



Creating Greater Capacity
on Smaller Spaces



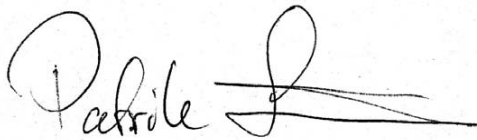
Obducat is the first company to introduce a manufacturing level system purpose built for Nano Imprint Lithography (NIL). Our proprietary technologies overcome the throughput and yield issues which, till now, have been barriers to NIL mass production.

Today, the market of electronic components and devices is driven by miniaturization and continuously improvements of price and performance. Technology allows us to communicate from anywhere at anytime, and digital storage has enabled what was once a library full of information to be carried in the palm of our hands. Large screen high definition televisions are a common consumer product and the ability to choose movies, sports or documentaries of our own preference are enabled by broadband communication directly to our homes, and ultra portable, mass storage media. Innovative approaches to medical/biological devices will improve quality of life by making diagnosis accurate, painless and routine.

Behind all of these innovations is nanotechnology, the science that allows us to produce and reproduce devices at a scale near the molecular level. Nano lithography is the ability to create and replicate features in order to build these devices.

Obducat are at the leading edge of nano lithography. Our electron beam writing tools enable sub 10nm patterning for applications in Storage media, and our nano imprint systems makes high-resolution replication of nano-sized structures possible.

We at Obducat are proud of our products, people and position, it is our purpose to offer the highest quality systems, and support, answering the technology challenges of research and industry.

A handwritten signature in black ink, appearing to read 'Patrik Lundström', with a stylized flourish extending to the right.

Patrik Lundström
CEO

About Obducat

Obducat is a Swedish based company with a history in the micro- and nanotechnology field since 1989.

We provide viable and cost-effective lithography solutions that will give a competitive edge to our customers, enabling them to deliver break-through applications and achieve improved profitability and success.

Obducat was the first company to commercialize Nano Imprint Lithography (NIL) and Electron Beam Recorder (EBR). Today we are the market leader and has the largest installed base worldwide of NIL.

Obducat CamScan is a wholly owned subsidiary in UK, that are producing, developing and distributing system solutions for advanced Scanning Electron Microscopy (SEM).

Business Concept

Obducat`s business concept is to develop and supply lithography solutions for production and replication of advanced micro- and nano structures for mass production as well as for R&D purposes.

The company's sales encompass equipment, stampers, licenses, and process optimization services.





Product Portfolio

Obducat is the preferred lithography solution provider among the world leading consumer electronic manufactures, offering a complete range of services and purpose built solutions.

■ **Electron Beam Recorder**

We provide e-beam based lithography systems dedicated to produce today's and next generations of storage media applications.

■ **Nano Imprint Lithography**

Obducat provides a complete range of Nano Imprint Lithography solutions for High Volume Manufacturing (HVM), hands-off, operation systems, as well as industrial and academic R&D work, product development and prototyping.

■ **Scanning Electron Microscopes**

Obducat CamScan provides SEM based analysis solutions for industrial as well as for R&D purpose.

■ **Stamp Services**

We offers stamp manufacturing services from our in-house stamp production line.

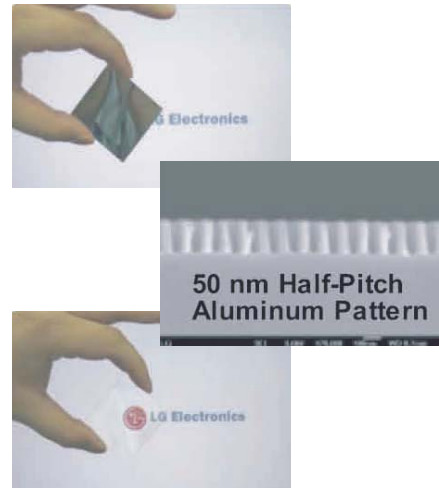
Partners

Obducat is a global company with a local presence through partners in US, Japan, South Korea, Singapore, Taiwan and China. Our partner network provides customers with outstanding sales support and technical service on demand.

Application Areas

Opto Electronics

Today a number of opto electronic devices are being developed and manufactured using Obducat Nano Imprint Lithography systems. Consumer electronics such as; Rear Projection TV (RPTV) and projector equipment can benefit from wire grid polarizer that substantially improve image quality. LCD screens with greater light intensity can be achieved by using a new type of LED:s called photonic crystal LED.

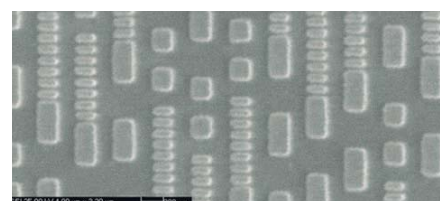
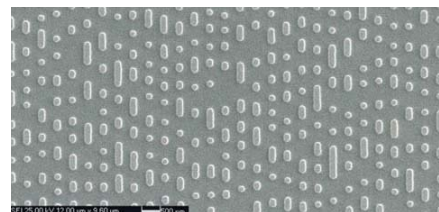


50nm Half-Pitch Nano Wire Grid Polarizer manufactured with an Obducat 4" Nano Imprinter. Courtesy: LG Electronics

Optical Storage Media

The demand for increased storage capacity requires a higher digital information density. In optical storage media this can be accomplished by reduction of pit and track width.

Obducat provides mastering and mass replication technologies for today's Blu-Ray and HD-DVD formats, as well as future formats which are based on near field reading technology. Our technology also support smaller form factors optical disks. Development work with Obducat's EBR-system is already being conducted with structures as small as 20 nm.

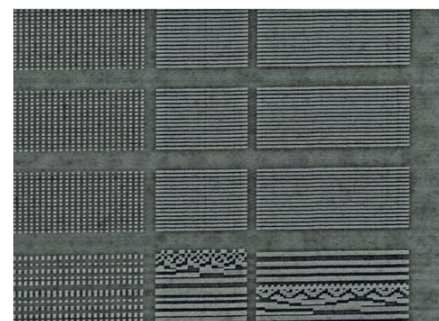


Top: Future generation of (AOD) for application on near field reading technology.
Bottom: Blu-Ray/HD-DVD type pattern.

Magnetic Storage Media

Next generation magnetic media require greater storage capacity and portability. This can be accomplished with Discrete Track Recording (DTR) or the creation of vertical small bits that circumvent the superparamagnetic relaxation problem.

These patterned media disks may consist of an array of discrete magnetic nano structures e.g. islands 50 nm or smaller in size, each of which can store one bit of data. The EBR give full flexibility to design the pattern to meet customers specific requirements, and with Nano Imprint Lithography the master disk can then be replicated, enabling cost-effective mass production of patterned media.



Servo pattern for hard disk application made with our EBR system.

MEMS and NEMS

Today, you find MEMS in devices used for measuring properties such as velocity, acceleration, pressure, mass flow, acoustic wavelength, etc. In more complex devices like Multifunctional Micro Systems (MMS), a combination of both passive and active micro systems is used.

The industry calls for integration on the smallest possible space, while still increasing the performance of the device itself.

Display

Obducat's proprietary NIL technology simplify present manufacturing processes, hence reducing associated productions costs.

Within displays, our Soft Press™ NIL printing make large area patterning in a simultaneous process step possible, as well as printing on material for flexible displays.

Nano imprint is also used to pattern high resolution pixel cavities for light emitting medium, in O-LED and LCD displays.

Bio-device - "Lab-on-a-Chip"

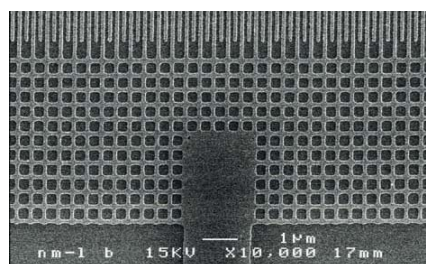
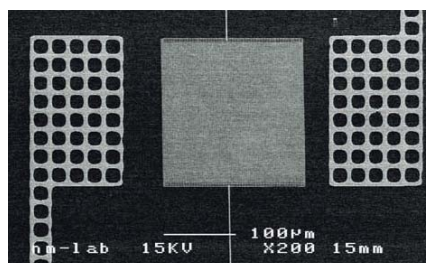
There is a growing demand for "laboratories on a chip". This requires the ability to scale down interdigitated arrays, micro fluidics, and integration of optical sensors. Researchers around the world have already developed chips that will allow instant glucose monitoring, DNA testing, and environmental monitoring.

Semiconductor and High Density Interconnects

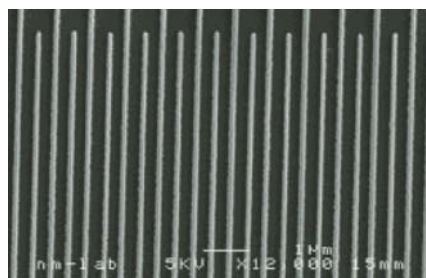
In order to fully utilize technology advancements of IC's, the interface between circuit and other electronics must be improved by allowing an increased number of interconnecting points. NIL technology can provide finer imprint of structures to interconnects, as well as simplify present manufacturing processes, and hence reduce associated costs.

Polymer and Molecular Electronics

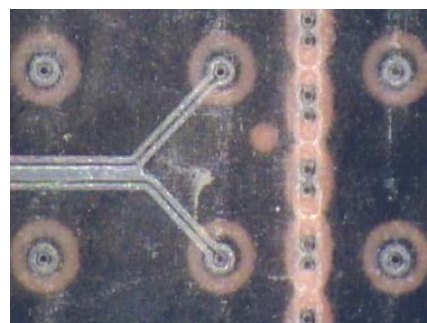
Further into the future polymer electronics as well as molecular electronics is believed to complement/replace today's electronics. In order to succeed in the fabrication of polymer based or molecular based electronics, a high resolution mechanical lithography technique is needed.



Magnification of a transducer chip manufactured by Nano Imprint Lithography. Top: a 200 × 200 μm² interdigitated array (IDA) electrode. Bottom: close-up of the 100 nm IDA electrode.



IDA-electrode for high sensitivity capacitance or redox cycling sensors.



Interconnects made with NIL. Two layer imprint with second layer aligned to core.



Electron Beam Recorder (EBR)

General Information

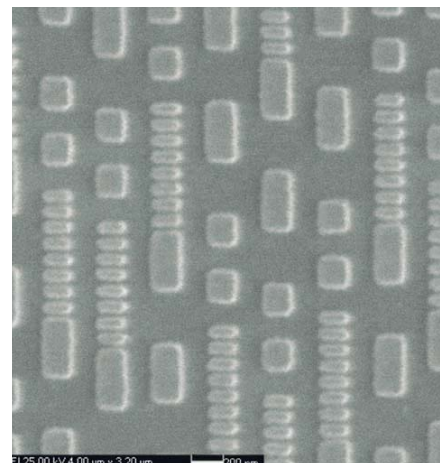
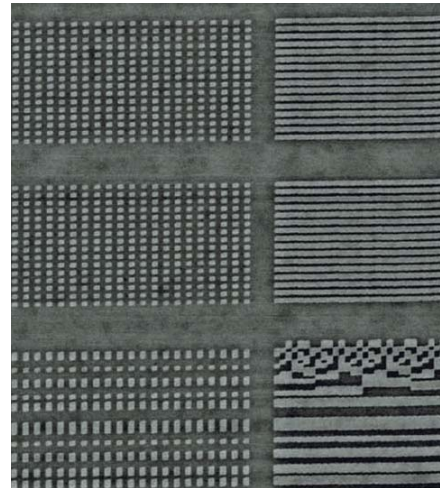
Obducat's world leading EBR technology has a unique set of capabilities. The stage management system with closed feedback loop control enables a highly accurate positioning capability

The E-beam columns, which are developed and built in-house based on more than 35 years of experience and know-how, are modified to address the very demanding requirements in lithography applications. The high performance stage and E-beam column is controlled by a sophisticated and user friendly interface which has the result of several years of development of exposure strategies embedded in it which makes operation of the system simple and straight forward. The pattern generator has a specialized mode for HDD applications making it very simple to define patterns such as servo patterns and similar patterns being used in patterned media applications within the hard drive industry.

The pattern generator also accepts data from externally connected formatters for DVD and Blu-ray formats making this system a very powerful mastering system for the optical media industry. The current formats such as HD-DVD and Blu-ray is easily recorded and the system is already today capable of mastering future formats as well.

The EBR system is offered in two different configurations with the main difference being the accuracy of the stage control and the exposure speed and resolution.

- EBR 30kV TFE
- EBR 50kV TFE



EBR- 30kV and 50 kV TFE

Obducat offers two configurations of the EBR system suitable for industrial production as well as R&D work. Both configurations are designed to handle substrates up to 8-inch in diameter. The 30 kV configurations are based on a 30kV TFE column with a high-speed beam blander and a stage control, which delivers high accuracy positioning capabilities. The high performance configuration is based on a 50kV column with high speed blanking system and ultra high precision feedback system for stage control enabling exposures with very high resolution. The systems also have a dynamic auto focusing system integrated to enable high-resolution exposure on non-flat substrates.

Electron Beam System

The E-beam columns are based on Thermal Field Emission technology. Years of experience and development have enabled the design of an E-beam column that delivers extremely high brightness as well as high current density. The E-beam column ensures high current stability of long periods of time, which is a crucial parameter in demanding lithography applications.

Software

The user interface and pattern generator provides full flexibility to modify and control the design of any media format.

Formats

Optical disk

- HD-DVD
 - DDP/CMF, DVD Authoring
- Blu-Ray
 - CMF (Cutting Master Format)

Hard disk

- Concentric tracks
- DTR (Discrete Track Recording)
- DPM (Discrete Patterned Media)

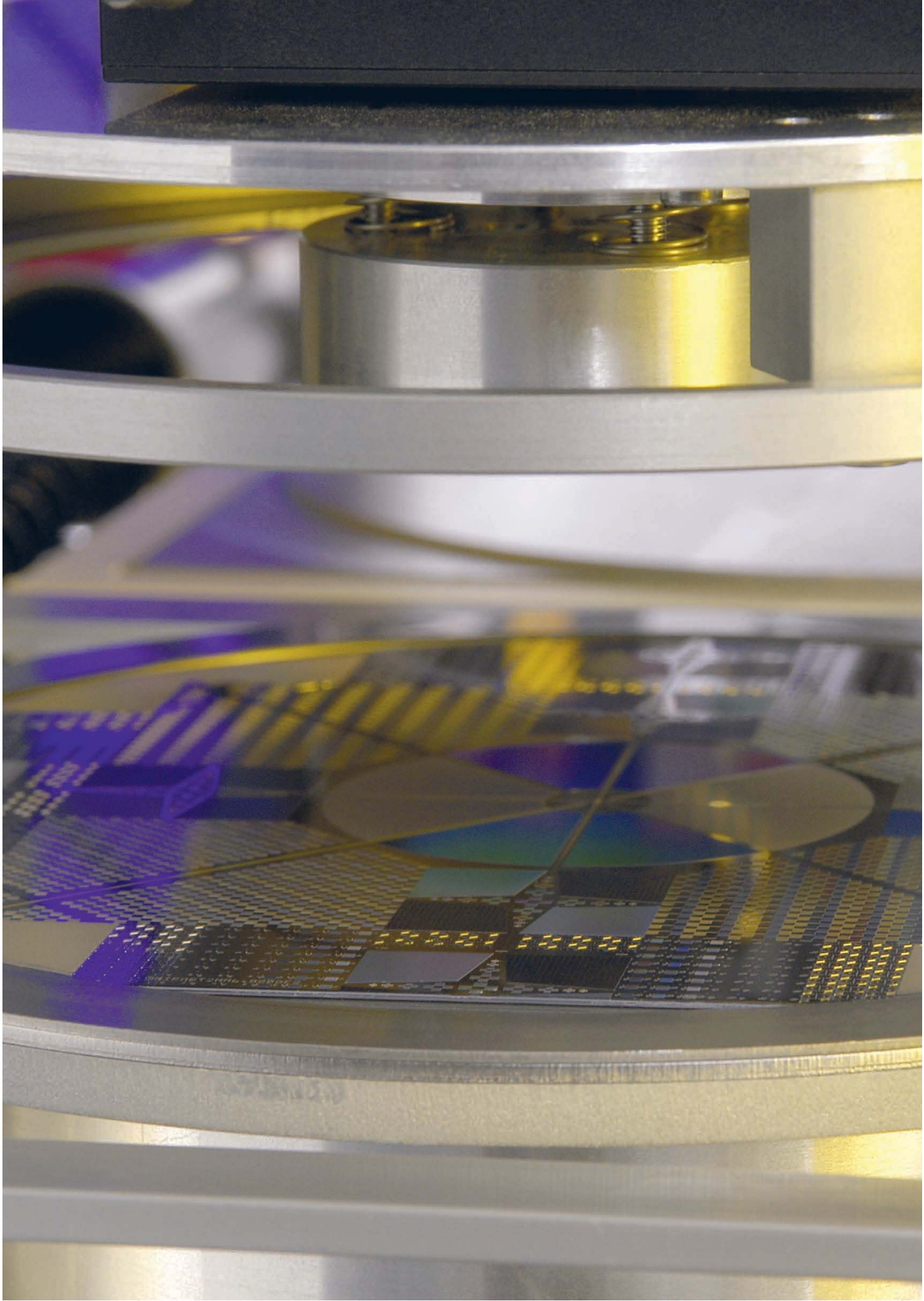


The EBR-30 kV and 50 kV TFE, electron beam recorder.

Technical Specifications EBR-30kV TFE and EBR-50kV TFE

	System Dimensions EBR-30 (L x W x H)	System Dimensions EBR-50 (L x W x H)
EBR Plint & Chamber	135 x 125 x 205 cm	135 x 125 x 205 cm
EBR Control Station	175 x 100 x 120 cm	175 x 100 x 120 cm
EBR Control Rack	80 x 80 x 235 cm	80 x 80 x 235 cm
General		
Vibration isolation table	Self-levelling gas suspension	Self-levelling gas suspension
Main frame	Rigid base plate for low natural frequency	Rigid base plate for low natural frequency
Load-lock	Automatic handling	Automatic handling
Mechanical Stage		
Maximal travel	100 mm	100 mm
Substrate holder size	150 mm, others TBD	150 mm, others TBD
Drive unit	Brush less 3-phase linear motor	Brush less 3-phase linear motor
Bearing	Cross roller bearing	Cross roller bearing
Straightness	< 5 µm / 50 mm	< 5 µm / 50 mm
Measuring system (X)	Integrated laser interferometer; resolution < 10 nm	Integrated laser interferometer; resolution < 1 nm
Speed range high resolution	Up to 250 µm/s	Up to 250 µm/s
Speed range low resolution	Up to 5000 µm/s	Up to 5000 µm/s
Radial rotational error	< 0.005 %	< 0.005 %
Asynchronous Error Motion	< 1 nm at 3 krpm	< 1 nm at 3 krpm
Rotation speed	Up to 3000 rpm	Up to 3000 rpm
Rotational direction	CW/CCW	CW/CCW
Drawing variation	CLV/CAV	CLV/CAV
Concentric drawing	inner ↔ outer	inner ↔ outer
Spiral drawing	inner ↔ outer	inner ↔ outer
E-beam Column		
Electron gun / Filament type	Thermal Field Emission (ZrO/C) X/Y Tilt, Shift Magnetic Alignment	Thermal Field Emission (ZrO/C) X/Y Tilt, Shift Magnetic Alignment
Cathode life	Typically >10,000 hrs+	Typically >10,000 hrs+
Beam spot size	Down to 8 nm	Down to 2 nm
Beam current density	Typically > 1000 A/cm ²	Typically > 1000 A/cm ²
Brightness	5*8^10 (A/cm ² /sr)	10^10 (A/cm ² /sr)
Acceleration voltage	30 kV	50 kV
Gun EHT unit	EHT unit includes Suppressor; Extractor; Lens and Filament supplies	EHT unit includes Suppressor; Extractor; Lens and Filament supplies
Condenser lenses	Integrated E/S Lens in Electron Gun, and Magnetic Condenser Lens	Integrated E/S Lens in Electron Gun, and Magnetic Condenser Lens
Objective lens	One magnetic low aberration final probe forming lens	One magnetic low aberration final probe forming lens
Stigmator	Two Octupole Stigmators, to correct both lens and source astigmatism	Two Octupole Stigmators, to correct both lens and source astigmatism
Beam blanker	Bandwidth up to 30 kHz. (tr/ff < 4 ns)	Bandwidth up to 30 kHz. (tr/ff < 5 ns)
Beam scanning range	Low resolution 2,5 mm / High resolution < 3 µm	Low resolution 2,5 mm / High resolution < 1,5 µm
Deflection resolution	2,5 nm/LSB	1 nm/LSB
Focus range	> 15 µm	> 20 µm
Beam current stability	< ±0.5% / hr	< ±0.5% / hr
Concentric Exposure		
Minimum line width	< 20 nm	< 10 nm
Line edge roughness	3sigma < 6 nm	3sigma < 4 nm
Down track accuracy	3sigma < 9 nm	3sigma < 6 nm
Cross track accuracy	3sigma < 20 nm	3sigma < 10 nm
Spiral track exposure		
Track pitch variation accuracy	3sigma < 20 nm	3sigma < 15 nm
Minimum Track pitch	< 45 nm	< 25 nm
Facility Requirements		
Magnetic field	≤ 0.1 µT in all directions	≤ 0.1 µT in all directions
Floor vibrations (Displacement)	< 2 µm / ptp	< 2 µm / ptp
Temperature	21-25°C	21-25°C
Room temperature variations	± 1°C	± 1°C
Humidity level	< 60%	< 60%
Current / frequency stabiliser	UPC	UPC
Compressed Air, min - max	7-8 bars, 5 m ³ / hr	7-8 bars, 5 m ³ / hr
Cooling Water (closed loop)	< 1 l / min	< 1 l / min
Water temperature variations	± 0,1°C	± 0,1°C
Voltage	380-400 VAC, 3 phase	380-400 VAC, 3 phase
Frequency	50 Hz	50 Hz
Power	8 kW	8 kW

Specifications subject to change



World Leading Nano Imprint Lithography Solutions

General Information

Obducat provides a complete range of Nano Imprint Lithography solutions for High Volume Manufacturing (HVM), hands-off, operation systems, as well as industrial and academic R&D work, product development and prototyping.

All NIL systems from Obducat are designed for full area imprint, using the patented Soft Press Technology™, enabling cost efficient pattern replication in the micro- and nanometer range.

Obducat offers field proven lithography solutions which provides for:

- Cost Efficiency
- High Resolution
- Imprint Repeatability
- Process Flexibility
- System Reliability

The technology is suitable for imprints on for example Si, SiO₂, GaAs and InP as well as on polymers, ceramics and metal substrates.

Soft Press Technology™

The Obducat Soft Press Technology™ allows pressure to be applied to the stamp and substrate hydraulically without using any rigid pistons.

The STU™ process is a patented technology from Obducat that will enable you to control thermal expansions between materials and allow cost efficient research work using any substrate and stamp materials.

The use of Soft Press™ ensures pressure uniformity over the entire imprint area, critical for high resolution NIL printing, and is independent of the substrate size and shape.

STU™ (Simultaneous Thermal and UV imprint)

Obducat's proprietary STU™ technology enables simultaneously combined UV and thermal NIL, allowing the complete imprint sequence into UV-curable thermoplastic pre-polymers to be performed at a constant temperature. The method has been developed in order to overcome problems related to different thermal expansions in stamp and substrate materials. The method allows the use of spin-coated UV-curable polymers with a homogeneous thickness distribution on wafer scale, crucial for CD control and enabling pattern transfer to an underlying substrate.

Nano Imprint Lithography for Research and Development

The Obducat 2.5- and 3-inch NIL equipment is the most user friendly R&D imprint tool in the market.

The system gives a flexible solution, that supports R&D work for both industrial and academic users conducting single layer imprinting with any stamp and substrate size up to 3-inch (77 mm) in diameter.

Obducat's R&D lithography solution offers a complete range of imprint methods, using thermal-, UV-imprints, as well as the combination between the two, known as the STU™ (Simultaneous Thermal and UV imprint).

The optional computerized control provides a programmable software interface with multiple temperature and pressure vs. time setting capabilities.

Key Specifications

- Pressure range 6 – 70 bar
- Temperature up to 250 °C
- UV and Thermal Imprint combination

Benefits

- Process flexibility
- High pattern transfer fidelity
- Bio-compatible lithography
- Easy to use and maintain



Obducat's 2.5 inch NIL system is developed for R&D purposes.



Technical Specifications NIL 2.5" and 3"

	System Scope Dimensions 2,5"	System Scope and Dimensions 3"
Dimensions (L x W x H)	80 x 60 x 180 cm	80 x 60 x 180 cm
Weight	Approx. 250 kg	Approx. 250 kg

Product Safety

CE Mark
Interlocked safety cover
Lock out/Tag out disconnect
EMOS

Configuration

Programmable PLC – Set value control for temperature, pressure vs. time with closed feedback loop to ensure process accuracy
Substrate holder: System will include a user-friendly "tray system" for loading and unloading work material into equipment.

Parameter Specification

Temperature (Minimum)	Ambient temperature	Ambient temperature
Temperature (Maximum)	250°C	250°C
Temperature Field Uniformity	± 1%	± 1%
Temperature Setting Accuracy	± 2 deg	± 2 deg
Heat-up Ramp (Maximum)	0.5 – 1 K / sec.	0.5 – 1 K / sec.
Cooling	Air cooling	Air cooling
Residual layer thickness uniformity	± 10 nm	± 10 nm
Pressure (Maximum)	≤70 bar	≤70 bar
Stamper Size	≤65 mm Ø	≤77 mm Ø
Imprinting Area (Maximum)	65 mm Ø	≤77 mm Ø
Substrate Size	≤65 mm Ø. (Diameter/Diagonal of Round/Square substrate in the range of 10 mm to 65 mm can be used)	≤77 mm Ø. (Diameter/Diagonal of Round/Square substrate in the range of 10 mm to 77 mm can be used)
Stamper and Substrate thickness	Standard thickness 1 mm (others possible according to specification)	Standard thickness 1 mm (others possible according to specification)

Options

Computerized System Control	Programmable software interface for profile control with multiple temperature, pressure vs time setting capabilities	Programmable software interface for profile control with multiple temperature, pressure vs time setting capabilities
High Temperature	Heating max 300°C	Heating max 300°C
UV-option	Configuration: High Pressure Mercury Vapor Short Arc Computer controlled Wave length: Standard 250 nm – 450 nm, (Wavelength filters available as options.) Light Power at sample: 40-100 mW / cm ² Exposure Time Set: minimum 0.2 second Exposure area: 2.5 inch Ø Temperature (Maximum): 200 °C Pressure (Maximum): ≤ 70 bar	Configuration: High Pressure Mercury Vapor Short Arc Computer controlled Wave length: Standard 250 nm – 450 nm, (Wavelength filters available as options.) Light Power at sample: 40-100 mW / cm ² Exposure Time Set: minimum 0.2 second Exposure area: 2.5 inch Ø Temperature (Maximum): 200 °C Pressure (Maximum): ≤ 70 bar

Facility Requirements

Voltage #1	Standard 220-240 VAC, 1 phase, earthed, pre-fused to 16 A (Exact voltage must be specified)	Standard 220-240 VAC, 1 phase, earthed, pre-fused to 16 A (Exact voltage must be specified)
Frequency	50/60 Hz	50/60 Hz
Power (Minimum)	2.5 kW	2.5 kW
Compressed Air	6 – 8 bars, 30 l / min	6 – 8 bars, 30 l / min
Room Temperature		
Range for Normal Operations	18 – 32°C	18 – 32°C
Relative Humidity	65 %	65 %
Clean-room Compatible	Class 100	Class 100

Specifications subject to change

Nano Imprint Lithography for Product Development and Prototyping

The Obducat 6 and 8-inch Nano Imprint Lithography (NIL) systems are designed for product development, process optimization and small volume production.

The equipment offers a complete range of system configurations providing the capability to realize both single and multi layer applications.

Thanks to the Soft Press™ technology the pressure can be evenly distributed, ensuring a uniform and thin residual layer over the entire 8-inch wafer, for both single and double-sided replications.

The optional UV system will provide for Simultaneous Thermal and UV imprint capability, allowing you to conduct imprints at a constant temperature and minimize the process time.

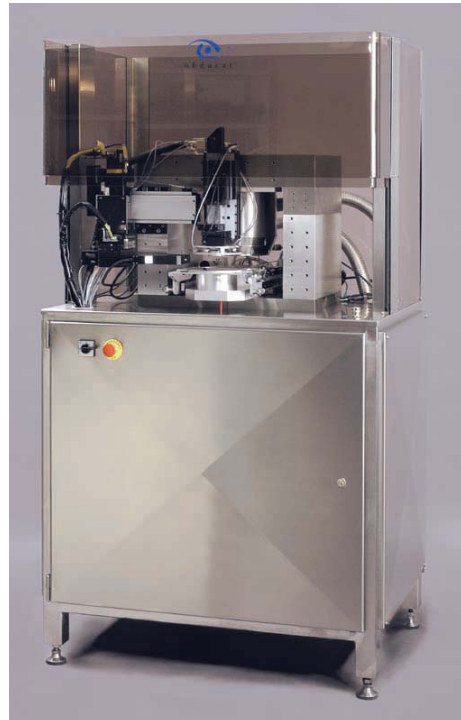
Obducat offers a completely integrated alignment system, meaning that there is no handling outside the system, reducing the likelihood of alignment shift.

Key Specifications

- Pressure range 6 – 80 bar (50 bar for 8-inch)
- Temperature up to 300 °C
- UV and Thermal Imprint combination
- Integrated alignment
- External water cooling

Benefits

- Cost efficiency
- System reliability
- Process repeatability
- Minimized imprint process time



The 6 inch system for Nano Imprint Lithography has been developed for industrial test production, and process optimization purposes.



Technical Specifications NIL 6" and 8"

	System Scope Dimensions 6"	System Scope Dimensions 8"
Dimensions (LxWxD)	100 x 75 x 180 cm	100 x 75 x 180 cm
Weight	Approx. 1000 kg	Approx. 1000 kg
Computer for system control	Embedded computer with 15" flat screen display	Embedded computer with 15" flat screen display

Product Safety

CE Mark
Interlocked safety cover
Lock out/Tag out disconnect
EMOS

Configuration

Programmable Recipe Software: Profile Control for Temperature, Pressure vs. Time with closed feedback loop to ensure process accuracy
Substrate holder: System will include a user-friendly "tray system" for loading and unloading work material into equipment.

Parameter Specification

Temperature (Minimum)	Ambient Temperature	Ambient Temperature
Temperature (Maximum)	300° C	250° C
Temperature Field Uniformity	± 3 %	± 3 %
Temperature Setting Accuracy	± 2 deg	± 2 deg
Heat-up Ramp (Maximum)	100 K / min	50 K / min
Cooling Ramp (Maximum)	50 K / min.	50 K / min. (External Cooling system as standard)
Print Uniformity	± 10 nm	± 10 nm
Pressure (Maximum)	≤ 80 bar	≤ 50 bar
Stamper Size	≤ 152 mm Ø	≤ 203 mm Ø
Max. Imprinting Area	152 mm Ø	203 mm Ø
Substrate Size	≤ 152 mm Ø. (Diameter/Diagonal of Round/Square substrate in the range of 10 mm to 152 mm can be used)	≤ 203 mm Ø. (Diameter/Diagonal of Round/Square substrate in the range of 10 mm to 200 mm can be used)
Stamper and Substrate thickness	Standard thickness ≤ 2 mm (others possible according to specification)	Standard thickness ≤ 2 mm (others possible according to specification)

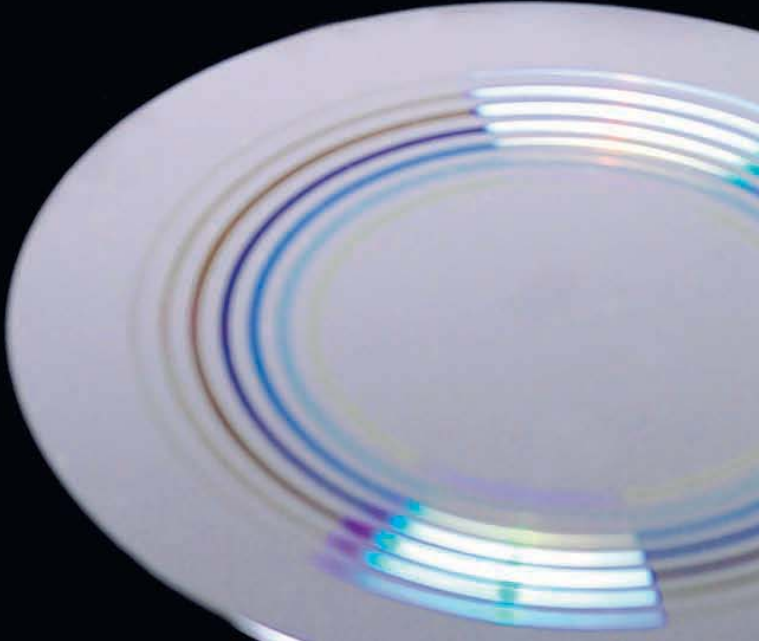
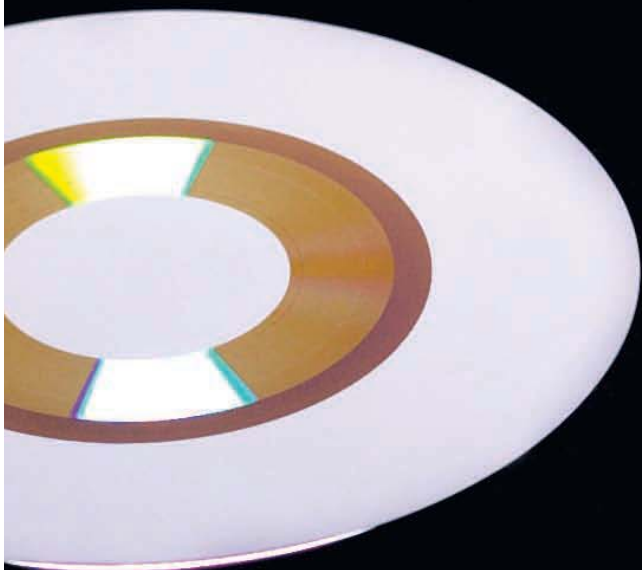
Options

Cooling	External Water Cooler	External Water Cooler
Overlay Alignment Accuracy (X,Y,Theta)	10 % of alignment mark line width (Limitation ± 1µm)	10 % of alignment mark line width (Limitation ± 1µm)
UV-Module	Wave length: 200 nm – 1000 nm, 1.8 W / cm ² UV-filter: 250 nm - 400 nm Configuration: One Lamp, pulsed Exposure area: 6 inch Ø Temperature (Maximum): 200° C Pressure (Maximum): ≤ 80 UV-Module	Wave length: 200 nm – 1000 nm, 1.8 W / cm ² UV-filter: 250 nm - 400 nm Configuration: One Lamp, pulsed Exposure area: 8 inch Ø Temperature (Maximum): 200° C Pressure (Maximum): ≤ 50 UV-Module
Separation unit	Semi Automatic separation unit for easy de-molding	Semi Automatic separation unit for easy de-molding
De-molding system	Automatic controlled De-molding (Each substrate size needs to be specified)	No

Facility Requirements

Voltage	400 VAC, 3 phase, grounded, pre-fused to 32 A (Exact voltage must be specified)	400 VAC, 3 phase, grounded, pre-fused to 32 A (Exact voltage must be specified)
Frequency	50/60 Hz	50/60 Hz
Power	Maximum 16 kW	Maximum 16 kW
Compressed Air	6 – 8 bars, 40 l / min	6 – 8 bars, 40 l / min
Room Temperature Range for Normal Operations	18 – 32° C	18 – 32° C
Relative Humidity	65 %	65 %
Cleanroom Compatible	Class 100	Class 100

Specifications subject to change



Stamp Services

Stamp Production

Obducat delivers high quality stampers used for pattern replications with features ranging from sub-50 nm up to the micrometer scale. In order to assure contamination free stampers, the production is carried out in a Class 10 clean-room environment. Available stamp materials are Si, Ni, quartz and polymer.

Proprietary Solutions

Obducat have technology solutions that encompass both draft angles and smooth sidewalls to minimize the interaction forces between stamp and substrate during separation after the imprint process. This gives the ability to produce high aspect ratio stampers for mass replication with NIL.

The Obducat proprietary stamp technology also includes anti-stick solutions for monolayer coating of stampers. This makes demolding easy and the stamper remains clean after each imprint. The anti sticking enhances the durability of the stamper, increasing stamp lifetime and resulting in low stamp cost per imprint.

Pattern Characteristics

Obducat produces stampers for a wide range of applications and R&D work, such as:

- High aspect ratio
- Interdigitated arrays
- Lines and spaces
- Pillar arrays
- 3D structures
- Spiral and concentric pattern



SEM micrograph of high aspect ratio stamp, ratio 34:1



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