

SPECIFICATION FOR
COMPUTER CONTROLLED UNIVERSAL TESTING M/C

Indent No. C/4200/7/2631 T

Date: July 6, 2007

Qualifying Criteria

Only those vendors who have supplied and commissioned at least one Computer Controlled Universal Testing M/C of same (600 KN) or higher capacity in the past 10 years in India, and, referred machine is presently working satisfactorily for more than one year after commissioning (on the date of opening of tender) should quote. However, if referred machine(s) has been supplied to BHEL then the m/c should be presently working satisfactorily for more than 6 months after commissioning & acceptance (on the date of opening of tender) in BHEL can also quote.

The following information should be submitted by the vendor about companies where similar equipment have been supplied. This is required from all vendors for qualification of their offer:

- i.) Name of customers/ companies where referred machine is installed
- ii.) Complete postal address of the customers, name & designation of the contact persons of customers with their phone/FAX and e-mail address
- iii.) Month and year of commissioning
- iv.) Type of products tested by the customer
- v.) Parameters of the m/c's supplied, i.e. capacity, type of extensometer with details regarding accuracy, gauge length etc.
- vi.) Performance certificate from the customers regarding satisfactory performance of the m/c supplied to them (original certificate) or through e-mail directly from the customer of the vendor.
- vii.) BHEL reserves the right to verify the information submitted by the vendor. In case the information is found to be false or incorrect the offer shall be rejected.

Technical Specification

1. The Universal Testing Machine (UTM) shall have a capacity of 600 KN (single range), and, be used for carrying out tensile i.e. 0.2% Proof Stress and Ultimate Tensile Strength, tests on metallic materials.
2. Only the latest model (including electronics & software) in the manufacturers' range of supply which fulfils the capacity criteria should be offered. Documentary evidence in this regard is needed along with the offer.
3. The UTM shall be capable of carrying out these tests as per ASTM A-370, ASTM E-8M, IS 1608, DIN 50120, DIN 50121, DIN 50145 (latest revisions in all cases)
4. The load accuracy of the UTM should be at least $\pm 0.5\%$ from 2 KN to 600 KN and meet the complete requirement of ISO 7500 Grade 0.5. Vendor to give the actual values for the m/c offered, over the total load range.
5. The UTM shall be of the floor standing type, and not require any foundation.
6. The metals to be tested shall range from soft copper to high tensile high alloy steels having 0.2% Proof Stress of the order of 1400 N/mm^2 . For accurate testing of these high strength samples, the UTM shall be highly rigid with a stiffness of less than 1 at Fmax. The UTM may be of the hydraulic (but, without chain-sprocket drive) or screw driven type as long as it meets or exceeds the rigidity criteria. Screw driven machines should have brushless three phase drive systems and low friction ball screws with digitally controlled gear-less drive system.

7. The UTM shall be equipped with suitable grips for testing round as well as flat samples..The dimensions of the specimens to be tested are :

- a. Flat : From 5 to 40 mm in thickness, and, up to 40mm in width
- b. Round: From 6 mm to 40 mm in dia.

Vendor to confirm.

8. The vertical opening (without grips) should be at least 1600 mm, and, the horizontal opening, at least 700 mm.

9. The vendor shall quote for suitable grips/ liners/ wedges for testing the total dimensional range (Cl.7) and material range (Cl.6).

- a. The grips shall be such as to be able to test the highest strength material without any slippage, and, the vendor has to confirm that such testing will be possible for a minimum of 1000 high strength samples (as per Cl.6), before any necessity of replacing grips should arise.
- b. It will be preferable to have collet type grips for shouldered type round specimens (as per IS 1608, Fig.11/DIN 50125 Type B or C/ ASTM E-8M Fig.4). If these are available, vendor should quote for these type of grips for round samples having 5-12 mm dia. in the parallel portion. For higher diameters, suitable wedge action grips may be quoted.
- c. The grips may be of the hydraulic or pneumatic type (if the UTM offered is of hydraulic type, the grips should be of hydraulic type also), but, in both cases the necessary power packs/ compressor will have to be supplied. External pneumatic line is not available in the laboratory.
- d. The lengths of the samples from which the specimens are to be made for testing will be between 200-250 mm. Vendor to confirm that the grips are such that specimens made from such samples can be tested for 0.2% Proof Stress in the UTM offered . Extra long samples should not be necessary.

10. The UTM shall be of electronic type with total computer control of operation, data acquisition and analysis. The digital electronics should be state of art and provide high accuracy and fast response. Single range digital conditioners should be used to provide high resolution throughout the entire measurement range, eliminating range change transients. The controller should also automatically recognize and calibrate the transducers used in the equipment. A remote control, if available should be quoted.

11. It should be possible to set the strain rate, stress rate & cross-head separation rate of the m/c within the values given below to conform to the requirements of ASTM A-370 & IS 1608 are:

- i.) For determination of the lower yield point the straining rate shall be variable between 0.0025/sec to 0.00025/sec, and, the stressing rate shall be variable between 2-30 N/mm²
- ii.) For determining the Proof Stress the rate of straining shall be less than 0.0025/sec.
- iii.) In the plastic range the rate of straining shall be less than 0.008/sec.
- iv.) After 0.5 of Yield Point, the free running separation of the crossheads shall be less than 1.6 mm/min./min. of the reduced section.
- v.) For determination of the ultimate tensile strength the free running separation of the crossheads shall be less than 12.5 mm/min./min. of the reduced section.

Vendor to confirm.

12. The software should be user friendly and Windows compatible to enable transfer of data. It should be possible to run the s/w on any PC without the need of installing slave cards. Subsequent to the feeding of the relevant sample dimensions (with the s/w calculating the areas of round, flat, tubular specimens or their segments) , the stress/strain rate and the elasticity modulus range, the UTM will perform the complete test, display out the stress-strain curve in real time ,and, along with sample and dimensional details, display the value of 0.2% Proof Stress & Load, Upper-Lower / Yield Strength & Load and Ultimate Tensile Strength & Load, E- Modulus etc. It shall be possible to print out this total data in form of a free styling report along with graph.

13. The machine should have necessary software and hardware for interfacing with gigabit Ethernet Local Area Network with 100 MB/sec. through UTP cables for data transfer. The network is to be connected to the Wide Area Network/ Internet. The network should have the following capabilities:
 - a. The m/c shall appear as a node in the Entire Network (Network Neighborhood)
 - b. The data transfer shall be through simple copy and paste method provided sharing access is allowed between any PC and the machine across the network.
14. Fully automatic electronic extensometer with automatic motorized clamping/unclamping of sensor arms (which shall remain on the specimen up to break), along with necessary cards/cables/drive unit etc. for determining the 0.2% Proof Stress is also to be quoted. The extensometer shall be of the adjustable gauge length type with gauge length variable between 30 to 100 mm, travel of at least 75 mm with a resolution of at least 0.5 microns and capable of accommodating the total sample dimensions given above. The extensometer shall be of at least Class B1 of ASTM E-83 or Grade 1 of EN ISO 9513. The extensometer shall be such as to be able to accommodate the total range of sample sizes mentioned in Cl..7.
15. Along with the UTM the vendor shall provide a suitable branded PC (preferably of Indian make) along with a Dot Matrix / Laser Printer. The minimum configuration of the PC shall be:
 - a. CPU: Intel Pentium of at least 3 GHZ
 - b. Hard Disk: 80 GB
 - c. CD / DVD Read/ Write
 - d. Monitor: TFT
 - e. Operating System: Windows XP with Office Professional 2007 (with original CDs)
 - f. Printer DMP or Laser **not Inkjet**
16. In the offer for the main equipment, the vendor shall detail the spares and consumables that are within the standard scope of supply and also quote for
 - a. UPS (of Indian origin) for the total equipment and accessories
 - b. Spares & Consumables (including hydraulic oil & greases) needed for the smooth running of the complete system for a minimum of 5 years.
 - c. Any other software available for room temperature tests
 - d. Consumables for printer

17. **General Terms & Conditions**

1. The UTM should be rugged, of proven design and construction, and, have an operational life of at least 20 years. This is to be guaranteed.
2. Software upgrades shall be provided by the vendor, free of cost for 10 yrs. Vendor to confirm.
3. The equipment shall be erected and commissioned in our laboratory by the engineers of the vendor who shall also train our operators in the operation and maintenance of the system for a minimum period of 3 days.
4. The UTM & extensometer subsequent to commissioning shall be calibrated at site and the vendor shall demonstrate capability to meet all the requirements of this specification & his offer.
5. Along with the offer the vendor shall provide the total dimensional and weight details of the main equipment and all its accessories i.e. hydraulic/ pneumatic unit.
6. The vendor shall provide along with the equipment 3 copies of complete O& M manual with complete circuit diagram of the main equipment and its accessories. Additionally, he shall also provide along with the original CD, an additional copy of the total programme, which can be executed in case the original is corrupted.

7. The UTM shall be guaranteed for satisfactory performance for a period of 24 months from the date of commissioning. Any spares required during this period shall have to be arranged by the vendor, and, breakdown durations of more than 7 days shall be added to the guarantee period.
8. The equipment shall work directly from either a 220 V, 1Ø or a 440 V, 3 Ø, 50Hz AC supply without the need of an intermediate transformer. The operating temperature is expected to vary between 10° C to 35° C over the course of the year.
9. The vendor should have a strong service network in India, especially in the northern region of the country. The detailed addresses of this network with the names, qualifications and experience of maintenance personnel are to be provided along with the offer.
10. Along with the offer, the vendor shall also provide a list of customers where similar equipment have been supplied. This list should include the model of UTM, capacity, year of supply, name & address/ phone no. / e-mail address of the contact person.
11. The initial offer as well as subsequent clarifications should be from the OEM only. All the points given above should be individually addressed and all supporting documents provided at the first instance to avoid repeated queries. It shall be preferable if an exhaustive technical presentation is made available in a CD for better understanding of the features.