



TECHNICAL SPECIFICATION OF DIGITAL TEST
EQUIPMENT FOR EMRP

Specification No.: EMRP-TS-
EM-E001, Rev.0
Dt. 24.09.12

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| TOTAL NO. OF SHEETS (INCLUDING COVER SHEET) | | = 11 |

IT IS CONFIRMED THAT OUR TECHNICAL OFFER COMPLIES WITH THE SPECIFICATION IN TOTO, &
THAT THERE ARE NO TECHNICAL DEVIATIONS AS SUCH & TECHNICAL DEVIATIONS (IF ANY) ARE
ENCLOSED SEPARATELY ALONG WITH OFFER.

BIDDER'S STAMP & SIGNATURE



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**SECTION – 'A'
SCOPE OF SUPPLY**

1. Bidder's scope covers the design, manufacture, inspection and testing at manufacturer's works, proper packing, delivery & installation & commissioning to EMRP, Mumbai of 1 set of DIGITAL TAN DELTA TEST EQUIPMENT (reputed make subject to BHEL approval) as mentioned in different sections of this technical specification and demonstration of equipment at EMRP, Mumbai.
2. This equipment is meant to be used at Test bed in testing area of BHEL-EMRP, Mumbai.
3. It is not the intent to specify herein all the details of design & manufacture. However, the equipment shall conform in all respects to high standards of design, engineering and workmanship and shall be capable of performing in continuous commercial operation up to bidder's guarantee.
4. Only those bidders should quote, who have supplied and commissioned at least one number of equipment having same or better specification for similar application within last three years and which is presently working satisfactorily. Bidder to inform year of commissioning(copy of PO & commissioning report to be submitted along with offer)
5. The bidders shall be responsible for and governed by all requirements stipulated hereinafter.
6. Requirements of the specification including the QAP shall be agreed upon for total compliance by bidders without any deviations. Price offers of only those bidders complying with this requirement shall be acceptable.
7. The documents shall be in English language and MKS system of units.
8. Bidder may quote as many items as in his range of manufacturing/supply. In case of sufficient offer not received within approved make, BHEL may accept other reputed make based on following criteria:
 - A. The proven performance in similar application (Documentary evidence is to be given).
 - B. Already supplied to BHEL for similar application (PO copy to be attached).
9. Bidder must furnish point wise compliance to technical specification and any deviation must be specifically listed as technical deviations. BHEL reserves the right to accept any deviation based on requirement.
10. The equipment shall conform to IEC rules 1956 and statutory requirements pertaining to safety, earthing and other essential provisions specified for installation & operation of electrical plant & equipment.



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SECTION – 'B'
PROJECT INFORMATION

Site conditions:

- | | |
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| 1. Project site | : BHEL-EMRP, Mumbai |
| 2. Altitude | : 10 meters |
| 3. Design ambient air temperature (Max.) | : 50 Deg C |
| 4. Design ambient air temperature (Min.) | : 8 Deg C |
| 5. Relative humidity (Max.) | : 87% |
| 6. Relative humidity (Max.) | : 60% |
| 7. Relative humidity (for design) | : 100% |
| 8. Location | : Indoor |

Note: Maximum temperature & maximum relative humidity do not occur simultaneously.

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**SECTION – ‘C’
SPECIFIC TECHNICAL REQUIREMENTS**

1.0 SCOPE:

Automated PC based digital Tan Delta Test Equipment along with compatible laptop mentioned in this section along with all essential accessories required for the successful operation of the equipment.

- 1.1 The bill of quantities shall be as per **ANNEXURE - 1** enclosed as “BILL OF QUANTITY/ PRICE SCHEDULE”.

2.0 CODES AND STANDARDS

Some of the standards, which shall generally be followed, are listed below. Other applicable Indian standards for any component part, even if not covered in listed standards shall be followed:

IEC 61010, CE Mark, General IEC 61326-1, IEC61000-4-X, 61000-3-X, EN 55011, ANSI/IEEE C37.90, any other relevant National/ International standards.

3.0 DESIGN CRITERIA:

- 3.1 Tan delta test Equipment shall be used for testing of various electrical motors, coils/bars at EMRP.
- 3.2 The Equipment will be kept in a clean but hot, humid and tropical atmosphere when not in use. Equipment will be placed in dust laden, hot, humid atmosphere during its use.
- 3.3 For continuous operation at specified rating, temperature rise of various equipment/ components shall be limited to the permissible value stipulated in the relevant standards and this specification.

4.0 SPECIFIC REQUIREMENTS & RATINGS:

- 4.1 The Bidder may note that the equipment range, rating, quantities as detailed herein, are the minimum requirement only. The equipment shall be furnished in strict accordance with the same. All accessories for the equipment not covered here, if necessary for satisfactory and trouble free operation of the equipment, shall be quoted by the Bidder.
- 4.2 Equipment shall be complete with applicable accessories like power supply main leads (2 sets), earth leads, etc.
- 4.3 The instrument shall be suitable for satisfactory operation at an ambient temp. from 0°C to 50°C.

4.4 DIGITAL TAN DELTA TEST EQUIPMENT

The digital tan delta test equipment shall be capable of determining impedance and dielectric losses (C,L,DF TAN δ , PF COS ϕ , QF ETC) of high-voltage equipment and liquid or solid insulation (on products like VFD motors, transformers, coils/bars etc. which are regularly tested at BHEL EMRP, Mumbai Plant). The supplier may visit BHEL EMRP, Mumbai Plant for detailed interactions, if required.



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The equipment construction shall permit field operation as well as factory operation. The equipment shall conform to the following specifications:

- The user interface shall be based on windows and TFT display.
- The software functionality shall include but not limited to :
 - Automatic test object temperature correction,
 - Programmable test sequences with pass/ fail limits,
 - Graphical results presentation, trending etc.
- Standard interface like Ethernet, USB.
- Measurement setting, test data saving in XML format.
- Record following values but not limited to:
 - Capacitance and Inductance
 - Dissipation Factor $\tan \delta$ 1 and Power Factor $\cos \phi$ 1
 - Quality Factor
 - Equivalent series/parallel Impedances
 - Power respectively Losses
 - Current and Voltage
 - Frequency
 - Temp. Correction Factor
 - Test Connection Mode and all Settings
- Signal analysis capabilities like Spectrum Analyser, Digital Scope and Data Logger.
- Advanced interference suppression to ensure accurate measurement at local power-line frequency.
- The Kit Should have solid state protection against HV Surges, Over Current & Specimen failure grounding Interlock to ensure proper grounding of the kit and also should have Hand held HV ON interlock safety Switch for dual hand operation to ensure safety of user.

The minimum accuracies shall be as per following table. Vendor may indicate in his compliance statement if the offered parameters are better.

| Sl. | Description | Range | Resolution | Minimum Accuracy | Remark |
|-----|--|---|-------------------|---|--------|
| 1. | Dissipation Factor ($\tan \delta$)1 ✓ | 0-100 (0-10000%) | 0.0001 (0.01%) | ± 0.5 % rdg ± 0.0001 (± 0.5 % rdg ± 0.01 %) | |
| 2. | Power Factor ($\cos \phi$)1 ✓ | 0-1 (0-100%) | 0.0001 (0.01) | ± 0.5 % rdg ± 0.0001 (± 0.5 % rdg ± 0.01 %) | |
| 3. | Quality Factor 1 ✓ | 0.01-10000 | 0.0001 | ± 0.5 % rdg ± 0.0001 | |
| 4. | Capacitance 2 ✓ | 0.1 pF | 0.01pF | ± 0.05 % rdg ± 0.3 pF | |
| 5. | Inductance 2 ✓ | 0-1500kH | 0.1mH | ± 0.1 % rdg ± 0.3 mH | |
| 6. | Test Voltage | Up to 20KV | 1 V | ± 0.3 % rdg ± 1 V | |
| 7. | Test Current INPUT A & INPUT B ✓ | 20 μ A-15 A | 0.1 μ A | ± 0.3 % rdg ± 1 μ A | |
| 8. | Test current INPUT Cn external ✓ | 20 μ A- 300mA | 0.1 μ A | ± 0.3 % rdg ± 1 μ A | |
| 9. | Internal Cn (Standard Capacitor) | 15 KV, 100pF, $\tan \delta$ 0.00002, Capacitance constancy <0.01%/yr, Temp. co-efficient <0.01%/K | | | |

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|-----|-----------------------|--|----------|--------------------|--|
| 10. | Test Frequency | 15 - 1000 Hz for Bridge 15-400 for Complete System | 0.01Hz | ±0.1 % rdg ±1 Hz | |
| 11. | Apparent Power S | 0.1 MVA for Bridge ≤ 4000VA for Complete System | 0.1 mVA | ±0.8 % rdg ±1 mVA | |
| 12. | Real Power P | 0.1 MW for Bridge ≤ 1100W for Complete System | 0.1 mW | ±0.8 % rdg ±1 mW | |
| 13. | Reactive Power Q | 0.1 MVAR for Bridge ≤ 4000VAR for Complete System | 0.1 mVAR | ±0.8 % rdg ±1 mVAR | |
| 14. | Operating Temperature | -10°C to 50°C | | | |
| 15. | Storage Temperature | -20°C to 70°C | | | |
| 16. | Humidity | 5- 95% r.h. | | | |
| 17. | Protection classes | IP54 | | | |
| 18. | Standards | IEC 61010, CE Mark, General IEC 61326-1, IEC61000-4-X, 61000-3-X, EN 55011, ANSI/IEEE C37.90 | | | |
| 19. | Safety specification | VDE 0411/part 1a, IEC/EN 61010-1:2002 | | | |
| 20. | Supply | 115V AC/230 V AC Selectable, 250 VA, 50/60 Hz, PFC | | | |
| 21. | Measuring time | 0.3 sec/ measurement @ averaging =1 | | | |
| 22. | Minimum interfaces | Ethernet 4, RS232, 4, USB, Firewire, Mouse (PS2), Keyboard (PS2) | | | |
| 23. | Minimum data formats | XML, CSV | | | |

Note:

1. Functional / operational demonstration of equipment & training of EMRP personnel at BHEL-EMRP shall be in bidder's scope.
2. The Tan delta test equipment shall be suitable for testing **upto 20kV**. In case the main testing is not capable upto 20kV, separate HV supply unit of 20KV, 1 Amps with Standard Capacitor of 20KV, 100pF may be provided but the system must be integrated as single unit and the operating software must support the external HV set.

5.0 DOCUMENT/DRAWING/DATA & MANUAL SUBMISSION:

- 5.1 To be submitted with the bid:
 - a) Point wise technical compliance sheet.
 - b) General technical particulars
 - c) General arrangement drawing showing constructional features, accessories, connections, range and rating, mounting arrangement, space requirement etc.
 - d) Technical leaflets/ Catalogues on following
 - i) Testing of equipment
 - i) Instruments
 - ii) Misc. Equipment



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- e) Test Reports with calibration curve on Testing Equipment.
- f) Copy of commissioning report for supply of same equipment for similar application.

The Bidder may note that the drawing, data and manual listed herein are minimum requirement only. The Bidder shall ensure that the other necessary write-ups, curves and information required to fully describe the equipment are submitted with the bid.

- 5.2 To be submitted after award of contract for BHEL approval:

- a) General arrangement drawing showing constructional features, accessories, connections, range and rating, mounting arrangement, space requirement etc.
 - b) Detail instructions for application, assembly & testing of equipment.
 - c) Wiring and schematic diagrams.
 - d) Tests Reports and calibration curve.
 - e) Guaranteed Technical Parameters.
 - f) Guarantee certificate
 - g) Technical Catalogues & leaflets.
 - h) Instruction manual of equipment
 - i) Operation & Maintenance manual
 - j) Calibration certificate of Capacitance & Tan delta measurement system & its options issued by valid accredited (ISO 17025) calibration agency, covering minimum & maximum points all parameters shall be supplied along with the system.
- Technical documentation such as Technical particulars, GA sectional drawings, Technical leaflets, Catalogues etc. are required to be submitted within 2 weeks of LOI by the successful bidder for BHEL approval.
- Initially 2 sets of above doc. shall be submitted by bidder for BHEL review/comments/ approval, minimum 8 sets (along with soft copy of all docs. in 2 sets of CDs) of BHEL approved documents shall be submitted by bidder after finalization.
- Final payment is subject to furnishing the complete documentation in required volumes in required no. of sets.

- 5.3 **Instruction manual of equipment**

The manual shall clearly indicate in English the installation and connection method, check list of the tests to be carried out before commissioning of equipment. Maintenance and Calibration method shall also be provided in the manual.

- 5.4 Bidder to furnish all user instruction manuals, maintenance, handling, installation manuals & all test reports complete in all respect in bound volumes & soft copies to BHEL at the time of handing over the same to BHEL.

- 6.0 **DELIVERY:**

The delivery of Equipment shall be completed as per NIT (Notice Inviting Tender)

- 7.0 Bidder shall furnish unit rate for item in the "Annexure-1: BILL OF QUANTITY/ PRICE SCHEDULE FORMAT".

- 8.0 The equipment components shall be procured from reputed manufacturers and make of equipment shall be subject to the approval of BHEL.

- 9.0 The modality of approval of technical documentation & priority of supply shall be mutually discussed & agreed upon with successful bidder after placement of LOI/PO.

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10.0 Demonstration & Handing over to BHEL

The bidder shall be responsible for demonstration of the supplied equipment & training of personnel at site to BHEL and ensure handing over the same to the satisfaction of BHEL. The lump sum charges for the same shall be indicated in the price schedule separately.

11.0 Performance Guarantee

The bidder shall guarantee that the equipment offered shall meet the requirement as stipulated in this specification and as confirmed by them in Guaranteed Technical Particulars Sheet. In case the performance of equipment is not as per performance guarantee, the bidder will have to replace the equipment at site free of cost.

The equipment should be guaranteed in respect of design, material, construction operation & against any manufacturing defects for a period of 24 months from the date of supply or 18 months from the date of commissioning, whichever is later & 4 copies of guarantee certificate are to be furnished. After sales services are to be provided free of cost during guarantee period.

SECTION – ‘D’ INSPECTION & TESTING

1. On award of order, bidder shall submit manufacturing/testing QAP for BHEL approval.
2. Testing & inspection of equipment shall be done as per BHEL approved QAP, without any cost implications to BHEL.
3. Equipment offered shall be duly tested at national/ government approved laboratories as per latest relevant Indian/ international standards.
4. Bidder to furnish type test report for BHEL approval, in case type test is to be conducted; bidder shall perform it without levying any cost to BHEL.
5. Type test & internal test certificates shall be provided before inspection.
6. BHEL Quality assurance plan is enclosed as Annexure –2 for reference. Bidder shall submit the test & inspection procedure along with QAP within 1 week from receipt of order.
7. All acceptance and routine tests as per relevant standards and specification shall be carried out by the manufacturer as per approved QAP. Charges for all these routine and acceptance tests for all the material shall be deemed to be included in the bid price.
8. Equipment shall be completely assembled, wired, adjusted and tested in factory as per the latest edition of relevant standards.
9. Bidder shall follow his standard procedure for quality control. However the said procedure/ quality checks shall be submitted for EMRP approval.
10. Following tests shall be performed by the bidder:

| Sl. No. | Name of Test | Inspection type Type/Routine | Test Method | Remarks |
|---------|----------------------|------------------------------|---|---------|
| 1 | Visual Inspection | B | Check for overall dimensions, general arrangements, Painting, rating, make etc. | |
| 2 | Degree of protection | A | Check for degree of protection | |
| 3 | Routine test | B | | |

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- A- Manufacturer's test certificates would be furnished.
B- Test to be conducted in presence of BHEL representative.

ANNEXURE – 1

BILL OF QUANTITY/ PRICE SCHEDULE FORMAT

| <u>Sl. No.</u> | <u>Description</u> | <u>Qty.</u> | <u>Unit price</u> | <u>Total price</u> | <u>Remarks</u> |
|-----------------------|---|--------------------|--------------------------|---------------------------|-----------------------|
| 1 A. | <u>Supply , installation & commissioning of Digital tan delta test equipment</u> This shall include all necessary hardware/cable/accessories/components & laptop to make the system complete as per specification (Including proper packing & transportation to EMRP, Mumbai). The bidder to furnish detailed BOM in their technical offer. | 1 set | | | |
| 1 B. | Functional/ operational demonstration of the Digital tan delta test equipment & Training of EMRP personnel at BHEL-EMRP, Mumbai | 1 visit | | | |



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