HEIDELBERG INSTRUMENTS

ULTRA

THE SEMICONDUCTOR MASK WRITER

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ULTRA

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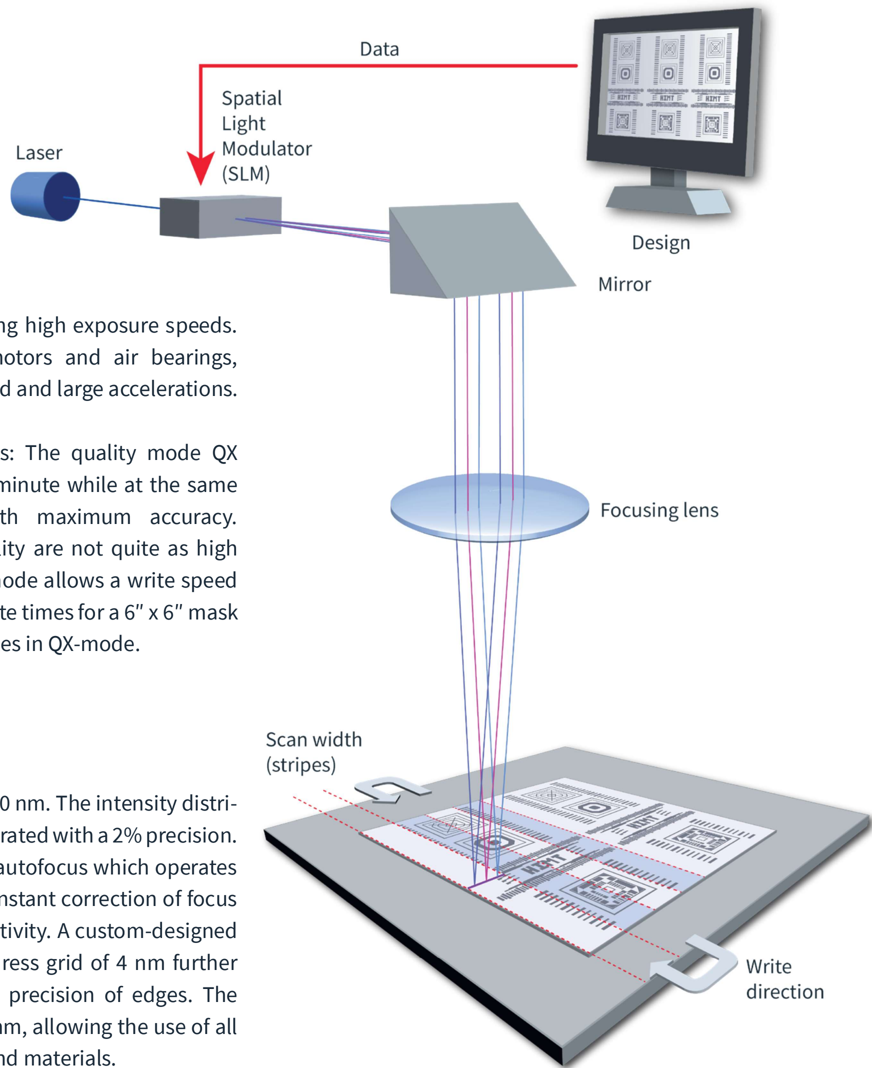
The ULTRA technology has evolved from our well-established line of Volume Pattern Generators and is designed and optimized specifically for the production of mature semiconductor photomasks. Key characteristics of the ULTRA are its speed, the advanced data path, high precision, and structure uniformity, as well as the sophisticated, extremely accurate alignment features. The ULTRA represents an economical solution with low cost of ownership. With its modern, compact build, it is easily incorporated into an existing mask shop infrastructure.

HIGH THROUGHPUT

For maximum throughput and image quality, the system features two powerful high-speed Spatial Light Modulators (SLM) set up in a finely tuned physical arrangement. The ULTRA's high-speed data path is designed to handle even complex geometries and dense patterns while upholding high exposure speeds. The stage is equipped with linear motors and air bearings, ensuring smooth travel even at top speed and large accelerations.

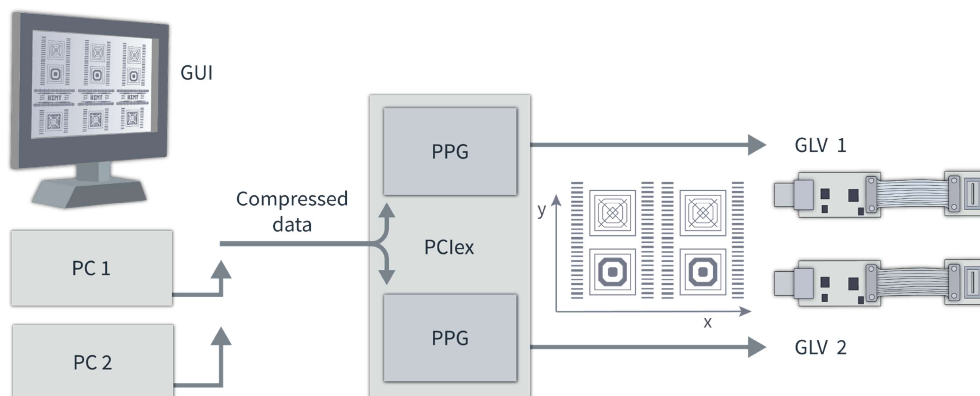
The ULTRA provides two speed modes: The quality mode QX reaches a write speed of 325 mm^2 per minute while at the same time achieving exposure results with maximum accuracy. If requirements on resolution and quality are not quite as high and the focus is on speed, the fast FX-mode allows a write speed of up to 580 mm^2 per minute. Typical write times for a 6″ x 6″ mask are 45 minutes in FX-mode and 75 minutes in QX-mode.



Exposure strategy

CD UNIFORMITY

The ULTRA provides a CD uniformity of 30 nm. The intensity distribution of each SLM is automatically calibrated with a 2% precision. Focus control is achieved by an optical autofocus which operates through the main write lens, providing instant correction of focus at the location of writing and high sensitivity. A custom-designed objective with an NA of 0.9 and an address grid of 4 nm further contribute to structure uniformity and precision of edges. The entire optical path is optimized for 355 nm, allowing the use of all i-line resists and associated processes and materials.



High-speed data path

ULTRA

SYSTEM SPECIFICATIONS

	QX mode	FX mode
Writing performance		
Address grid [nm]	4	10
Line edge roughness [3σ, nm]	20	40
Position accuracy [3σ, nm]	40	80
Overlay [3σ, nm]	30	60
Stitching [3σ, nm]	20	60
2nd layer alignment [max error /nm]	100	100
CD uniformity [3σ, nm]	30	60
Minimum feature size [nm]	500	700
Write speed [mm^2 / min]	325	580
Write time for 6" x 6" [min]	75	45
Operation		
Protocols, standards	SECS / GEM protocols	
User interface (software)	SEMI-compliant GUI	
Maximum write area	228 x 228 mm^2	
Substrate size	4", 5", 6", 7", and 9" masks (larger and other substrates on request)	
System features		
Optics	• 0.9 NA objective lens • Low-distortion UV optics • Automatic calibration routines	
Laser	• 355 nm high-power solid state laser • Highly economical compared to gas laser	
Focus system	• Real-time optical autofocus	
Alignment	• Camera system • Distortion compensation • Field-by-field alignment • Edge det ctor	
Data path	• Real-time compression • Scalable hardware concept • Input formats: All standard formats, e.g. GDSII and Jobdeck	
Spatial Light Modulator	• Frequency 350 kHz • Data rate 2.4 GB/s	
Loader	• Automatic mask loader with two independent carrier stations	

Please note: Specifications depend on individual process conditions and may vary according to equipment configuration. Write speed depends on exposure area. Design and specifications are subject to change without prior notice.

Visit product website for more information

To contact your local representative, please consult our website
heidelberg-instruments.com

HEIDELBERG INSTRUMENTS
The power of direct writing

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