

INVITATION FOR TENDER FOR SUPPLY OF EQUIPMENT

Sealed tender offers are invited in two separate sealed covers (Technical and Commercial offers) from eligible manufacturers/suppliers or their direct Indian agents for the supply of the following equipment.

Name of the equipment or item: Single Lever Arm Type CREEP TESTING MACHINE.

Please send offers, ALONG WITH DESCRIPTIVE CATALOGUE/ BROCHURE. The validity of the bid should be at least four months (120 days) or more from the date of the opening of this tender. Please ensure that your quotation reaches not later than **22.12.2017 at 15:00 Hrs** at the following address:

**Dr. Sumantra Mandal (C.I.),
Assistant Professor, Department of Metallurgical and Materials Engg.,
Indian Institute of Technology Kharagpur – 721 302, West Bengal, India**

Earnest money of **Rs. 15,000/-** is to be deposited in the form of Account payee Demand Draft in favour of IIT Kharagpur, payable at Kharagpur, India. Any bid which is not accompanied with an EMD shall be summarily rejected. Earnest money deposited will be forfeited if the tenderer withdraws or amends its tender or impairs or derogates from the tender in any respect within the period of validity of its tender. No interest will be paid on the earnest money of the unsuccessful bidders.

Tender Reference	IIT/SRIC/MME/HBA/SM/2017/EQ-3, Dated: 30.11.2017
Price of Tender Document	NIL
Last Date and Time for submitting the tender document	22.12.2017 at 15:00 Hrs (Indian time)
Time and Date of Opening of Technical Bids	22.12.2017 at 15:30 Hrs (Indian time)
Place of Opening Tender	Department of Metallurgical and Materials Engineering, Indian Institute of Technology, Kharagpur – 721 302, West Bengal, India
Address of Communication	As stated above
Contact Telephone Numbers	+91- 3222 – 282879
E-mail	sumantra.mandal@metal.iitkgp.ernet.in

DETAILED TECHNICAL SPECIFICATIONS FOR
Single Lever Arm Type CREEP TESTING MACHINE

1. The machine should be able to perform creep testing under air environment in accordance with ASTM E139 testing standard.

2.1 General Features:

- I. The machine includes a loading frame with an integral control cabinet.
- II. Capacity of the machine shall be 50 kN. Load will be applied to the specimen through a single-lever arm with lever ratio of 20:1 and with a load accuracy of $\pm 0.5\%$.
- III. The machine should be equipped with a three zone furnace to carry out the tests at high temperatures in the range 50°C to 1000°C with an accuracy of $\pm 1^{\circ}\text{C}$. High precision, high accuracy temperature controller and power control unit are to be employed to achieve the above mentioned temperature accuracy over a length of 150 mm. each zone should be controlled by separate temperature controller and power supply unit.
- IV. Automatic load lever beam leveling device with over travel trips is required.
- V. The specimen elongation (strain) has to be measured by an attachment of extensometer and digital dial gauge during the test continuously.
- VI. Continuous temperature and strain measurements, and also storage and analyses of data are required through computer controlled data acquisition system.
- VII. It is required to indicate the elapsed test time by a digital time meter with a zero hour to a full scale reading of 99999 hours, with a resolution of 0.1 hour. The digital meter shall have provision for manual reset to zero hour and with a memory at power break.
- VIII. There must be a provision to automatically shut off the electrical power to the machine when the specimen breaks.
- IX. The operating power for the whole control cabinet and the furnace should be of 230 volts single phase 50 Hz.
- X. 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.
- XI. A good quality of bright neon pilot light should be used wherever required.
- XII. Fuses should be used wherever required and the fuse points shall be easily accessible.
- XIII. Spirit level should be mounted on top of lever arm in each machine, so that the horizontal position of the beam can be confirmed periodically.
- XIV. 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.
- XV. Creep testing of both Flat and Round(i.e. cylindrical) specimens should be possible.
- XVI. Testing of standard samples with gage lengths of 25mm as well as, testing of sub-size specimens(half inch or quarter inch gage length) should be possible.

2.2 Load Frame

- I. Capacity of the machine shall be 50 kN. Load will be applied to the specimen through a single-lever arm with lever ratio of 20:1 and with a load accuracy of $\pm 0.5\%$. Fulcrum material should be high strength tool steel (HSS).
- II. Free standing load frame features a small footprint that optimizes laboratory floor space.
- III. Automatic load lever beam leveling device with over travel trips is required.

- IV. Design of the machine is such that it requires no special foundation.
- V. There should be provision for vibration isolation with neoprene waffle pads.
- VI. The material for the frame is IS 226 mild steel (MS). All the components should be painted with three coats of epoxy paint and finally coated with approved colour.
- VII. Provision of spirit level to indicate beam position.

2.3 Motorized Draw Head Assembly to maintain lever horizontality

- I. Provision should be made to prevent the draw head assembly from exceeding the limits during manual or automatic operations.
- II. There must be a provision to manually operate the draw head motor (i.e. the motor and gear assembly which supports the creep specimen train) electrically to move it up or down. During the test, it should be ensured the draw head motor moves down automatically by the above said beam-leveling unit.
- III. There must be a provision to de-clutch the motor assembly from the gear assembly so that the specimen train assembly can be moved up or down manually by hand wheel.
- IV. Precise, anti-rotation worm gear drive jack with at least 100 mm linear travel and powered by a gear reduced high torque motor.
- V. Flexible coupling for stable, no-jitter continuous draw head motion.
- VI. Proximity switch for non-contact sensing of lever arm position. (This provides auto-leveling control and prevents damage when the specimen fails.)

2.4 Furnace

- I. Three-zone vertical cylindrical furnace should be of split type and hinged in the rear side. Other end should have provision for locking at top and bottom using CAMLOC type of assembly or equivalent.
- II. The power supply terminals to the furnace should be kept near the hinges i.e. in the rear side of the furnace with the suitable protective covers.
- III. Heating element:
 - Kanthal - A1
 - Max. Temperature: 1000 °C
 - Operating Voltage: 230 V AC single phase 50 Hz.
 - Furnace power: 3.8 amps / 880 watts per zone, 2640 W (or better).
- IV. Top and bottom finish insulation should be low thermal conducting (low 'K' factor) vacuum cast ceramic fiber insulation to provide minimum heat loss, high temperature capability and for rigid structure.
- V. The outer shell should be made by a bright stainless steel 1.6 mm thick or above. It is preferable to avoid using flanges. Closures at top and bottom of the furnace should fit snugly around pull bars and reduce the heat loss at these points. Provisions must be there to seal the top and bottom of the furnace by the compressed vacuum cast ceramic fiber insulation. Clamps or equivalent can be provided to keep the tight fitting of the above thermal insulation boards to seal the leakages.
- VI. Dimensions:
 - Outer Diameter: 250 mm
 - Inner Diameter: 75 mm
 - Height: 375 mm
- VII. Uniform temperature zone ($\pm 1^\circ\text{C}$) at the middle of the furnace should be at least 150 mm.

- VIII. Separate temperature controllers with power supply unit should be employed to control the temperature of each zone. At least three (3) Thermocouple ports to be located at the middle-length in each zone.
- IX. The rear-hinged part of the furnace should be mounted on the machine frame such that the position of the furnace is adjustable vertically over a distance of double of the furnace height.
- X. Integrated, sophisticated control-Algorithm for a precise temperature control along specimen and to prevent overshooting temperature.
- XI. Automatic temperature control setting from 50 °C to 1000°C.
- XII. Interface for 4 Thermocouples (3 for 3 zones of furnace, 1 for over temperature protection)
- XIII. Digital display of temperature.

2.5 PID Temperature controller: (Eurotherm make or equivalent)

Input

- 1. Temperature range 50 °C – 1000°C
- 2. Input range ± 100 mV and 0 to 10 V dc (auto ranging)
- 3. Sample rate 9 Hz (110 ms)
- 4. Calibration accuracy 0.25% of reading, ± 1 LSD, ± 1°C/F
- 5. Resolution < 1 µV for ± 100 mV range, < 0.2 mV for 10 V dc range
- 6. Linearization accuracy < 1.0 of reading
- 7. Input filter 1.0 to 999.9 seconds
- 8. Zero filter To be available

Thermocouple

K-Type (At least 10 numbers of spares thermocouple should be provided)

- 1. Cold junction compensation Automatic
- 2. Thermocouple break protection To be available
- 3. Output Relay output and control output (4-20 mA)

Control functions

- 1. Modes PID or PI with overshoot inhibition, PD, PI, P only on/off
- 2. Application Heating and cooling
- 3. Auto/manual Bump less transfer
- 4. Set point rate limit 0.01 to 99.99 degrees or display units per minute
- 5. Cooling algorithms Linear
- 6. Tuning: One-shot tune Automatic calculation of PID and overshoot inhibition parameters
- 7. Automatic droop compensation Automatic calculation of manual reset value when using PD control
- 8. Alarm types Full scale high or low, deviation high, low, or band

General

- 1. Display Dual, 4 digit x 7 segment high intensity LED
- 2. Dimensions 48 x 48 x 103 mm (width, height and depth respectively)

- | | |
|------------------------|---------------------------------------|
| 3. Supply | 230 V AC, 50 Hz, 5 Watts max |
| 4. Temperature and RH | 0 to 55°C RH: 5 to 90% non-condensing |
| 5. Panel sealing | IP65 |
| 6. Non-volatile EEPROM | To be available |

2.6 Thyristor Power Control Units: (Eurotherm make or equivalent)

- | | |
|--------------------------|------------------------------------------------------------|
| 1. Load type | Constant resistance |
| 2. Power supply | 230 V AC, 50 Hz |
| 3. Heater voltage | 230 V AC |
| 4. AC current rating | 15 A |
| 5. Firing mode | Phase angle |
| 6. Input | 4-20 mA DC |
| 7. Manual input | Input impedance 330 kilo ohms |
| 8. Slave output | +10 V |
| 9. Operating temperature | Upto 50°C |
| 10. Mounting | Din Mounting |
| 11. Current limit | Adjusted from 10 to 100% |
| 12. Compatibility | Should be compatible with the above temperature controller |

Thyristor protection

- | | |
|-------------|-----------------|
| 1. External | High speed fuse |
| 2. Internal | RC snubber |

2.7 Pull Rods, Universal coupling, Grips, Adapter and Fixtures

- I. Pull rods made of nickel-base superalloy grade INCONEL 713C having durability greater than 3 years at full load and at a temperature upto 1000 °C.
- II. System shall have suitable fixtures to avoid bending and eccentricity.
- III. Specimen adapters as per ASTM specification made of nickel-base superalloy grade INCONEL 713C to adopts specimen having M8x1.25, M16x2 threading and group of flat adaptors for flat specimens of 1 to 5 mm, 5 to 10 mm, 10 to 20 mm (one pair of each size).
- IV. Pull Rods, Universal coupling, Grips (pin-loaded), Adapter and Fixtures should provide perfect axial alignment according to the ASTM E 292 standard.

2.8 Weights

Weights of denominations 10 Kg, 5 Kg, 2 Kg, 1 Kg, 500 grams, 200 grams and 100 grams (5 numbers of each) should be supplied. The material for the weight is IS 226 MS, weights should be calibrated and should be painted with three coats of epoxy paint and finally coated with approved colour.

2.9 Extensometer (Two numbers)

Extensometer should be of 4-rod type with provision for single elongation measuring instrument (Digimatic indicator). Materials of the extensometer should be nickel base superalloy to work upto 1000 °C.

2.10 Strain Measuring Instruments (Two numbers)

Digimatic indicator (Mitutoyo make or equivalent) with the following features.

- I. Inductive Spring loaded type.
- II. Stroke: 20 mm length.
- III. Least count: 1 micron (0.001 mm).
- IV. Accuracy: ± 1 micron (0.001 mm).
- V. Data output: compatible with data logging system.
- VI. Powered externally
- VII. With inbuilt storage
- VIII. Compatible Printer (Mitutoyo Printer or equivalent) for taking print of the data

2.12 Calibrated Load-Cell Unit

One calibrated load cell having 100 KN capacity has to be supplied.

2.14 Special performance requirement

- I. The concerned Company should have supplied 5 or more machines in one LOT in last 5 years, in INDIA.
- II. The Concerned Company must submit performance test reports of the supplied creep testing machines in Indian Govt. Institutes.
- III. The Concerned Company should submit the Name and Address of at least 3 Indian Govt. Institutes, to whom Single Lever Arm Type Creep Testing Machines have been supplied.

2.15 Warranty requirement

Two years (2 years) standard warranty from the date of commissioning at site (IITKGP).

GENERAL TERMS & CONDITIONS

PLEASE SPECIFICALLY INDICATE THE FOLLOWING POINTS IN YOUR QUOTATIONS AND COMPLY THE TERMS AS MENTIONED HEREUNDER:-

1. TENDER ARE INVITED COMPLYING THE REQUIREMENT FOR TENDER AS DETAILED IN THE TENDER SPECIFICATION TO BE SUBMITTED IN THE COMPANY'S / FIRM'S LETTERHEAD NEATLY PRINTED / TYPED DULY SIGNED BY AUTHORIZED PERSON WITH THE SEAL OF THE BIDDERS. ALL ENVELOPS CONTAINING THE TENDER SHOULD BE PROPERLY SEALED. SEPARATE ENVELOPS SHOULD BE USED FOR TECHNICAL AND PRICE BID AND INDICATION TO THEIR EFFECT MAY PLEASE BE SUPERSCRIBED ON THE ENVELOP.

THE FOLLOWING DOCUMENTS ARE REQUIRED FROM THE INDIAN AGENTS OF FOREIGN FIRMS:

- 1.1 FOREIGN PRINCIPAL'S PROFORMA INVOICE INDICATING THE COMMISSION PAYABLE TO THE INDIAN AGENT AND NATURE OF AFTER SALES SERVICE TO BE RENDERED BY THE INDIAN AGENT.
- 1.2 COPY OF THE AGENCY AGREEMENT WITH THE FOREIGN PRINCIPAL INDICATING THE NATURE OF AFTER SALES SERVICES, PRECISE RELATIONSHIP BETWEEN THEM AND THEIR MUTUAL INTEREST IN THE BUSINESS.
- 1.3 PLEASE ENCLOSE THE DOCUMENT(S) RELATED TO THE ENLISTMENT OF THE INDIAN AGENT WITH DIRECTOR GENERAL OF SUPPLIES & DISPOSALS (DGS & R) UNDER THE COMPULSORY REGISTRATION SCHEME OF MINISTRY OF FINANCE.
2. TECHNICAL CATALOGUE/LEAFLET SHOULD BE ENCLOSED WITHOUT FAIL. PROVIDE COMPLIANCE STATEMENT WITH RESPECT TO THE TECHNICAL SPECIFICATIONS MENTIONED ABOVE.
3. PLEASE CONFIRM WHETHER YOU ARE AUTHORISED TO QUOTE ON BEHALF OF YOUR PRINCIPALS AND IF SO, PLEASE ENCLOSE A COPY OF SUCH AUTHORISATION WITH YOUR QUOTATION.
4. **PRICE BIDS FOR FOREIGN FIRMS:** PRICES ARE TO BE QUOTED ON 'EX-WORKS' DULY PACKED OR ON "FCA/FOB" INTERNATIONAL PORT" BASIS AND ALSO INCLUDING AGENCY COMMISSION PAYABLE TO YOUR INDIAN AGENTS, IF ANY SHOWING CLEARLY THE FOLLOWING BREAK UP:-
 - I) EX-WORKS PRICE
 - II) PACKING & FORWARDING
 - III) FREIGHT
 - IV) ANY OTHER RELEVANT EXPENSES.
 - V) TAXES PAYABLE BY THE INSTITUTE

INSURANCE WILL BE PAID BY OUR INSTITUTE SEPARATELY AND SHOULD NOT FORM PART OF THE QUOTED PRICE.

PRICE BIDS FOR INDIAN FIRMS: PRICES ARE TO BE QUOTED ON F.O.R., IIT KHARAGPUR, ON DOOR DELIVERY BASIS CLEARLY SHOWING THE BREAK UP.

5. **PERIOD OF VALIDITY:** BIDS SHALL REMAIN VALID FOR ACCEPTANCE FOR A PERIOD OF 120 DAYS FROM THE DATE OF OPENING.
6. INDIAN AGENTS ADDRESS AND PERCENTAGE OF AGENCY COMMISSION INCLUDED IN ABOVE F.O.B./EX-WORKS PRICE. (THIS WILL BE PAID TO THE INDIAN AGENTS IN INDIAN RUPEES ONLY AND NOT IN FE). PLEASE ENCLOSE COPY OF AGENCY AGREEMENT ENTERED INTO WITH YOUR

PRINCIPALS INDICATING THE NATURE OF AFTER SALES SERVICES OF INDIAN AGENTS, PRECISE RELATIONSHIP & MUTUAL INTEREST IN THE BUSINESS.

7. **MEASUREMENTS/WEIGHT:** NETT/GROSS OF THE CONSIGNMENT. IN CASE OF AN ORDER, YOU SHALL USE AIR WORTHY PACKAGE (AS APPLICABLE) DULY CERTIFIED WITH DOCUMENTS – PLYTO – SANITARY CERTIFICATE (AS PER QUARANTINE ORDER 2003).
8. **SCOPE OF SUPPLY:** SHOULD INCLUDE FREE INSTALLATION AND COMMISSIONING
9. **PAYMENT TERMS FOR FOREIGN FIRMS**
 - A) 100% PAYMENT THROUGH SIGHTDRAFT/FORIGN DEMAND DRAFT/LC (EXCEPTIONAL CASES)/SWIFT TELE TRANSFER AFTER RECEIPT OF STORE IN GOOD ORDER AND CONDITION.
 - B) BANK CHARGES ON LC/SD (WITHIN INDIA APPLICANT ACCOUNT AND OUTSIDE INDIA TO BENEFICIARY ACCOUNT).

PAYMENT TERMS FOR INDIAN FIRMS

- A) 100% PAYMENT THROUGH CROSSED ACCOUNT PAYEE CHEQUE / ELECTRONIC TRANSFER AFTER RECEIPT OF STORE IN GOOD ORDER AND CONDITION.
- B) ENSURE MENTIONING
 - i) BANK DETAILS OF THE BENEFICIARY, VAT NO., SERVICE TAX NO. AND PAN NUMBER
 - ii) FULL NAME AND ADDRESS OF THE BENEFICIARY ON WHOM ORDER HAS TO BE PLACED
10. WHETHER ANY EXPORT LICENCE IS REQUIRED FROM YOUR GOVERNMENT, IF SO, PLEASE CONFIRM WITH DETAILS.
11. COUNTRY OF ORIGIN OF THE GOODS IS TO BE MENTIONED.
12. THE INSTITUTE SHALL PROVIDE THE CONCESSIONAL CUSTOMS DUTY AND EXCISE DUTY EXEMPTION CERTIFICATE AS PER GOVT. NOTIFICATION NO. 51/96 CUSTOMS DATED: 23.07.1996 AND CENTRAL EXCISE DUTY EXCEMPTION IN TERMS OF GOVT. NOTOFICATION NO. 10/97 – CENTRAL EXCISE DATED: 01.03.1997 AS AMENDED FROM TIME TO TIME.
13. **LIQUIDATED DAMAGES:** THE STORES SHOULD BE DELIVERED / DISPATCHED TO DESTINATION AND READY FOR OPERATION NOT LATER THAN THE DELIVERY DATE SPECIFIED. IT THE SUPPLIER FAILS TO DELIVER ANY OR ALL THE STORES OR PERFORM THE SERVICE BY THE SPECIFIED DATE, LIQUIDATED DAMAGES AT 1% PER MONTH OR PART THEREOF IN RESPECT OF THE VALUE OF STORES WILL BE DEDUCTED FROM THE CONTRACT PRICE SUBJECT TO A MAXIMUM OF 5%. ALTERNATIVELY, THE ORDER WILL BE CANCELLED AND THE UNDELIVERED STORES PURCHASED FROM ELSEWHERE AT THE RISK AND EXPENSE OF SUPPLIER.
14. **PATENT RIGHTS:** THE SUPPLIER SHALL INDEMNIFY THE PURCHASE AGAINST ALL THIRD PARTY CLAIMS OF INFRINGEMENT OF PATENT, TRADEMARK OR INDUSTRIAL DESIGN RIGHTS ARISING FROM USE OF THE GOODS OR ANY PART THEREOF IN INDIA.
15. ONLY THOSE BIDDERS WHO'S BIDS HAVE BEEN TECHNICALLY FOUND ACCEPTABLE WILL ONLY BE INVITED FOR PARTICIPATION IN THE PRICE BID.

16. THOSE BIDDERS WHO DO NOT RECEIVE ANY COMMUNICATION FOR PARTICIPATION IN PRICE BID OPENING MEETING MAY PRESUME THAT THEIR BID HAS NOT BEEN ACCEPTED BY THE INSTITUTE.
17. CONDITIONAL OFFER WILL NOT BE ACCEPTED.
18. LATE TENDERS I.E. TENDER RECEIVED AFTER THE DUE DATE AND TIME OF SUBMISSION AS MENTIONED ABOVE SHALL NOT BE ACCEPTED.
19. BIDDERS TO ENCLOSE THE FOLLOWING DOCUMENTS:-

A) CURRENT INCOME TAX AND SALES TAX CLEARANCE CERTIFICATES (VAT No.), SERVICE TAX NO. AND PAN NO.

C) BANKER’S SOLVENCY CERTIFICATE

C) SUMMARY OF AUDITED STATEMENT OF ACCOUNTS FOR THE LAST THREE YEARS TO BE ENCLOSED AND FINANCIAL HIGHLIGHTS AND THE KEY PERFORMANCE DURING THE LAST THREE QUARTERS TO BE ENCLOSED AS PER FORMAT:-

COMPANY’S KEY PERFORMANCE

DESCRIPTION	JAN. TO MARCH	APRIL TO JUNE	JULY TO SEPT.
GROSS REVENUE			
PROFIT BEFORE TAX			
PROFIT AFTER TAX			
RETURN ON INVESTED			
CAPITAL (ROIC)			

D) CUSTOMER SATISFACTION CERTIFICATE FROM ONE SUCH ORGANIZATION IS TO BE ATTACHED WITH THE TECHNICAL BID AND PRICE BID.

E) NAME AND ADDRESS OF MINIMUM THREE CLIENTS TO WHOM SUCH EQUIPMENT HAVE BEEN SUPPLIED SHOULD BE MENTIONED.

20. **WARRANTY / GUARANTEE:** THIS COMPREHENSIVE WARRANTY / GUARANTEE SHALL REMAIN VALID FOR **24 MONTHS** AFTER THE GOODS (OR ANY PORTION THEREOF AS THE CASE MAY BE) HAVE BEEN DELIVERED AND COMMISSIONED TO THE FINAL DESTINATION.
21. THE INSTITUTE DOES NOT BIND ITSELF TO OFFER ANY EXPLANATION TO THOSE BIDDERS WHO’S TECHNICAL BID HAS NOT BEEN FOUND ACCEPTABLE BY THE EVALUATION COMMITTEE OF THE INSTITUTE.
22. ALL TENDERS (UNLESS OTHERWISE SPECIFIED) ARE TO BE SUBMITTED / HANDED OVER TO **DR. Sumantra Mandal, Assistant Professor, Department of Metallurgical and Materials Engineering, INDIAN INSTITUTE OF TECHNOLOGY, KHARAGPUR - 721 302** AND ACKNOWLEDGEMENT TO BE OBTAINED.

IMPORTANT

1. IIT Kharagpur authority may accept or reject any or all the bids in part or in full without assigning any reason and does not bind itself to accept the lowest bid. The Institute at its discretion may change the quantity / upgrade the criteria / drop any item or part thereof at any time before placing the Purchase Order.
2. Promptly make arrangements for repair and / or replacement of any damaged item (s) irrespective of settlement of claim.
3. In case of any dispute, the decision of the Institute authority shall be final and binding on the bidders.
4. For any query pertaining to this bid document correspondence may be addressed to **DR. Sumantra Mandal, Assistant Professor, Department of Metallurgical and Materials Engineering, INDIAN INSTITUTE OF TECHNOLOGY, KHARAGPUR - 721 302**, at the address mentioned above.

LAST DATE FOR SUBMISSION OF SEALED BIDS: 22.12.2017

- 1) Please Note that the Institute remains closed during Saturdays & Sundays and all specified government holidays.
 - 2) Fax, e-mail Tender will not be accepted.
 - 3) The General Terms and Conditions as stated above relate to supply of stores / equipment /assets etc. and for specific service other terms and conditions of the Institute will apply.
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