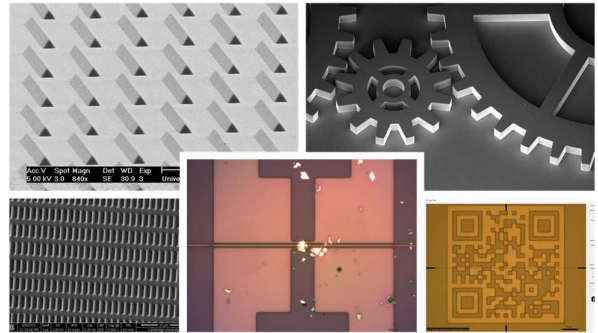


## MicroWriter ML<sup>®</sup> 3 Baby



### EXCELLENT ENVIRONMENTAL FOOTPRINT

Power consumption of the machine even when exposing is comparable to that of a laptop.

### WORLDWIDE USER BASE

Over 170 laboratories around the world, including national labs and international leading Universities.

### INTUITIVE WINDOWS<sup>®</sup> USER INTERFACE

Designed for use by PhD students and post-docs in a research environment while offering high levels of flexibility.

### COMPETITIVE PRICE AND LOW COST OF OWNERSHIP

Affordable price ideal for universities and industrial R&D.

For more information, please visit us on the Web at:

[www.durhammagnetooptics.com](http://www.durhammagnetooptics.com)

The MicroWriter ML<sup>®</sup> products are a range of photolithography machines designed for rapid prototyping and small volume manufacturing in R&D laboratories and clean rooms.

Conventional approaches to photolithography are usually based on exposing through a chromium-glass mask manufactured by specialist vendors. In R&D environments it is often necessary to change the mask design frequently. Direct-write lithography tools (also known as digital mask aligners or maskless aligners) overcome this problem by holding the mask in *software*. Rather than projecting light through a physical mask, direct-write lithography uses computer-controlled optics to project the exposure pattern directly onto the photoresist.

MicroWriter ML<sup>®</sup>3 Baby is a compact, high-performance, direct-write optical lithography machine which is designed to offer unprecedented value for money in a small laboratory footprint. It also has an excellent environmental footprint: power consumption of the machine even when exposing is comparable to that of a laptop.

Measuring only 70cm x 70cm at its base, the MicroWriter ML<sup>®</sup>3 Baby sits on a standard laboratory bench or desk and plugs into a supplied laptop computer. Its only service requirement is a standard power socket. A light-excluding enclosure with safety interlock allows it to be used equally well in an open laboratory environment or in a clean room. Easy to use Windows<sup>®</sup> based software means most exposures can be set up and launched with just a few mouse clicks. An interferometer controlled XY stage allows accurate overlay across an entire wafer. A carefully optimised friction chuck allows delicate samples and substrates (with no minimum size limitation) to be used. The system by default uses all-optical autofocus, which works well on large wafers as well as on small or non-conventional samples.

Durham Magneto Optics

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DURHAM MAGNETO OPTICS INC  
2530 MERIDIAN PARKWAY, 3<sup>RD</sup> FLOOR, DURHAM, NORTH CAROLINA 27713, USA.



## Key features and specifications

### FAST WRITING SPEEDS

50mm<sup>2</sup>/minute at 1µm resolution, allowing a typical a typical 50mm x 50mm area to be exposed in under 1 hour.

### AII OPTICAL AUTOFOCUS

Works well on large wafers as well as on small samples or on non-conventional samples.

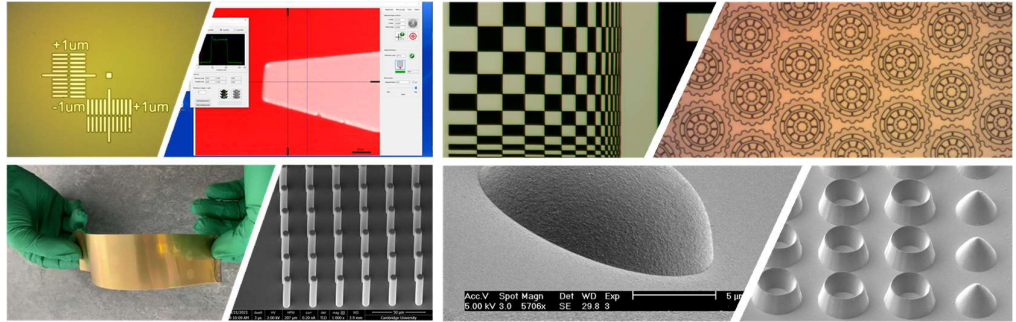
### DUAL WAVELENGTH EXPOSURE

LIGHTSOURCE OPTION  
Adds both 365nm light source and 405nm light source; software selectable.

### HIGH PERFORMANCE LASER INTERFEROMETER

Uses a high performance XY laser interferometer for position control.

For more information, please visit us on the Web at:  
[www.durhammagnetooptics.com](http://www.durhammagnetooptics.com)



- 149mm x 149mm maximum writing area.
- 155mm x 155mm x 7mm maximum wafer size.
- 1µm minimum feature size across full writing area.
- 405nm long-life semiconductor light source, suitable for broadband, g- and h-line positive and negative photoresists (e.g. S1800, ECI-3000, MiR 701). Replacement 385 nm and 365nm lightsources available as option, suitable for g-, h-, and i-line photoresists (e.g. SU8). Dual wavelength option (405nm lightsource and 365nm lightsource, software selectable) available for best performance across g-, h-, and i-line photoresists.
- XY interferometer with 15nm resolution for precise motion control.
- Extremely fast writing speed - up to: 50mm<sup>2</sup>/minute (1µm minimum feature size). This allows a typical 50mm x 50mm area to be exposed in under 1 hour.
- Optical autofocus system using yellow light with real-time surface tracking module – no minimum wafer size.
- High quality infinite conjugate optical microscope with x10 Olympus plan achromatic objective lens, and yellow light illumination for alignment to lithographic markers on the wafer ( $\pm 2.0\mu\text{m}$   $3\sigma$  alignment accuracy).
- Additional x4 digital zoom can be selected in software.
- Grey scale exposure mode for 3-dimensional patterning (up to 255 grey levels).
- Export image tool (also known as “Draw Mode”) allowing exposures to be designed directly on top of an image taken from the real-time microscope.
- Built-in databases to store common lithographic marker positions and exposure parameters for different photoresists.
- Software API for external interfacing and control, allowing scripting and development of more advanced automatic procedures.
- 100nm minimum addressable grid. 15nm sample stage resolution.
- Acceptable file formats: CIF, GDS2, BMP, TIFF, JPEG, PNG, GIF; Oasis, DXF, Gerber RS-274X acceptable via KLayout conversion.



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# Key features and specifications

## AUTOCALIBRATION

Autocalibration tool allowing users to check and correct calibration.

## AUTOMATIC MARKER RECOGNITION

Automatically identify the precise position of lithographic markers visible the real-time microscope.

## AUTOMATIC BARCODE GENERATION AND RECOGNITION

Automatically create the exposure pattern for 2D barcode. Developed barcode can be identified automatically.

## COMPACT LABORATORY FOOTPRINT

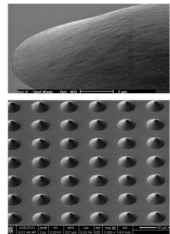
70cm (w) x 70cm (d) x 75cm (h).

## TECHNICAL SUPPORT

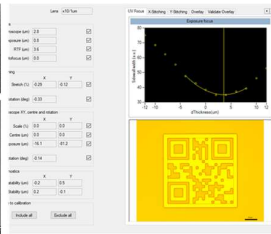
International network of trained local service engineers to keep you running.

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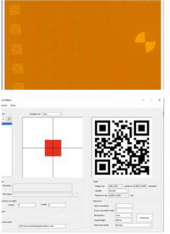
Greyscale lithography.



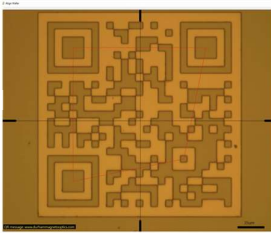
Autocalibration tool.



Wide field viewer.



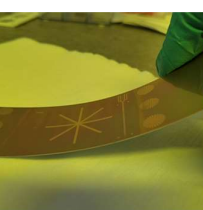
Barcode recognition.



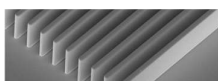
Producing photomasks.



Exposure on a flexible substrate.



High aspect ratio structures.



- Automatic wafer centring tool.
- Autocalibration tool allowing users to check and correct calibration.
- 2D barcodes can be automatically generated through software for exposures. The software can then identify the developed barcode patterns and reads the contents.
- Bulls-eye tool can automatically identify the precise position of lithographic markers visible under the real-time microscope.
- Enhance contrast tool can digitally enhance contrast and brightness of a microscope image for seeing low contrast structures.
- Estimate theta tool can automatically determine the rotation angle of the current microscope image.
- Light-excluding enclosure with safety interlock.
- Easy to use, Windows® based control software supplied.
- Supplied with KLayout open-source mask design software ([www.klayout.de](http://www.klayout.de)).
- Supplied with pre-configured 64-bit Windows® 10/11 PC with monitor, keyboard, and mouse for 'plug and play' installation.
- Includes on-site installation by trained service technician.
- Extremely competitively priced for University and industrial R&D budgets.
- Can be later upgraded to MicroWriter ML® 3 Baby Plus, Mesa or Pro for higher performance.
- 90-260 VAC, 50-60Hz, 4A single phase power requirement.
- External dimensions: 70cm (w) x 70cm (d) x 75cm (h), excluding computer.
- CE-marked and compliant with EN-61010.

Well-established user base around the world.



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## Examples of fabricated structures

### FRICTION CHUCK

Carefully designed friction chuck allows MEMS devices with nitride windows or other delicate substrates to be used; no minimum wafer size.

### CURVED SUBSTRATES

Perform exposures across a variety of substrates, including flat and curved forms, Si, glass, ceramic, diamond, and liquid polymers.

### PHOTOMASKS

Produce photomasks conveniently and cheaply.

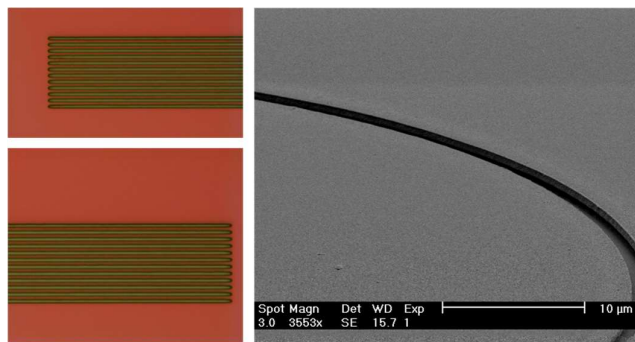
### FREE SOFTWARE UPGRADE

Receives free software upgrades for the lifetime of the machine.

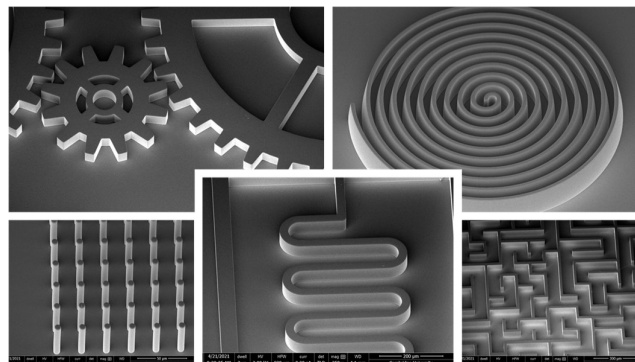
### COMPANY CULTURE AND PHILOSOPHY

We are from a research and design (R&D) background based in Cambridge, UK and the Research Triangle Park, Durham, NC, USA.

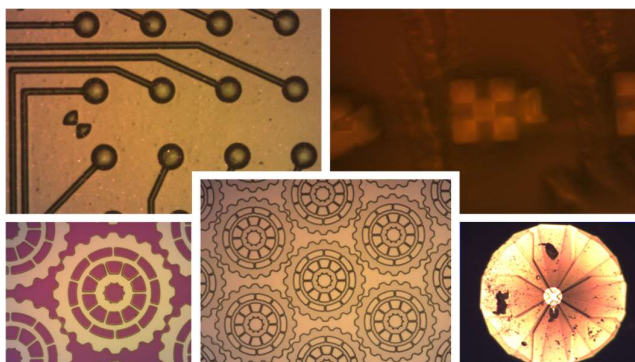
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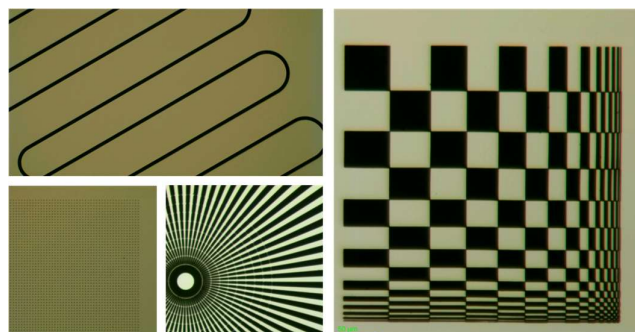
- Images of resolution-limited structures. Left: Lines array with width of 1.0µm and period of 2.0µm on Si/Bottom antireflection coating/S1805 (0.5 µm). Right: A ring with width of 1.0 µm on Si/LOR/S1805 (0.5µm).



- Scanning Electron Microscope images of micro-moulds. Structures were produced on a 50µm thick SU8 layer. Aspect ratio of the dots array (bottom left) is 8.



- Optical Microscope images of patterns produced across varied types of substrates: Top left: AIN ceramic. Top right: Liquid polymer. Bottom left: Si/SiO<sub>2</sub>. Bottom middle: Glass. Bottom right: Diamond.



- Optical Microscope images of patterns produced on a photomask.

