

Femtosecond laser based Micromachining system

Femtosecond laser

One Box Compact Industrial femtosec laser and control electronics suitable for easy integration into our laser-based production tools.

The minimum specifications required for the one box laser must be:

Wavelength	1035nm +/- 10nm
Output Power	40W (at 1MHz)
Rep. Rate variable	Single shot to 1MHz
Pulsewidth variable	<350fs to >10ps
Beam quality	TEM ₀₀ , : $M^2 < 1.2$ to 1.3
Beam divergence	< 1mrad
Beam diameter	2-3mm
Polarization	Vertical
Beam pointing stability	<25urad
Pulse Energy stability (% RMS)	<1.5
Long term Pointing stability	+/- 25 over 8 hrs
Laser medium	Only solid-state fiber lasers
Pulse generation	Modelocked lasers (not Q-switched)
Pulse amplification	MOPA (Master-oscillator Power-amplifier)

This pulsed laser system should have the following features:

- Beam should be accessible for use with existing motorized XYZ-stack of stages in our lab using additional optics and hardware.
- Variable pulse width from < 350fs to >10ps. Scan time is <2 seconds.
- System should be all fiber single pass MOPA design from seed laser to main amplifier.
- Should have on-board pulse-width monitor and energy monitor.
- To facilitate easy integration and quick operation it should be a single-box design with no distributed seed laser or pump diodes in a separate boxes or enclosures.
- On board AOM for single shot to full laser rep rate pulse selection.
- For long-life operation, seeder must include mode locking SESAM shifter.
- Three-point kinematic mount on laser head for superior long term stable operation in diverse ambient temperatures.

- Onboard active cleaning engine (e.g. PureFemto) to maintain cleanliness of laser housing in harsh environments throughout the life of the laser.

Other Essential requirements:

- System shall be fully computer controlled and connected to external computer via USB RS 232 and Labview drivers
- System should work with std 220VAC, 50Hz (Indian condition)

Micromachining work station :

Compact, Rugged , fully integrated Workstation capable of high resolution feature size in Two Photon Polymerization and Surface micro- and nano-structuring (Nano-Processing) applications with essential requirements as follows:

- Should be compatible to work with above mentioned femtosec laser
- Should have High accuracy sample positioning (preferably Aerotech stages) and with Granite base structure
- Should have very good Machine vision for Live Preview during Microfab process
- Should have Control of entire system through single-window GUI software
- System should be Laboratory design - easily extendable system for future upgrade or custom optimization.
- Should have safety enclosures

The following minimum specifications are required in the system:

3 axis XYZ preferably AEROTECH positioning system:

- Total travel XYZ : 60 x 60 x 5 mm
- Accuracy XYZ : ± 250 nm
- Resolution XY : 1 nm
- Max speed XY (No Load) : 350 mm/s
- Max Acceleration (No Load): 1 G
- Load Capacity XY (Horizontal): 10 kg
- Resolution Z : 2 nm
- Repeatability XYZ (Bidirectional) : ± 100 nm
- XYZ orthogonality : 10 arc sec
- Mounted on granite base
- Position synchronized output (PSO)

Power control

- Motorized control
- Power control 0 – 100 %
- Auto calibration

Focussing Optics/ Objective

- Magnification : 40X or higher
- Numerical aperture : 0.9
- Working distance : 0.41mm

Machine vision microscope camera

- Operating wavelength should be of any visible wavelength
- On-axis vision
- Coaxial and back lighting
- CMOS matrix size of 1280 x 1024
- Pixel size ~1 μm
- Should have on-axis camera for live preview and recording
- With advanced find focus algorithms and superposition preview

Sample Holder

- Should handle Sample size : Up to 50 mm x 50 mm
- Should have Integrated backlighting
- Should have fine XY controls to move the sample

Safety Enclosure

- Should have safety enclosures and interlock switches
- Should have Preview window to view the system while in operation

Control software with Computer/Laptop.

Should have full control features as below:

- Controls all system devices
- Laser firing
- Laser power
- Pulse repetition rate
- Power attenuation with motorized attenuator
- Automatic and manual positioning stage control
- Beam power real-time read out by software
- DXF, STL, TXT file import
- Multiple user level access protected by password
- Extra soft licenses included

General Terms & conditions

- Service Personnel to provide efficient local service support with at least 2 Service engineers. The training certificate from the manufacturer should be provided to prove the capability of the service engineer
- System must have installation and on-site training included.

- Compliance statement should be enclosed with the quotation.
- The details of the quoted system should be available in the manufacturer's web site
- The manufacturer should have ISO9001 or similar certifications.
- Authorization letter should be furnished along with the quotation.
- Vendor should have supplied at least 3 scientific / industrial pulsed laser systems of the similar class defined by key specifications such as pulse-duration range (fs-ps), consisting of amplifier and average power in Indian institutes like IIT's, IISER's etc in the last 5 years. Vendor should provide proof of installation and maintenance of such systems. Proof can be provided as reference letters from the users of the systems.

Other terms

- 1 year comprehensive warranty with service and spare parts must be provided
- Installation and training must be done on site
- Technical support should be available preferably through Indian counterparts
- AMC prices if any should be quoted herein.
- Training on this system should be provided free or any additional cost