



**INDIAN INSTITUTE OF TECHNOLOGY MADRAS**  
**DEPARTMENT OF METALLURGICAL AND MATERIALS ENGINEERING**  
**CHENNAI 600036**

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**Dr. Murugaiyan Amirthalingam**  
*Head - Physical Metallurgy Laboratory*

Limited Tender No: **MME / PML / 002 / 2019**

Date: **20.12.2019**

Due Date: **03.01.2020** Time: **4.00 p.m.**

Technical Bid opening meeting Date: **06.01.2020** Time: **4.00pm**

**PHYSICAL METALLURGY LABORATORY**

**Technical Specification –Micro/Macro Vickers Hardness Testing Equipment**

**Subject**–It is proposed to procure a new micro/macro Vickers/ Knoop hardness tester for the Physical Metallurgy Lab, Department of Metallurgical and Materials Engineering, IIT Madras. Following are the technical specification and guidelines to be followed:

**Standard equipment and Standard accessories–**

1. Equipment should be capable of testing any metals and their alloys, polymers and ceramics.
2. Primarily the applied force should be based on the approach of a multi load cell, closed loop force application system.
3. The hardness equipment should be capable of a range of test loads to enable performing the micro-Vickers hardness as well as macro-Vickers hardness, in the range of 10 gf to 10 kgf.
4. Force application should be regulated electronically using a suitable PID or equivalent control mechanisms.
5. Standard deviation between the programmed load to applied load should be less than 0.25 % for the test loads above 100 gf and should be less than 0.5% for the test loads below 100 gf. The supporting proof of quality reports / certificates in this regard should be presented with the offer.



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6. The micro-Vickers indenter (standard accessory) of suitable diameter for the turret, should be certified as per relevant ASTM / ISO standards. The equipment calibration should be certified for direct and indirect verification methods as per ASTM E 92 or equivalent ISO or JIS standards.
7. A motorized turret is required which can have minimum four and up to six centering positions, of which there should be at least two positions for fixing different indenters and the remaining positions for objective lens.
8. There must be collision detection system to avoid accidental damage of the indenter and the samples during the motorized turret movement.
9. To view the smaller indentations as well as bigger indentations, two separate objective lenses suitably of long working distance is required with a magnification of 10X and 50X.
10. For testing the samples at small incremental distances, a manual XY stage with analogue metric micrometers and essential connector plates is required (as standard accessories). The XY stage should be of size 100 x 100 mm and the displacement should be of 25 x 25 mm. The analog micron meter should have a least count scale of 0.01mm.
11. Stage illumination should be by TTL powered LED with colour filters and adequate luminescence.
12. Integrated system and camera are mandatory with capability for automatic focus, snapshot function, automatic measurement of indentation along with user level management and features for generating reports.
13. System should have an 18 mega pixel camera with 4K, full color integrated system controller with intel (or equivalent) i7 processor with a storage of either 1 Tb mechanical hard drive or 512 Gb solid state drive (with suitable RAID configuration) is required.
14. An industrial touch screen (at least 15'' size) display with provision for connecting



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external monitors or projector should be available. This touch should have full operator interface and all machine control and process workflow can easily be operated from the touch screen. Screen should be fully integrated with the control system and equipment such a way that indentation positions on the sample can be selected by simple touch.

15. Stage view camera should be capable of performing autofocus, optical and digital zooms using the touch screen.
16. Software of the system should be capable of generating simple hardness graphs, 2D hardness charts and automatic hardness test report generation.
17. It is necessary to provide a certified test blocks (standard accessory) as per relevant ASTM / ISO standards.
18. Electrical connections should be compatible with a power supply of 230V AC / 50Hz (Single Phase + Neutral + Earth). The weight of the standard equipment shall not exceed 100 kg and should be appropriately packed to avoid any damages during dispatch.
19. A minimum of two years warranty is mandatory with an option of extending warranty to another three years.
20. Details of installed equipment in India and their running status should be provided.
21. A detailed compliance statement against the above technical specifications should be provided.

**Optional Accessories –**

1. High speed CNC motorized stage with essential connector plate for fixing to the equipment base. The size of the stage can be of 100 x 100 mm or lesser with digital micron meter and with a displacement of 25 x 25 mm or lesser. The digital micron meter shall have a LC scale of 0.001 mm. Connector plate should easily be removable to enable interchanging of manual and motorized stage.



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2. Micro-Knoop indenter of suitable diameter, should be certified as per relevant ASTM / ISO standards.
3. Recommended vice for holding samples of irregular bottom with one side polished surface.
4. V-block with bracket preferably of size 40 x 40 x 50 mm.
5. Annual maintenance contract upon completion of warranty period.
6. Bidder should have a service centre and permanent service engineers placed in South India. A guaranty statement should be given stating that any equipment malfunctions should be addressed within three days. Details of the service centre and service engineers in South India should be provided.

**Note -**

- i) In addition to the above specifications, in case of clarity required, the supplier might be requested for demonstrated operation in their already installed equipment.
- ii) Installation, commissioning and necessary training to be provided by the supplier or their associates.
- iii) Separate sealed bids are invited through tender for i) the conformation of the technical specification and ii) the competitive commercial bid quoting the standard equipment/accessories and optional accessories separately.
- iv) Suppliers should send the separately sealed technical and commercial bids along with the relevant brochures within one sealed envelope package with the title "Vickers hardness equipment - Tender No: MME / PML / 002 / 2019.
- v) The bids should reach before 4 pm on the designated date mentioned in the tender, by person or by post, addressed to:

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**IIT Madras, Chennai 600036**