



**INDIAN INSTITUTE OF TECHNOLOGY BOMBAY
MATERIALS MANAGEMENT DIVISION
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(PR No. 1000037270)

(RfxNo.6100001650)

Technical Specifications for High Load Nanoindenter (Add-on components for TI Premier Low Load Indentation Module) (Qty: 1 Nos.)

Sr.No	Specification	Compliance (Yes/No)
1	<p>Instrumented, depth sensing indenter equipped with electromagnetic force actuation and capacitive displacement sensing, with optical imaging needed. It should allow depth sensing indentation from nano to meso scale load up to 10N or higher, with a spatial accuracy of placing the indents up to 1 micron in a site specific manner. The optical zoom should be at least 10X, with a digital zoom of at least 100X. The load frame stiffness should be greater than or equal to 1×10^6 N/m. Compliance should be linear across the entire load range. It should have suitable environment isolation to minimize external disturbances like thermal gradient and acoustic noise. The system should come with a dedicated controller and PC with the latest configuration and licensed software. It should be capable of measuring hardness, modulus, toughness, adhesion and many other properties of coatings, thin films, bulk materials and other surfaces. Instrument should adhere to ISO14577 parts 1-3 methodology for micro and nano indentation.</p> <p>Vague terms/specifications will not be acceptable. The specifications should be proved on a sample sent by the customer.</p> <p>I. Normal Loading</p> <ul style="list-style-type: none"> a. Transducer Technology: Electromagnetic Force Actuation and Capacitive Displacement Sensing b. Usable load range: <200 mN to 10N c. Force: Both Tensile and Compression (full range) d. Normal Load Noise Floor: <100µN or better <p>II. Displacement.</p> <ul style="list-style-type: none"> a. Maximum Displacement for Hard Materials: At least 50µm with < 1nm resolution. b. Maximum Displacement for Soft Materials: at least 6 mm with 1 nm resolution 	

- c. Displacement Rate 100mm/sec
- d. Displacement Noise Floor: <1nm or better
- e. Thermal drift: 0.05 nm/s or better (demonstration to be provided)

III. Scratch Loading

- a. Maximum Lateral Force: 5 N
- b. Maximum Scratch Length: 150 mm
- c. Maximum Normal Force: Selectable, 1 N to 10 N
- d. Maximum Normal Displ. At least 50 μm

IV. High temperature shield

- a. Enviro Shield – High Load Transducer Shield upto 600°C under heating conditions

V. Stage Specifications

- a. Travel: at least 100mm x 50mm in x-y
- b. Step Resolution: 10nm or better
- c. Maximum Translation Speed: 3 mm/s
- d. Movement accuracy 0.2 μm or better
- e. Large samples can be accommodated and testable sample area at least 100 mm x 50 mm
- f. “Point and click” experiment site selection and sample movement unit should be possible
- g. Travel in z direction: 50mm
- h. Step Resolution in z direction: 10nm

VI. Dedicated Workstation and Software

- a. Intel Core i5 Processor
- b. 4GB RAM
- c. 500GB SSD
- d. Windows 11
- e. Complete software package for instrument control and data analysis: should include scheduling system for unattended operation; All data saved in raw form for post experiment analysis; Instrument frame compliance, thermal drift corrections and tip calibrations should be possible within the control software supplied
- f. Software updates free of charge for at least three years.
- g. Additional copies of the software should be available free of charge for off-line data analysis on other computers.

VII. Optics

- a. Optical Objective 10X
- b. Optical Resolution at least 1 μm

VIII. Environmental Isolation

- a. Passive Vibration Isolation:
- b. Environmental enclosure: Isolation from acoustic, thermal, and air current disturbances

	<p>IX. Miscellaneous</p> <ul style="list-style-type: none"> a. Fused silica and Aluminum reference samples used for instrument performance monitoring should be provided. One Berkovich tip for high load, and One 3-sided pyramidal diamond probe for heating should be included b. System software should provide for: <ul style="list-style-type: none"> 1. Automatic hardness and elastic modulus calculation. 2. Hardness/elastic modulus vs depth measurements 3. Stiffness measurement 4. Rapid depth profiling possibilities mode using Oliver & Pharr analysis. 5. Scratch and friction coefficient measurement 6. Creep and stress relaxation mode allowing long duration (> 2 hours) creep experiments. 7. Elastic and plastic work measurement. 8. Displacement rate controlled experiments. 9. User defined loading profiles. 	
2.	<p>I. Installation and Training</p> <ul style="list-style-type: none"> a. The system must include on-site training for IIT-B students and staff including an initial installation and training week, and then a further week to allow for the highest level of training. Warranty period covering on-site maintenance and trouble-shooting for 48 months. References should be supplied from at least 2 current users of these systems AND a demonstration measurement should be carried out and raw data shared with the customer on a sample of customer's choice. 	