

ANNEXURE - 01 A: SPECIFICATIONS

1.0 SCOPE OF ACTIVITY

Refurbishment of the existing UTM at VSSC, Trivandrum which is part of High temperature testing system. The 2009 make UTM is integrated with a 2000°C capability Thermal chamber. Basic features of this UTM is depicted in Table-01:

1	Max. load capability	500 kN
2	Type of tests can be performed	Tension, compression, shear, Flexural & ILSS
3	Cross head speed for testing RANGE-1	0.05; 0.1; 0.2; 0.5; 1; 2; 3; 5; 7,5; 10; 20; 30; 50; 75 and 100 mm/min
4	Cross head speed for testing RANGE-2	0.1; 0.2; 0.4; 1; 2; 4; 6; 10; 15; 20; 40; 60; 100; 150; and 200 mm/min
5	Cross head speed for testing in a Return stroke	100 or 200 mm/min
6	Cross head displacement resolution	0,01mm
7	Max. travel (stroke) of the movable crosshead without grips	800mm
8	Permissible absolute error limits during cross head movement in tension operation mode:-on travel length up to 10 mm	$\pm 0,1$ mm
9	Permissible absolute error limits during cross head movement in tension operation mode - on travel length up to 800 mm	$\pm 0,5$ mm
10	Total power input,	5.3 kW
11	Length, Width, Height [mm]	1175, 1340, 2710
12	Working space width & Height	Working space width – 750mm Working space height – 895mm

13	<p>Construction of UTM:</p> <p>The load frame is constructed with two lead screws, four guide columns, the fixed crosshead and movable crosshead.</p> <p>Base houses the electric drive and left and the right worm gearboxes for leadscrew. Both gearboxes are connected via a connection shaft. A V-belt bridges two pulleys. One of the V-belt is attached to the worm shaft of the left worm gearbox and the other one is connected to the electric drive. The electric drive transmits rotary movement to the left worm gearbox by means of the V-belt with the aid of the pulleys and then to the right worm gearbox via the connection shaft.</p> <p>The Load cell is placed on the lower base plate of the load frame. Displacement transducer is integrated with the Fixed cross head and connected to right lead screw for displacement measurement.</p>
14	<p>Attachments to UTM:</p> <p>Thermal chamber of size 475 x 375 x 300 mm is integrated with the UTM. This thermal which is capable of generating 2000 °C at heating rate of 2000 °C per minute is equipped with Cooling water and gas flow systems and controlled by dedicated SCADA unit.</p>

It is proposed to refurbish the above UTM by replacing the following sub-systems.

- Drive & Control system
- Load cell
- Data Acquisition Unit (DAQ)
- Software

Scope of work in this regard involves the following:

- **Inspection of the above mentioned UTM**

Vendor need to make a mandatory visit to the site, to understand its features and refurbishment requirements.

[Please note that proposals of the Vendors who did not perform the site visit for understanding the UTM features will not be considered]

- **Prepare & submit a procedure for refurbishment with the following details**
 - Activities to be executed in detail.
 - Details of items to be replaced and modified if any (Make and model of the items to be furnished).

- Tentative schedule for accomplishing the task.
- Commercial terms and conditions.
- Support requirement from VSSC.
- Supply of items / sub-systems
- De-installation of existing sub-systems
- Installation of new sub-systems.
- Calibration.
- Satisfactory Performance demonstration.
- Training & commissioning.

Necessary features and specifications for the sub-systems to be replaced / modified are described in the subsequent sections. **However, vendor may suggest better features and methods for refurbishment as options.**

Note: Review and Approval of the above action plan will be conducted by an empowered evaluation committee of VSSC.

2.0 SUB SYSTEMS TO BE MODIFIED / REPLACED

2.1 DRIVE AND CONTROL UNIT

New Drive and Control unit to be provided with the following Features:

- A. Ability to perform all kind of standard mechanical tests including Tension, Compression, Shear, Flexural and ILSS.
- B. Ability to perform Profile load tests with customized ramp and dwell parameters.
- C. Drive & Control system shall meet / provide better parameters related to all parameters of cross head movement control such as speed ranges, position control, resolution and other parameters as mentioned in Table-01.
- D. Suitable servomotor with necessary control electronics and accessories to meet the required control of displacement, position and load and servo control to be provided. Make for servomotor shall be ABB / Allen-Bradley/AMC /Copley/ Data Electronics / Mitsubishi / MOOG / Panasonic/Siemens / Yaskawa
- E. Servo control output shall have minimum 5kHz update frequency for precise machine control.
- F. Jog control panel to be provided [With a provision for latching on UTM frame] for crosshead up/down movements.

G. Emergency stop provision.

H. Encoder for Position measurement & rate control. Encoder make shall be Alps Alpine/Bourns/CUI / Dyanpar / EPC/Grayhill / Honeywell /Omron/ Schneider / Velmex

I. Provision to safeguard the control electronics from the signal noise generated by drive system.

2.2 LOAD CELL

New load cell which meets the following specification to be supplied and installed

Table 02 : Specification of Load cell		
Sl. No	Force capacity:	±250kN (Min.)
1	Type	Bi-directional [Tension & compression]
2	Accuracy Class to meet	ISO 7500 Class 0.5 or ASTM E4
3	Static Error Band	±0.05 % FS
4	Non-linearity	±0.05 % FS
5	Hysteresis	±0.06 % FS
6	Output	mV/V
7	Overload capability	150%
8	Load Measurement Accuracy	+/- 0.5% of reading down to 1/500 of load cell capacity
9	Load Measurement Repeatability	+/- 0.25% of reading
10	Load Measurement Resolution	+/- 0.0004% of rated capacity
11	MAKE	Artech / FUTEK / Instron/Interface / HBM / Honeywell / MTS / Omega / TML /ZwickRoell
12	Interfacing	<p>Load cell to be supplied with suitable fixtures and adapters for interfacing with the existing UTM Frame.</p> <p>In the existing UTM load cell is positioned at the base of the frame. To replace it with the new load cell the Thermal chamber attached to the UTM needs to be removed. Vendor needs to perform this activity.</p>

2.3 DATA ACQUISITION MODULES:

Data Acquisition (DAQ) modules to be replaced / added with new ones having the following capabilities

2.3.1 INPUT CHANNELS:

- A. Minimum Four (4) high speed, high precision input channels for Load, Position, and Strains (Strain-1 & Strain-2) to be provided.
- B. Minimum four additional auxiliary input channel for collecting real-time data from external sources such as Temperature source, displacement sensor, actuator or other measurement device.
- C. Automatic transducer recognition for each input channel to help minimize test setup errors.
- D. Eight (8) Digital inputs for monitoring machine status such as over travel limit switches, interlocks and interfacing to external devices.
- E. Data log rate of min. 500 Hz simultaneously or better from all inputs. Option to customize the rate

2.3.2 OUTPUT CHANNELS:

- A. Minimum Four (4) – [Load, position, strain1, strain2] analog (0-10v) outputs for use with external data logging device.
- B. Output correspond to real-time XY graph channel assignments.
- C. Minimum Eight (8) Digital outputs for interfacing

2.4 SOFTWARE:

Present software to be replaced with new software with the capabilities mentioned below:

2.4.1 The software shall have **Control Module** with the following features:

- A. Configure Test control parameters.
- B. Enable the user to perform Tension, Compression, Shear, Flexural and ILSS tests in composites specimens as per relevant standards.
- C. Configuring load cell calibration and balancing features.

- D. Set up Data acquisition parameter.
- E. Software shall automatically detect any transducers (Load cell, Extensometer etc.) connected with controller.
- F. Setting up of limits for load and displacement and strain.
- G. Configure Profile loading with ramp and dwell parameters.
- H. Configure real time display of test parameters.
- I. Ability to generate custom made Test templates / Test procedures.
- J. Ability to generate work space where user can store all resources pertaining to a particular test category for quick access.

2.4.2 The software shall have Test **Data Display module** with the following features:

- A. Generate real time graphical display of test plots with auto scaling,
- B. Zoom-in and out options in the graphical display.
- C. Multi-plots capability enabling minimum 10 plots of Stress/ Load vs strain/deflection in a single graph.

2.4.3 The software shall have **Data Analysis and Report Generation Module** with the following features:

- A. Computation of modulus with Auto-generation of modulus line plots.
- B. Ability to export the test data into Microsoft Excel.
- C. Analysis module which shall enable the computation of mechanical properties in composites testing. Module shall enable computation in accordance with ASTM Standards ASTM D 638, D 695, D3039, D3410, D3518, D2344, D5379 & D 2344.
- D. Provision for Test Data Archival and Re-analysis of the archived test data.
- E. Report preparation module which facilitates generation of report with multiple test data in tabular and graphical form (Minimum 10 nos. of multi test plots in a single graph). This module shall also contain user definable test information and report header fields of minimum 10 nos. in each category.

2.4.4 General Points regarding Software:

- A. Software shall be provided with life time license.
- B. Upgradation of s/w without cost implication to be ensured for a period of minimum FIVE Years.
- C. Software shall be compatible with latest version of Microsoft windows operating system.
- D. Units in the software to be in SI system.

2.5 Computer with the following specifications

- A. Intel Core i7 processor or better
- B. 16GB DDR3 RAM-Minimum
- C. 1TB or Higher SSD,
- D. External USB DVD R/W Drive
- E. Remote Keyboard & Mouse,
- F. OS: Windows-11 or Higher version [UTM s/w to be compatible with the OS]
- G. MS Office 2022 Professional plus or latest version,
- H. 32" LED Monitor – 2nos. connected to single PC.
- I. Make shall be Alienware / Dell / HP / Lenovo / MSI
- J. Accessories to be supplied: 1KVA UPS, color printer & network switch.

ANNEXURE – 1. B: CONDITIONS

1.0 Installation, Calibration & Acceptance

1.1 INSTALLATION

Vendor shall make a pre-dispatch visit to the work site and identify the logistic requirements at least one month prior to the commencement of installation. Vendor shall undertake the full responsibility for: the dispatch and unloading of the components at the site in VSSC, and successful installation, commissioning at the site provided by VSSC.

1.2 CALIBRATION

- A. Vendor needs to perform one-time calibration on load [tension & compression], cross head speed & position meeting the specified needs after installation at VSSC Work site.
- B. Valid calibration certificate traceable to National/ international accredited agencies to be provided.

1.3 TESTING AND PERFORMANCE DEMONSTRATION

- A. Refurbished UTM shall be tested for all applicable criteria mentioned in Specification (Annexure-01 A). A procedure including check list for testing and acceptance to be prepared and submitted prior to installation for review and approval by VSSC.
- B. Any constraints in performing the above testing and performance demonstration shall be brought out by the Vendor in clear terms, along with the offer submission.

2.0 TRAINING

The vendor shall impart detailed training to the team of VSSC officials (6 persons) for the operation of the system. The clear description of the operation/ logics implemented in the system, procedure for programming/ configuring the system for testing, check list for operation, system safety aspects, safety interlocks provided, precautions to be followed for operating, Post test data analysis and report preparation etc. to be detailed and to be explained in detail and the same shall be for part of the user manual.

Detailed training material both in soft and hard form shall be supplied.

3.0 WARRANTY AND SERVICE

- A. The equipment shall be fully guaranteed for performance for 24 months from the date of commissioning and acceptance. A certificate to this effect shall be given to VSSC.
- B. Any defect observed during the warranty period will have to be repaired/replaced free of cost with minimum down time. All the software updates during the guarantee period shall be supplied, installed and staff trained on real time basis free of cost.
- C. The Vendor shall provide commitment for after sale service and supply of spare parts for the offered equipment for a period of at least 10 years.

4.0 AMC & Calibration

- A. Vendor shall be willing to enter into Non comprehensive AMC for minimum FIVE years (Extendable up to 10 years) after the warranty period for maintenance, periodical verification of parameters pertaining to the system and also onsite calibration of UTM and all transducer connected to the UTM. Periodicity for the same to be indicated by the Vendor. Vendor needs to provide separate quote for both AMC and Calibration.

Finalized Non comprehensive AMC charges to be furnished for Two Preventive maintenance and any no of Break Down visits.

5.0 Method to Quote

- 1. The offer is invited in TWO-PART Bid basis namely PART-1: Techno- commercial bid and PART-2: Price bid.
- 2. **IMPORTANT: Prior to the submission of bids vendor need to make a visit to the facility to understand the features of existing UTM. This visit is mandatory. Bids of the vendors who fail to make the visit will not be considered.**

5.1 Techno-commercial bid

Techno-commercial bid shall essentially contain the following details.

- A. Vendor profile and product line
- B. Expertise and Experience in realizing similar systems and the list of clients, especially aerospace industries of similar field

- C. All the technical requirements mentioned in specification document (Annexure-1A) shall be addressed in the technical bid.
- D. All commercial aspects including the plan of action on how the vendor proposes to accomplish the requirement such as delivery schedule, payment schedule etc: shall form part of the offer. **(Any price figures viz: cost of the system/ any components/ sub systems/ AMC cost etc... shall not be included in this part of the offer).**
- E. Detailed configuration of the proposed plan meeting the specified requirements shall be furnished with figures /drawings /working diagram.
- F. Compliance chart/check list for each requirement including optional requirements shall be specifically addressed.
- G. Detailed technical catalogue of all standard components shall be given.
- H. If the vendor intends to subcontract any part of the work, such details shall be given in the offer. A subsystem-wise listing and capability in realizing each system and a plan of integration, calibration and testing need to be furnished. **(In such cases, managing the sub-contracted/outsourced activity in all respects is the responsibility of the Vendor)**
- I. Availability of spare parts to be assured and explicitly committed for at least 10 (ten) years after the commissioning of the system.
- J. Supply of software and firmware updates, installation and training from the system manufacturer till the end of warranty period (24Months) shall be ensured.
- K. Service support facility shall be made available for at least ten years after the expiry of the guarantee period.
- L. Details of service facilities and personnel availability to attend any fault after receipt of the information, whenever called for.
- M. Willingness to enter into AMC for a period of minimum five years (Which can be extendable up to 10years) after the expiry of warranty.
- N. Periodic calibration of the required sub systems during and subsequent to expiry of performance warranty (Periodicity to be indicated).

5.2 Price Bid

- A. The price bid shall contain the detailed breakup of the cost each subsystem needed for refurbishment of UTM. Break-up of the Cost involved in installation, Training, transportation, P&F charges, tax and other relevant charges to be quoted.
- B. The price bid shall also contain the overall cost and all other cost details.
- C. The vendor shall include both the Comprehensive and Non-Comprehensive AMC charges for 5 years after warranty (Which is extendable up to 10years).
- D. Rate for preventive maintenance calls and Break down calls to be mentioned separately.
- E. A list of critical spares shall be included with current price break up need to be mentioned.
- F. Vendor can also mention the optional features / items if any mentioning the cost.

Both bids shall be submitted within the specified time period mentioned in the tender. No late submission will be accepted.

6.0 Documents / Details to be submitted

6.1 Documents to be submitted along with the offer

- A. Detailed configuration of the proposed refurbishment plan meeting the specified requirements along with figures, drawings, circuit diagrams, software details and other relevant information.
- B. The utilities and logistic support to be provided by VSSC for the installation of the system.
- C. Technical specifications of the standard components / sub-systems proposed to be used in the system along with detailed technical brochure.
- D. **Compliance check list for each requirement including optional requirement - mandatory**
- E. List of essential and recommended spares and consumables.
- F. List of all bought out components / equipment.
- G. Time needed for installation & commissioning.

- H. Brief details of the similar activities performed by the party with documentary evidences.
- I. Details of customers with full addresses and contact details (including mobile phone number & email id) where similar systems were installed. (References / feedback obtained from customers if available may also be furnished)
- J. Any other conditions Vendor wants to specify.

6.2 Documents to be submitted upon receipt of Purchase order

The Vendor shall submit detailed report describing the following:

- A. Plan of action with milestones for the activity
- B. Detailed drawings and electrical / electronic circuit diagrams
- C. Details of standard components /equipment
- D. Quality assurance (QA) plan during the different stages of activity.

6.3 Documents to be submitted During Installation

- A. User Manual,
- B. Maintenance manual
- C. Software manual
- D. Test certificates
- E. Calibration certificates
- F. Other relevant documents.

[All documents shall be in English]

7.0 EVALUATION OF OFFERS

- a. Vendor should have prior experience in executing UTM refurbishment or UTM manufacturing.
- b. Vendor is required to submit all the relevant documents mentioned in clause 6.1 along with the offer. Same will be evaluated by the VSSC empowered evaluation committee. **Failing the same may lead to rejection of offer.**
- c. Documents submitted by the vendor will be evaluated. If needed vendor shall submit additional documents including the documentary proof of technical competence, details of similar activities performed and financial capability. **Offer submitted by the vendors who are not ready to fulfill this requirement WILL NOT be considered.**

- d. If required, Vendor shall be prepared to give a presentation to the VSSC empowered evaluation committee as per the schedule and guidelines given by VSSC. Offer submitted by the vendors who are not ready to fulfill this requirement WILL NOT be considered.
- e. The vendor is free to propose different options for meeting the requirements and can submit quotes for different options, by bringing out the positive aspect of the alternative option. However, all the requirements listed in the technical document need to be met with proper design.
- f. If required, vendor shall facilitate for a free demonstration of the capabilities of the already refurbished UTMs for assessing the performance. Offer submitted by the vendors who are not ready to fulfill this requirement WILL NOT be considered.
- g. If required, Vendor shall demonstrate material testing on samples supplied by VSSC at free of cost on the UTMs refurbished / manufactured by the vendor. Offer submitted by the vendors who are not ready to fulfill this requirement WILL NOT be considered.
- h. Vendor shall provide all the necessary clarifications/details sought by the above Committee during any phase of evaluation.
- i. AMC for minimum 5years post warranty period needs to be given by the vendor.
- j. Amount for the UTM refurbishment and Non comprehensive AMC charges together will be considered for selection of lowest offer.

8.0 Minor Modifications after placement of Order

Minor modifications, which are necessary to be incorporated – for better performance/ safe operation shall be implemented by the vendor, at no extra cost. Items not explicitly mentioned but demanded for the performance need to be supplied, realized.

ANNEXURE – 1. C: COMPLIANCE MATRIX

Sample format for compliance statement

(Vendor need to prepare similar format & fill the necessary details. Each page shall be verified by the responsible personnel with sign and stamp)

INTRUCTIONS TO VENDOR

1. Vendor shall submit the specifications-cum-compliance statement in the format as given below with clear remarks.
2. Complied / partially complied or/ Not-complied status against each specification or requirements shall be clearly stated. Associated remarks need to be given wherever required.
3. Any additional information, better features, reasons for deviations shall be provided separately as Annexure.
4. **If any specification or requirement is kept blank in “Complied / Partially Complied / Not-complied” column, it shall be treated as non-compliance to Purchaser’s specification and in such case, offer may NOT be considered.**
5. **If the vendor provides ‘Complied’ status to a specification(s) OR Condition(s) and later if the same is found ‘Non-complied’ OR ‘Partially complied’ the offer will NOT be considered.**
6. **Any deviation or disagreement must be brought out clearly**

SL NO	Specification / Requirement / condition	Fully Complied/Partially Complied Not Complied	Specification / Features / conditions not comply with (In case of Partially complied)	Remarks (If Any)
1	Vendor need to mandatory make the site visit to understand the existing UTM features and refurbishment requirements.			
2	<p>Vendor need to Prepare & submit a procedure for refurbishment with the following details</p> <ol style="list-style-type: none"> 1. Activities to be executed. 2. Details of items to be replaced, modified and repaired (Make and model of the items to be furnished). 3. Tentative schedule for accomplishing the task. 4. Commercial terms and conditions. 5. Support requirement from VSSC. <p><i>[Point nos. 1 to 5 shall be addressed separately]</i></p>			
3	<p>Annexure 1-A Clause 2.1: Drive and Control unit: All points (A to I) mentioned in this clause to be addressed separately.</p>			
4	<p>Annexure 1-A Clause 2.2: Load cell All points (Sl. no 1 to 12) mentioned in this clause to be addressed separately.</p>			

5	<p>Annexure 1-A Clause 2.3: Data Acquisition Modules</p> <p>All points (A to E in sub clause 2.3.1 and A to C in sub clause 2.3.2) mentioned in this clause to be addressed separately.</p>			
6	<p>Annexure 1-A Clause 2.4: Software</p> <p>All points (Sl. no A to J in sub clause 2.4.1, Sl. no A to C in sub clause 2.4.2, Sl. no A to E in sub clause 2.4.3 & Sl. no A to D in sub clause 2.4.4) mentioned in this clause to be addressed separately.</p>			
7	<p>Annexure 1-A Clause 2.5: Computer</p> <p>All points (Sl. no A to J) mentioned in this clause to be addressed separately.</p>			
8	<p>Vendor shall make a pre-dispatch visit to the work site and identify the logistic requirements at least one month prior to the commencement of installation.</p>			
9	<p>Vendor shall undertake the full responsibility for: the dispatch and unloading of the components at the site in VSSC, and successful installation, commissioning at the site provided by VSSC.</p>			
10	<p>Vendor needs to perform one-time calibration as per the requirements mentioned in Annexure-1B clause 1.2</p>			

11	Refurbished UTM shall be tested for all applicable criteria mentioned in Specification & Conditions. A procedure including check list for testing and acceptance to be prepared and submitted prior to installation for review and approval by VSSC.			
12	The vendor shall impart detailed training to the team of VSSC officials (6 persons) for the operation of the system as per the requirements mentioned in Annexure-1B Clause 2.0.			
13	The equipment shall be fully guaranteed for performance for 24 months from the date of commissioning and acceptance as per the requirements mentioned in Annexure-1B Clause 3.0.			
14	Vendor shall be willing to enter into Non comprehensive AMC as per the requirements mentioned in Annexure-1B Clause 4.0.			
15	The Techno-commercial bid shall contain all the details mentioned in Annexure-1B Clause 5.1, Points A to N.			
16	The Price bid shall contain all the details mentioned in Annexure-1B Clause 5.2, Points A to F.			
17	Vendor shall submit all the documents mentioned in Annexure-1B Clause 6.0 (Sub clause 6.1 Points A to J, Sub clause 6.2 Points A to D, Sub clause 6.3 Points A to F).			

18	Minor modifications, which are necessary to be incorporated – for better performance/ safe operation shall be implemented by the vendor, at no extra cost. Items not explicitly mentioned but demanded for the performance need to be supplied, realized.			
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