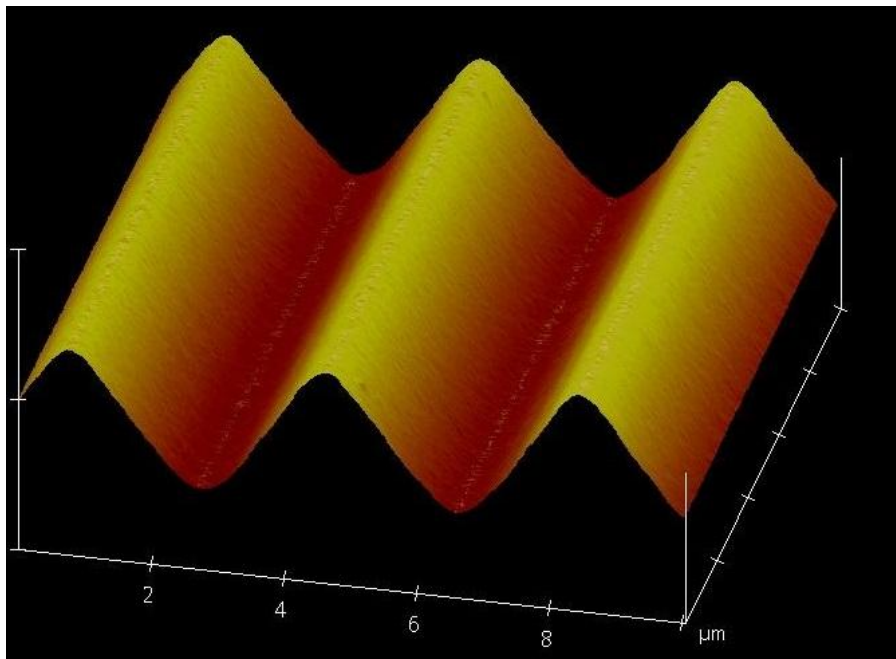


# PICO MASTER 100

UV direct laser writer  
for maskless lithography

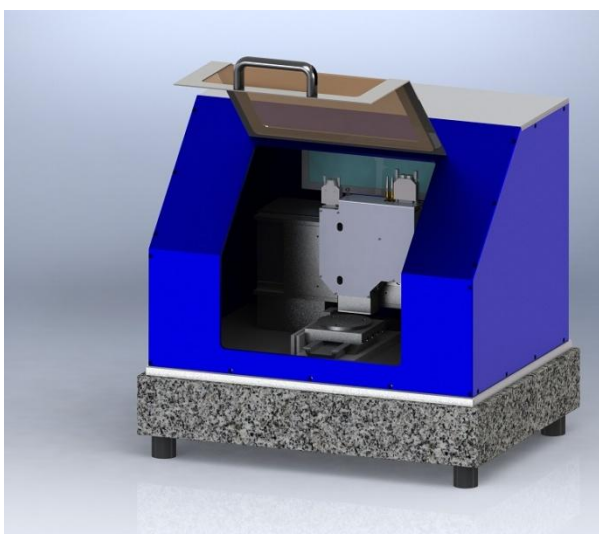


## 1. Introduction

The PicoMaster is a versatile UV laser writer with ultra high precision components, specifically designed to give the user the highest degree of freedom to create micro structures in photo sensitive layers. The rasterizing principle of the machine ensures proper and constant exposure over the whole surface. Scanning the substrate at high speed and stepping the laser head with a software adjustable pitch.

Supporting up to 4096 levels of grayscale or pure binary mode allows for 3D optical structures, surface structures as well as mask projects makes the PicoMaster the ideal Litho tool for R&D as well as production.

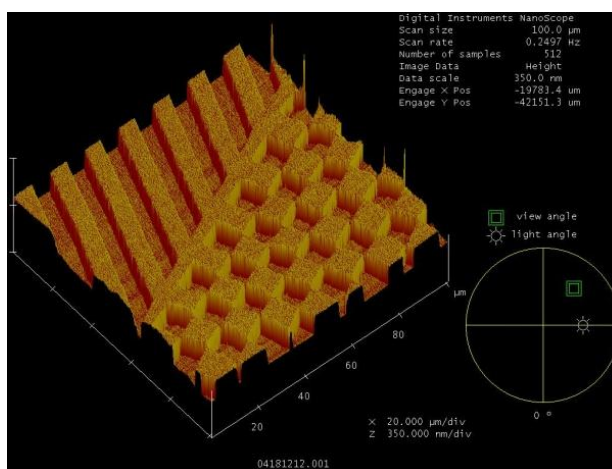
The PicoMaster is a standalone, table top lithography system. All required components, including control rack and vacuum pump are included with the delivery, which allows for quick and easy installation.



The massive base frame supported by isolation mounts filter out ground frequencies to ensure minimum vibrations in the system.

\*Image is for illustration purposes. The PicoMaster 100 might differ from this image.

## 2.



Sample of binary mode image

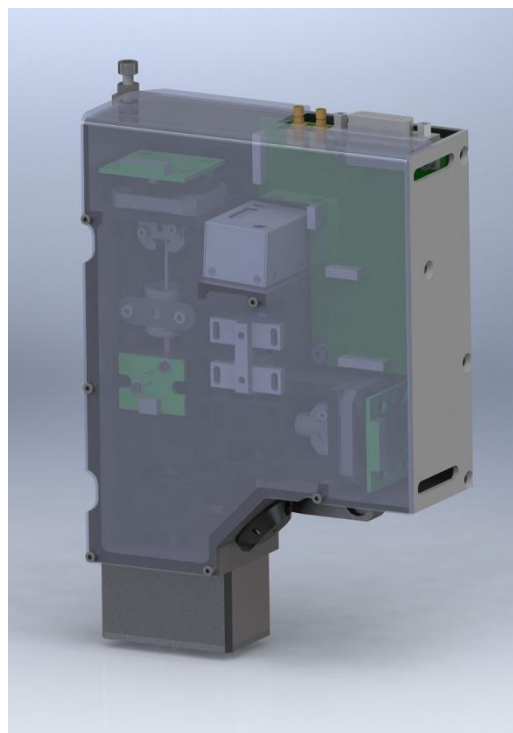
## 2. Optics

The full optical path is contained in a small easily changeable module. By keeping the optical path as short as possible, the pointing stability is greatly increased.

The laser controlled autofocus system automatically corrects for surface errors or wedge shaped substrates.

3 versions of optical modules are available. A 405nm with 0.85NA objective lens, a 375nm with 0.85NA.

Optical units can easily and quickly be exchanged for minimum downtime.



Optical properties	405nm	375nm
Wavelength	405nm	375nm
Spot size	290nm FWHM	270nm FWHM
NA	0.85	0.85
Min line width <sup>1</sup>	<0.3 $\mu\text{m}$	<0.26 $\mu\text{m}$
Intensity	Max 3mW in the spot. Software controllable.	
Autofocus	2Khz bandwidth, red laser (680nm) controlled -0.5...x...+0.5mm height variation.	
Focus offset	Adjustable by software control.	
Wafer thickness	0...5mm, mechanically adjustable.	
Wafer size	Max 105x105mm	
Exposable area	Max 100x75mm (speed depended)	
Data rate	Standard 10Mhz.	

<sup>1</sup>Critical Dimension of the PicoMaster strongly depends on process parameters, such as resist types and layer thickness.

### 3. Mechanics

The scan axis incorporates a high precision dove tail air bearing which is driven by linear motors with nanometer resolution encoder. The scan axis uses a high precision linear bearing with sub micron encoder. This motion platform allows for extreme low mechanical errors and fast scan movements.

Substrates are clamped down by using a vacuum chuck. The vacuum chucks are easily exchangeable to support different wafer sizes.

Mechanical properties	
Stroke Scan and Step	Max 105mm.
Repeatability	<20nm
Resolution	2nm
Scan speed	Max 200mm/s
Mechanical alignment	<0.1mm
Optical alignment	Optional
Write speed	Up to 1mm <sup>2</sup> per minute
Address grid	Standard: 20nm in scan direction and 100nm in step direction. Software adjustable down to 10nm in both directions.

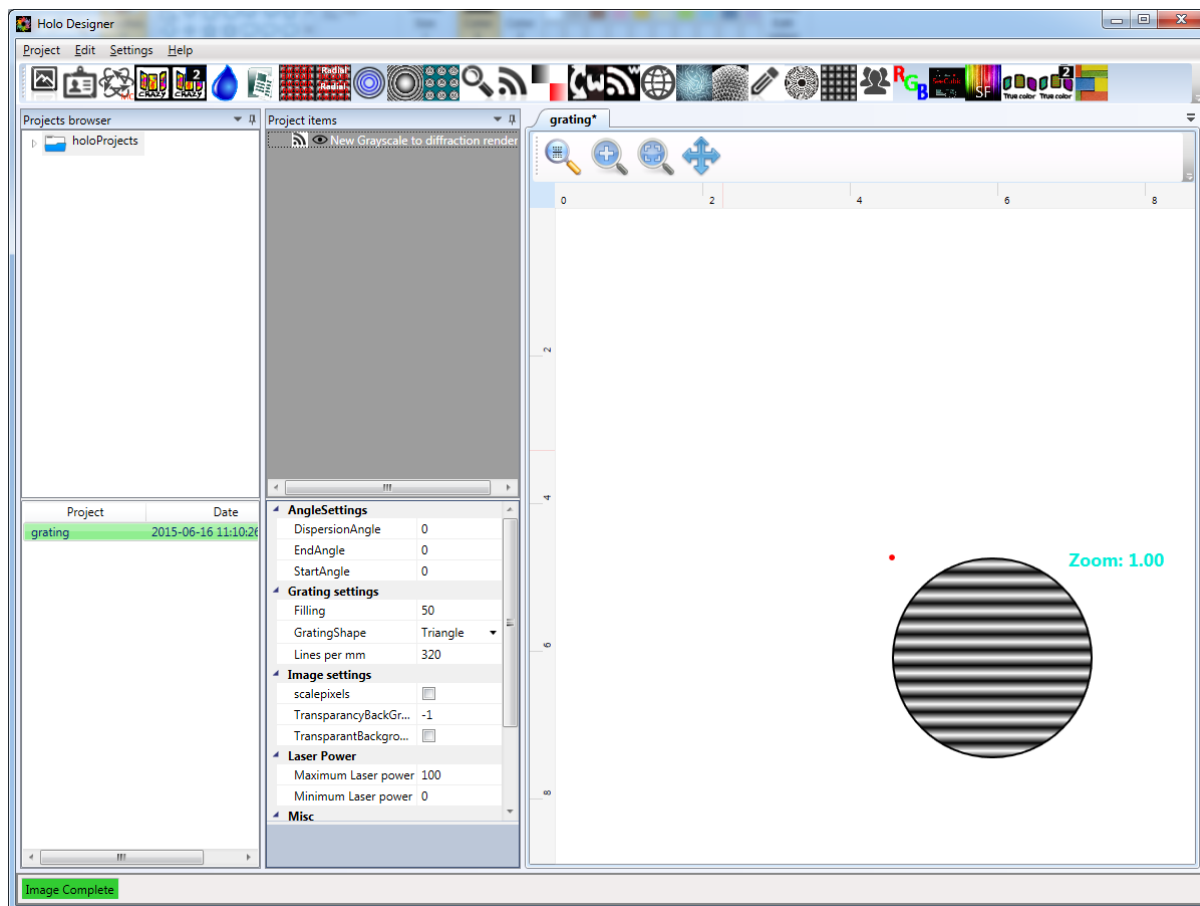
### 4. Top side alignment

Optional, the system can be equipped with a high resolution camera for topside alignment purposes.

Alignment specifications	
Camera	5M pixel BW
Light source	Integrated green LED.
FOV	2.5 x 2mm
Resolution	<500nm

## 5. Software

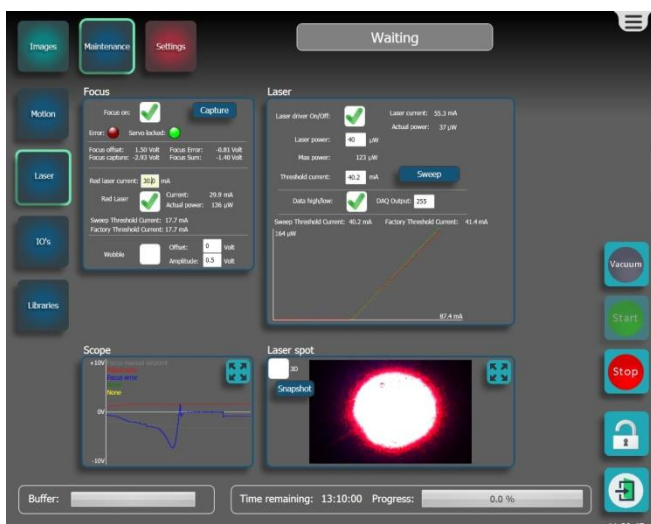
The Picomaster comes with two windows based applications, the PicoMaster Machine controller and the Designer. The Designer allows the user to select features and combine images while the PicoMaster Machine controller processes these jobs and control the machine. Jobs are processed on the fly, limiting preparation time to the minimum.



Screen shot of the visual designer software.



The PicoMaster machine controller allows the operator to queue jobs, monitor progress and gives a high level of manual control features.



Manual functions to monitor laser quality and stability, including spot camera.

## Supported formats

Binary sources

Parameterization

3D sources

Optional formats

Optional Supported but not recommended

Bitmaps

Basic shapes can be configured without source files.

grayscale bitmaps, Parametric

Optional: STL, Step

GDSII, Oasis, Gerber

DXF

Although not required, it is highly recommended to run the designer software on a separate Windows based computer.

## 5.1. User libraries

The PicoMaster software supports user libraries. These libraries can be written in C# or VB.net. With these user libraries the operator can create his own algorithm to calculate the laser intensity at each grid point.

## 5.2. Optional holographic libraries

The PicoMaster comes optionally with an extended set of libraries specifically for holographic structures. Each library is a plug-in software module to the designer software. This allows for individual updates or new features to be added over time.



### Some of the standard available libraries specifically for holographics.

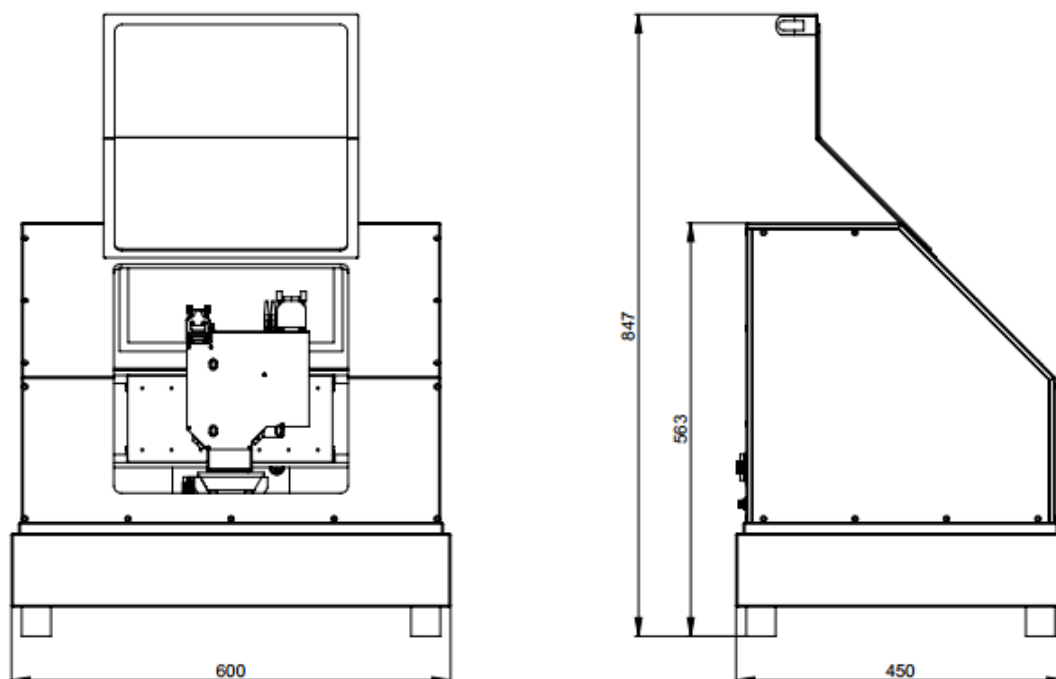
Micro images	Copies b/w bitmaps to micro format. Can be used for micro text or micro images
2D/3D images	Creates colored images with high reflectivity.
Covert images	Hidden images which are only visible when illuminating with a point source laser.
Stereogram	Animated images up to 40 frames.
True color images	Stunning true RGB images
Bas relief	Outputs images which give a strong height effect.
Switch	Flip true different images when tilting the object

Image sources: Black/white bitmaps, Grayscale bitmaps, 32bit color bitmaps (including transparency)

All features come with programmable frequencies, angles, dot sizes and shapes. Using analog mode instead of binary mode even more effects are possible to achieve.

The proprietary designer software allows the user to combine many features and effects and create complex projects with ease. The PicoMaster processes these projects on the fly. No Pre-Processing is required.

## 6. Installation requirements



Dimensions <sup>2</sup>	
Width	600 mm
Height	850 mm
Depth	450 mm
Weight	150 kg
Additional components	Desktop computer and electronics cabinet
Electrical connection	230V AC, max 1kW
Compressed air	5-7 Bar
Vacuum	
Ethernet	For server connections and remote access
Recommended environment	Clean room ISO class 5 or better.
	Room Temperature 21°C +/- 1°C
	Room Humidity 45-70% RH

<sup>1</sup> It is strongly recommended to use an air conditioner with recirculation option to maintain optimal process conditions within the PicoMaster.

<sup>2</sup> Specifications may change without notification.