



EXTRA FAST

PicoMaster^{XF} 500-H

Holographics – UV laser based origination system

Ultimate speed - create excellent 3D micro structures

- User friendly dedicated holographic design software with many pre-installed libraries, very easy to combine effects
- Open software interface enables users to add proprietary algorithms to the libraries
- Real time laser controlled auto focus: superb surface tracking of substrates with large height differences

***Unique opportunity
for packaging and
label manufacturers***
*The high resolution
capabilities in
combination with the
high speed of the
PicoMaster^{XF} 500-H
allow manufacturers
to create innovative
packaging solutions*

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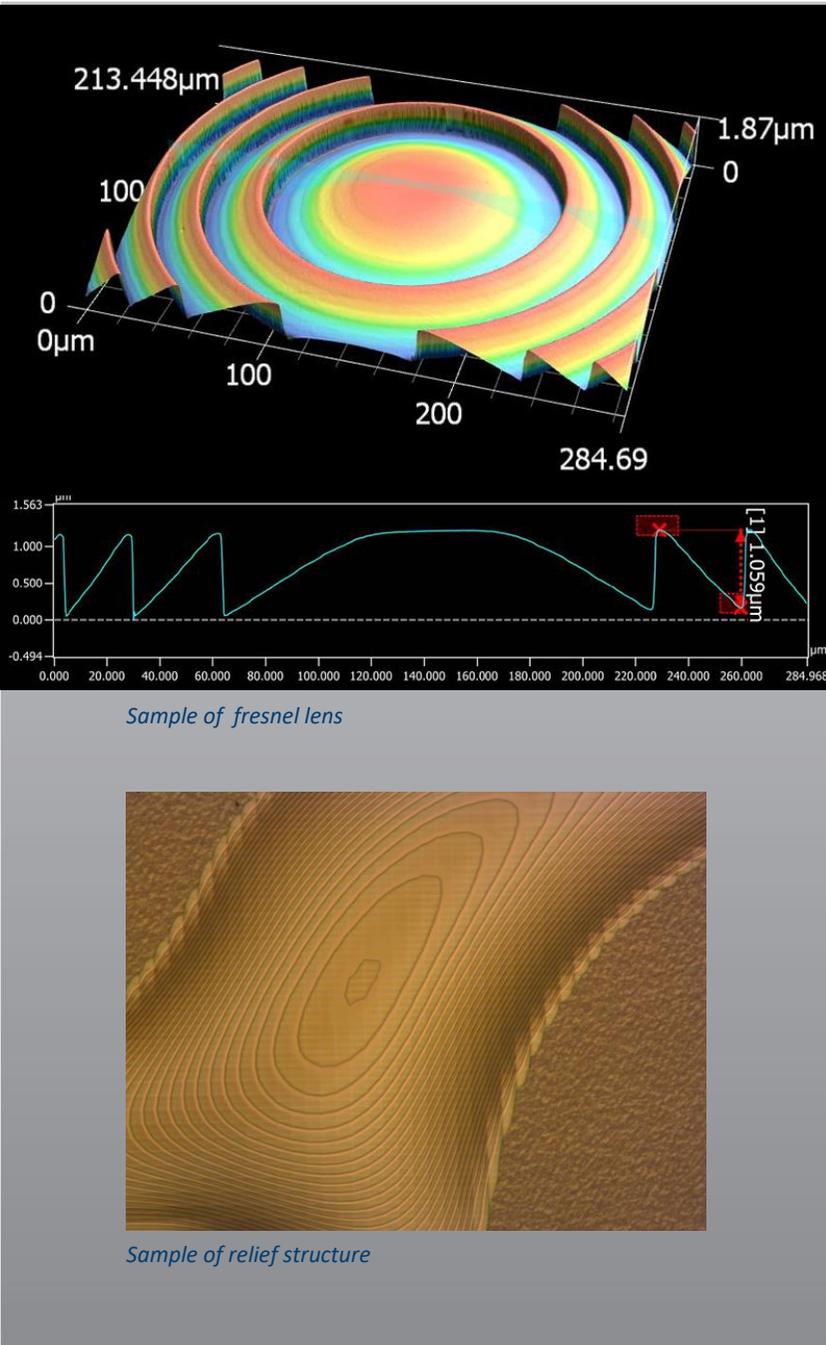
Introducing the ideal tool for the production of Fresnel lenses and other blazed grating images

Large area origination equipment supporting ultimate speed

The PicoMaster^{XF} 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. With an output of over 1200 lines per mm the user-friendly holographic systems by 4PICO Litho provide excellent performance. Our distinctive holographic design software PicoHLD supports many pre-installed holographic effects and calculates gratings & structures itself. The ease with which effects can be combined is astounding. Add your own algorithms and structures to customize your library and create perfection.

The PicoMaster^{XF} 500-H base system is a fully operating system. It includes a 405 nm optical module capable of writing lines as small as 500 nm in photo resist layers. This user friendly tool supports up to 256 levels of grayscale or pure binary mode and allows for 3D optical structures and surface structures. Real time laser controlled auto focus and laser intensity control ensure high quality imaging during the entire exposure process.

The control electronics are all mounted within the frame including the vacuum pump and control PC. This Microsoft Windows based desktop PC and all required software is included in the package.





Ultra high precision
Excellent performance in creating 3D micro structures

Benefits

■ Dedicated holographic design software: PicoHLD

- User friendly Hologram & Lens Designer (HLD) software with many pre-installed libraries.
- Very easy to combine effects.
- Open software interface enables users to add proprietary algorithms to the libraries.

■ Capabilities

- Very high resolution: over 1200 lines per mm.
- Critical dimension of 500 nm.
- Up to 256 levels of grayscale or pure binary mode. Grayscale writing allows for blazed gratings and other types of gratings.
- EXTRA FAST: expected maximum recording time 500 x 500 mm: 28 hours.
- Software controllable selection of write modes.

■ Operation

- A modern Microsoft Windows based user interface allows for user-friendly operation.
- Highly automated processing, one button operation.
- Short preparation time required using PicoHLD and PicoMaster^{XF} Machine Controller applications.
- On the fly processing of jobs, minimum pre-processing required.
- Up-to-date online manuals and remote internet support.

■ Installation and maintenance

- The PicoMaster^{XF} 500-H comes with a small server rack to support the powerful multicore computer and closed circuit water cooling.
- Optical Module: use a spare optical module for revolutionary machine downtime reduction.
- Minimal maintenance costs, no regular maintenance required.

PicoMaster Machine Controller Software

■ PicoMaster Machine Controller and Pico Hologram & Lens Designer (PicoHLD)

The Picomaster ^{XF} comes with two Windows based applications: PicoMaster Machine Controller and PicoHLD. PicoHLD allows the user to select features and combine images while PicoMaster Machine Controller processes these jobs and control the machine. Jobs are processed on the fly, reducing preparation time to the minimum. PicoMaster Machine Controller allows the operator to queue jobs, monitor progress and gives a high level of manual control features.

Features of PicoMaster Machine Controller:

- On the fly processing of jobs.
- Job queuing.
- Freely definable process and substrate recipes.
- Extended history database.
- Remote support.
- Optional: User access control through login credentials or smart card.



Screenshot of the visual PicoHDL software

User friendly
 Minimum preparation
 time required using
 Pico Hologram & Lens
 Designer (PicoHLD) and
 PicoMaster Machine
 Controller

PicoHLD: dedicated holographic design software

4PICO Litho presents Pico Hologram & Lens Designer (PicoHLD): the most user-friendly software available in the market. Use pre-installed libraries, add proprietary algorithms or parameters and combine effects very easily. PicoHLD calculates the correct gratings & structures itself!

■ Build in effects

The project manager is a dedicated tool with which the user can combine images from several sources and give each image a different effect. Each image within the total design can have transparent parts, can be scaled, rotated and ordered in front / back of other images.

Effects that can be assigned to each image can be a simple rainbow effect, a stereogram effect, true color effect, flip flop effect, DOE's, relief effects and many more.

The designer software also allows the user to add some build in effects for which no source image is required, such as Fresnel lenses, backgrounds, etc.

■ User Algorithms

The PicoHLD software supports user libraries. These libraries can be written in C# or VB.net. With these user libraries the user can create his own algorithm to calculate the laser intensity at each grid point. This allows the user to generate their own proprietary unique effect.



Extreme bright images



White relief effect

Supported formats

Standard file formats

8 and 16 bit grayscale bitmaps and TIFF files, color bitmaps
CDR files and text files

Parameterization

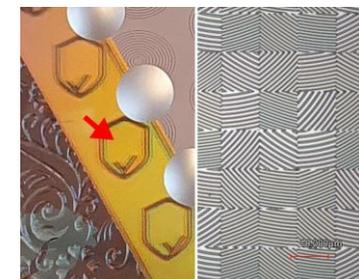
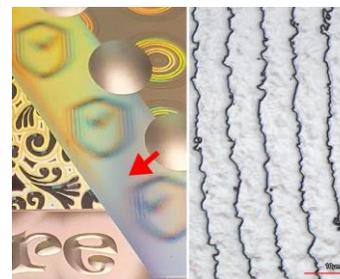
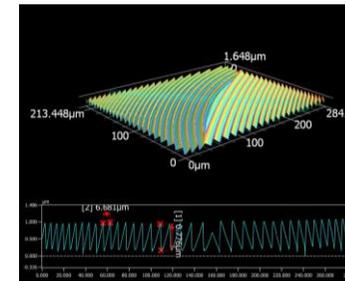
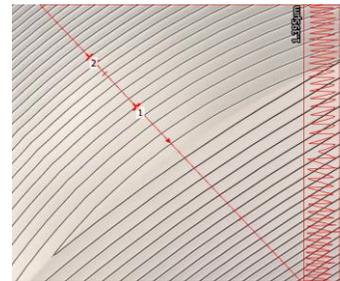
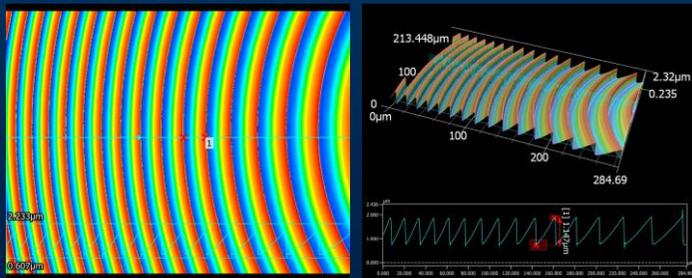
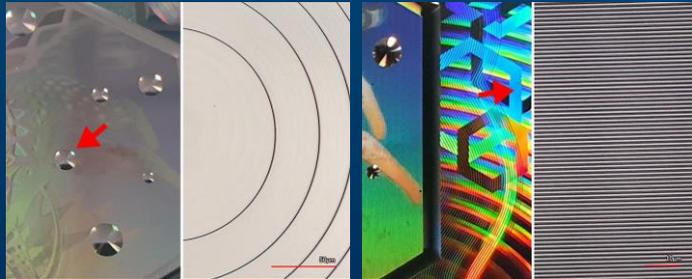
Basic shapes can be configured without source files
such as fresnel lenses, micro lenses, micro text etc..

Effect samples

■ Numerous high quality effects to distinguish and secure your product

User-friendly creation of designs with effects like rainbow, hidden images, DOE's, microtext, stereograms, platinum look and many more:

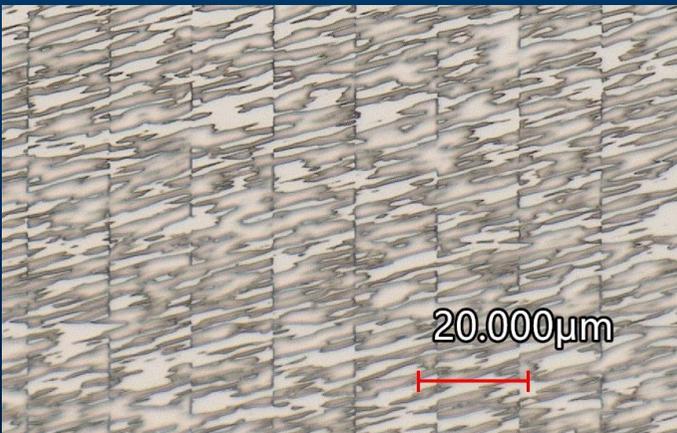
- White background effect, uniform white diffuser
- Directional white effect
- Multi level Diffractive Optical Elements (DOE), Letter Lens effect
- Fresnel Lens & (broken white) Fresnel relief effect
- Uniform gratings
- True color 3D effect
- Diffraction grid
- Curved gratings



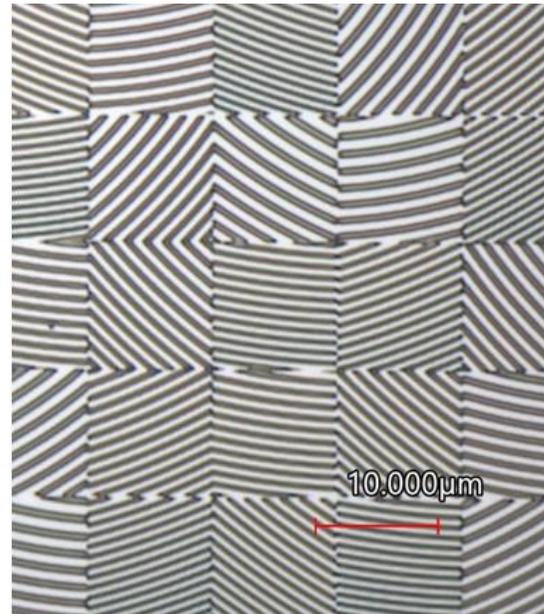
Sample of structure types



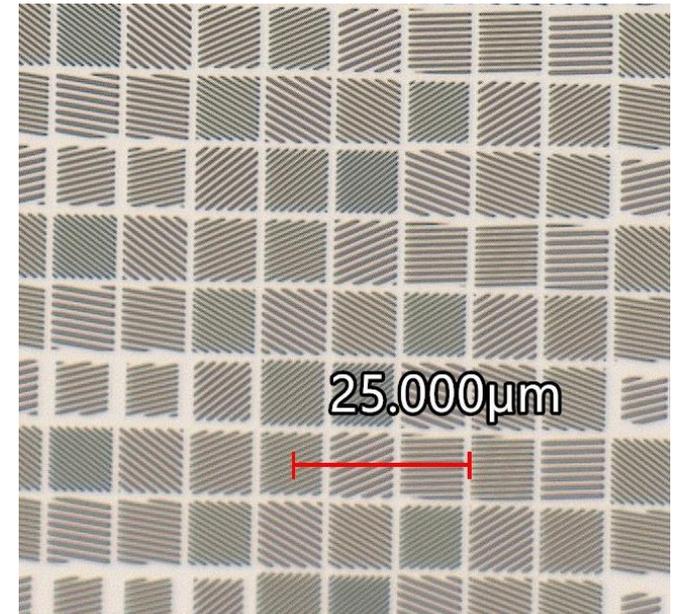
Blazed gratings with random noise



Single direction white based on random



Curved gratings



Classic dot matrix style pixels with intensity control



Large areas of single frequency gratings

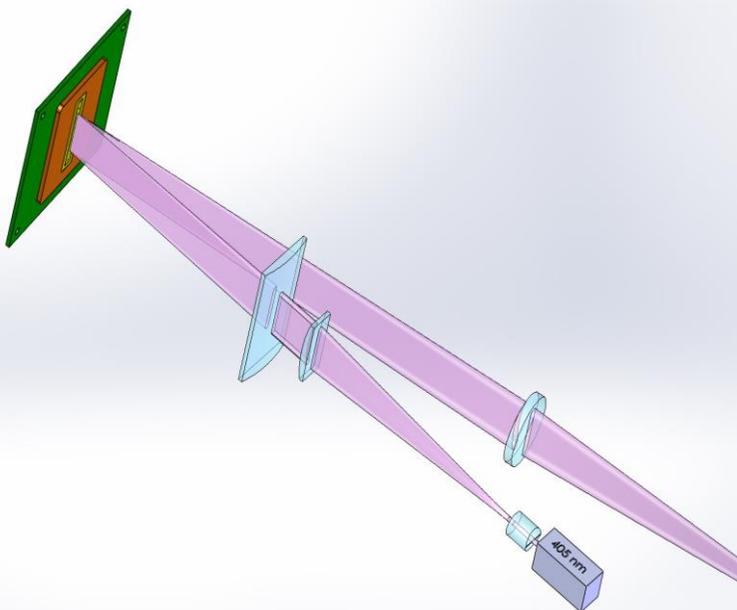
Optics

■ **Compact optical module for excellent stability & revolutionary short machine downtime**

The full optical path is contained in an exchangeable module (optical module). By keeping the optical path as short as possible, the pointing stability is greatly increased compared to traditional optical setups. The optical module contains a high power long lifetime 405 nm GaN laser diode and beam shaping optics for the best possible exposure.

Features:

- The integrated 650 nm red laser controlled autofocus system automatically corrects for height variations.
- Automatic Dose control.
- Closed loop water cooling to ensure maximum intensity stability.



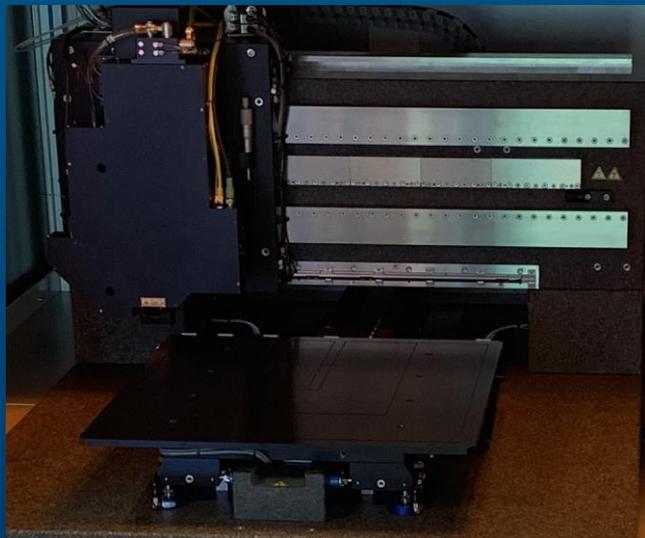
Unique
 Multibeam technology
 enabling to write in
 parallel

Optical properties	
Laser source	300mW, 405 nm, GaN laser diode
Lifetime	>10.000 hours
Min optical resolution	0.5 μm FWHM
NA	0.5
Grayscale control	256 levels
Autofocus	800 Hz bandwidth, 650 nm red laser controlled +/- 0.15 mm height variation with auto height tracking. Fast voice coil actuator for accurate real-time Z correction.
Focus offset	Adjustable by software control.

Mechanics

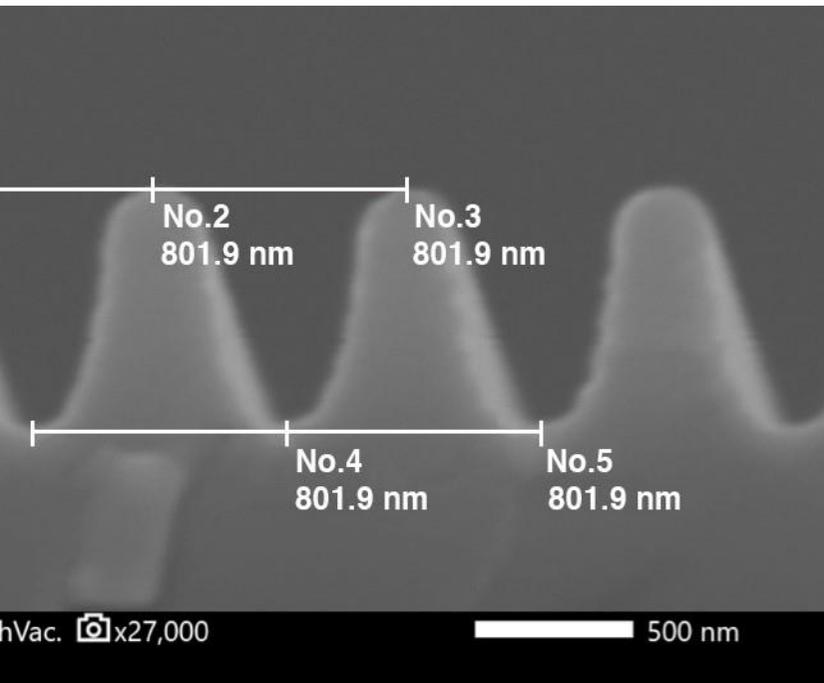
The PicoMaster^{XF} 500-H is equipped with high precision axes for X and Y motion. Both the scan axis (Y) and step axis (X) incorporate high precision air bearings which are driven by linear motors with nanometer resolution encoders. This system allows for extreme low mechanical errors and fast scan movements. The optional motorized controlled Z-axis has a 14 mm stroke to support various substrate thicknesses which are clamped down by using a vacuum chuck.

The fully enclosed frame has an integrated Filter Fan Unit to ensure proper environmental conditions within the PicoMaster^{XF} 500-H.



Benefit
Maintenance free axes

Mechanical properties	
Stroke Scan and Step	Max. 600 mm
Repeatability	< 20 nm RMS
Resolution	2 nm
Scan speed	Max 50 mm/s
Substrate thickness	0 - 14 mm manual adjustment. Optional: a motorized Z-axis can be installed.
Substrate thickness variation	Max +/- 0.15 mm
Substrate size	Min. 125 x 125 mm, max. 550 x 550 mm
Exposable area	Max. 525 x 525 mm



Performance

Performance specifications

CD¹	Min. 500 nm
Lines per mm	>1000
Data rate	6Gb/sec

¹Critical Dimension of the PicoMaster^{XF} depends on process parameters, such as resist types and layer thickness.

Writing mode	Resolution (μm)	mm ² /min
High resolution	0.5	150

Benefit

*PicoMaster^{XF} 500-H:
a stand alone system
that allow for quick
and easy installation*

Additional options

■ Air-conditioning unit

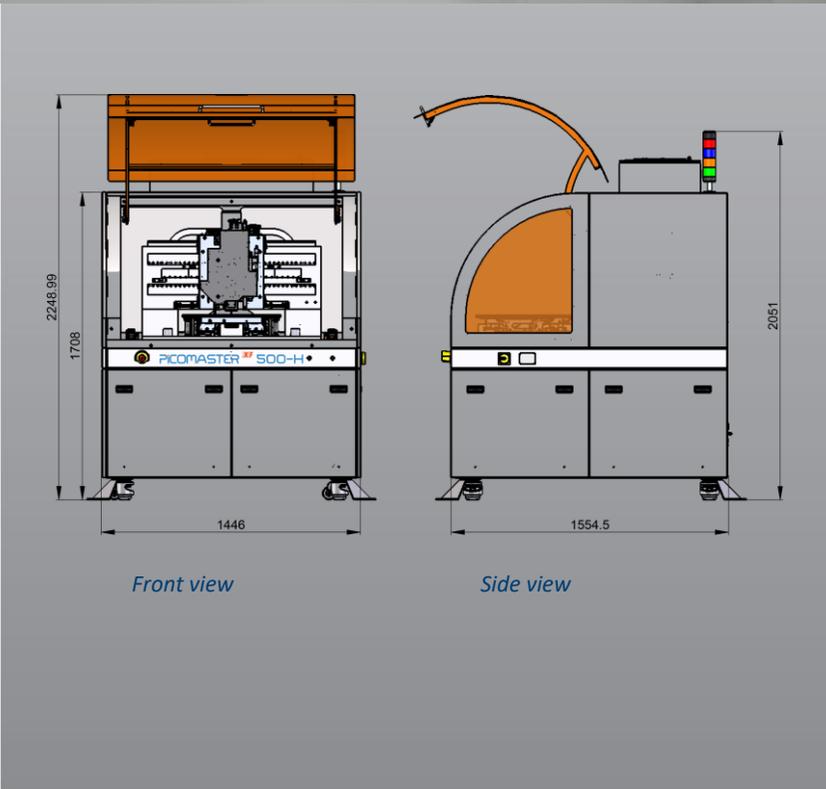
For best results the temperature inside the PicoMaster^{XF} 500-H should be maintained at constant environmental conditions with a temperature range of +/- 0.5 °C and a humidity range of 45 - 70%. It is recommended to use a dedicated air conditioning unit to supply conditioned air to the PicoMaster^{XF} 500-H.

■ Motorized Z stage

Some applications require thick substrates. The motorized Z stage will allow the system to detect the surface of a wafer fully automatically. Operator interference for height adjustment based on the used substrate is not required.

Mechanical properties motorized Z stage

Stroke	Max. 14 mm
Resolution	1 μm
Substrate thickness	0 - 14 mm



Installation requirements

Dimensions ¹	
W x D x H	1500 x 1600 x 2250 mm
Additional server rack	600 x 900 x 730 mm
Weight	2000 kg
Electrical connection	230V AC, max. 1.5 kW
Compressed air	5 - 7 Bar, Air quality according ISO8573-1:2010 class 3 or better.
Ethernet	For server connections and remote access.
Conditioned air piping²	Ø 150 mm in and out
Recommended environment	Clean room ISO class 5 or better.
	Room Temperature 21 °C +/- 1 °C
	Room Humidity 45 - 70% RH

¹ Specifications may change without notification.

² It is recommended to use an air conditioner with recirculation option to maintain optimal process conditions within the PicoMaster^{XF}. An air conditioner can be supplied as option.

About 4PICO Litho

4PICO Litho is specialized in lithography equipment since 2004. The PicoMaster^{XF} systems are a derivative of 4PICO's CD/DVD mastering system and built on 15 years of experience. The efficient multidisciplinary team of 4PICO Litho is based in Braintree Region and has access to high tech suppliers. All developments are done in-house.

Innovation

*Braintree Region:
A perfect ecosystem
for innovation*



Ultramodern
4PICO Litho's
demo samples are
state-of-the-art

Service and dealer information

■ Samples

Seeing is believing... 4PICO Litho's demo samples are state-of-the-art. Send in your requirements for a sample. At all times at least 1 demo system is operational. 4PICO Litho has in-house metrology tools such as 3D Microscope, AFM and SEM for analyzing the samples.

■ Service

Local service engineers, remote support and minimum maintenance will guarantee a smooth and worry-free operation.

■ Dealer

Questions regarding the PicoMaster ^{XF} 500-H and your application: please contact your local contact.

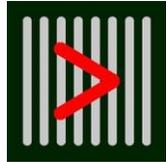
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