

## XENOS XeDraw 2 WRITER



The **XENOS XeDraw 2** Writer is a system that designs pattern data and produces the respective deflection signals for beam steering of charged particle beams such as electron beams for semiconductor lithography applications or focussed ion beam systems.

When attached to a conventional scanning electron microscope, FIB or dual beam tool, it upgrades the system to perform advanced nanolithography on semiconductor or other materials.

The **XENOS XeDraw 2** consists of a fast pattern generator in order to produce the deflection signal data for the patterns which are then written by the SEM, e-beam or FIB system, implementing intelligent writing schemes and shape primitives so as to take full benefit of limited deflection chain bandwidths. The system is supplied with user-friendly and application-based *ECP* design and control software. Firmware boot via USB also allows easy firmware updates as well as the implementation of new features without actual hardware changes or flash reprogramming.

### KEY HARDWARE SPECIFICATIONS :

- **Writing Speed:** up to 10 Mpixels/s
- **Resolution:** 16 Bit, writing field size of 50000 x 50000 pixels
- **Implemented Shapes:** dot, single pixel line, rectangular primitives (spiral or meander fill), trapezoidals, triangles, parallelograms, arrays, 3rd order polynomials, circles, rings or ring segments import of image files (\*.bmp, \*.jpg ...), GDS II and AutoCad/ Autosketch \*.dxf
- **Writing Clock:** 10 kHz up to 10 MHz in 1 kHz increments
- **Digital Full Bandwidth Field Correction:** scaling, rotation, orthogonality, shift and trapezoidal correction
- **Mark Detection Input:** analog input for image detector output (adjustable gain and offset) with 12 Bit sampling, single line scan, selected area or full frame
- **Deflection Outputs:** Analog outputs up to +/- 10 V (galvanically isolated, adjustable)
- **Blanker Output:** TTL output with adjustable polarity or optional fibre optics output
- **PC Interface:** USB 2.0 compliant

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### KEY ECP SOFTWARE SPECIFICATIONS:

- **Exposure Patterns:** design of shapes (with hierarchical structures), dose and field size within the design
- **Batch Processing Files:** design of size and position of multiple writing fields for larger areas (with stitching between fields), controls for writing scheme (calibration, alignment, beam current control, user breaks...), automated cutting of shapes
- **Stage Control:** mapping of user coordinates, homing, absolute and relative positioning, predefined positions
- **Focus, Field and Stage Calibration:** calibration of deflection and stage coordinates (relative to laser interferometer coordinates if installed), feedback of the mechanical stage misalignment
- **Mark Detection and Alignment:** calculation of field correction parameters, scan control of the alignment marks

*The XeDraw 2 offers 4 essential advantages:*

#### Writing Speed

Pixelrates up to 10 MHz can be realised with the **XeDraw 2** system. Due to intelligent writing algorithms, the limited deflection bandwidth of current FIBs or SEMs is taken into account. Optimized data transmission via USB and settling time calculation are matched to the writing speed in order to provide all advantages of fast writing.

#### Intelligent and Versatile Writing Primitives

In competing systems, curved structures like circles, rings or ellipsoids will be written by a polygonal approximation of the structures. Arising problems are due either to poor approximation or huge amounts of data that have to be processed and that often result in undesirable blanking between the polygonal parts of the structures. The **XeDraw 2** implements a polynomial scan logic of 3rd order that can generate and write those polynomials and thus improved in comparison with our competitors. Circles, rings or ellipsoids can therefore be written by concentric single pixel rings (with spline interpolation).

Thus, maximum writing speed and approximation quality can be achieved with minimum data overhead and transmission time. Moreover, the sinusoidal shape of the deflection signals consumes much less deflection bandwidth than raster scanning of polygonal parts of the structures. Furthermore, the **XeDraw 2** writing algorithm symmetrically uses the bandwidth of X- and Y- axis.

#### Extreme Flexibility

The system can be configured to suit your needs perfectly. The DSP kernel boots at startup via the USB link, therefore making kernel updates a mere cut and paste operation on the controlling PC.

#### Latest Digital Electronics, User Friendly Software and First Class Accessories

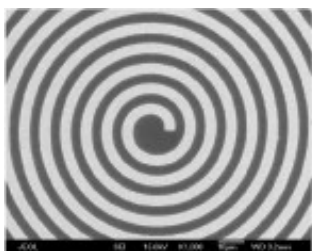
The complete deflection signal generation is implemented in a fast digital signal processor (DSP) with 16/32 bit per axis. The field correction does not use bandwidth limiting multiplying analog DACs, but is fully digitally built, therefore writing at maximum speed without any distortions in the resulting deflection signal.

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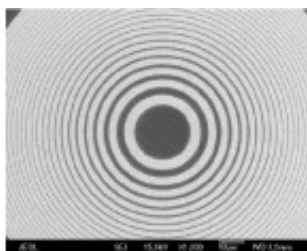
The exposure dwell time is generated linearly with sub nanosecond resolution. Our CAD and control software ECP has been written by experienced lithography users, subsequently making the ECP a user friendly and lithography user specific system. ECP is available for Linux or Windows whilst the CAD part can be used at liberty within the workgroup.

A set of different specimen stages is available to complete the system.

### Intelligent and Versatile Writing Primitives



Spiral structure exposed with XeDraw and JEOL JSM-7000F into PMMA on GaAs

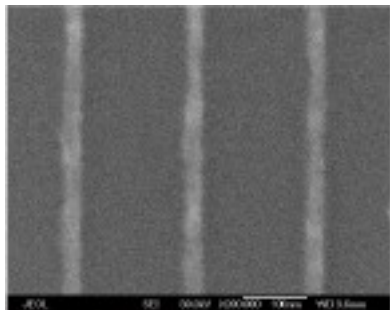


Fresnel lens exposed with XeDraw and JEOL JSM-7000F into PMMA on GaAs

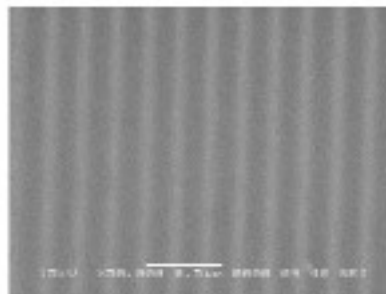


Circles exposed with XeDraw and JEOL JSM-7000F into PMMA on Si

### High Resolution



20 nm lines exposed with XeDraw and JEOL JSM-7000F into HSQ on Si

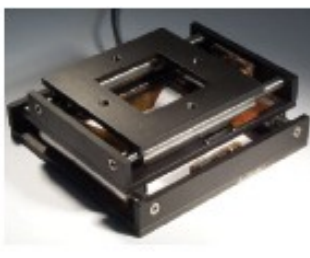


60 nm lines exposed with XeDraw and JEOL JSM-6480 into PMMA on Si

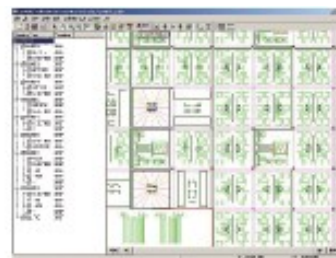
### Latest Digital Electronics, User Friendly Software and First Class Accessories



High-end electronics DSP and Gate Arrays



Ultra compact piezo stage, 100 nm resolution, 20 or 30 mm travel



ECP CAD and control program