

Modular Microdrilling End-station with integrated 2D fast-optical scanning and Pulsed-laser

Tender is invited for the procurement of Micro-drilling end-station consisting of integrated 2D optical scanning head with an industrial pulsed laser system inclusive of software for various microstructuring applications according to the specifications below.

Requirements

The Microdrilling end-station system should incorporate and integrate the scanning head (Part A) for guided motion and pulsed laser beam (Part B) for non-contact drilling along with all required software for control.

Part A

Optical micro-drilling head - 2D scanning system with galvanometric mirrors

Galvanometric 2-axis scanning Industrial grade scanning system dust-proof, low-drift, compact design with a minimum aperture of 10 mm

Specification	Value
Number of axis	2 (Min.)
Scan type	Galvanometric
Input beam diameter	10 mm or greater
Beam deflection	12 mm or greater
Acceleration time	1 ms or less
Writing speed (cps)	at least 300
Processing speed (m/s)	5 or greater
Positioning speed (m/s)	5 or greater
Angular Resolution	15 micro-radians or better (smaller)
Repeatability	Better than 3 microradians
Max. gain drift	50ppm/K (Max.)
Max. offset drift	20 micro-radians/K (Max.)
Long-term drift	
Mirror coating	Should be suitable for the wavelength of the accompanying pulsed laser (in Part B)
Mirror surface coating finish	$\lambda / 4$ or better
Scratch and Dig	60-40
Linearity	99% or better
Threadings	Metric (preferably)
Scan-head Compactness	175 mm (max.), any dimension
Operating temperature	15 - 35 C or wider range
Software for operating scanning-head	Should be included in this package
Housing	Should have adequate dust-proofing
Mounting	Should be mountable on standard optical breadboards (preferably metric)
Controller	Should be included, should be plug-and-play
Compatibility with focusing element	Integration with f-theta lenses should be possible
Alignment and calibration	Should be pre-aligned and calibrated

Mandatory conditions

- Electronic controller for control and operation of scanner should be included
- Should be integrable into existing micromachining system (Specs will be provided upon request)
- Should be possible to integrate this scan-head with a suitable f-theta lens to have a range of at least 100 mm by 100 mm.
- Should be built and studied at the factory and tested prior to shipping. Manufacturer should share the test results with the shipment;
- Optics of the scanner should be upgradable to second- and third-harmonics of the accompanying primary pulsed laser described in part B.
- It is mandatory to quote for all optional items as well.

Optional A1: f-theta lens

f-theta lens should be suitable for integration with the scanning head the main item in Part A to with:

- i) min. range: 100mm x 100mm.
- ii) wavelength range: compatible with scanner

Optional A2: optical vibration isolation platform (6ft x 4ft)

The vendor may only specify anti-vibration platforms from product lines which have proven capability.

- A. Tabletop of Dimension: 6ft (1800 mm) x 4 ft (1200 mm) x 2 ft 600 mm (L x B x H) or nearest – **1 nos**
 - Thickness of Table top required: 600mm or nearest – 1 set
 - Dynamic Deflection coefficient: 1.10×10^{-3}
 - Compliance: 37nm/N
 - Natural frequency: 110Hz
 - Table-top skin: include non-magnetic option in the quotation
- B. Suitable Air compressor(s) should be quoted along with the system
- C. Provision for joiner with similar table should be specified optionally

Optional A3:

Advanced software which enhances control, implementation of designs and related tasks.

Optional A4:

Appropriate computer PC tower or laptop for control and operation of scanning unit.

Part B

Pulsed fiber based modelocked MOPA laser – industrial grade one-box pulsed laser with variable temporal duration integrated with all optical elements and control electronic suitable for easy integration into this microdrilling work-station 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 Enetery 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.
- Microburst mode with burst leveling. Bursts of up to 5 mode locked pulses leveled to yield up to 200uJ/burst.
- Variable pulsewidth 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 modelocking 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)

General Terms & conditions

- 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.
- 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 manufacturer should have ISO9001or similar certifications.
- Authorization letter should be furnished along with the quotation.

Warranty

- Min warranty period: 1 years.
- Should also quote for extended warranty year-wise for up to 3 years.

Support and Service

- Technical support should be available preferably through Indian counterparts
- AMC prices if any should be quoted herein.

Sample

- Specimen samples including glass (fused silica, BK7 etc), metal and polymer need to be supplied at the vendor's cost on request.
- Alternative to the above, the vendor may list research articles for each material where the quoted product line was used to do micromachining, in which case a letter or communication from one of the authors of the paper confirm this should be included.

Training

- Training on this system should be provided free of any additional cost

Shipping and Handling

- FOB prices should be quoted with
- Insurance
- Delivery time.