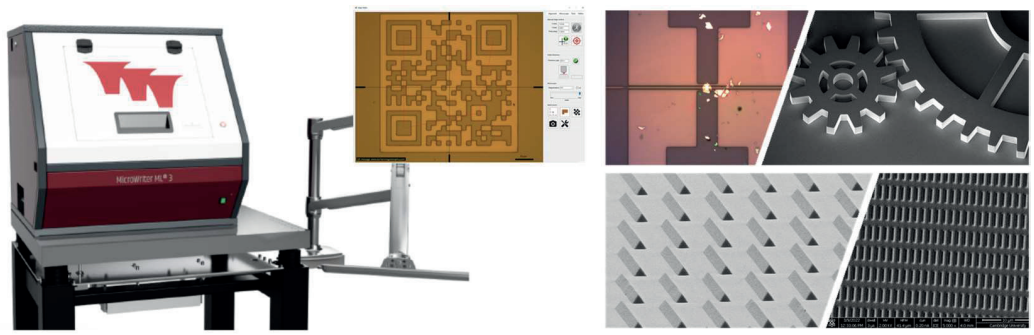
MicroWriter ML® 3 Pro



The MicroWriter ML® 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®3 Pro is our flagship machine and 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.

Sitting on its own vibration-isolation optical table, its only service requirement is a standard power socket. A temperature-compensated 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® based software means most exposures can be set up and launched with just a few mouse clicks. Four different minimum feature sizes (0.6µm, 1µm, 2µm and 5µm) can be selected automatically via software. This allows non-critical parts of the exposure to be performed rapidly while retaining high resolution writing for critical parts. An additional 0.4µm minimum feature size is available as an option. The MicroWriter ML®3 Pro features an optical surface profilometer tool and an automated wafer inspection tool for examining fabricated structures. A backside alignment camera with real-time images for aligning double-polished wafers is available as an option.

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® 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

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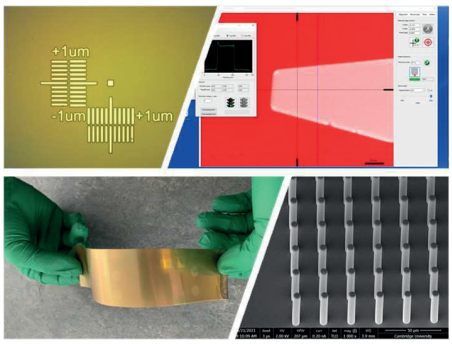
Key features and specifications



- 195mm x 195mm maximum writing area. 295mm x 295mm maximum writing area available as an option.
- 230mm x 230mm x 15mm maximum wafer size. 330mm x 330mm x 15mm (customisable up to 330mm x 330mm x 175mm) maximum wafer size available as an option.
- 0.6µm, 1µm, 2µm and 5µm minimum feature sizes across full writing area. 0.4um minimum feature size available as an option.
- Automatic selection of minimum feature size via software – no manual changing of lens required.
- 385nm long-life semiconductor light source, suitable for broadband, g-, h- and i-line positive and negative photoresists (e.g. S1800, ECI-3000, MiR 701, SU-8). Replacement 365nm lightsource available as option for improved performance with SU-8 photoresist.
  Dual wavelength option (405nm lightsource and 365nm lightsource, software selectable) available for best performance across g-, h-, and i-line photoresists.
- XY interferometer with 1nm resolution for precise motion control.
- Extremely fast writing speed - up to: 15mm^2/minute (0.6µm minimum feature size), 50mm^2/minute (1µm minimum feature size), 120mm^2/minute (2µm minimum feature size) and 180mm^2/minute (5µm minimum feature size). These allow a typical 50mm x 50mm area combining critical and non-critical areas to be exposed in under 30 minutes or a typical 100mm x 100mm area to be exposed at 2µm minimum feature size in under 2 hours.
- Optical autofocus system using yellow light with real-time surface tracking module – no minimum wafer size.
- High quality infinite conjugate optical microscope with x3 aspheric objective lens, x5 and x10 Olympus plan achromatic objective lens, x20 Olympus plan apochromat objective lens, and yellow light illumination for alignment to lithographic markers on the wafer (±0.5µm 3σ alignment accuracy). x50 Olympus plan apochromatic objective lens available as an option.
- Automatic changing between microscope magnifications via software – no manual changing of lens required. Additional x4 digital zoom can be selected in software.
- Grey scale exposure mode for 3-dimensional patterning (up to 768 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.
- Software API for external interfacing and control.
- 30nm minimum addressable grid. 12.5 nm minimum addressable grid available as an option. 4nm sample stage resolution.
- Acceptable file formats: CIF, GDS2, BMP, TIFF, JPEG, PNG, GIF; Oasis, DXF, Gerber RS-274X acceptable via Clewin 6 conversion.
- Built-in 2-dimensional optical surface profiler (100nm thickness resolution) for examining exposed resists and other MEMS process steps.

FAST WRITING SPEEDS

120mm^2/minute at 2µm resolution and 180mm^2/minute at 5µm resolution, allowing a typical 100mm x 100mm area to be exposed at 2µm resolution in under 2 hours.

PROPER AUTOMATIC LENS CHANGER

Automatically changes microscope objective lenses and exposure resolution beams using a motorised motor.

DUAL WAVELENGTH EXPOSURE LIGHTSOURCE OPTION

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

BACKSIDE ALIGNMENT OPTION

Adds imaging module underneath the wafer chuck, allowing alignments of structures on both sides of wafers.

For more information, please visit us on the Web at: www.durhammagnetooptics.com

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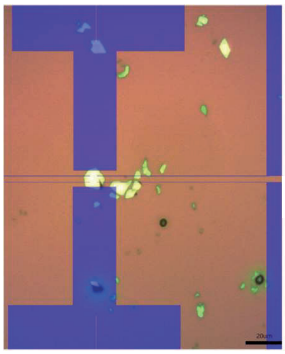
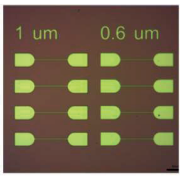
Key features and specifications

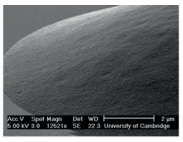
Virtual mask aligner.



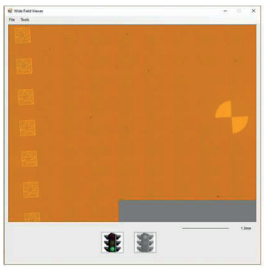
Combining resolutions.



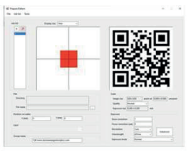
Greyscale lithography.



Wide field viewer.

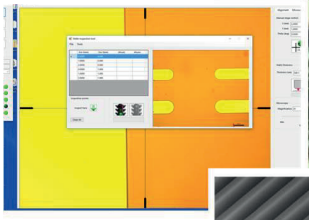


Barcode generation.



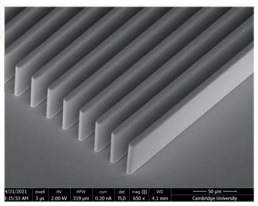
Multiple samples.

Wafer inspection.



Producing photomasks.

Structures with a high aspect ratio.



Well-established user base around the world.

- Automatic wafer centring tool.
- Automatic wafer inspection tool allowing each die on a wafer to be imaged.
- Virtual mask aligner mode in which the pattern to be exposed is displayed on top of the real-time microscope image, allowing the machine to be used like a traditional mask aligner.
- Multiple wafer / chip handling, allowing different exposure patterns and alignment coordinates to be supplied for multiple wafers or chips on the chuck.
- 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.
- Emails multiple users when exposures are finished.
- Built-in databases to store common lithographic marker positions and exposure parameters for different photoresists.
- Includes passive vibration-isolation optical table.
- Light-excluding enclosure with safety interlock and temperature compensation to ±0.25ºC.
- Easy to use, Windows® based control software supplied.
- Supplied with Clewin 6 mask design software.
- Supplied with pre-configured 64-bit Windows® 10/11 PC with monitor, keyboard and mouse.
- Includes on-site installation by trained service technician.
- Extremely competitively priced for University and industrial R&D budgets.
- 90-260 VAC, 50-60Hz, 4A single phase power requirement.
- Footprint 90cm (w) x 75cm (d); height 153cm (including optical table; excluding PC workstation).
- CE-marked and compliant with EN-61010.

AUTOCALIBRATION

Autocalibration tool allowing users to check and correct calibration.

EMAIL NOTIFICATIONS

Notify users via emails when an exposure is finished.

AUTOMATIC BARCODE GENERATION AND RECOGNITION

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

COMPACT LABORATORY FOOTPRINT

90cm (w) x 75cm (d) x 153cm (h) (including optical table; excluding PC workstation).

TECHNICAL SUPPORT

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

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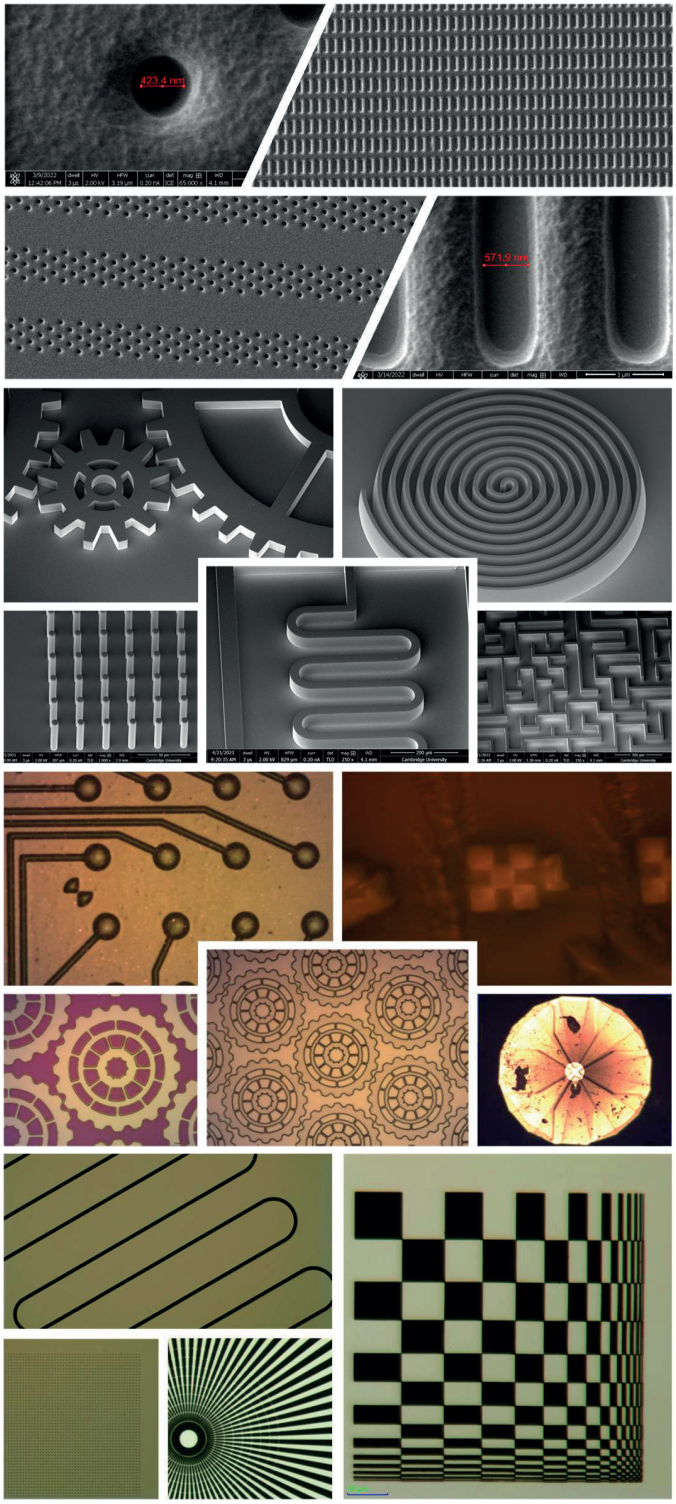
Examples of fabricated structures



- Scanning Electron Microscope images of resolution-limited structures.
  Left: Dots array with diameter of 0.4µm.
  Right: Lines array with width of 0.6µm.
  Structures were produced 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: AlN ceramic.
  Top right: Liquid polymer.
  Bottom left: Si/SiO_2.
  Bottom middle: Glass.
  Bottom right: Diamond.
- Optical Microscope images of patterns produced on a photomask.

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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