

B.I.T.SINDRI
METALLURGICAL ENGINEERING DEPARTMENT
P.O. SINDRI INSTITUTE
DHANBAD-828123. (JHARKHAND)
(Tender notice for **upgradation** of Universal Testing Machine)

OPEN TENDER NOTICE NO:MET/PROJECT/BRNS/3/2017-18

(Also available on Institute Website:www.bitsindri.ac.in)

Sealed tenders are invited in duplicate from the reputed Manufacturers, Authorized dealers and Suppliers for the upgradation and installation of existing INSTRON make UTM, model-4206, in the Department of Metallurgical Engineering for project sanctioned by BRNS, BARC, DAE Govt. of India. The terms, conditions and technical specifications of upgradation of UTM will be made available from the Purchase office of the institute with the tender documents and also from the institute website.

The intending eligible tenderers may obtain the requisite tender documents on any working day from **05.12.2017 to 27.12.17** between **10 AM to 4.00 PM** against payment of non –refundable amount of **Rs.500/- (Rs. Five hundred only)** in the form of Demand Draft / Banker’s cheque in favour of the “**Director, B.I.T.Sindri payable at Sindri**” on SBI/BOI/Canara Bank, Sindri **or from the institute website** as mentioned above. The quotations will have to be submitted by the Bidders in duplicate. The last date of submission of quotation will be **30.12.2017** in office hours and tender will be opened in the **office chamber** of the undersigned on **03.01.2018 at 10:30 AM**.

Quotation must be submitted in two parts/bids separately-(i)**Technical bid and (ii) Price bid**. Price bid will be opened/valid only when the technical bid is acceptable. **Prices of accessories as mentioned in technical specification(Annexure-1) should be given/mentioned separately.**

The bid paper/quotations must be accompanied with required Earnest Money Deposit (EMD) of Rs 50,000/- (Rs Fifty Thousand only) in the form of a Demand Draft / Banker’s cheque in favour of the “**Director, B.I.T.Sindri payable at Sindri**” on SBI/BOI/Canara Bank, Sindri. The details of the EMD and other terms and conditions will be made available with the tender documents. EMD and Non-Refundable D.D (Cost of tender Documents if downloaded from www.bitsindri.ac.in) of Rs.500/- (Rs. Five Hundred only) should be submitted along with Technical bid and not Price bid. No relaxation what so ever the case will be given for tender fee and EMD.

The tenderers must enclose copy of registration certificate of G.S.T. along with respective clearance certificates .The undersigned reserves the right to accept or reject any or all the tenders in whole or part without assigning any reason whatsoever. The conditional tender will be ignored summarily. In case of any legal dispute, the jurisdiction will be under the court of **Dhanbad/Ranchi only**. The tenderer must satisfy all the criteria mentioned in the **Technical specification** for upgradation of existing UTM (Annexure-1).

Director
B.I.T., Sindri.

TECHNICAL SPECIFICATIONS FOR UPGRADATION OF 150KN (15TON) ELECTRO MECHANICAL UNIVERSAL TESTING MACHINE.

1. SCOPE OF WORK AND GENERAL REQUIREMENTS.

Upgradation of Existing Instron make electro mechanical Universal Testing Machine model 4206 capacity 150KN with following features so as to perform tensile, compression and 3-point bend tests, fracture toughness test on metallic specimens. The main components of the machine are load frame, controller cum data acquisition system, software for machine control, data acquisition and analysis, furnace and accessories. The load frame, grips, load cells, extensometers, other accessories of Instron machine will be used. The supplier should upgrade the machine with existing and other required accessories and operating/application software to perform the above tasks. The machine should have provisions for conducting tension, compression and fracture toughness tests between room temperature to 1000 °C. The upgraded machine needs to be installed and commissioned by the supplier at Metallurgical Engineering Department of B.I.T. Sindri (Dhanbad). On commissioning, the supplier should demonstrate the performance of the UTM by performing five number of tension, compression and fracture tests (both using CT and 3pt bend samples) using standard samples as per ASTM standard and train the operating personnel for one week. For proper functioning of the machine, the supplier should provide warranty of all the supplied items for one year from the date of final acceptance. Thereafter, for trouble free operation the supplier should be in the position to provide annual maintenance contract as post warranty support, in addition to supply of spare parts.

The scope of supply includes the following but the vendor may include any other item, which is essential for upgradation of the equipment:

- _ Replacement of drive by latest AC Servo motor drive.
- _ Interfacing of load cell and extensometers.
- _ Supply of 1 micron rotary encoder.
- _ Supply of controller with 32 bit processor and specs as per technical specification given below.
- _ Supply of 3 zone 3 PID split type furnace of 1000 °C.
- _ Supply of pull rods of Inconel for sample holding and extenders.
- _ Mounting arrangement of furnace.
- _Supply of 50 KN load cell with matching adaptors: Indian /Imported (optional)

Technical specifications for load frame, controller, application software, furnace, accessories and general points are given below:

2. LOAD FRAME: (Mechanical specifications as per Instron machine.)

Floor standing system for closed loop control (Mechanical, Thermal or thermal mechanical testing) static tensile, compression, flexural and fracture test on a wide varieties of different specimen and materials.

- Rigid machine frame with high stiffness providing superior axial and lateral stiffness. Maintenance free digital A/C servo motor and drive should be used for controlling the cross head speed.
- Backlash free ball screw assembly to provide high load capacity, high positional accuracy and repeatability, suitable for tension or compression direction but also through zero crossing of load and displacement. (As per original feature of Instron machine)
- Digital control for faster starts and stops, best control and highest accuracy at extremely low noise level.
- The machine should be equipped with multi position limit detectors for the best protection of operator, test sample and machine.
- Column protection over total traverse stroke.
- Load train alignment suitable for testing for metallic and ceramics.

Technical Specifications

1. Max Load capacity+/- 150kN (Tension/Compression), fatigue proof load cell
2. Force measuring accuracy from 1% to 100% capacity (accuracy class 0.03 or better).
3. Screw driven, twin-column, floor standing model.
4. High stiffness of 0.1mm/100kN or better.
5. Stroke of traverse greater than 400 mm.
6. Speed of traverse 0.05 to more than 500 mm/min (under load)
7. Cross head speed accuracy 0.2 % of command value or better.
8. Resolution of stroke encoder 1 micron or better.
9. Servo controlled digital drive system.
10. Operable on single phase 220VAC+10%, 50Hz.
11. Return speed 500mm/min
12. Speed resolution 0.01mm/min or better.
13. Vertical test space-1000mm or more and Horizontal test space-500mm or more suitable for mounting furnace for carrying out elevated temperature tests.
14. Mechanical over travel limits.

3. CONTROLLER

Digital control system for force, displacement, deformation closed loop control and data acquisition. Suitable multitasking control system with high resolution and high control and data acquisition rate with synchronization of all channels are required. The controller should be equipped with data acquisition and control card for communication of load cell, extensometer, DCPD and temperature chamber/ furnace (i.e. thermocouples of 03 zones). It should be able to carry out test under force control, cross-head displacement control and strain control, feature for generating constant true strain rate through software. On line display of test proceeding as well as digital display of various transducers.

1. Microprocessor based digital controller – 32 BIT or better.

2. High resolution LCD based touch screen with graphical user interface and Alpha Numeric display on Controller Screen for all functional parameters
3. PID loop update rate 5 kHz or better.
4. Data sampling rate 500 Hz or better.
5. Data resolution of 1/50000 or better.
6. High speed data acquisition rate up to 500 Hz. Automatic or user control.
7. Default control modes: Position Control, Load Control and Strain Control.
8. Auto identification and digital auto calibration of all sensor devices.
9. Calibration facility through software, linearization/compensation of load frame deformations.
10. Measurement accuracy of Load and Strain will be (+/-) 0.5% or better of reading values as per ASTM/ISO Standards.
11. Auto stop/auto return at the end of test.
12. Capability of printing test results directly from controller with limited test results.
13. Capability of creating test methods comprising of temperature, load or displacement ramps or their combination as part of the test cycle within the controller.
14. Capability of operating the machine in the absence of PC to conduct routine tests and obtain basic results.
15. Remote connectivity through internet for easy access of the machine for remote trouble shooting.
16. Electronic safety limits for protection of sensors like load-cell, extensometer etc.
17. Provision for Interfacing of high temperature furnaces, extensometer, LVDT, C.O.D gauge, DCPD and other accessories.
18. Facility to add any accessories in future without any modification(s).

4. A three zone split furnace for mechanical testing with following features: (one number)

1. Dimensions : 100 I.D.X 300 mm ODX450 long (approximate , supplier can suggest to suit the machine frame)
2. Elements : Kanthal A1 or suitable
3. Temperature rating : 1100°C (max.)
4. Power: approximately 3.5 KW (230 Volts, single phase)
5. End bore for load train : suitable for load train assembly
6. 200 mm of constant heating zone at the middle of the furnace
7. Mounting bracket with load frame & swivel unit to move furnace in or out of test axis
8. Suitable digital programmable controller capable of providing different temperature- time profile/zero cross over SCR with temperature indicator
9. Complete with high temperature pull rods, adaptors, connectors, cables, wiring etc.

5. ACCESSORIES

The Supplier/ Manufacturer will use the already available accessories of the existing UTM which are workable.

1. High Resolution Extensometer (s), XL Model already available with B.IT. Contact type extensometer with resolution 0.001mm (1micron) or better. Suitable for testing specimens having gauge lengths –25 mm. and 50 mm minimum travel+50% and -10%. This extensometer need to be interfaced with new controller by the supplier.
2. Grips and fixtures to be used along with the machine. Grips and fixtures are already available with the machine in B.I.T which can be used.
 - a. Wedge action grip rated for 150 kN for performing room temperatures tensile testing using 5-12 mm round specimens or 0-10 mm thick flat specimens.
 - b. Self aligning compression platen rated at least for 50 kN and
 - c. 3 point bend fixture rated at least for 50 kN**Above grip and fixture will be used which is part of Instron machine.**
3. One pair of HT –pull rods for HT tensile tests, Relaxation, or LCF testing upto 1 Hz and temperatures upto 1100 °C (with provision for water cooling if needed) -- one set
4. One pair of adapters made from suitable material to fix into pull rods for HT-tensile tests upto 1100 °C of samples with threaded ends to match pull rod (item 3). Price per pair may be quoted (thread M8,M12 & M16) ---one set.
5. Adapters made from suitable materials to fix into pull rods for HT- tensile tests upto 1100 °C of flat samples with thickness in the range 2 to 10 mm to match pull rod (item -3). Price per pair may be quoted : (one set)
6. Host Computer System compatible to the controller preferably having following configurations or better :
Processor-Intel Pentium core 2 Duo, RAM-3GB, HDD-1 TB, DVD writer, SVGA & networking adaptor card, compatible mouse and key board, 17”- TFT monitor or larger, latest Widows operating software and MS-Office. High dpi colour Printer for printing the test results.

6. APPLICATION SOFTWARE

A general software to carry out tension and compression (at nominal and constant true strain rate), stress relaxation, fracture, bend tests and low-cycle fatigue as per ASTM standards or other international standards. The application software (Material Testing Software) should have the following features/capabilities:

1. Compatible with the latest MS Windows software and Linux open source OS.
2. Interfacing to controller through TCP/IP protocol
3. Ultra high speed data transfer rates up to 100MBPS

4. Capable of conducting Tensile, Compression, 3-Point Bend Tests, stress relaxation test, fracture tests and low cycle fatigue tests.
5. Test methods in accordance with popular ASTM and ISO Standards
6. Should readily accept variety of sample geometry like, Rectangular, Cylindrical etc. with option to enter the cross sectional area directly for irregular shaped samples
7. User-settable measurement units – (i) for Force kgf, lbf, MPa, N, KN, (ii) for Elongation: mm, cm, inch, etc. and (iii) DCPD: mV or V.
8. User-settable graph screen to have choice of orientation
9. Multiple graph screen with option to choose the outputs.
10. Customized report option to create user defined report format.
11. Preloading capability for testing of materials like plastics, polymers, etc.
12. Extensometer removal option at specified stress/strain level
13. Key test results such as Peak load and strain, Break load and strain, UTS, Young's Modulus, Yield stress and strain, 0.2% Proof stress and strain, Area under the curve, Loads at specified elongation, Elongations at specified loads, Average of the curve, Statistical analyses such as Mean, Min, Max, Std. Deviation, Strain hardening coefficient 'n' Material constant 'K', r- value, etc. for multiple specimen testing.
14. User defined calculations with formula editor to create non standard formulae
15. Automatic printing facility of graph and report with statistical analysis
16. Simultaneous real time graphic display of Load, Displacement, Stress, Strain, Peak value, Break Value, etc.
17. Graphical display of Load Vs Displacement, Load Vs Time, Displacement Vs Time, Stress Vs Time, Stress Vs Strain, True stress Vs True Strain etc.
18. Provision to handle input/output of external transducers (DCPD 0-20 mV, extensometer and strain gauges)

Note to suppliers :

- i) any deviation from the range indicated or from the specification must be pointed out
- ii) all the items are to be supplied at one time
- iii) calibration certification of each transducers used should accompany the supply
- iv) the supplied items are to be installed, integrated and satisfactory performance is to be demonstrated at the user's site. Training must be imparted by the suppliers engineers (qualified) at user's site for running and routine maintenance.
- v) suppliers must give undertaking that the supplied items will be maintained after the lapse of the warranty period by qualified engineers and necessary spares will be made available
- vi) Suitable mechanical arrangement to position the furnace in load frame
- vii) Supplier to submit the list of similar job undertaken by them along with the

viii) contact details of the user.
The following must be included with the equipment.

- Installation and Operating instructions : hard copy and on CD ROM.
- Component manuals for proprietary items.
- General Arrangement Drawing.
- Assembly Drawings.
- List of recommended spares with current prices (for three years trouble free operation).

Note: The suppliers are required to visit B.I.T. Sindri for checking the health the machine and also for verifying the accessories already existing with machine before taking up job order.