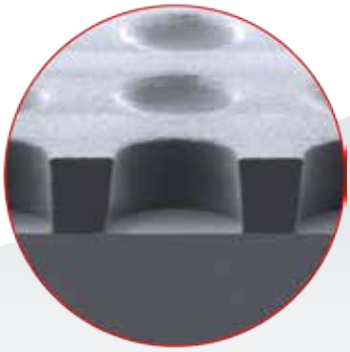
HEIDELBERG INSTRUMENTS

MLA150

The Advanced Maskless Aligner



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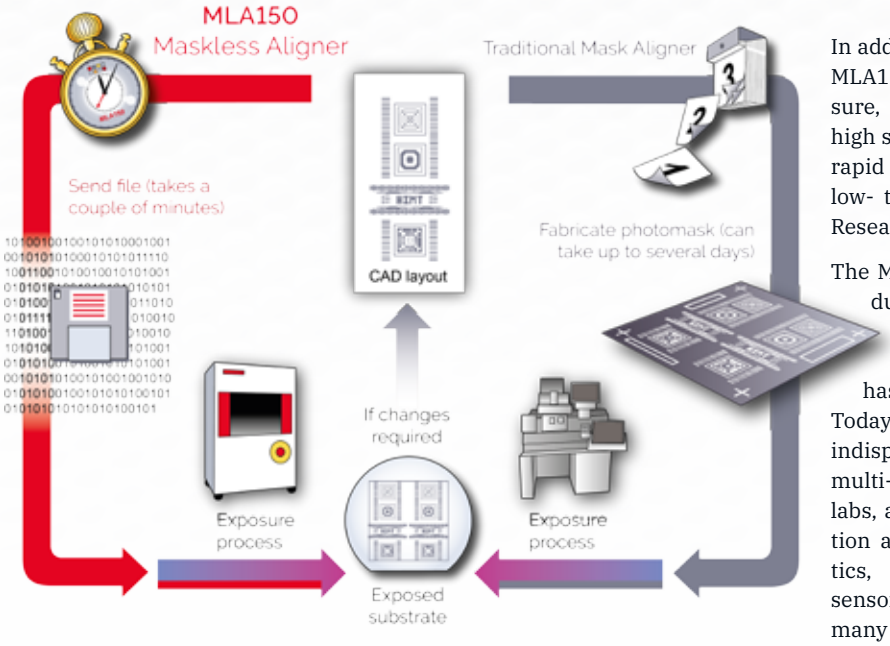
MLA150
THE MASKLESS ALIGNER

The Maskless Aligner MLA150 takes you into the future of photolithography: The traditional photomask becomes a thing of the past as your design file is exposed directly onto the resist-coated wafer via a 2-dimensional Spatial Light Modulator.

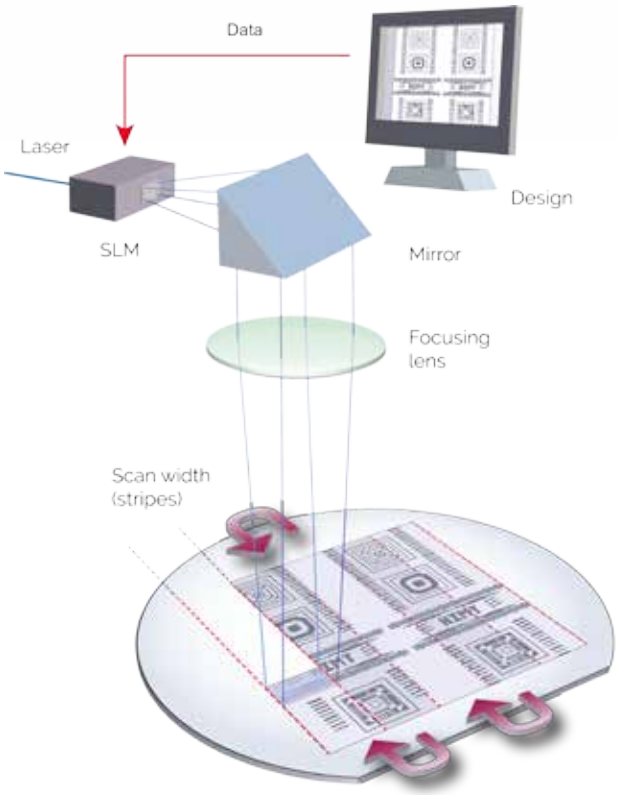


In addition to flexibility and economy, MLA150 provides non-contact exposure, outstanding ease of use, and high speed, making it the ideal tool in rapid prototyping environments, for low- to mid-volume production, and Research & Development.

The Maskless Aligner was first introduced in 2015. Since then, the revolutionary, state-of-the-art maskless technology has become firmly established. Today, the MLA150 serves as a trusted, indispensable workhorse in many multi-user facilities, nanofabrication labs, and national institutes. Application areas include MEMS, micro-optics, diffractive optical elements, sensors, electronic components and many more.

SPEED

- High-speed Spatial Light Modulator (SLM)
- Bidirectional writing process
- „Empty stripes“ optimization
- Ultra-fast x-y stage

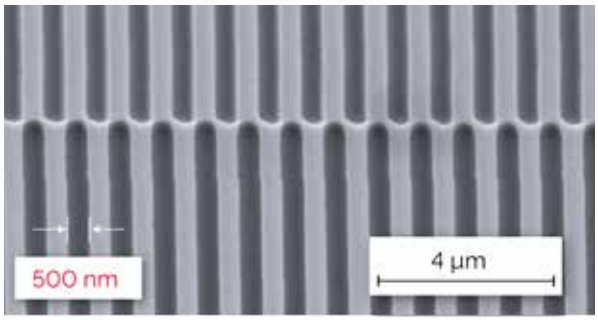


MLA150 exposure times ★

Laser wavelength	405 nm
50 x 50 mm²	4 minutes
100 x 100 mm²	9 minutes
150 x 150 mm²	16 minutes
200 x 200 mm²	36 minutes

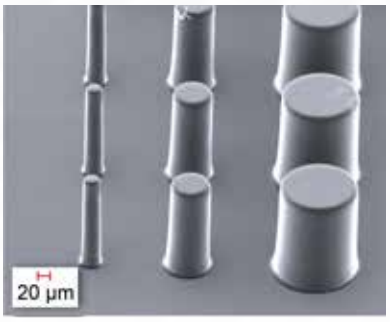
★ For exposure at 100 mJ/cm² and minimum feature size of 1 µm

HIGH RESOLUTION



High-resolution mode: Vertical 500 nm lines and spaces. Resist: S1805. Wavelength: 375 nm

HIGH-ASPECT-RATIO

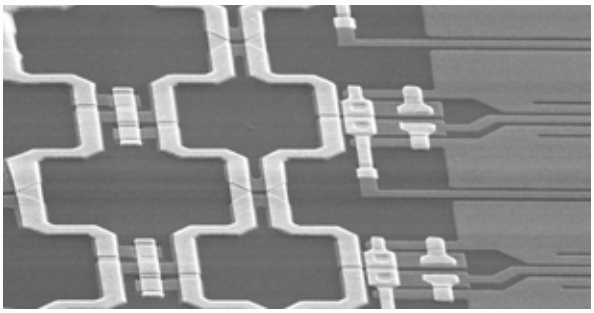


High-aspect ratio: Pillars. Resist: 160 µm SU-8

- Adjustable depth of focus
- Aspect ratio up to 1:20
- Applications: Micro-fluidics, MEMS, waveguides

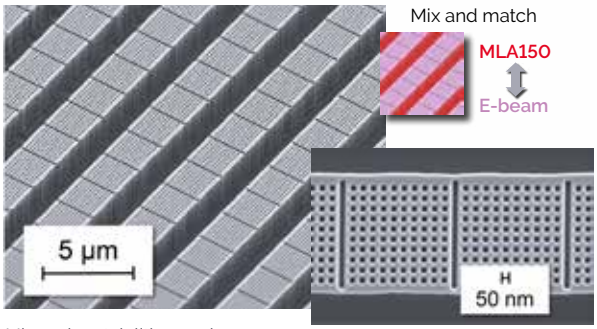
FAST AND HIGH-PRECISION ALIGNMENT

- Global and field-by-field alignment
- Backside alignment
- Alignment accuracy of better than 500 nm
- Fast and easy alignment procedure
- Alignment error compensation: Corrects for rotation, offset, scaling and shearing
- Allows mix and match between different tool sets, e.g. e-beam or thermal scanning probe lithography and laser lithography



SQUID magnetic flux sensor; 18 layer process

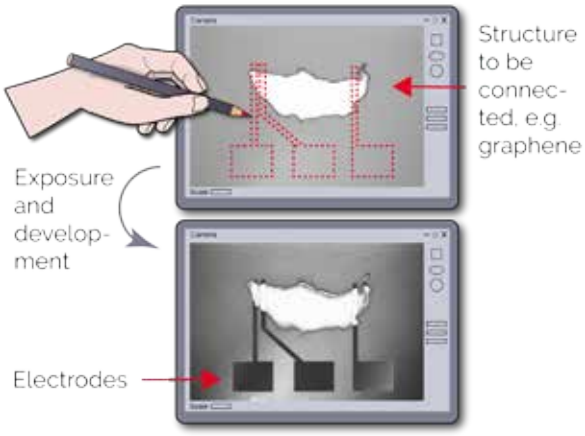
Courtesy of the Kirchhoff Institute for Physics, Heidelberg



Mix and match lithography

Courtesy of EPFL LMIS1, Lausanne

FLEXIBILITY



- The available solid state laser sources (405 and 375 nm) make the system compatible with all broadband UV photoresists (including SU-8) and can both be installed in the MLA150 at the same time
- 3D-patterning with grayscale lithography
- Optional: exchangeable chucks with individual vacuum layouts
- The Draw Mode: Add individual features to a previously patterned substrate. Using graphic elements, or even a bitmap, simply „draw“ the desired structures - such as labels, markers, or electrical connections - directly into the camera image

MLA150
SYSTEM SPECIFICATIONS

	Write Mode I ★	Write Mode II ★
Writing performance		
Minimum structure size [µm]	0.6	1
Linewidth variation [3σ, nm]	100	120
Global 2nd layer alignment [3σ, nm]	500	500
Local 2nd layer alignment [3σ, nm]	250	250
Backside alignment [3σ, nm]	1000	1000
Exposure time 405 nm laser for 4" wafer [min]	35	9
Exposure time 375 nm laser for 4" wafer [min]	35	20
Max. write speed 405 nm laser [mm^2/min]	285	1100
Max. write speed 375 nm laser [mm^2/min]	285	500
System features		
Light source	Diode lasers: 8 W at 405 nm, 2.8 W at 375 nm, or both	
Substrate sizes	Variable: 3 x 3 mm^2 to 6" x 6" | Optional: 8" x 8" Customizable on request	
Substrate thickness	0 - 12 mm	
Maximum exposure area	150 x 150 mm^2 | Optional: 200 x 200 mm^2	
Temperature controlled flow box	Temperature stability ± 0.1°	
Real-time autofocus	Air-gauge or optical	
Autofocus compensation range	180 µm	
Grayscale	128 gray levels	
Software features	Exposure wizard, resist database, automatic labeling and serialization, Draw Mode for CADless exposures, substrate tracking / history	
System dimensions (lithography unit)		
Height × width × depth	1950 mm × 1300 mm × 1300 mm	
Weight	1100 kg	
Installation requirements		
Electrical	230 VAC ± 5%, 50/60 Hz, 16 A	
Compressed air	6 - 10 bar, stability ± 0.5 bar	
Economical considerations		
Saves on the cost of photomasks		
Low running costs for maintenance, energy consumption, spare parts		
Solid state laser light sources with lifetime of several years		

★ Only one write mode can be installed on the system

Please note: Specifications depend on individual process conditions and may vary according to equipment configuration. Write speed depends on exposure area. Design and specifications are subject to change without prior notice.

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HEIDELBERG INSTRUMENTS
The power of direct writing

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