

MicroWriter ML[®]3 family overview

Durham Magneto Optics Ltd



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 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.

The MicroWriter ML[®]3 family comprises four compact, high-performance, direct-write optical lithography machines which are designed to offer unprecedented value for money in a small laboratory footprint.

MicroWriter ML[®]3 Baby

This is our entry level machine and is one of the lowest cost direct-write optical lithography machines available anywhere in the world. It operates at a single resolution of 1 μ m with a wavelength of 405nm and is designed to sit on a standard laboratory bench either in a clean-room or in a general laboratory. A high quality optical microscope with a x10 Olympus objective allows exposures to be aligned to existing structures or to the edges of the substrate. Despite its low cost, it is still fast with a top writing speed of 20mm²/minute, allowing a typical 50mm x 50mm area to be exposed in approximately 2 hours.

MicroWriter ML[®]3 Baby Plus

The Baby Plus is our top selling machine and adds a number of features to the Baby which are usually only found in high-end machines. Two different resolutions (1 μ m and 5 μ m) can be selected automatically via software and without the user needing to exchange any lens manually. This allows non-critical parts of the exposure to be performed rapidly at 5 μ m resolution while retaining high resolution writing for critical parts. Locating alignment markers or edges of substrates is faster thanks to an automatic lens changer on the optical microscope allowing the user to switch between x3 and x10 objectives via software. The MicroWriter ML[®]3 Baby Plus also features an optical surface profilometer tool and an automated wafer inspection tool for examining fabricated structures. As with all of our machines, writing speeds are some of the fastest on the market: up to 20mm²/minute at 1 μ m resolution and up to 120mm²/minute at 5 μ m resolution, allowing a typical 50mm x 50mm area combining critical and non-critical areas to be exposed in under 30 minutes.

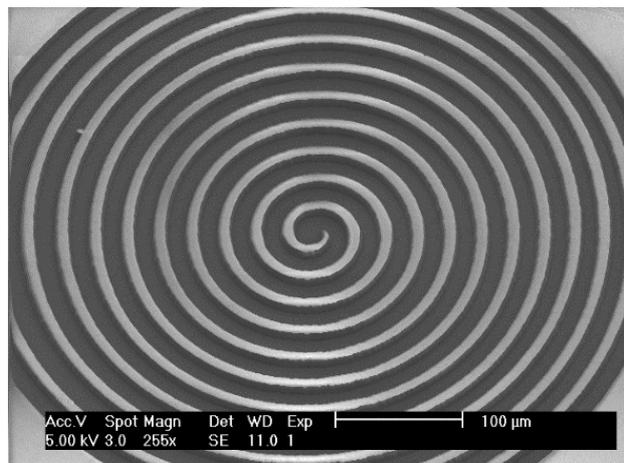
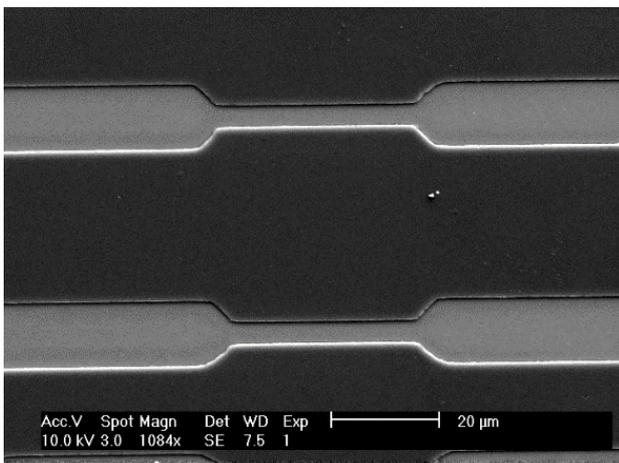
MicroWriter ML[®]3 Mesa

The Mesa has all of the features of the Baby Plus and adds a 0.6 μ m resolution lens and x20 microscope objective, making it a table-top lithography tool with sub-micron resolution.

MicroWriter ML[®]3 This is our flagship machine and offers no-compromise sub-micron lithography on up to 9" wafers. It is designed for highly demanding individual research groups or for central clean room facilities. Four different resolutions (0.6 μ m, 1 μ m, 2 μ m and 5 μ m) can be selected automatically via software and without the user needing to exchange any lens manually. The optical microscope contains a full set of high performance bright and sharp infinite conjugate objectives (x3, x5, x10 and x20) with a software controlled automatic lens changer, allowing large substrate areas to be searched rapidly and individual sub-micron objects such as nanowires and crystal flakes to be accurately located. Top writing speeds are very fast: 20mm²/minute at 0.6 μ m resolution, 50mm²/minute at 1 μ m resolution, 100mm²/minute at 2 μ m resolution and 180mm²/minute at 5 μ m resolution, allowing a typical 100mm x 100mm area to be exposed at 2 μ m resolution in under 2 hours. In addition to the optical surface profilometer tool and automated wafer inspection tool present in the Baby Plus, there is also a 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.

Why choose the MicroWriter ML[®]3 family?

- All of our machines are very competitively priced.
- All of our machines have fast writing speeds.
- All of our machines have a low cost of ownership. Our lightsources have a lifetime of 20,000 hours and are guaranteed for 5 years.
- The MicroWriter ML[®]3 Baby Plus and MicroWriter ML[®]3 have an impressive array of advanced features usually only found in high-end machines.
- All of our machines are designed for use by PhD students and post-docs in a research environment and so have an attractive, intuitive and simple Windows[®] user interface while offering the flexibility and high levels of access to machine operation for those who want to develop new techniques.
- All of our machines share a common technology platform, allowing you to upgrade from MicroWriter ML[®]3 Baby to MicroWriter ML[®]3 Baby Plus and to MicroWriter ML[®]3 at a later date.
- There is a well-established user base of MicroWriter ML[®] machines in over 35 laboratories around the world, including national labs and internationally leading Universities.
- We have an international network of trained local service engineers to keep you running.



Detailed comparison of features and performance

	MicroWriter ML[®]3 Baby	MicroWriter ML[®]3 Baby Plus	MicroWriter ML[®]3 Mesa	MicroWriter ML[®]3
Maximum substrate size	155mm x 155mm x 7mm	155mm x 155mm x 7mm	155mm x 155mm x 7mm	230mm x 230mm x 15mm
Maximum writing area	149mm x 149mm	149mm x 149mm	149mm x 149mm	195mm x 195mm
Exposure resolutions	1um	1um and 5um	0.6um, 1um, 5um	0.6um, 1um, 2um, 5um
Surface tracking autofocus system?	Yes	Yes	Yes	Yes
Greyscale lithography?	Yes	Yes	Yes	Yes
Alignment microscope objectives	x10	x3 and x10	x3, x10, x20	x3, x5, x10, x20
Automatic lens changer for exposure resolution and alignment microscope?	No	Yes	Yes	Yes
Backside alignment?	No	No	No	Available as option
Exposure wavelength	405nm. 385nm available as option.	405nm. 385nm available as option.	405nm. 385nm available as option.	385nm.
Maximum writing speed	20mm ² /minute at 1um resolution	20mm ² /minute at 1um resolution and 120mm ² /minute at 5um resolution	10mm ² /minute at 0.6um resolution, 20mm ² /minute at 1um resolution and 120mm ² /minute at 5um resolution	20mm ² /minute at 0.6um resolution, 50mm ² /minute at 1um resolution, 100mm ² /minute at 2um resolution, 180mm ² /minute at 5um resolution
Overlay alignment accuracy at best resolution	±2um	±1um	±1um	±0.5um
Minimum addressable grid	200nm	200nm	100nm	100nm
Motion stage minimum XY step size	20nm	20nm	20nm	20nm
Optical surface profiler Z resolution	Not applicable	200nm	200nm	100nm
Automatic wafer inspection tool?	No	Yes	Yes	Yes
Virtual Mask Aligner tool?	No	Available as option	Available as option	Yes
Temperature stabilized enclosure?	No	No	No	Yes

Supplied with vibration isolating optical table?	No	No	No	Yes
Mask design software?	Open source KLayout supplied. Clewin available as option	Open source KLayout supplied. Clewin available as option	Open source KLayout supplied. Clewin available as option	Clewin supplied.
Can be upgraded?	Yes	Yes	Yes	No

