We are motivated and strive to explore innovative nanopatterning and fabrication technologies to make end-products in broader areas smaller, better, and cheaper.

HIL 1000

Wafer-Scale Interference Nanopatterning System

Single Exposure Cover Entire Wafer

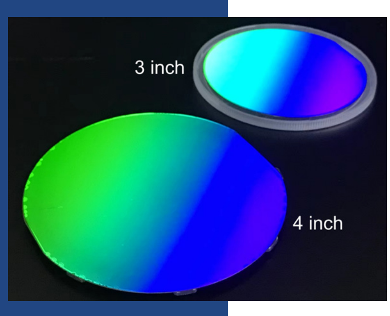
Sub-50 nm Feature Size

Diverse 1D / 2D Nanopatterns

HIL 1000

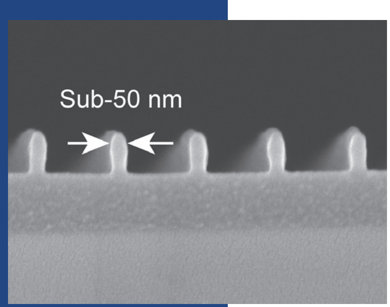
The HIL 1000 nanopatterning system features powerful functions such as single-shot wafer-scale nanopatterning capability, semi-automatic reconfigurable beam delivery, active interference pattern stabilization, etc. All these features are controlled by our proprietary user-friendly software LithoPro. The system can produce sub-50-nm periodic nanostructures on a large area (up to 4-inch wafer, larger size feasible) within minutes with one single exposure. Users can further reduce the feature sizes to sub-20 nm with additional nanofabrication processing protocols available from InterLitho. The wafer-scale exposure field can be patterned with versatile 1D or 2D nanostructures of deterministically set periodicity, lattice, and feature sizes. Optional modules are available for extended functions of patterned modulation of feature sizes and lithographic process simulation.

The HIL 1000 is ideal for manufacturing high-quality wafer-scale nanoimprint masters for R&D and mass production. It's also a highly productive tool for prototyping devices that demand large-area nanopatterns, especially when fast turnaround time is critical.



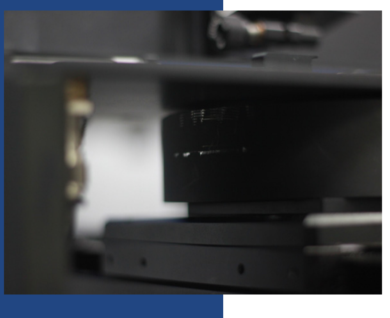
WAFER-SCALE NANOPATTERNING

Our standard HIL1000 model supports wafer-scale nanopatterning on 3-inch wafers with one single exposure. With an upgrade option of our **pattern size modulation** module, the patterning area can be extended to 4 inches with higher uniformity.



HIGH-RESOLUTION PATTERNING

The HIL 1000 model is able to fabricate nanostructures with feature sizes below 50 nm. Photoresist patterns in the nanometer scale with rectangular profiles and high aspect ratios could benefit subsequent processes such as etching and deposition.



SEMI-AUTOMATIC DIMENSION SETTING

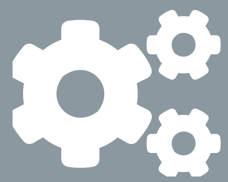
The fast-reconfigurable beam delivery module and the motorized sample positioning stage provide great flexibility in fabricating nanopatterns of various dimensions and geometries, including lines, pillars, holes, checkerboards, rods, etc.

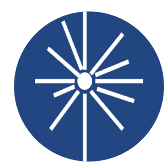
PATTERN SIZE MODULATION

The upgradable **pattern size modulation** module can modify the filling ratio of 1D and 2D structures, further improving the pattern uniformity and producing arbitrarily designed spatial distribution of feature sizes.

CORE TECHNIQUES

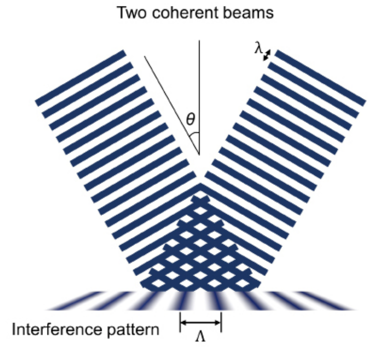
InterLitho invented the world's first two-beam interference nanopatterning system which provides turn-key solutions for large-area, high-throughput, and versatile nanopatterning.





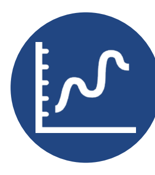
INTERFERENCE LITHOGRAPHY (IL)

Interference lithography (also known as holographic lithography) is a maskless nanolithography technique, useful for high-throughput fabrication of large-area periodic nanostructures. In a basic two-beam interference lithography configuration, a coherent laser beam is split into two sub-beams and the two sub-beams overlap on a photoresist-coated wafer with an angle. The periodicity of the interference pattern is determined by $\Lambda=\lambda/2\sin\theta$, where λ is the laser wavelength and θ is half of the angle between the two sub-beams.



FAST-RECONFIGURABLE BEAM DELIVERY

The periodicity of the interference nanopattern is determined by the angle between the two beams. Adjusting the beam angle on a conventional IL system is complex, time-consuming, and requires professional skills. Our interference nanopatterning systems employ flexible beam delivery with motorized positioning that enables fast tuning of the periodicity via semi- or fully-automated operation. The reconfigurable beam delivery module in our standard model has a wide periodicity tuning range from below 240 nm to over 1500 nm with 2% accuracy or better.



ACTIVE INTERFERENCE PATTERN STABILIZATION (AIPS)

Nanopatterns recorded in photoresist directly reflect the periodic intensity distribution of the interference patterns. To obtain high-quality nanostructures, a stable intensity distribution of the interference pattern is desirable, which is often affected by environmental disturbance and mechanical vibration. Our AIPS module employs innovative optical design, precise electronics, and advanced embedded firmware algorithm to automatically compensate phase variations with a high refresh rate. The AIPS module is essential for high-quality interference nanopatterning with vertical sidewalls and high aspect ratios.

PRECISION OPTOMECHANICS

High-quality precision optomechanical design in our interference nanopatterning systems adopts fine optomechanical adjustment components for accurate beam splitting, efficient beam delivering, and stable beam pointing. The optomechanical system can reach 0.1° angular accuracy in the beam positioning to achieve accurate pattern periodicity. The solid and stable rails and motorized stages enable unprecedented automation in interference patterning with highly suppressed mechanical variation to get high interference pattern contrast. The beam delivery module contains a pneumatic exposure shutter that provides accurate exposure time control. Our interference patterning modules are assembled on an air-suspension optical table with a specially designed enclosure to further eliminate the mechanical and environmental disturbance.

AUTOMATIC SAMPLE POSITIONING

The automatic sample positioning module in our HIL series has superior performance with a rotation accuracy of 0.1°. It allows for precisely defining nanopattern parameters, such as period and lattice. Supporting components made of lightweight aluminum alloy substantially mitigate mechanical vibration. The computer-controlled sample positioning module can significantly improve patterning speed.

TECHNICAL DATA

Our HIL series is a powerful nanopatterning system which can produce sub-50-nm periodic nanostructures on a large area within minutes with one single exposure. It is ideal for high-quality wafer-scale nanoimprint masters fabrication and nanostructured device prototyping.

Exposure Parameters	
Period Adjustment Mode	Semi-Automatic
Minimum Feature Size [nm]	< 50
Minimum Achievable Period [nm]	≤ 240
Maximum Achievable Period [nm]	≥ 1500
Patterning Uniformity	± 15% on 3-inch wafer; (optional upgrade) ± 5% on 4-inch wafer
Maximum Photoresist Aspect Ratio	> 6:1
Exposure Time [min]	≤ 10 (typ.)
Line Edge Roughness (3σ) [nm]	≤ 5 nm
Photoresist	h-line (405-nm-sensitive)
Pattern Lattice	1D/2D
System Features	
Laser Wavelength [nm]	405
Maximum Substrate Size [mm]	100 (diameter)
User Interface	LithoPro
Beam Delivery Angular Accuracy [degree]	0.1
Substrate Stage Angular Accuracy [degree]	0.1
Optical Shutter Timing Accuracy [s]	0.1
Advanced Options	
Pattern Size Modulation System	Linewidth modulation with user-defined spatial profile to achieve enhanced uniformity or designed spatial pattern size variation
System Dimensions (TPP unit)	
Footprint (width × depth × height)	2200 mm x 1500 mm x 1800 mm
Weight [kg]	<1000
Installation Requirements	
Electrical	220-230 V, 50/60 Hz, 16 A
Optimum Lab Conditions	Temperature: 21℃ ± 1℃ Humidity < 60%
Compressed Air	6-8 bar, stability ± 0.5 bar

CONTACT US

Unit 707, 7/F, Building 19W
Hong Kong Science Park
No. 19 Science Park West Avenue
Pak Shek Kok, N.T.
Hong Kong S.A.R.

+852-56442621

info@interlithotech.com