Pico Master SERIES

Picosecond Laser Micromachining Workstation

Featuring short picosecond pulses, *PicoMaster* is a perfect and cost effective choice for almost any process development experiment. Experiments using *PicoMaster* are fast and close enough to industry requirements, due to its capability to machine directly a wide range of micron scale features in almost all material at relatively high speed.

The heart of the system is high repetition rate diode pumped laser, providing up to 100 kHz repetition rate. Advanced optical set-up ensures small, down to 5 µm laser beam spot size. Full automatic control provides for ease of use, and the functionality is enhanced through open for customization software: the system can be made either flexibly adaptive or process specific. A Class 1 laser-safe and cleanroom compatible enclosure houses a rigid vibration-isolated granite platform ensuring robustness and reliability.

Researchers, wishing to save their time and costs and requiring combination of optimal pulse duration laser with accurate, fast and high volume positioning together with masterly designed beam delivery and focusing optics should seriously consider *PicoMaster*.

CUSTOMIZATION OPTIONS

- Vision system for process control
- Dual axis galvo-scanner for complex high speed beam scanning, trepanning and scribing
- Optical setup for helical drilling and polarization control
- Customizable software
- 1064 nm, 532 nm, 355 nm and 266 nm wavelengths
- Other lasers are available

FEATURES

- Down to **5 µm** spot size
- High **Resolution** XYZ positioning
- High **Accuracy** and **Repeatability**
- Pulse sinchronized output based laser with **Motion Synchronization**
- Computer control using **Fast** FireWire (IEEE-1394)
- High **Speed** (up to 100 kHz repetition rate)
- **Remote** control for help and support
- Short pulse duration of 10 ps
- **Low** maintenance costs

APPLICATIONS

- Drilling:
  - Circular holes in thin foil from several µm to a few hundred µm
  - Shaped holes up to mm dimensions
  - Aerosol and injector nozzle drilling
- Ablation
- Marking
- Cutting
- Surface structuring

EKSPLA
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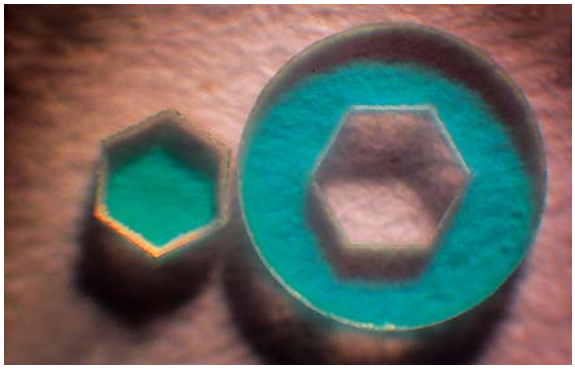
Advantages of picosecond lasers

New challenges in real-world applications of the laser micro-fabrication induce the picosecond lasers The pulse duration of the lasers is comparable to the time of electron-phonon relaxation and is short enough for “cold” ablation. Easy and effective conversion to UV radiation offers a cost effective source for micromachining. As well as shorter pulse duration results in lower ablation threshold what allows to use lower pulse energy and so less mechanical stress to sample is applied. As the same time picosecond lasers have a number of advantages of even shorter pulse femtosecond ones. Picosecond lasers are less complicated in their design as there is no need for pulse stretching and compressing for amplification what makes them more cost effective and more reliable at the same time pulse duration is short enough for most of processes.

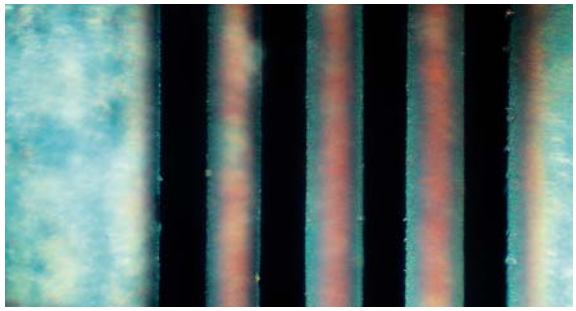
Picosecond laser micromachining workstation is capable of directly machining a wide range of micron scale features in almost all material, including:

- Metals
- Semiconductors
- Diamond
- Sapphire
- Ceramics
- Polymers
- Composites and resins
- Photoresists
- Thin films
- ITO films
- Glass
- Others

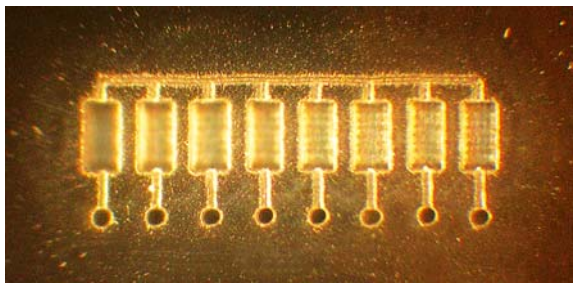
Micromachining samples



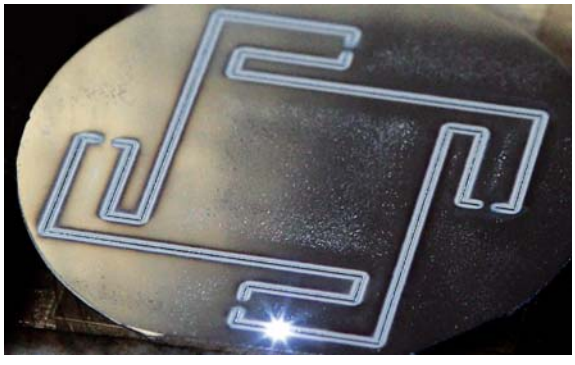
The round and hexagonal parts cut out from the LCD filter glass with thickness of 0.3 mm using the PL10100 laser radiation at 266 nm



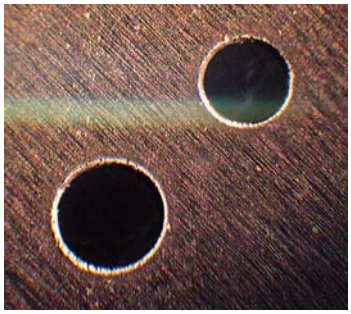
Slots cut in the Invar mask for OLED & LCD with the PL10100 laser: 266 nm, 100 kHz, 0.35 W; thickness 34 μm; cutting speed 5 mm/s



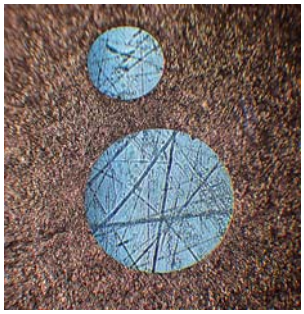
Polymer ablation



Silicon cutting

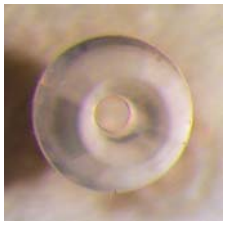


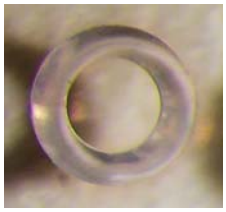
Holes cut by laser in tantalum (0.4 and 0.3 mm diameters)



Holes cut by laser in tungsten (0.5 and 0.3 mm diameters)

PMMA structuring



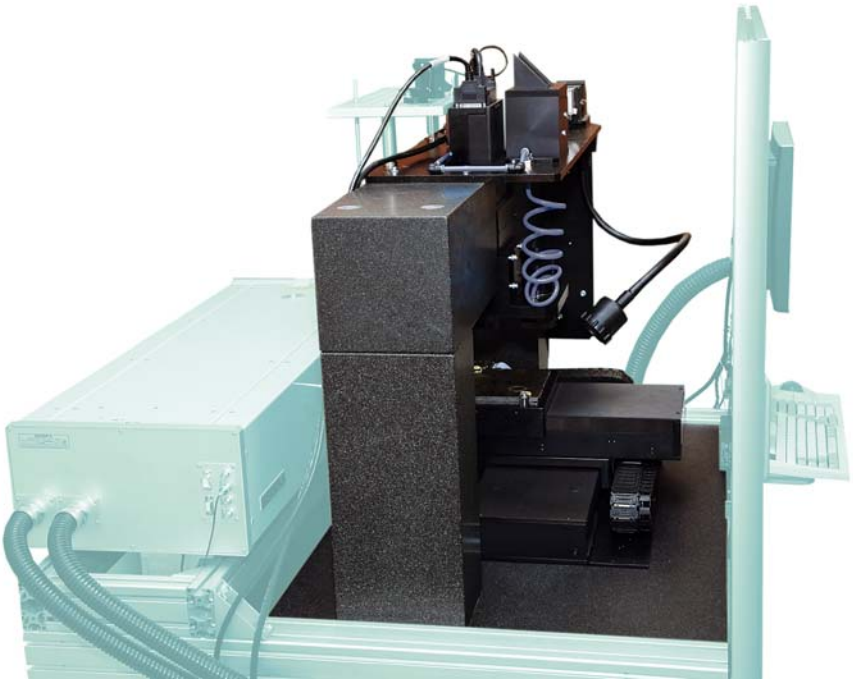


Glass structuring

Design of the micromachining workstation

Positioning system

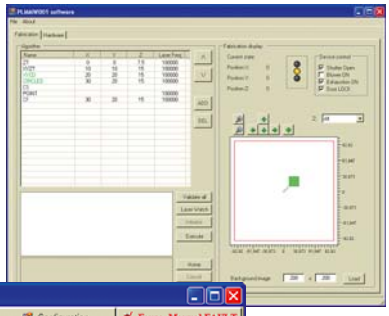
A Class 1 laser-safe and cleanroom compatible enclosure houses a rigid vibration-isolated granite platform holding positioning axes and ensuring robustness and reliability at the same time allowing extremely high accuracy positioning at high speed over a large volume. This makes a perfect combination of fast short pulse laser and fast high accuracy and large volume positioning synchronized with each other using pulse synchronized output technique.
Advanced optical set-up ensures small, 5 µm spot size in combination with relatively long working distance.



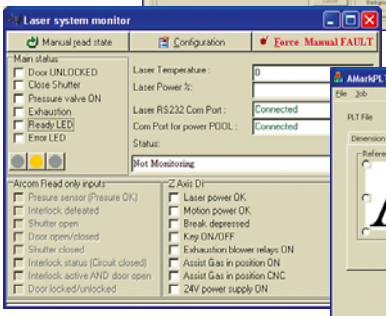
Software

- MS Windows environment
- control of positioning and laser operation
- Integration possibilities of additional proces specific devices
- .plt and .bmp file import (possibility to import more various formats upon request).

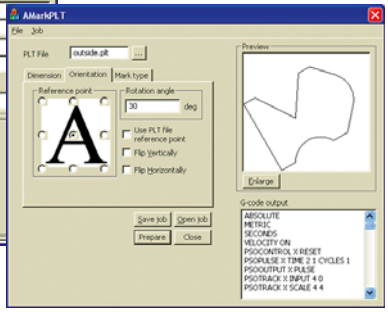
Advanced software is used for full automatic control of all system units. Software features intuitive management and is open for customization: the system can be made either flexibly adaptive or process specific. To speed up material research, software enables user to save all sample related material processing „geometry“ (size, depth, arrangement and other measurements of engraving/drilling/cutting) into one file and processing system parameters (speed of positioning stages, laser repetition rate and etc.) into another.
With supplied Internet conection, posibility to remotely control the system or give fast support.



Main system control window



Laser parameters setting and monitoring window



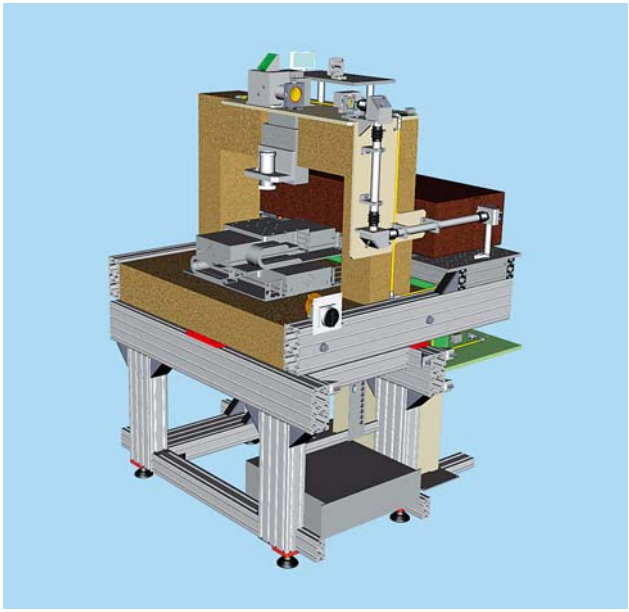
.plt file import positioning window

SPECIFICATIONS

XY AXIS	
Travel X,Y	200 mm
Maximum travel speed *	2000 mm/s
Maximum linear acceleration *	30 m/s^2 (no load)
Accuracy *	± 1 µm
Repeatability *	± 0.5 µm
Resolution *	± 0.1 µm
Straightness/flatness *	± 1 µm / 25 mm, ± 1.5 µm max deviation
Pitch and yaw *	8 arc sec
Orthogonality	10 arc sec
Z AXIS	
Travel Z	100 mm
Maximum travel speed	400 mm/s
Maximum linear acceleration	30 m/s^2 (no load)
Accuracy	± 1 µm
Repeatability	± 1 µm
Straightness/flatness	± 2.4 µm
Resolution	± 1.0 µm
LASER **	
Average output power	10 W @ 1064 nm
Pulse duration	10 ps
Repetition rate	50 – 100 kHz
Beam quality	M^2< 1.5
Max. pulse energy	200 µJ @ 1064 nm & 50 kHz
Pulse-to-pulse stability	1.5% @ 1064 nm
FOCUSING OPTICS	
Spot size	down to 5 µm

* *For X and Y stages separately.*
** *Other wavelengths or laser parameters are available.*

Specifications are subject to changes without advance notice.



Cost effective Class 4 solution without safety covers and electronics is available in cases when it is not necessary e.g. operation by qualified experts in application laboratories.

Control

- Built in PC based control
- Pulse sinchronized output based laser and motion sinchronization.

Requests for custom made products are welcome !

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