

**Tender Notification for Procurement of ONE Creep Testing Machine at IISc
(Last Date of Submission of Tenders: 5:00 PM, 29th August 2020)**

Dear Sir/Madam,

In order to study creep deformation behavior of materials at Department of Materials Engineering, IISc Bangalore, purchase of ONE SINGLE-LEVER ARM CREEP TESTING MACHINE is planned. The machine will be utilized for testing and evaluating creep properties of Nickel- and Cobalt-base superalloys, Aluminum-base and Magnesium Base- alloys at temperatures ranging from 200 to 1100°C (sample temperature). The machine should also be capable of doing the creep tests **with an option of automatic change of load during the test (*in-situ*)**. This is to evaluate the creep response of the material at different changing loads during the test.

Below, the detailed technical specifications for an ideal machine are mentioned.

TECHNICAL SPECIFICATIONS

Scope of work: Supply, installation, and commissioning of single-lever type creep test machines for testing in air environment in accordance with ASTM E139 testing standard with the following features.

Item	Sub-Item	Specification
Load Frame		
	Capacity	50 kN or more
	Lever ratio	20:1
	Load accuracy	±0.5 % or better of Calibrated range
	Fulcrum material	High strength tool steel (HSS)
	Load frame material	Manufactured from ASTM A 36 Structural Steel that Will have multiple coats of Polystar water borne lacquer
	Variable Speed Draw Head Drive	The Draw head should include a variable speed drive. The Faster speeds to be used to reposition the Draw head at the beginning of a Test.
	Load lever beam leveling device	Automatic
	Over travel trips	Required
	Flooring requirement	Freestanding, with no special foundation
	Vibration isolation	Neoprene waffle pads or better
Motorized draw dead assembly: For maintaining lever horizontality		
	Limit switches	Required to keep draw head assembly within the limits during both manual and automatic operations
	Manual operation	Provision to manually operate the draw head motor electrically to move it up or down. During the test, the draw head motor moves down automatically by the beam-levelling unit.

	Gear drive jack	Precise, anti-rotation worm gear drive jack with at least 100 mm linear travel and powered by a gear reduced high torque motor.
	Coupling	A Chain and Sprocket drive to be provided for smooth no jitter connection between the gear motor and the worm gear jack
	Intermediate Proximity Switch	Proximity switches to be provided for noncontact sensing of lever arm position.
Furnace		
	Automatic change of load during the testing	To provide the capability of automatically loading the creep tester without the operator intervention during the test
	Temperature range	200-1100 °C
	Temperature stability	The Furnace to be designed to carry out tests at temperature range of 100 deg c to 1100 deg c within a accuracy of ± 2 deg C or better.
	Type	Cylindrical, split type with front locking option and hinged mounted to creep fame on rear side
	Zones	3 equal sized zones with independent temperature controllers in the Control system
	Temperature uniformity	accuracy of $\pm 2^{\circ}\text{C}$ or better. Temperature uniformity should be in the central region of furnace with height of > 200 mm
	Power requirement	230 V AC single phase 50 ± 2 Hz and 220 ± 10 Volts.
	Heating element	Kanthal – Al
	Insulation	Self-containing by using low thermal conducting vacuum cast ceramic fiber, without requiring water cooling of outer jacket.
	Outer shell body	The outer shell of furnace is to be of stainless-steel sheet of 20gauge (0.8 to 0.9mm) thickness. Closures at top and bottom of the furnace should fit snugly around pull bars and reduce the heat loss at these points. Provisions to seal the top and bottom of the furnace by the compressed vacuum cast ceramic fiber insulation.
	Dimensions	Inner Diameter: 90 mm or above Outer Diameter: 250 mm or below Height: 400 mm or above.
	Controller	The controller should provide independent power to each zone to provide optimal temperature uniformity over the gauge length of specimen

	Temperature indicators	5:3 for each zone, 1 for the actual sample temperature and 1 extra (for room temperature, additional sample temperature etc.)
Deformation Measurement System		
	Extensometer	Attached to sample. 4-rod type with provision for single elongation measuring instrument
	Material of extensometer	Nickel base superalloy to work up to 1100 °C over extended period of times
	Type	High precision, high accuracy LVDT or linear encoder offering long term stability for creep test running up to 33, 000 h.
	Accuracy	1 µm or better
	Stability	± 1 µm or better over 24 h under no load
Pull Rods, Universal coupling, Grips, Adapter and Fixtures		
	Pull Rods	Made of nickel-base superalloy grade MAR-M-246/247. Proof of the creep properties of the material is required.
	Fixtures	System shall have suitable fixtures to avoid bending and eccentricity
	Material for adapters	As per ASTM specification Made of nickel-base superalloy grade MAR-M-246/247 M6, M8 and flat adaptors for flat specimens of 2mm (one pair of each size per machine).
	Alignment	Pull Rods, universal coupling, grips, adapter and fixtures should provide perfect axial alignment according to the ASTM E 292 standard.
	Compression Fixture and Compressometer Frame	Made of nickel-base superalloy grade MAR-M-246/247 or Super alloys having durability of greater than 3 years at 8.9kN and at a temperature up to 1100 °C.
Weights		
	Denominations	150 N, 100 N, 50 N, 25 N, 5 N and 2.5 N
	Material	These can be from Cast iron and should have multiple coats of Aluminum Enamel applied on them and they should be calibrated as per E 617 Class 7.
	Calibration	Certificate required
	Quantity	150N - 10Nos;100N - 9Nos;50N - 2Nos;25N - 2Nos;5N – 4Nos;2.5N – 2 Nos.
Data Analysis and Storage		
	Type	Computerized data logging system
	Data set	The Controller system should be capable of recording up to 4 temperatures and 2 Displacement for each tester and store the data indefinitely. The data is downloaded from the frame controller to host PC at regular

		intervals. In case the host PC becomes unresponsive, the frame controller must continue to record the data and should hold the same for 72 Hours of data at a maximum recording intervals. Data collection rate should be set for each test individually. Test status reports and Graphs should be available any time during the test. The status display screen on the PC should indicate the temperature for Top, Middle, Bottom Thermocouple , Average creep, Total Plastic Strain, Stress and other useful data.
	Sampling frequency	User defined: 1 data set per second to 1 data set per hour or more for up to 33,000 h
	Data analysis	Real time calculation of stress, strain and strain rate
	Display	Instantaneous values of temperature, displacement, strain, strain rate, load onto sample, stress and all temperatures should be displaced on computer screen in real time; Stored and analyzed data should be plotted, as per user selected style, as a graph on the screen
	Data export	Provision should be there for easy upload of the data periodically for spread sheet applications
	Computer and accessories	Processor : i5 or better Operating system : Microsoft Windows 10 Professional Memory : 8 GB or better Key board : USB Key board Mouse : optical USB Mouse Monitor : 19.5 inch Flat Panel Display or Better Hard drive : SSD 512 GB or better CD Drive : DVD –Writer or better Network Interface : Integrated 10 /100 Ethernet RS 485 Adapter with Connector cable between Computer and the Control console with suitable length.
	Software	Software to perform tasks listed above should be included, with perpetual license.
	Ability to do jump tests	There should be a provision for changing load automatically during testing.
	Interrupted tests	There should be a provision to stop the test automatically after the user specified time or strain
Safety		
	Automatic shutdown	There must be a provision to automatically shut off the electrical power to the machine /Furnace when the specimen breaks.

	Switches	The main switch and the other switches for temperature controllers, elevator motors, etc., must be provided with suitable good quality circuit breaker for the safety reasons.
	Fuses	Fuses should be used wherever required and the fuse points shall be easily accessible. A minimum of 10 spare fuses / MCB should be provided
	Power off facility	Provision should be there to put off the power to the furnace, in case of overshooting of temperature due to malfunctioning of any of the temperature controllers.
	UPS	APC make or better to continue powering up the sensors and computers for a minimum of 30 minutes. Data protection is essential. The CPU Board in the tester should have a battery to maintain data in the event of loss of Electrical power
	Calibration	Calibration certificate for all digital and non-digital instruments and probes to be used: <ul style="list-style-type: none"> ○ Load measuring system: ASTM E4 and E74 ○ Extensometer: ASTM E83 ○ Thermocouples: ASTM E220
Training and user manual		
	Training	2 to 3 research students need to be trained during the time of installation and commissioning (i.e., at Indian Institute of Science, Bangalore)
	User manual and certificates	1 hard copy and 1 soft copy in a CD/DVS/USB of the detailed user manual, complete with circuit diagrams (mechanical, electronic and electrical), operational features, calibration certificates. A Hard copy of the manual also to be provided.
	Installation files	Installation DVDs/USB for the PC and the software shall be supplied along with the equipment.
Warranty and post-supply services		
	Warranty	18 months from the date of supply or 12 months after installation and commissioning, whichever is later. Extension of warranty period shall be applicable if the downtime of the machine is more than 30 days.
	AMC	3 years following expiry of warranty
	Services	The supplier should have an office or an associate (agent) in India to provide after sales service, support and maintenance.
Acceptability criterion		

	Pre-dispatch inspection	Based on mutually agreed testing plan, on-site testing on samples provides by IISc and qualification will be done before the equipment is made ready for shipping. Data should be shared with IISc and approval should be obtained before shipping. Supplier should furnish the compositional analysis of pull rods, fixtures, adapters, grips and couplers before shipping
	Acceptance	The supplier has to demonstrate all the functions of the system according to the specifications after successful commissioning at IISc
Supply of Spares (Optional)		
	Load train assembly	1 set of load train assembly (Pull rods, Universal coupling, Grips, Adapter and Fixtures)
	Extensometer Electrical	1 no Basic necessary Electrical spares

TERMS AND CONDITIONS

1. Two-bid system (separate technical and financial bids) in sealed tenders.
2. The technical bid must clearly specify the prescribed technical specifications without including the prices. Please provide in detail the specifications under each subhead and bullet point. Unique characteristics may be highlighted.
3. Vendors who include price information in the technical bids will be automatically disqualified.
4. The Vendors must have supplied at least 5 similar creep frames to centrally funded technical institutes (IISc, IITs and NITs) and national research labs (DAE, DRDO, DMRL, NAL, NML and equivalent) in the last 5 years. A detailed list of users, along with contact information of primary users, should be provided.
5. At least 3 independent reference letters from India (from institutions mentioned in point 4) should be provided at time of submission of tender (as part of technical bid). IISc may contact more users for obtaining independent references. The committee will have right to reject a bid based on reference letters.
6. The financial turnover of the equipment manufacturer in the previous financial year should be more than or equal to 10 times the total order value. The bidder shall furnish specific details of the company performance.
7. Technical bids will be opened first. IISc may seek clarifications after opening of technical bids and may ask vendors to perform some example experiments on the samples given by IISc to demonstrate the promised technical specifications. Vendors may be required to give presentations.
8. There are several items that require detailed information to be provided by the supplier. If information is not provided against any of these items, this will disqualify the supplier.
9. After technical evaluation by a committee, vendors may be asked to re-quote in a specific format to facilitate comparison of prices.
10. Price bids of only technically qualified vendors will be considered.
11. The price bids must offer CIF Bangalore prices.
12. Prices to be quoted separately for the system with mandatory requirements and the optional items. Prices should be quoted in adequate detail with relation to packing details to cover insurance compensation in case of damage to any specific modules.
13. Indicate separately price of spares listed above in terms of unit cost. The price of these spares will be included in the price comparison. Any additional spares recommended by the company will be considered for ordering but not included in the comparison. The buyer reserves the right to make the final decision on ordered spares.
14. IISc also reserves the right to cancel the tender at any time without assigning any reason whatsoever.
15. Indicate delivery period.
16. Order will be placed on lowest bid from technically qualified vendor
17. The tender documents can be sent at the following address:

The Chairman
Department of Materials Engineering
Indian Institute of Science, Bangalore 560012
Karnataka
India

