

MicroWriter ML[®] 3 Baby Plus



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 Baby Plus is a compact, high-performance, low-cost direct-write optical lithography machine which is designed to offer unprecedented value for money in a small laboratory footprint. Measuring only 70 cm x 60 cm at its base, it 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 based software means most exposures can be set up and launched with just a few mouse clicks. Two different resolutions (1 μm and 5 μm) can be selected automatically via software. This allows non-critical parts of the exposure to be performed rapidly at 5 μm resolution while retaining high resolution writing for critical parts. The MicroWriter ML[®]3 Baby Plus also features an optical surface profilometer tool and an automated wafer inspection tool for examining fabricated structures.

Key features

- Autofocus system using yellow light – no minimum wafer size.
- High quality infinite conjugate optical microscope camera with x3 aspheric objective lens and x10 Olympus plan objective lens and yellow light illumination for alignment to lithographic markers on the wafer ($\pm 1 \mu\text{m}$ 3σ alignment accuracy).
- 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 (255 grey levels).
- Built-in 2-dimensional optical surface profiler (200 nm thickness resolution) for examining exposed resists, deposited layers, etching and other MEMS process steps.
- Automatic wafer inspection tool allowing each die on a wafer to be imaged.
- Supplied with KLayout open-source mask design software (www.klayout.de)
- Supplied with pre-configured 64-bit Windows 10 PC and monitor for 'plug and play' installation.
- Extremely competitively priced for University and industrial R&D budgets.
- Can be upgraded to ML 3 Mesa or Pro for higher performance.
- CE-marked and compliant with EN-61010.

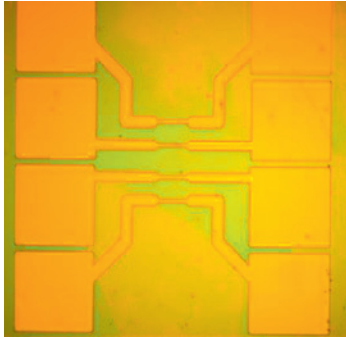
Specifications	
Writing area	149 mm x 149 mm maximum
Maximum wafer size	155 mm x 155 mm x 7 mm
Resolutions	1 μm and 5 μm across full writing area
	Automatic selection of resolution via software – no manual changing of lens required
Lightsource	405 nm long-life semiconductor lightsource suitable for broadband, g- and h-line positive and negative photoresists (e.g. S1800, ECI-3000, MiR 701). Replacement 385nm lightsource available as option, suitable for g-, h- and i-line photoresists (e.g. SU-8).
Writing speed	Up to 50mm ² /minute (1 μm minimum feature size) and 180 mm ² /minute (5 μm minimum feature size), allowing a typical 50 mm x 50 mm area combining critical and non-critical areas to be exposed in under 30 minutes.
Software	API for external interfacing and control
Addressable grid	200 nm (minimum)
File formats	CIF, GDS2, BMP, TIFF, JPEG, PNG, GIF
External dimensions	700 mm (w) x 700 mm (d) x 700 mm (h), excluding laptop computer

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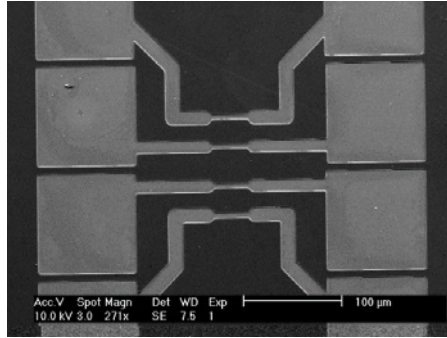
Designed for R&D in:

- Microelectronics and semiconductors
- Spintronics
- MEMS/NEMS
- Sensors
- Microfluidics and lab-on-a-chip
- Nanotechnology
- Materials science
- Graphene and other 2-dimensional materials

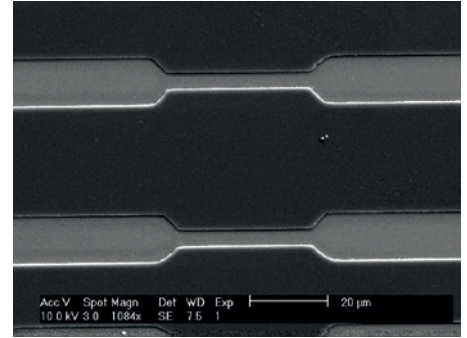
Electrical transport measurement chip



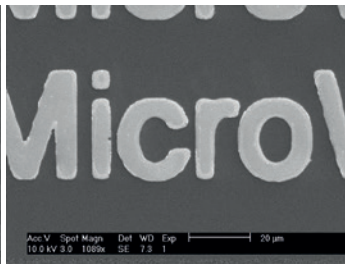
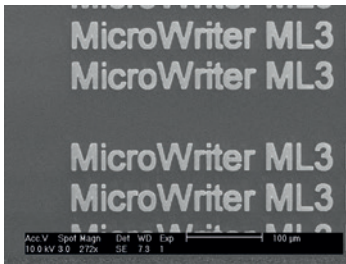
ML 3 microscope image of exposed AZ[®] ECI 3007 positive photoresist developed in AZ[®] 326 MIF developer



SEM images after metallisation with 20 nm of gold (centre and right)



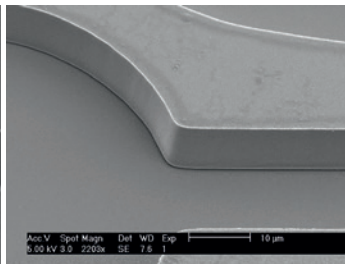
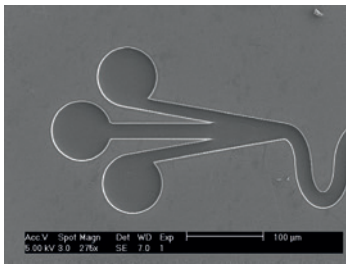
Square contact pads are 100 μm wide; central wires are 3 μm wide



Micro text

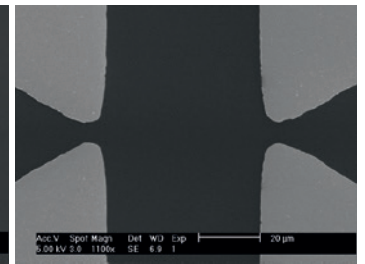
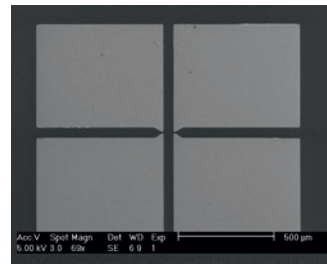
SEM images after metallisation with 20 nm of gold and lift-off. Lower case letters are 27 μm high; gap between letters 'r' and 'o' is 1.5 μm .

Microfluidic device

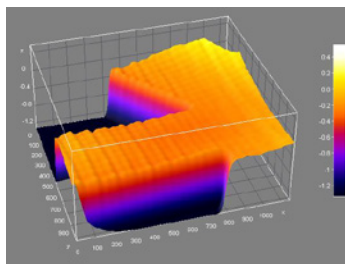
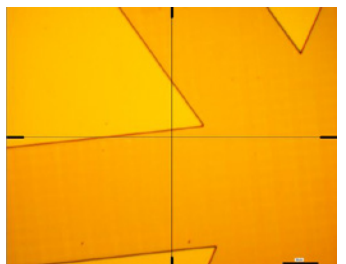


SEM images after metallisation with 20 nm of gold of AZ[®] 9260 12 μm thick positive photoresist developed in AZ[®] 326 MIF developer.

Large area contact pads



SEM image after metallisation with 20 nm of gold and lift-off of four 660 μm x 540 μm contact pads exposed rapidly using 5 μm resolution.



Lithographically patterned metallic etch mask

MicroWriter ML[®]3 Baby Plus built-in optical microscope image (left) and 3D rendered MicroWriter ML[®]3 Baby Plus optical surface profilometer image (right) of 1.4 μm thick patterned resist. Scale bar is 30 μm .