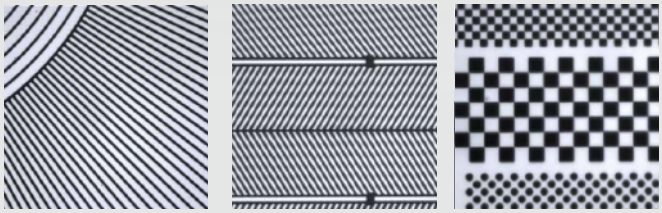
HEIDELBERG INSTRUMENTS

VPG+ 200 / VPG+ 400

THE SMALL-AREA VOLUME PATTERN GENERATORS FOR PHOTOMASK PRODUCTION



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VPG⁺ 200 / VPG⁺ 400

THE SMALL-AREA VOLUME PATTERN GENERATORS FOR PHOTOMASK PRODUCTION

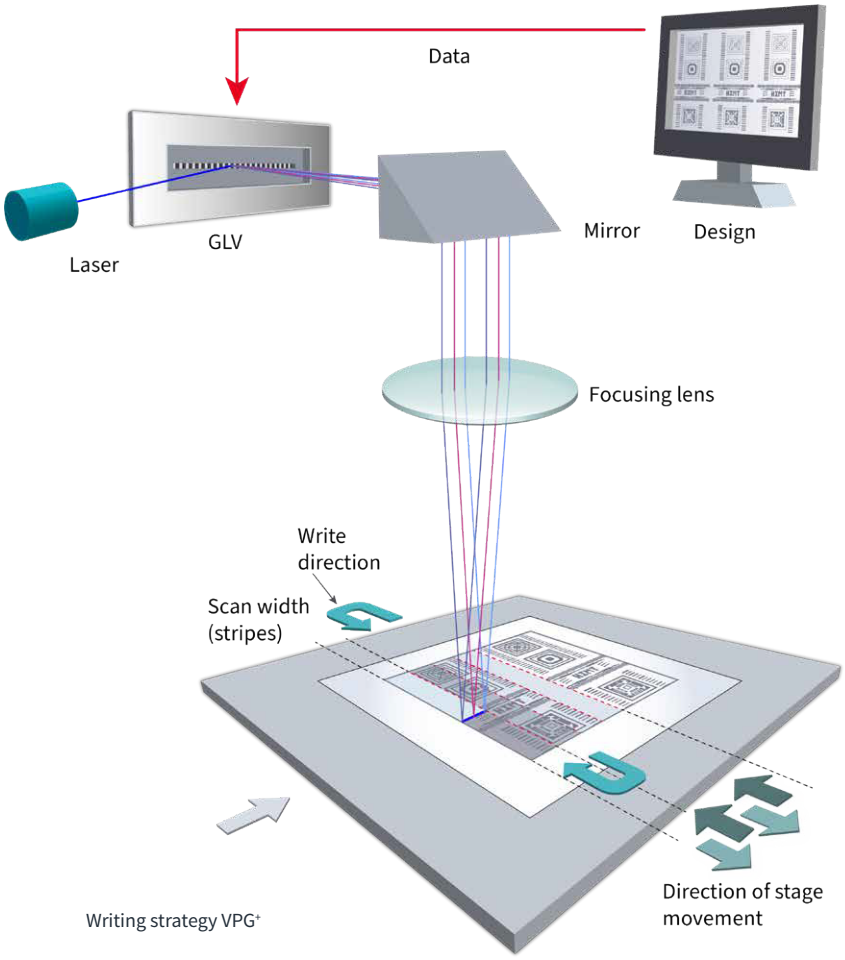
Our small-area Volume Pattern Generators VPG⁺ 200 and VPG⁺ 400 are perfectly suited for the production of binary photomasks. An ultra-high-speed exposure engine and automated alignment capability both contribute to systems that excel through high resolution, outstanding image quality, and fast throughput.

THE SMALL AREA MASK WRITERS

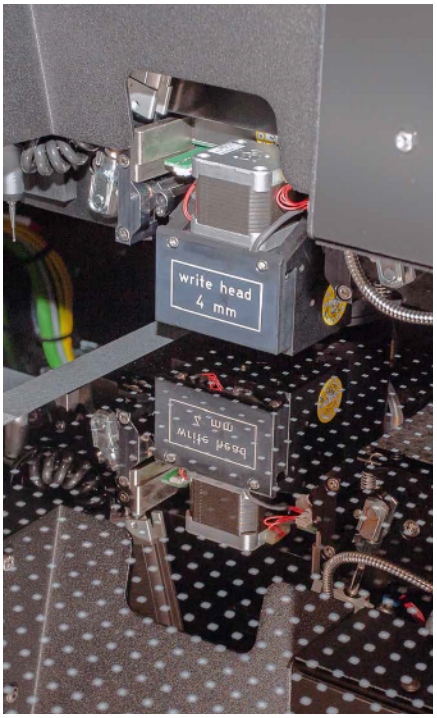
The VPG⁺ 200 and VPG⁺ 400 family of systems has always benefitted from Heidelberg Instruments' vast experience in small area lithography; and just as much from the field-proven technology employed on the company's industry standard large area VPG⁺ platforms. VPG⁺ systems both large and small share the same powerful technology.

EVEN HIGHER EXPOSURE SPEED

The „plus" has been added ever since the series has been featuring an even significantly faster high-speed spatial light modulator (custom-made for Heidelberg Instruments and therefore exclusive to this series). The entire exposure engine operates at a higher rate than ever before and the data path too has been vastly enhanced, making the VPG⁺ the fastest tool for mask-writing in this market-segment.



Writing strategy VPG⁺



LIGHT SOURCE AND STAGES

The VPG⁺ small-area systems operate with a high-power pulsed UV laser source with a wavelength of 355 nm. The systems is equipped with a full air-bearing stage designed to accommodate substrates of up to 9" (VPG⁺ 200) and 17"(VPG⁺ 400) respectively.

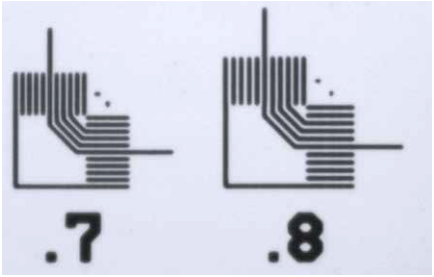
THE SMALL-AREA VPG⁺ IN A NUTSHELL

- Ultra-high-speed exposure engine
- Real time auto focus system
- High power DPSS laser with 355 nm
- Exchangeable write modes
- Camera system for metrology and alignment
- Closed-loop climate chamber
- Automatic loading system
- Stage map correction
- Edge detector system
- Multiple data input formats
- User programmable interface
- Special chucks
- Labelling options
- Optional Zerodur™ chuck
- Minimum structure size down to 0.75 µm

Photograph courtesy of IMS Chips

ALIGNMENT AND CALIBRATION

System features include automated alignment capabilities allowing multilayer exposures with excellent overlay accuracy and repeatability. The alignment functionality includes distortion compensation and field-by-field alignment. The 2D Stage Map Correction automatically calibrates stage positioning improving registration of the written structures.



Example from a test- and evaluation mask: Typical iso/dense resolution pattern in binary resist

ENVIRONMENTAL CONTROL

Rigorous environmental monitoring and feedback control ensure the specified overlay accuracy: software corrections based on precise measurements compensate for any variations in environmental parameters. An integrated metrology system enables self-calibration functions and various critical dimension measurements.

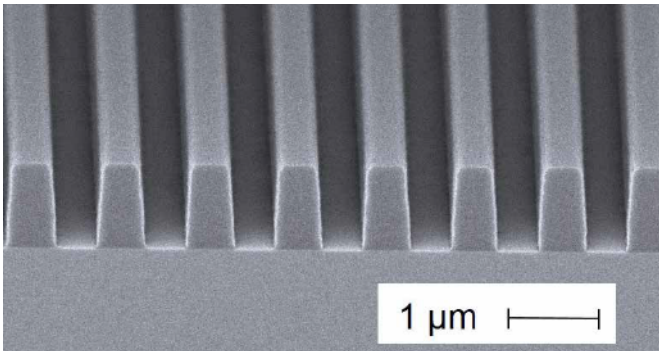
DESIGN CONVERSION

An easy to use interface converts all standard design formats to machine data. Advanced conversion functions like flexible write grid, pattern matching data optimization, biasing, and mask layout functions are included.

APPLICATIONS

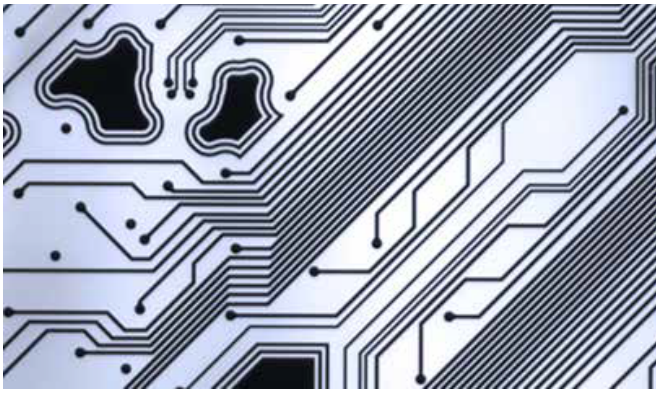
The VPG⁺ 200 and VPG⁺ 400 are perfectly suited for the production of standard photomasks. The systems can be used in a range of demanding fields that require microstructured photomasks: Typical applications include MEMs, advanced packaging, 3D integration, LED production, and compound semiconductors.

HIGH-RESOLUTION STRUCTURES



Structures created with IP3250 (1 µm thickness). Courtesy of IMS Chips.

ADVANCED PACKAGING



The VPG⁺ series presents the solution for the fabrication of the high-quality photomasks or direct writing required for advanced packaging applications. For some critical applications direct write lithography is currently the only available solution. The VPG⁺ series of maskless lithography systems offer high speed, automatic distortion compensation, and excellent resolution in order to master these applications.

APPLICATIONS IN A NUTSHELL

- Industrial photomask production
- Masks for rapid prototyping
- Microfluidics, MEMS
- Advanced packaging
- 3D integration
- LED production
- Compound semiconductors
- Particularly suitable for i-line resists such as SU-8 and IP 3600

VPG+ 200 / VPG+ 400

SYSTEM SPECIFICATIONS

Write mode	I-QX	I	II	III
Writing performance				
Minimum feature size [µm]	0.75	0.75	1	2
Minimum lines and spaces [µm]	1.5	1.5	2	4
Address grid [nm]	12.5	12.5	25	50
Edge roughness [3σ, nm]	30	40	50	70
CD uniformity [3σ, nm]	55	65	75	110
Stitching stability [3σ, nm]	30	60	70	100
2nd layer alignment [nm]	225	225	350	500
Write speed [mm²/min]	485	970	3150	6400
Exposure time for 100 x 100 mm² area [min]	28	14	5.6	3.5

System features	
Light source	High-power DPSS laser with 355 nm
Maximum substrate sizes	9″ x 9″ / 17″ x 17″
Substrate thickness	0 to 12 mm (other thicknesses on request)
Maximum exposure area	205 mm x 205 mm / 410 mm x 410 mm
Autofocus	Realtime autofocus system (optical and pneumatic)
Autofocus compensation range	Up to 80 µm
Flowbox	(Closed-loop) temperature controlled environmental chamber
Alignment and metrology	Camera system and software package for metrology and alignment
Other features and options	2D Stage map and data Mura correction, edge detector, multiple data input formats (DXF, CIF, GDSII, Gerber and others), optional automatic mask handling, optional Zerodur® stage, advanced write mode and special chucks

System dimensions	System	Electronic rack
Width [mm]	2605	800
Depth [mm]	1652	650
Height [mm]	2102	1800
Weight [kg]	3550	180

Installation requirements	
Electrical	400 VAC ± 5 %, 50/60 Hz, 16A, 3 phases
Compressed air	6 - 10 bar

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.

STELLA

Tel: +86-512-62529622
Fax: +86-512-62522966

苏州工业园区北摆宴街8号恒润商务大厦一楼A-3

www.stella-litho.com

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