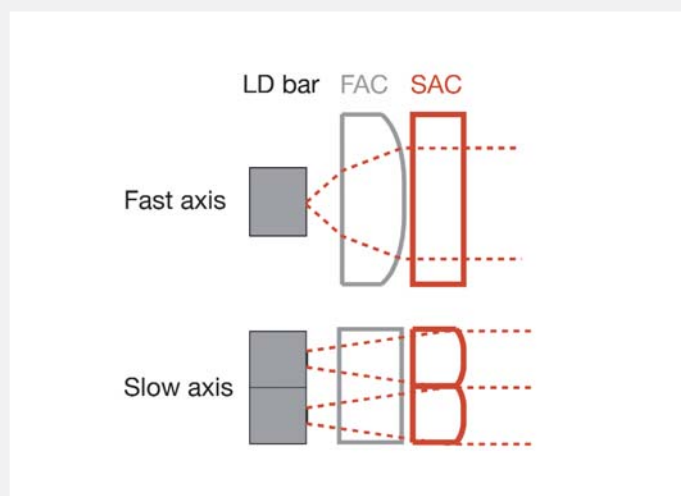
Axetris slow axis collimators are cylindrical micro-lenses designed for efficiently collimating the «slow axis» of high-power laser diode bars. They can be used in combination with our «fast axis» collimators.

Features

- Compensation of beam astigmatism
- High damage threshold compatible with high power laser diode bars
- Minimal scattering loss due to high quality fused Silica
- Very low surface roughness
- Stackable
- Compatible with fast axis collimating lenses

Applications

- Solid state laser pumping
- Material processing
- Medical applications
- Fiber coupling



Specifications

Parameter	SAC 500FS	Comments
Array pitch (emitter spacing)	500 μm	other pitches possible
Number of lenses per array	21	
Lens arrays substrate size	12.0 x 1.5 x 0.6	length x width x 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	tolerances: < $\pm 5\%$ array to array other focal lengths available upon request
Material	Fused Silica	Schott Lithosil [®] Q1
AR coating	< 0.5 % per side	double sided; wavelength range $\lambda = 770 - 1080 \text{ nm}$
Surface roughness	3 nm	rms

Technical data and specifications are subject to change without prior notice

Custom slow axis collimators are available upon request

Laser diode micro-lenses

Description

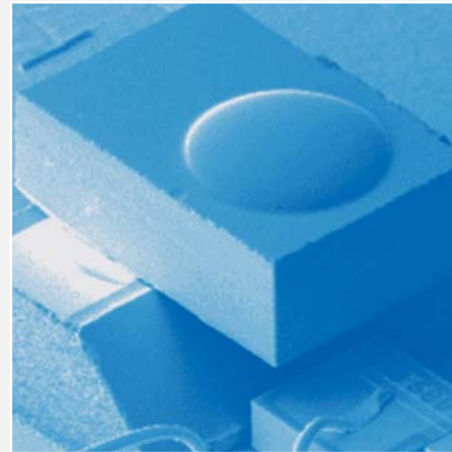
Axetris laser diode micro-lenses are optimized for efficient coupling to edge laser diodes (LDs) and vertical cavity surface emitting lasers (VCSELs). Applications range from optical communication to sensors.

Features

- High coupling efficiency
- High N.A. and aspherical design
- High focal length repeatability
- Optimized surface profile
- Low surface roughness
- Small form factor
- Telcordia compliant

Applications

- Data - and telecommunications
- Sensors
- Spectroscopy
- Metrology



Specifications

Parameter	LDC 500Si	Comments
Lens surface profile	aspherical	
Lens aperture diameter	480 μm Article no. 600.385	other diameters possible
Lens numerical aperture	0.7	other NA possible
Laser divergence	$\leq 35^\circ$ ($1/e^2$ 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 $\lambda = 1280 - 1620 \text{ nm}$
Surface roughness	< 5 nm	rms
Mechanical dimensions	0.94 mm x 0.94 mm x 0.38 mm	length x width x 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 micro-lenses and micro-lens arrays are available upon request, optimized for your specific mechanical dimensions, alignment marks, numerical aperture and working distance

Fiber micro-lens arrays

Description

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

Features

- Small size
- Low insertion loss
- Fused Silica or Silicon material
- Low surface roughness
- 100 % inspection

Applications

- Parallel channel communication
- WDM, De/MUX and R/OADM
- Optical amplifiers, attenuators, isolators



Specifications

Parameter	FCA 250FS	FCA 1000Si	Comments
Material	Fused Silica*	Silicon	*Schott Lithosil® Q1
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 1 × 10 Article no. 602.227	larger arrays 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 1 × 10: 10.93 × 1.93 × 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	< 4 nm	rms
Insertion loss	< 1 dB	< 1 dB	Fiber- to-fiber
Metallization	optional	optional	masking, alignment marks, soldering pads, etc.

Technical data and specifications are subject to change without prior notice

Custom fiber micro-lens arrays are available upon request

Shack-Hartmann lens arrays

Description

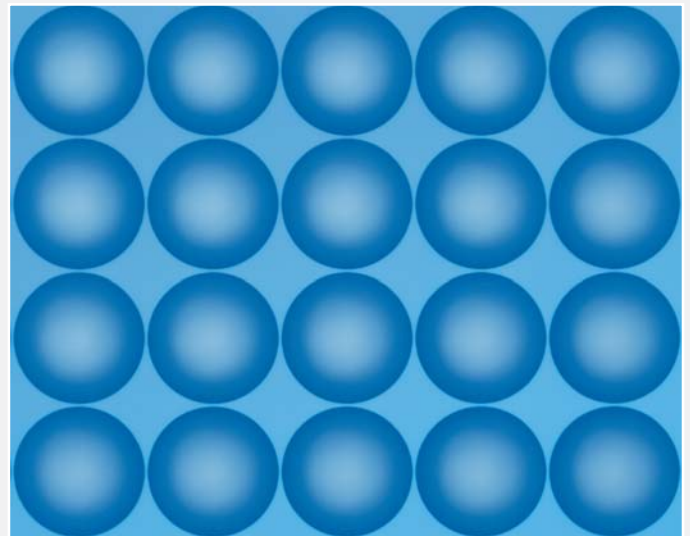
Axetris Shack-Hartmann lens arrays are the heart of Shack-Hartmann wavefront-sensors. These micro-lens arrays are available in a variety of focal lengths.

Features

- Diffraction limited spot size
- Superior surface quality
- Low surface roughness and low stray light
- Long focal lengths

Applications

- Wavefront sensing
- Astronomy
- Material processing



Specifications

Parameter	SHL150FS	Comments
Lens surface profile	spherical	
Array pitch	150 μm	custom pitches available
Focal length	< 15 mm	custom, up to 15 mm
F#	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	< 4 nm	rms
Mechanical dimensions	10 mm \times 10 mm \times 1.6 mm	length \times width \times thickness
Material	Fused Silica	Schott Lithosil [®] Q1
Metallization	optional	masking, alignment structures, soldering pads, etc.

Custom Shack-Hartmann lens arrays are available upon request

Diffraction gratings

Description

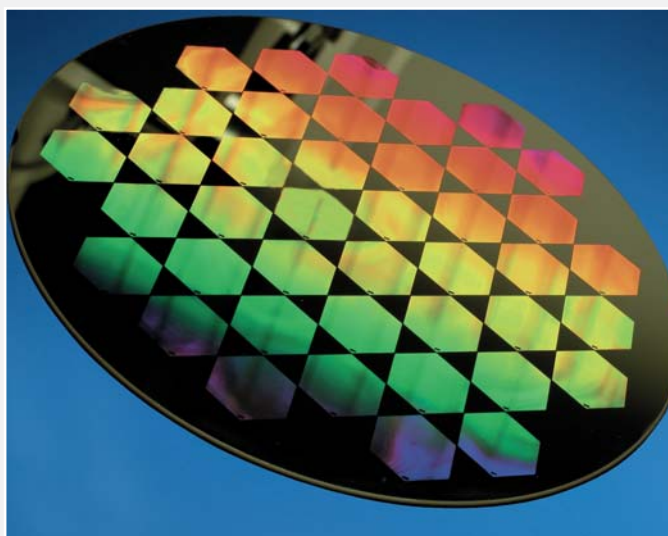
Axetris offers high quality binary & multilevel diffraction gratings in a wide parameter range. Excellent etch depth control, low surface roughness and a high uniformity are key advantages. Applications range from sensors to metrology, spectroscopy and many more.

Features

- Binary and multi-level gratings
- Phase and amplitude gratings
- Transmissive and reflective gratings
- controlled 0th order
- Sub-micron period control
- Chirped gratings
- Superior verticality

Applications

- Optical sensors
- Beam sampling
- Metrology and measurement equipment
- IR spectroscopy



Specifications

Parameter		Comments
Optical function	Transmissive or reflective	
Grating periods	3 μm to > 1 mm	minimum feature size = 1.5 μm
Period accuracy	$\pm 0.25 \mu\text{m}$	no cumulative errors
Levels	up to 16	
Groove shape	Binary, rectangular	
Surface roughness	< 5 nm	rms
Materials	Fused Silica	UV grade available
	Silicon	
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

Technical data and specifications are subject to change without prior notice

Custom diffraction gratings are available upon request

Custom micro-lens arrays

Description

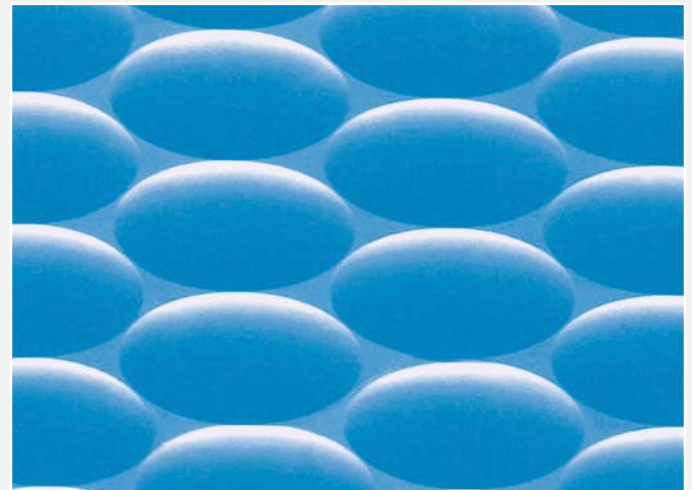
Axetris offers custom micro-lens arrays within a wide range of parameters designed and manufactured to customer requirements. Our optics experts will support you from concept to volume production.

Features

- Low surface roughness
- Sub-micron pitch control
- No cumulative pitch variation
- Various lens profiles
- Wavelengths range from UV to IR

Applications

- Laser beam shaping
- Fiber optics
- Displays
- Sensor enhancement
- Imaging systems
- Lighting / illumination



Specifications

Parameter	
Array Size	up to 130 mm diameter
Lens aperture sizes	10 μm to 1.5 mm
Lens aperture shapes	circular / hexagonal / square / custom
Lens surface profiles	spherical / aspheric / cylindrical
Materials	Silicon / Fused Silica / Plastic
F-number	Silicon: F/0.5 to F/10 Fused Silica: F/2.0 to F/100
Wavelength range	ultra violet to infrared (UV to IR)
Metallization	masking, alignment structures, soldering pads, etc.
Technical data and specifications are subject to change without prior notice	

OEM solutions

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 9001:2000 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
- E-beam

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 for micro-optical elements

Thin membranes

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

CMOS wafers post processing

- CMOS post process 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

Contact

ISO 9001 certified

Headquarters

Leister Process Technologies
Axetris Division
Schwarzenbergstrasse 10
CH-6056 Kaegiswil/Switzerland

phone: +41 41 662 74 74
fax: +41 41 662 75 25
axetris@leister.com
www.leister.com/axetris

USA

Leister Technologies, LLC
Axetris Division
1253 Hamilton Parkway
Itasca, IL 60143/USA

phone: +1 630 760 1000
fax: +1 630 760 1001
sales@leisterusa.com
www.leister.com/axetris