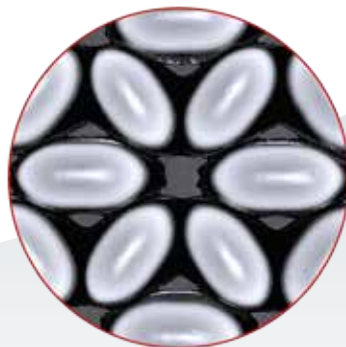
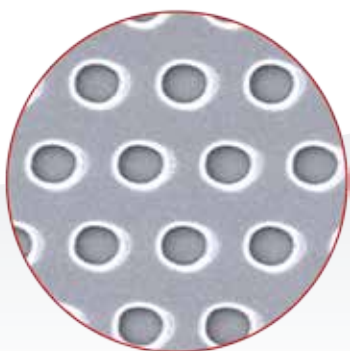


DWL 2000 / DWL 4000

The High-Resolution
Pattern Generators



DWL 2000 / DWL 4000 HIGH-RESOLUTION PATTERN GENERATORS

The DWL 2000 and DWL 4000 laser lithography systems are fast, flexible high-resolution pattern generators for mask making and direct writing. With a write area of up to 200 x 200 mm² and 400 x 400 mm² respectively, these systems are the perfect solution for fast patterning of masks and wafers in MEMS, BioMEMS, Micro-Optics, ASICs, Micro Fluidics, Sensors, CGHs, and all other applications that require microstructures.

High-Stability Setup

A fixed optical setup, a reliable real-time auto focus system and a high precision air-bearing stage system guarantee the quality and position accuracy of the exposed structures. A high-resolution interferometer monitors the position of the stage at all times. To ensure maximum stability, an advanced climate control provides constant temperature stability during operation. Additional software is used to compensate for any remaining variation in the mechanical structures or the environmental parameters.

Write Modes

The system operator can choose between four available write modes, making it possible to optimize the performance of the system for different applications.

Loading System

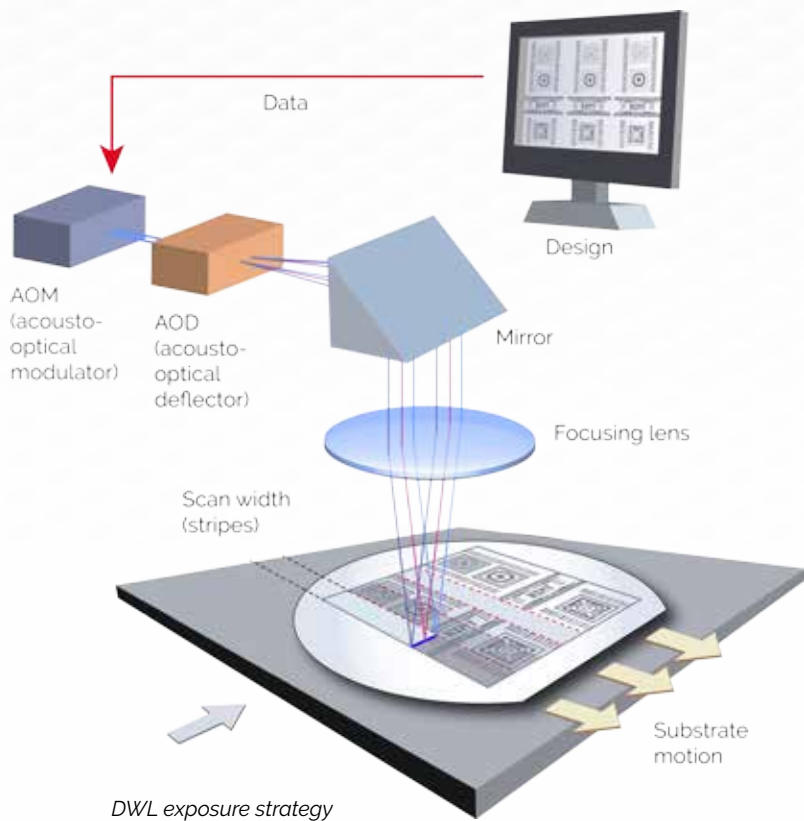
To further increase the efficiency a loading system can be installed, which loads the substrates automatically from a cassette. According to the setup done by the operator, each substrate can be exposed with an individual design.

Camera System

The DWL 2000 and DWL 4000 include two CCD cameras used for metrology and alignment purposes. This enables the systems to perform overlay exposures with high accuracy. Arbitrary structures on the substrate can be used for the alignment.

The Grayscale Mode

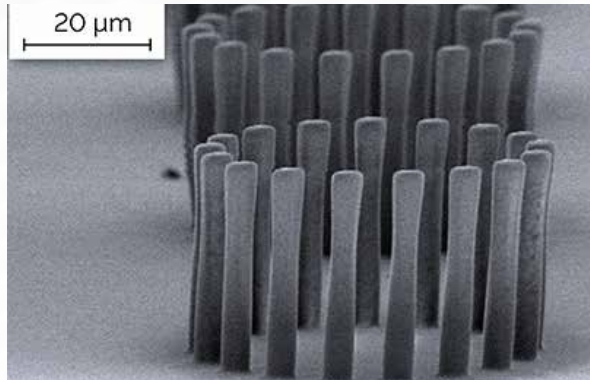
In addition to the exposure of high-resolution 2D patterns, the DWL series systems excel at Grayscale exposures. The Professional Grayscale Exposure Mode enables them to create complex 3D structures with high quality in thick photoresist.



In contrast to other technologies, this method facilitates high-throughput formation of 2.5D microstructures over large areas. Special software tools for optimization and evaluation of Grayscale exposures have been developed to reduce the cycle time for new products. To ensure lowest surface roughness and shape conformity, the systems support up to 1000 gray levels. Most common applications include fabrication of wafer level optics used for telecommunication or illumination market segments, where our systems are being used by some of the largest multinational corporations. Other new applications include display manufacturing as well as device fabrication in the areas of biology and life sciences.

APPLICATIONS

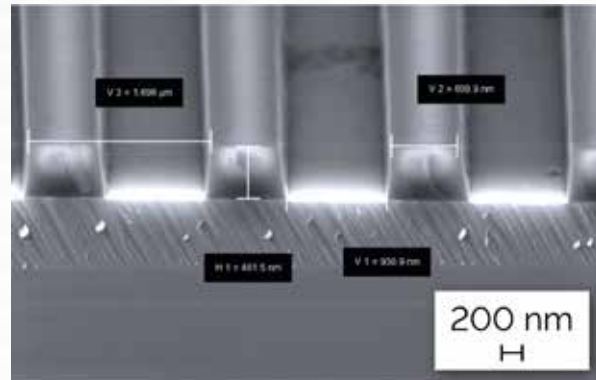
High-Aspect-Ratio Structures



This structure was written into MR-DWL, an epoxy-based negative photoresist from micro resist technology GmbH which is specifically optimized for use in direct writing lithography. It is sensitive above 400 nm and was exposed with a diode laser at 405 nm wavelength. It can be applied in a thickness up to several hundreds of microns and allows for the creation of high-aspect ratio structures with an aspect ratio of up to 1:40.

Courtesy of EPFL

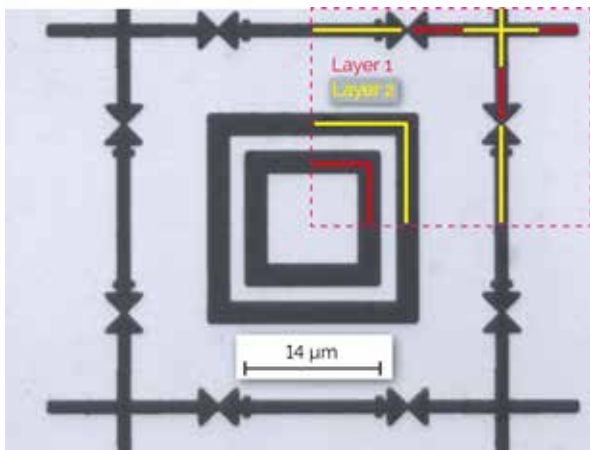
Micro-Optics



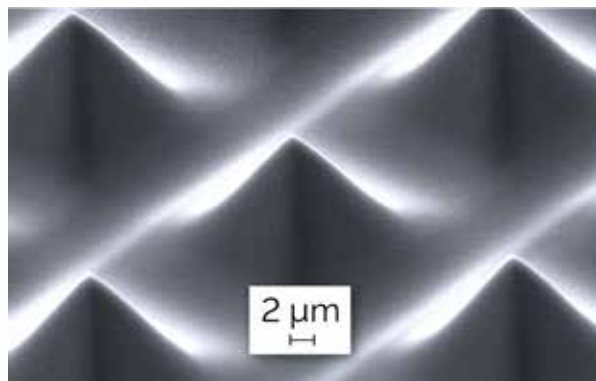
Optical gratings are used in spectrometers, monochromators, lasers, and other devices. For effective optical gratings, the wave front error must be smaller than $\lambda/10$. The image shows such a grating fabricated by direct write lithography with the DWL 2000. The surface was covered with 500 nm of Shipley S1805. The exposure resulted in a groove density of 600 lines/mm and the resulting optical grating has a wave front error of 25 nm.

Courtesy of Heidelberg Instruments and Berkeley Laboratories

Multilayer Applications



A crucial parameter in any multilayer lithography application is the alignment. The image shows a test pattern exposed with a DWL 2000, where elements exposed in two subsequent layers (arrows, crosses, arrow tips) align accurately. Multilayer applications include many important areas such as sensors and semiconductor devices.



Structured surfaces for micro-optics applications like diffusers and reflectors can take many shapes. The image shows pyramids with 15 µm height and 20µm base length, created by Grayscale lithography in AZ4620 resist.

The DWL 2000 / DWL 4000 in a Nutshell

- Substrates up to 17" x 17"
- Structures down to 0.5 µm
- Address grid down to 5 nm
- Professional grayscale exposure mode
- Real time auto focus system
- Exchangeable write modes
- Camera system for metrology and alignment
- Advanced climate chamber
- Automatic substrate loading system
- Stage map correction
- Multiple data input formats
- User programming interface

DWL 2000 / DWL 4000

SYSTEM SPECIFICATIONS

Write mode	I	II	III	IV
Writing performance				
Minimum structure size [µm]	0.5	0.7	0.8	1.3
Minimum lines and spaces (half pitch, µm)	0.8	1	1.2	2
Address grid [nm]	5	10	12.5	25
Edge roughness [3σ, nm]	40	50	60	80
CD uniformity [3σ, nm]	60	80	90	120
Alignment measurement accuracy [3σ, nm]	60	70	90	140
2nd layer alignment over 100 x 100 mm ² [3σ, nm]	250			
Registration accuracy over 200 x 200 mm ² [3σ, nm]	200			
Max. write speed 405 nm laser [mm ² /min]	29	110	160	-
Max. write speed 413 nm laser [mm ² /min]	29	110	160	340
System features				
Light source	Diode laser with 405 nm or Krypton laser with 413 nm			
Maximum substrate size	DWL 2000: 9" x 9" / DWL 4000: 17" x 17"			
Substrate thickness	0 to 12 mm			
Maximum exposure area	DWL 2000: 200 x 200 mm ² / DWL 4000: 400 x 400 mm ²			
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			
Further options				
Professional Grayscale Mode	1000 gray levels, professional data conversion software			
Automatic loading system	Automatic loading unit, optional additional substrate carrier station, optional pre-aligner and wafer scanner			
System dimensions (DWL 2000)				
DWL 2000 lithography unit (width x depth x height); weight	2020 mm x 1250 mm x 2100 mm; 2500 kg			
Electronic rack (width x depth x height); weight	800 mm x 650 mm x 1800 mm; 180 kg			
Installation requirements				
Electrical	400 VAC ± 5 %, 50/60 Hz, 32 A			
Compressed air	6 - 10 bar			
Cleanroom	ISO 6 or better recommended			

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.

WORLDWIDE SALES OFFICES

To contact your local representative please consult our website www.himt.de or email us at info@himt.de

