



**Micro-Optics**

**Products and  
Services**



**a:etris**  
A Division of Leister



Leister Process Technologies, Switzerland

### Leister Overview

Leister Process Technologies has over 60 years of 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, laser diode gas detectors, mass-flow meters and controllers.

Axetris offers a wide range of high-quality off-the-shelf products as well as custom solutions for its OEM customers. Our engineering and manufacturing teams combine 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 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.

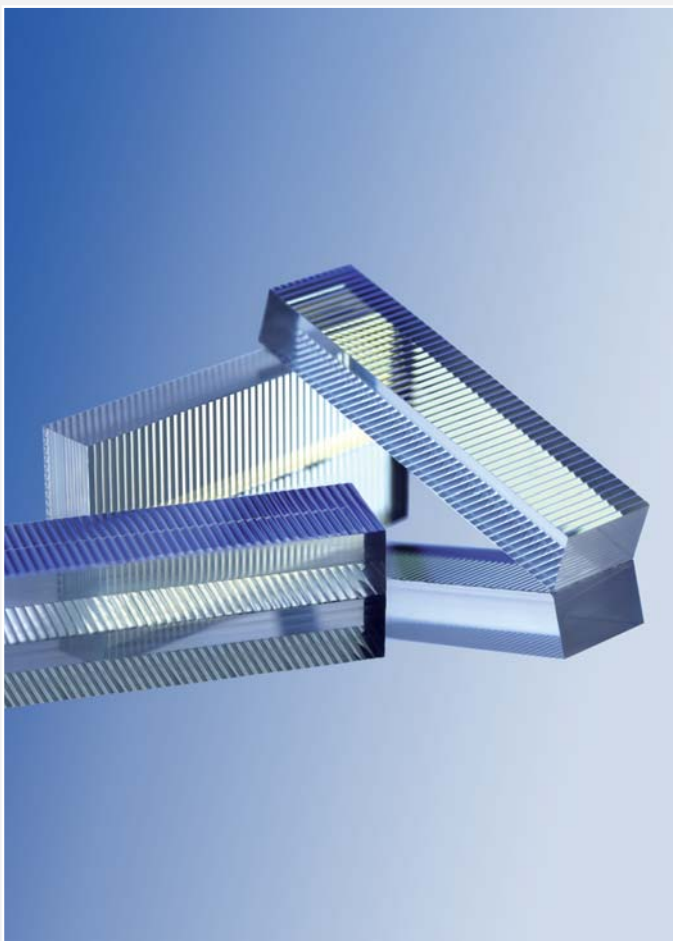
As an ISO 9001:2008 certified and ISO TS 16949 compliant company our production processes, dedicated manufacturing equipment and specialized characterization tools, make us a reliable manufacturer.

### Micro-optics product range overview

Axetris' micro-optics offering ranges from refractive micro-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

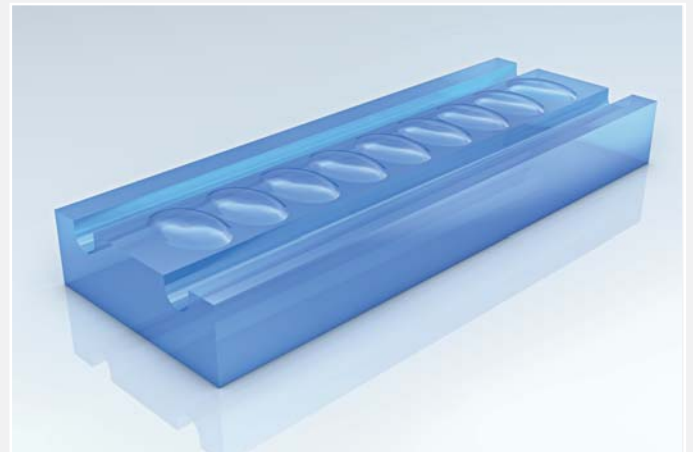
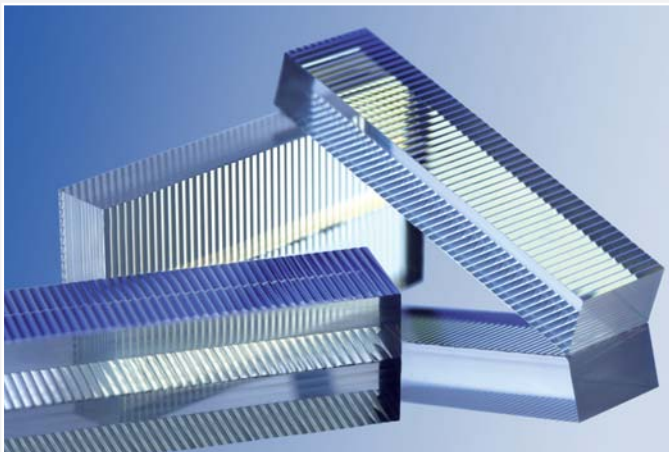
Axetris offers custom micro-lens arrays within a wide range of parameters designed and manufactured to customer requirements. Our optics engineers will support you from concept to volume production.

## 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 $\mu\text{m}$ to 1.5 mm
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

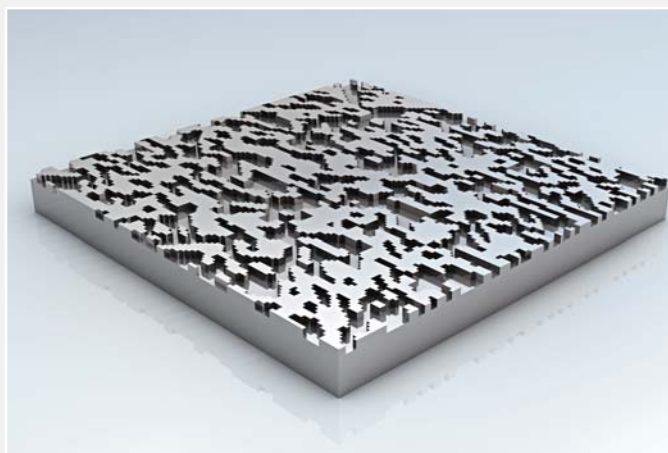
Axetris offers high quality binary & multilevel diffraction gratings in a wide parameter range. Excellent etch depth control, low surface roughness and a high uniformity are key advantages. Applications range from sensors to metrology, spectroscopy and many more.

## Features

- Binary and multi-level gratings
- Phase and amplitude gratings
- Transmissive and reflective gratings
- Controlled 0<sup>th</sup> 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	

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**Diffraction gratings & diffractive optical elements custom made to your specifications**

# Fiber Coupling Micro-Lens Arrays

## Description

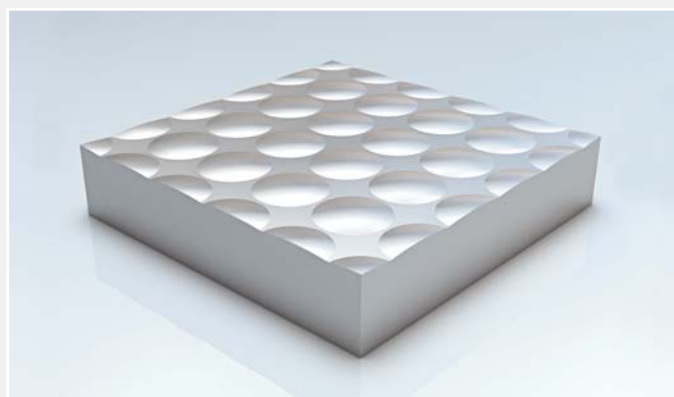
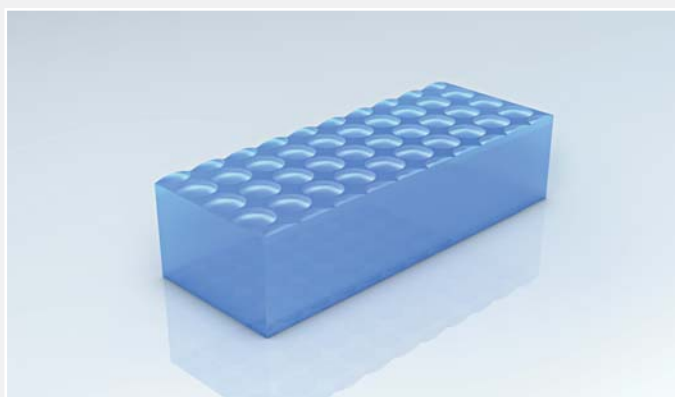
Axetris' fiber coupling micro-lens arrays are optimized for coupling light efficiently to single mode fiber arrays for optical communication applications.

## 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 $\mu\text{m}$	1000 $\mu\text{m}$	Tolerance: $\pm 0.25 \mu\text{m}$
Number channels per array	1 x 4 Article no. 600.178 1 x 8 Article no. 600.303 1 x 16 Article no. 600.408	1 x 4 Article no. 600.383 4 x 4 Article no. 600.499	larger arrays available
Lens array dimensions	1 x 4: 1.5 x 1.0 x 1.0 1 x 8: 2.5 x 1.0 x 1.0 1 x 16: 2.5 x 4.5 x 1.0	1 x 4: 4.93 x 1.93 x 1.0 4 x 4: 4.93 x 4.93 x 1.0	length x width x thickness in $\text{mm}^3$
Lens diameter	240 $\mu\text{m}$	950 $\mu\text{m}$	
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 $\mu\text{m}$	2420 $\mu\text{m}$	at $\lambda = 1.55 \mu\text{m}$
AR coating	< 0.5 % per side	< 0.5 % per side	double sided; wavelength range $\lambda = 1260 - 1620 \text{ nm}$
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.
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

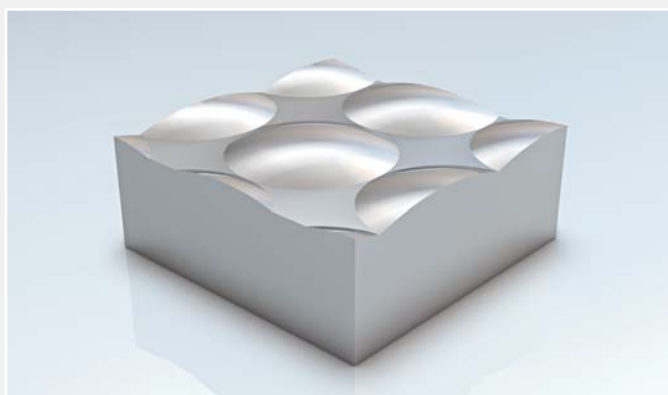
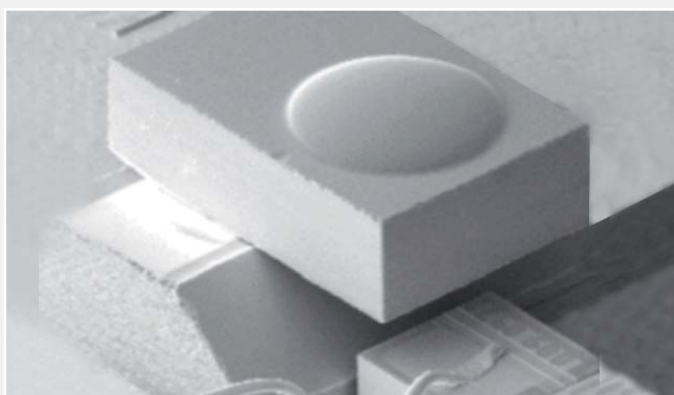
Axetris' laser diode collimation micro-lenses are designed and optimized for efficient collimation of edge emitting laser diodes (LDs) and vertical cavity surface emitting lasers (VCSELs). Applications include collimation of laser diodes and focussing onto photodiodes for optical fiber communications 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 aperture diameter	480 $\mu\text{m}$	other diameters possible
Lens numerical aperture	0.7	other NA possible
Laser divergence	$\leq 35^\circ$ ( $1/e^2$ half angle)	
Working distance	100 $\mu\text{m}$ to 300 $\mu\text{m}$	custom working distances available
Wavelength range	> 1.1 $\mu\text{m}$	
AR coating	< 0.5 % per side	double sided, wavelength range $\lambda = 1280 - 1620$ nm
Surface roughness	< 5 nm	rms
Mechanical dimensions	0.94 mm $\times$ 0.94 mm $\times$ 0.38 mm	length $\times$ width $\times$ 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

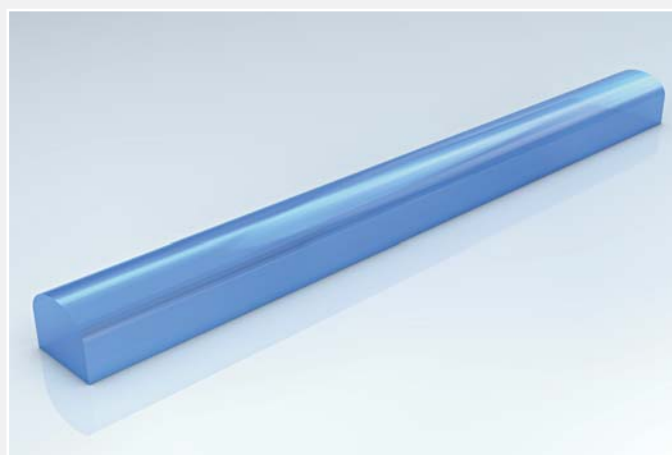
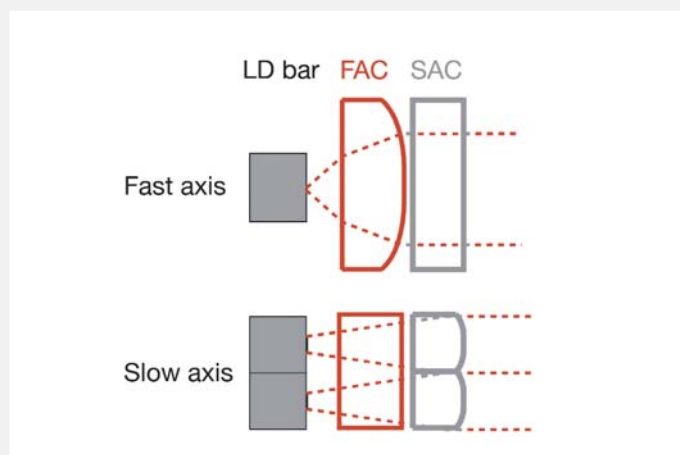
Axetris' fast axis collimators are acylindrical micro-lenses designed for collimating the «fast axis» of high-power laser diodes and laser diode bars. They can be used in combination with our slow axis collimators.

## 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 $\mu\text{m}$	< 1 $\mu\text{m}$	peak-to-valley
Collimation	< 2 mrad	< 2 mrad	
Lens size	11.5 mm $\times$ 1 mm $\times$ 0.8 mm	11.5 mm $\times$ 1.5 mm $\times$ 1.5 mm	length $\times$ width $\times$ thickness
Back focal length	150 $\mu\text{m}$	70 $\mu\text{m}$	
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

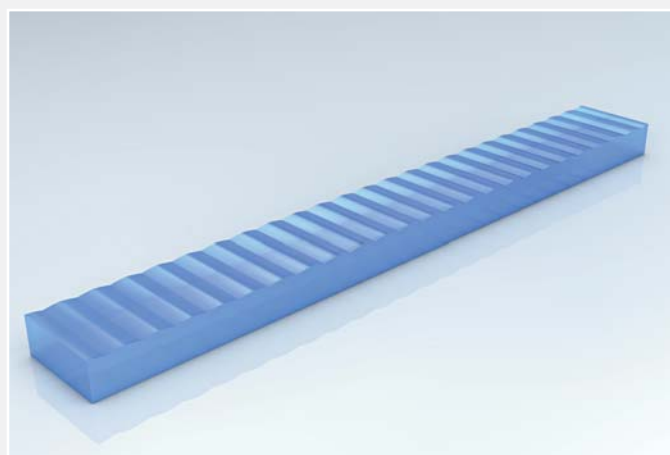
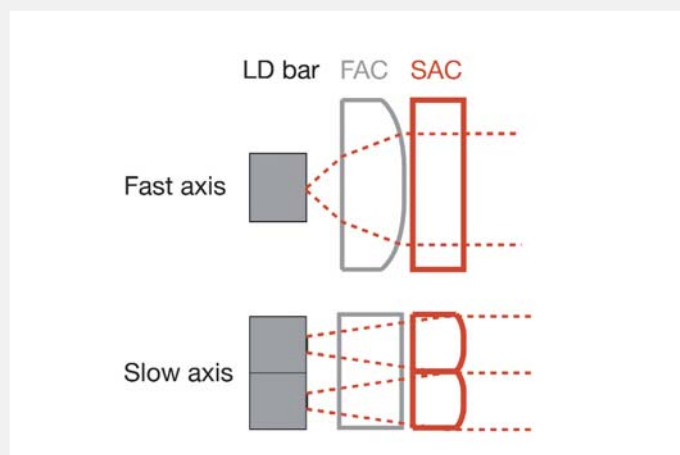
Axetris' slow axis collimators are cylindrical micro-lenses designed for collimating the «slow axis» of high-power laser diodes and bars. They can be used in combination with our fast axis collimators.

## 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 $\mu\text{m}$	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 <sup>3</sup>
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	3 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

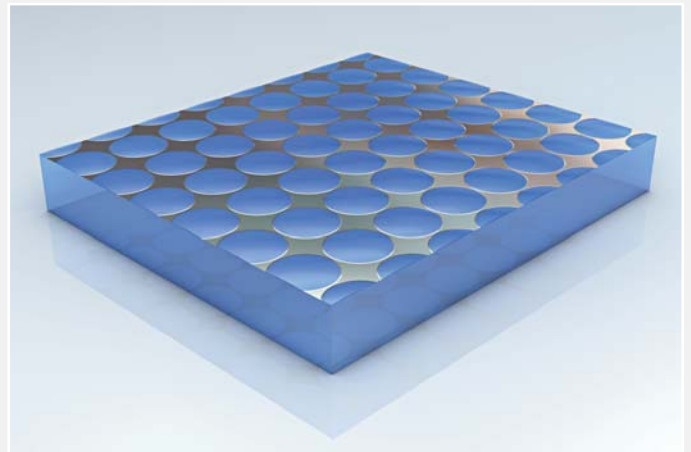
Axetris' Shack-Hartmann lens arrays are the heart of Shack-Hartmann wavefront-sensors. These micro-lens arrays are available in a variety of focal lengths.

## 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 $\mu\text{m}$	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	< 4 nm	rms
Mechanical dimensions	10 mm $\times$ 10 mm $\times$ 1.6 mm	length $\times$ width $\times$ 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  $\mu\text{m}$  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

## Contact

ISO 9001:2008 certified

### Headquarters

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