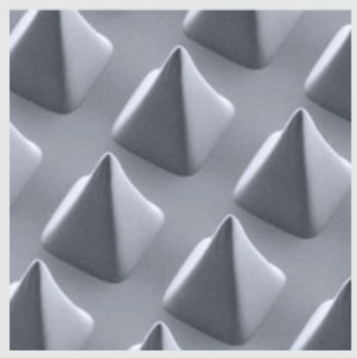
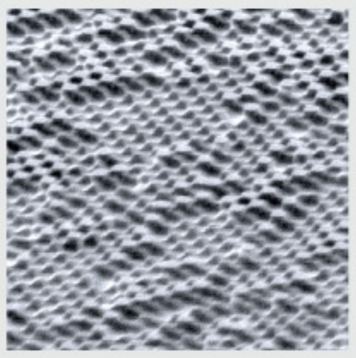
HEIDELBERG INSTRUMENTS

DWL 66+

THE ULTIMATE LITHOGRAPHY RESEARCH TOOL





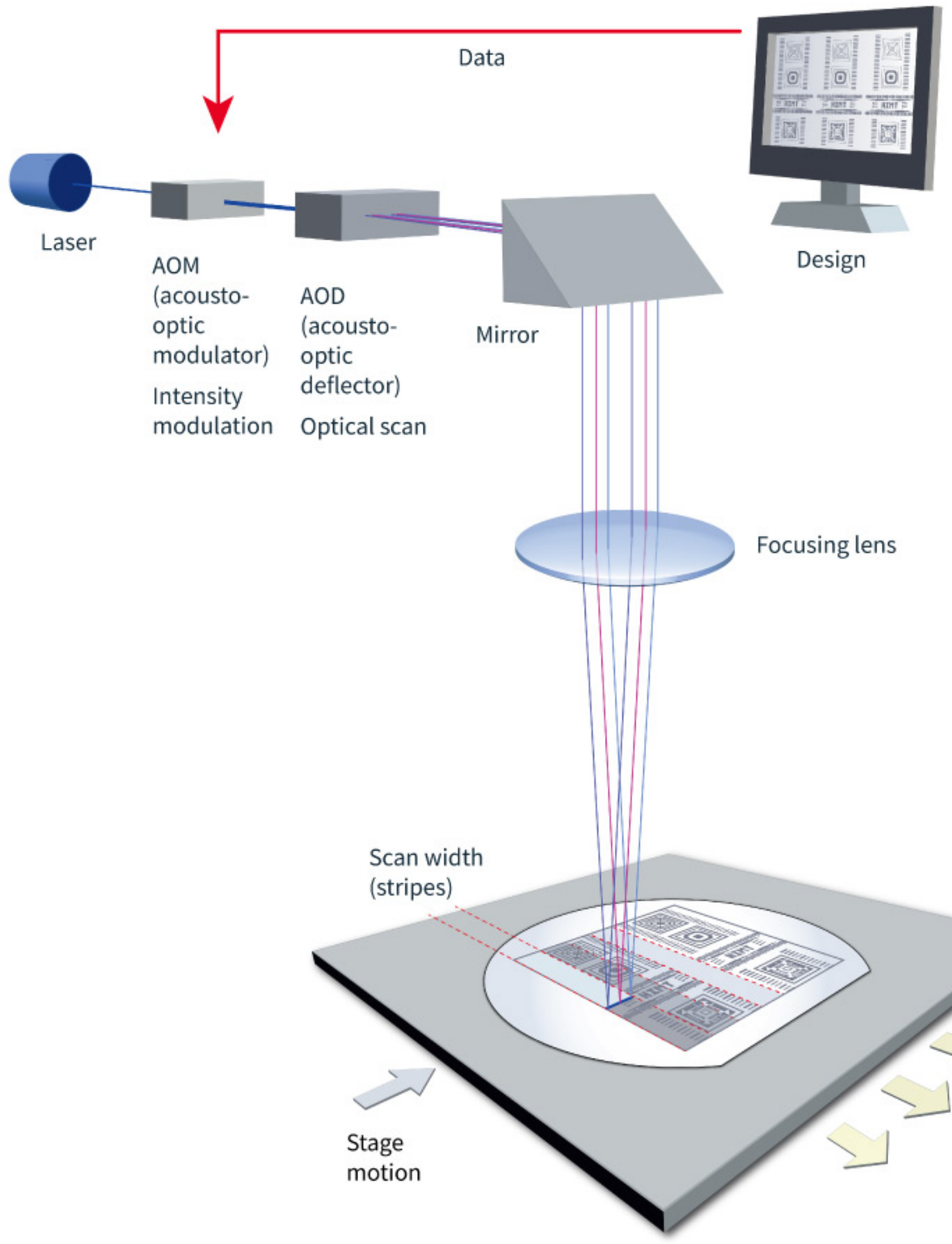
DWL 66+

THE ULTIMATE PHOTOLITHOGRAPHY TOOL FOR RESEARCH & DEVELOPMENT

The DWL 66+ laser lithography system is a highly versatile, high-resolution pattern generator for direct writing and low-volume mask making. Its customer base includes over 300 leading universities, research facilities, and companies worldwide.

The system features powerful standard options such as the High-Resolution Mode, backside alignment (BSA), and the optical autofocus. In addition to high-resolution 2D patterns, the system also supports the creation of complex 2.5D structures in thick photoresist with the help of the gray-scale exposure mode. The DWL 66+ can be equipped with either a 405 nm laser for work with all broadband resists, or with a 375 nm UV laser that in addition allows the use of SU-8 and other i-line-resists. Advanced professional options like the High-Accuracy Coordinate System and an automatic loader are also available.

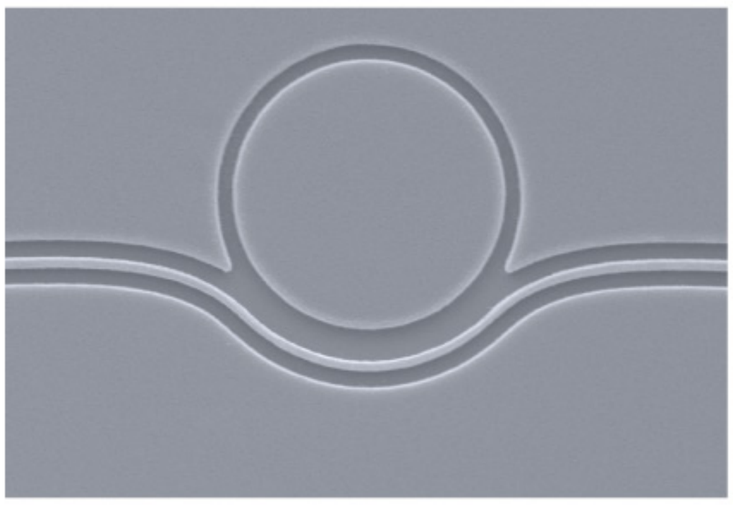
With a minimum structure size of 300 nm, the DWL 66+ provides the ultimate in high resolution, outperforming the most powerful optical lithography systems in the Research & Development market segment. The system's main application areas can be found in optical sciences, material research, micro-engineering and micro-electronics.



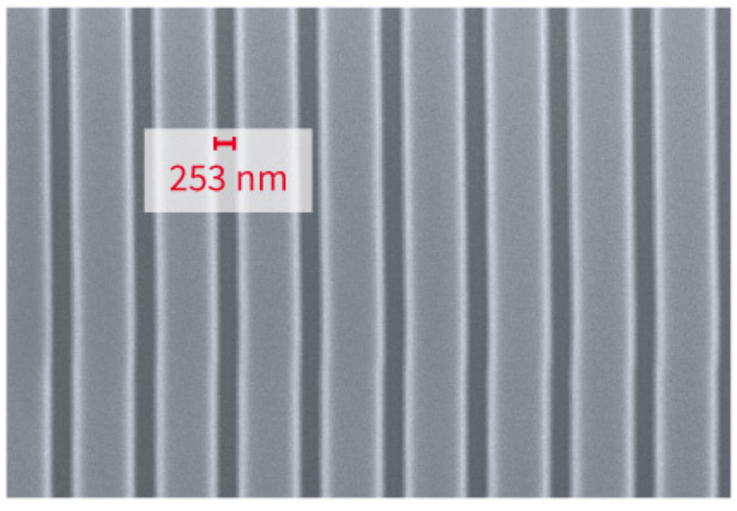
DWL 66+ exposure strategy

THE HIGH-RESOLUTION MODE

This is one of the six write modes that are available for the DWL 66+. The optimized optics and electronics setup of the High-Resolution Write Mode provide ultimate stability and resolution and enable exposures of structures with a minimum feature size of 300 nm.



A channel waveguide coupled to a ring resonator. The waveguide is approximately 320 nm wide, the resonator diameter is 3 µm. The exposure laser wavelength was 405 nm. Design created with [1].



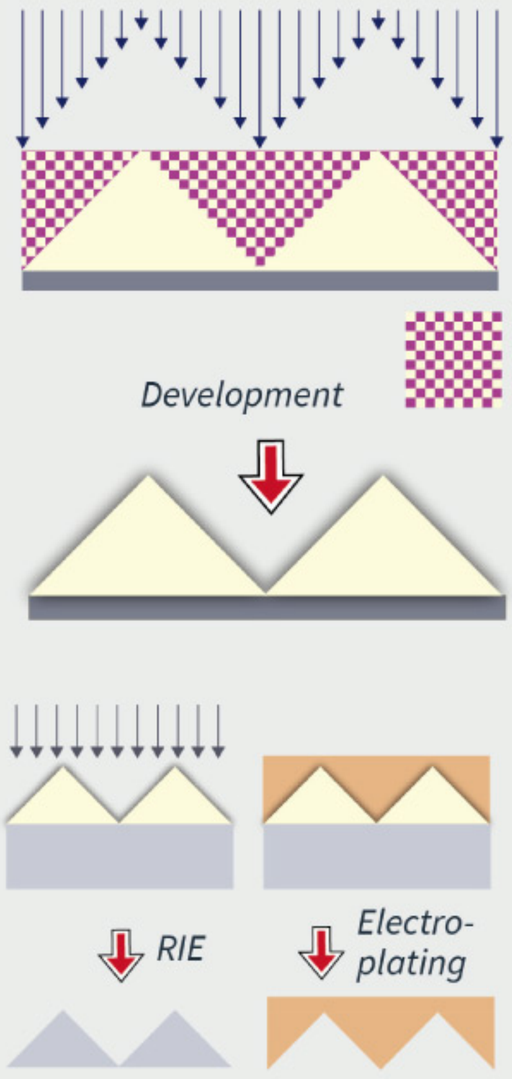
Minimum feature size: 300 nm - or even less. The image shows the result of a high-resolution test exposure with a nominal linewidth of 250 nm!

[1] The Nanolithography Toolbox, K.C. Balram et al., J. Res. Natl. Inst. Stand. 121, pp. 464-475 (2016). http://dx.doi.org/10.6028/jres.121.024

A CHOICE OF GRAYSCALE CAPABILITIES

Grayscale lithography uses a low-contrast positive photoresist. The exposure intensity gradient transfers directly into exposure depth. The result after processing is a 2.5D topography on the microscale.

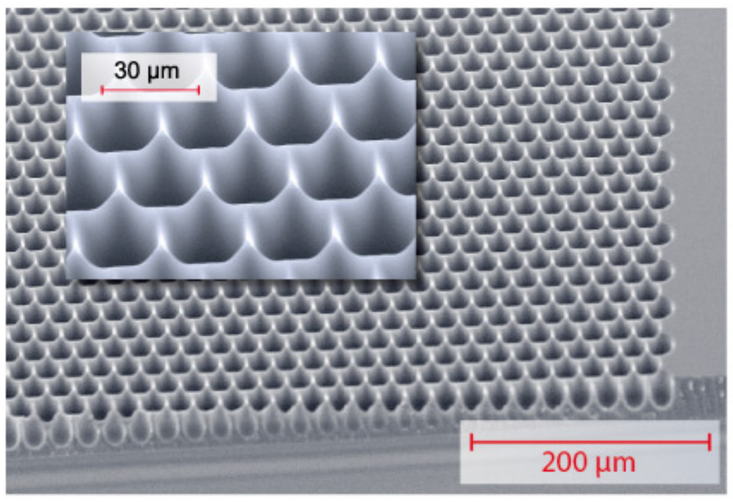
Whether standard, advanced or professional - the grayscale mode presents a powerful tool for the creation of complex topographies for example for micro-optical components or MEMS.



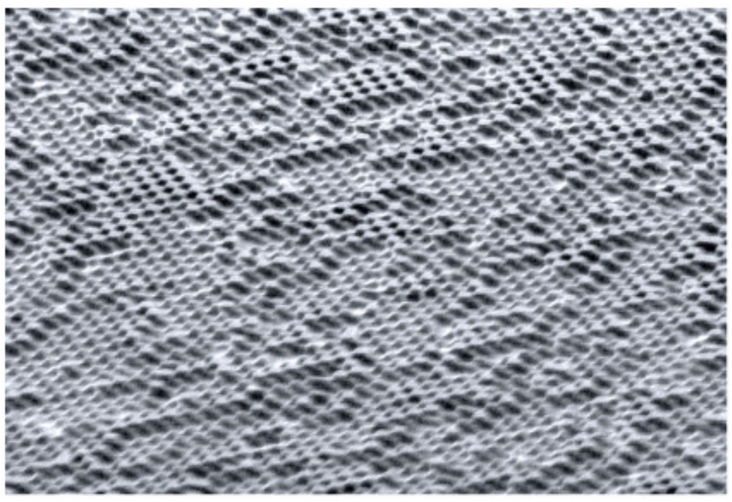
GRAYSCALE LITHOGRAPHY:

CREATION OF 2.5D TOPOGRAPHIES ON THE MICROSCALE

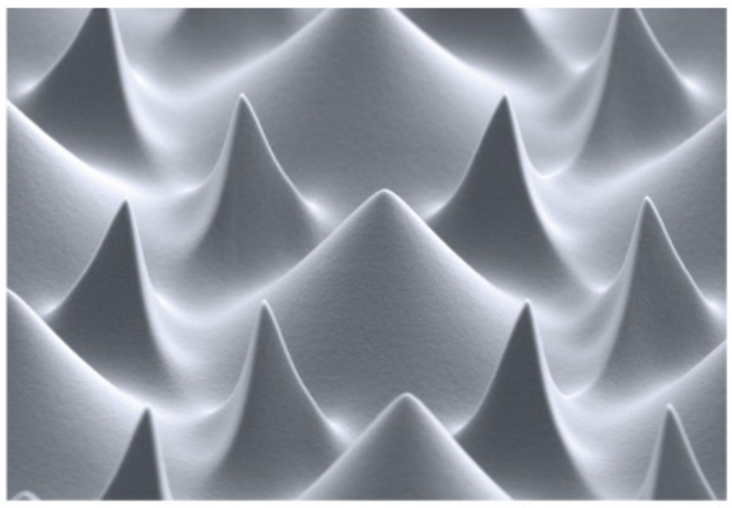
APPLICATIONS



Microlens array: Width of lenses 20 µm, depth 30 µm



DOE: Resist AZ 4633, resist thickness 4 µm, structure size 2 µm



Diffuser: Resist AZ 4562, structure size < 5 µm

Image courtesy of IGI

ADVANCED OPTIONS AND UPGRADES

- Professional Grayscale

  Allows the exposure of CAD files with up to 1024 gray levels in order to create complex topographies for applications such as microoptics. Includes highly sophisticated software package.

- High-Accuracy Coordinate System

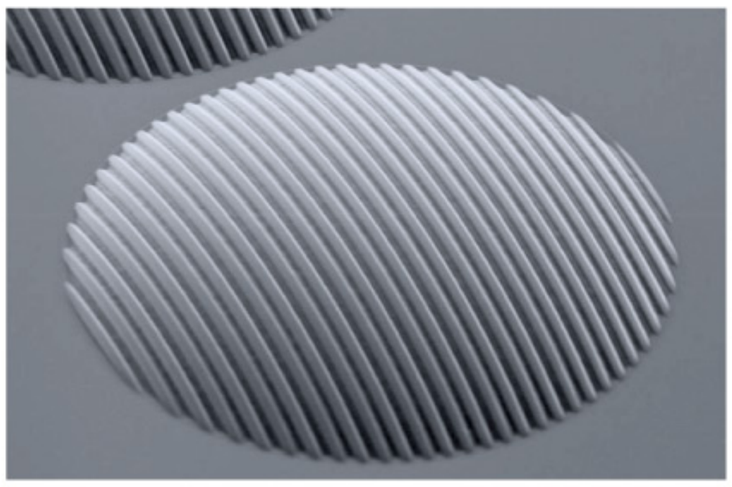
  Includes various technical measures to improve the thermal stability and position accuracy of the stage's coordinate system. Provides improved specifications for 2nd layer overlay accuracy.

- Automatic Loader

  Handling of masks up to 7" and wafers up to 8" with two carrier stations, pre-aligner and wafer scanner.

- Basic Freeform (BFF)

  Exposures on non-planar substrates with features down to 3 µm. Typical applications are microstructures on top of convex or concave lenses.



Grating on concave lens

Image courtesy of Fraunhofer IOF

DWL 66+
SYSTEM SPECIFICATIONS

Write mode	HiRes	I	II	III	IV	V
Writing Performance						
Minimum Feature Size [µm]	0.3	0.6	0.8	1	2	4
Minimum Lines and Spaces [µm]	0.5	0.8	1	1.5	3	5
Address Grid [nm]	5	10	25	50	100	200
Edge Roughness [3σ, nm]	50	50	70	80	110	160
CD Uniformity [3σ, nm]	60	70	80	130	180	250
2nd Layer Alignment over 5 x 5 mm² [nm]	250	250	250	250	350	500
2nd Layer Alignment over 100 x 100 mm² [nm]	500	500	500	500	800	1000
Backside Alignment [nm]	1000					
With Diode Laser (405 nm)						
Write Speed [mm²/min]	3	13	40	150	600	2000
Exposure Time for 100x100 mm² area [min]	3000	740	255	72	20	7
With UV Diode Laser (375 nm)						
Write Speed [mm²/min]	2	10	30	110	-	-
Exposure Time for 100x100 mm² area [min]	5000	1015	350	100	-	-

System Features	
Light Source	Diode laser with 405 nm or 375 nm
Substrate Sizes	Variable: 5 x 5 mm² to 9″ x 9″ | Customizable on request
Substrate Thickness	0 to 12 mm
Maximum Exposure Area	200 x 200 mm²
Temperature controlled Flow Box	Temperature stability ± 0.1°, ISO 4 environment
Real-Time Autofocus	Optical autofocus or air-gauge autofocus
Autofocus Compensation Range	80 µm
Standard or Advanced Grayscale Mode	128 / 256 gray levels respectively
Vector Mode	Enables the writing of stitching-free lines
Overview Camera	8 x 10 mm² field of view facilitates alignment to marks and substrate navigation
Backside Alignment (optional)	Allows the alignment of exposures to structures on the backside of the substrate
Advanced Options - Performance Upgrades	
High-Accuracy Coordinate System	Includes golden plate calibration and climate monitoring: 2nd layer alignment down to 350 nm
Professional Grayscale Mode	1024 gray levels, professional data conversion software
Automatic Loading System	Handling of masks up to 7″ and wafers up to 8″ with two carrier stations, pre-aligner and wafer scanner
System Dimensions of Standard Version	
Width × Depth x Height	1300 mm x 1100 mm x 1950 mm (lithography unit only)
Weight	1000 kg (lithography unit only)
Installation Requirements	
Electrical	230 VAC ± 5 %, 50/60 Hz, 16 A
Compressed air	6 - 10 bar

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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