

TECHNICAL
SPECIFICATION

**TSGENCO
4 X 270 MW BHADRADRI TPS**

VOLUME II B

**TECHNICAL SPECIFICATION
FOR
ELECTRICAL LAB EQUIPMENT (METERING & TESTING)**

SPECIFICATION NO. : PE-TS-411-556-E003, REV. 04



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR PROJECT ENGINEERING MANAGEMENT
NOIDA, 201301**

666072/2022/PS-PEM-EL



**4X270 MW BHADRADRI TPP
TECHNICAL SPECIFICATION FOR
ELECTRICAL LAB EQUIPMENT (METERING & TESTING)**

Doc. No. PE-TS-411-556-E003

Volume

Section

IIB

Rev. : 04 DATE-25.01.2022

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TOTAL NO. OF SHEETS=
(INCLUDING COVER/ SEPARATOR SHEETS)

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COMPLIANCE CERTIFICATE

The bidder shall confirm compliance to the following by signing/ stamping this compliance certificate and furnishing same with the offer.

1. The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusion/ deviation with regard to same.
2. There are no deviation with respect to specification other than those furnished in the 'schedule of deviations'
3. Only those technical submittals which are specifically asked for in NIT to be submitted at tender stage shall be considered as part of offer. Any other submission, even if made, shall not be considered as part of offer.
4. Any comments/ clarifications on technical/ inspection requirements furnished as part of bidder's covering letter shall not be considered by BHEL, and bidder's offer shall be construed to be in conformance with the specification.
5. Any changes made by the bidder in the price schedule with respect to the description/ quantities from those given in Annexure-A [BOQ-Cum-Price schedule] of the specification shall not be considered (i.e., technical description & quantities as per specification shall prevail).
6. All essential accessories for each electrical laboratory equipment required for testing various electrical equipment /devices during Commissioning, Operation and Maintenance of power plant to be ensured by bidder in their offer.

 BIDDER'S STAMP & SIGNATURE

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	SPECIFIC TECHNICAL REQUIREMENTS		Section I
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1.0 SCOPE


- 1.1 Design, manufacture, inspection and testing at manufacturer's work, proper packing and delivery to site of Electrical Laboratory Equipment as mentioned in different sections of this specification.
- 1.2 General technical requirements of the Electrical Laboratory Equipment are indicated in Section – II. Project specific technical requirements/changes are listed in section-I.
- 1.3 Electrical Laboratory Equipment shall be supplied along with all essential accessories required for the successful operation of the equipment.
- 1.4 Detailed technical parameters of Electrical laboratory equipment are listed in Annexure – I of Section-I.
- 1.5 The requirement of section-1 shall prevail and govern in case of conflict between the corresponding requirements of Section-I and section-II.

2.0 BILL OF QUANTITIES

- 2.1 Quantity requirement shall be as per 'BOQ cum price schedule' enclosed in NIT.
- 2.2 Supplier to also give the following undertaking in the BOM: "The BoM provided herewith completes the scope (in content and intent) of material supply under PO No. -----, dated -----. Any additional material which may become necessary for the intended application of the supplied item(s)/package will be supplied free of cost in most reasonable time."

3.0 SPECIFIC TECHNICAL REQUIREMENT

S.No.	Reference Clause No. of Section-II (if any)	Specific Requirement/Change
1	Cl. No. 1.9	In addition to the clause 1.9 of section-II, Bidder to note that "During contract stage , if it is found that the offered model is not meeting the specification requirement , bidder shall offer higher model of same make meeting specification requirement without any techno commercial implication to BHEL"
2	Cl. no 4.1	Shall be read as "BHEL/BHEL's customer shall witness the testing of equipment. Vendor to furnish test report/calibration certificate to BHEL for review/ acceptance. "

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1. Insulation Tester(Megger) 5 KV : 2 Nos


Make:	MEGGER, OMICRON, DOBLE, ISA OR EQUIVALENT
Purpose:	For Checking the Insulation level, Polarization index, Di-electric absorption ratio, Step Voltage, di-electric discharge, of HV/EHV Electrical equipment in Switchyard.
Test Voltages:	5 KV DC either continuously or variable in steps of 500/1000/2500/5000 V
Display:	Digital Display
Display information:	Resistance, Voltage, Leakage current.
Mega Ohm Range:	1 TΩ or More
Noise Rejection:	4 mA and software filtering.
Charge Current:	5 mA.
Accuracy :	± 5 %.
Safety Standards:	IEC 61010-1, IEC 60364
EMI/EMC Standards:	IEC 61326-1
Ingress Protection:	IP 54
Interface:	RS 232/USB
Data Storage:	Yes
Power Supply:	240 V, 1 Phase, AC and Rechargeable DC Battery of 4Hrs continuous capacity.
Accessories:	15 M length Test leads set with insulated clips, RS 232/USB cable, Carrying case, software, Instruction manual, Test/Calibration certificates.

2. LV Insulation Tester (Megger) 500V : 10 No

Make:	MEGGER, OMICRON, DOBLE, ISA OR EQUIVALENT
Purpose:	For Checking the Insulation level, Polarization index of LV Electrical equipment
Test Voltages:	500 V DC variable in steps of 250/500V
Display:	LCD 3 ½ Digit and/or Analogue.
Mega Ohm Range:	500 MΩ
Accuracy :	± 3%.
Safety Standards:	As per IEC
EMC Standards:	IEC
Power Supply:	Battery operated or Hand Crank
Accessories:	Test Leads, Carrying case, Instruction manual, Test/Calibration certificates.

3. Mega Ohmmeter 10 KV : 1 No

Make:	MEGGER, OMICRON, DOBLE, ISA OR EQUIVALENT
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Purpose:	For Checking the Insulation level, Polarization index, Di-electric absorption ratio, Step Voltage, di-electric discharge, of HV/EHV Electrical equipment in Switchyard.
Test Voltages:	10 KV DC either continuously or variable in steps of 500/1000/2500/5000/10000 V
Display:	Digital/Analogue back lit Display
Display information:	Resistance, Voltage, Leakage current & Battery Status.
Mega Ohm Range:	1 TΩ or More
Noise Rejection:	4 mA and software filtering.
Charge Current:	5 mA.
Accuracy :	± 5 %.
Safety Standards:	IEC 61010-1, IEC 60364
EMI/EMC Standards:	IEC 61326-1
Ingress Protection:	IP 54
Interface:	RS 232/USB
Data Storage:	YES
Power Supply:	240 V, 1 Phase, AC and Rechargeable DC Battery
Accessories:	15 M length Test leads set with insulated clips, RS 232/USB cable, Carrying case, software, Instruction manual, Test/Calibration certificates.

4. Earth Resistance Tester : 2 Nos

Make:	MEGGER, OMICRON, DOBLE, ISA OR EQUIVALENT
Purpose:	To measure earth electrode resistance and soil resistivity in substation/switchyard having low earth values.
Power Supply	from Batteries.
Earth Test Technique:	2 Pole, 3 Pole and 4 Pole earth measurement Ac.
Earth Resistance:	0-20 /20-200/200-1000/1000-10000 Ohm.
Resolution:	0.01/0.1/1/10 Ohm.
Accuracy:	±5%.
Test Frequency:	Frequency 128 HZ
Test Current	20 mA
Maximum Output voltage	< 50 V (RMS)
Noise Rejection:	40 V
Display:	3½ Digit Alpha numeric Display
Standards:	IEC
Accessories:	Whether and dust proof case to IP 54, O& M manual, 4 GI Spikes, Hammer, 4 sets of cable on a cable winder, Crocodile clip test wire.

5. Digital Ducter Ohmmeter : 1 No

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Low resistance digital Ohmmeter (Micro-Ohmmeter)

Make:	MEGGER, OMICRON, DOBLE, ISA OR EQUIVALENT
Purpose:	For carrying out measurements in charged EHV (>400 KV)
Range:	Up to 200 Ohm available starting from 1 $\mu\Omega$.
Accuracy:	$\pm 0.2\%$ to $\pm 0.5\%$.
Current test range:	0-10 A.
Display:	Digital
Safety Standards:	IEC 61010-1
EMI/EMC Standards:	IEC 61326-1
Ingress Protection:	IP 54
Power Supply:	240 V, 1 Phase, AC
Accessories	supplied with built in charger, main leads, Test leads of 15M Length, operating manual, test/calibration certificate, mounted in a light weight portable case with clip on clamps and voltage leads for 4 wire measurement system.

6. Power Analyser : 1 No

Make:	MEGGER, OMICRON, DOBLE, ISA OR EQUIVALENT
Purpose:	for Measurement of Power in Single and three phase Circuits at the same time.
Input Voltage	up to 600 V, AC/DC
Current:	up to 2000 A 0-5 A range shall also be provided for measuring power from CT Secondary.
Frequency range:	45-55 HZ
Accuracy:	$\pm 2.5\%$
Accessories:	The instrument shall be supplied with Rugged carrying case, Probes, Manuals, warranty certificate etc.



**TECHNICAL SPECIFICATION FOR
ELECTRICAL LABORATORY
EQUIPMENT (METERING & TESTING)
EQUIPMENT**

SPECIFICATION NO. PE-TS-411-556-E003

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SECTION II

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SHEET -

SECTION-II

STANDARD TECHNICAL SPECIFICATION



TECHNICAL SPECIFICATION FOR ELECTRICAL LABORATORY (METERING & TESTING) EQUIPMENT

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1.0 TECHNICAL REQUIREMENTS

- 1.1 Basic technical requirements for Electrical Lab Equipment shall be as indicated in this section, in addition to technical requirements specified in Section-I.
- 1.2 The intent of specification is not to specify herein all the details of design and manufacture. However, the equipment shall conform in all respect to high standards of design engineering and workmanship and shall be capable of performing in continuous commercial operation up to vendors guarantee.
- 1.3 The Bidder may note that the equipment range, rating, quantities as detailed herein, are the minimum requirement only. 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.
- 1.4 The instrument shall be suitable for satisfactory operation at an ambient temperature from 0°C to 55°C.
- 1.5 The Analog instruments shall be provided with knife-edge pointer and anti – parallax mirror.
- 1.6 The Bidder to quote only 'one' make/model against each equipment best to suit specification requirement.
- 1.7 The instrument shall be suitable for hand held operation, rugged in construction and suitable for field use.
- 1.8 All the equipment components shall be procured from reputed manufacturers and make of equipment shall be subject to the approval of BHEL/ BHEL's Customer.
- 1.9 **Bidder to note that "In case any offered make / model becomes obsolete or is stopped manufacturing by manufacturer, next higher model of the same make may be considered for ordering / supply at contract stage, without any price implication. In such cases, bidder is required to furnish valid confirmation letter from OEM as proof of change of model (citing reason: obsolete technology or stopping of manufacturing with date of effect) and that the offered model is "technically equivalent or better".**

2.0 CODES AND STANDARDS

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

- i) IS – 6103 Method of test for specific resistance (resistivity) of electrical insulating fluid.
- ii) IS – 6700 Requirements of general purpose Cathode Ray Oscilloscope.
- iii) IS – 722 Specification for AC electricity meters.
- iv) IS – 8143 Specification for plugs & keys for resistance boxes.
- v) IS – 6104 Method of test for interfacial tension of oil against water.
- vi) IEC-51 Direct acting indicating analogue electrical measuring instruments and their accessories.
- vii) Any other relevant National/ International standards as mentioned in Section-II with technical specification.

3.0 DESIGN CRITERIA:

- 3.1 Electrical Laboratory Equipment shall be used for metering & testing of various electrical equipment/ devices during Commissioning, Operation and Maintenance of power plant.
- 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.



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- 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 TEST REQUIREMENTS:

- 4.1 Vendor to furnish test report to BHEL for review/ acceptance. BHEL/BHEL's customer may witness the testing of equipment.

5.0 PACKING:

All equipment shall be properly packed in Galvanized sheet steel trunk/ box with proper lock & key arrangement except for equipment which are trolley mounted or are already available in rugged steel/wooden box packing. Further, any damage (reading error/calibration error/broken parts/missing parts etc) found on receipt at site, leading to replacement of parts/whole item, shall be to bidder's account.

6.0 DEMONSTRATION TO BHEL / BHEL'S CUSTOMER

- 6.1 The vendor shall be responsible for demonstration of the supplied equipment at site, conforming the satisfactory operation.
- 6.2 The equipment for which demonstration is required at site shall be intimated by BHEL.
- 6.3 The charges for visit to site for demonstration at site shall be in-line with Annexure- I of Section-II.

7.0 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 Technical Data 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.

8.0 DRAWING DATA & MANUAL

- 8.1 To be submitted with the bid as technical offer:

- Compliance to Technical parameters of various equipment as specified in Annexure-I of Section-I in Data Sheet – B (as enclosed).
- Technical leaflets/ Catalogues/Product Manual of the Equipment

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.

- 8.2 Following documents/drawings shall be submitted after placement of order for BHEL & customer's approval:
- Technical Datasheet for each equipment
 - Technical leaflets/ Catalogues/Product Manual of the Equipment
 - Tests Reports and calibration certificate
 - General arrangement drawing showing constructional features, accessories, connections, range and rating, mounting arrangement, space requirement etc.
 - Detail instructions for application, assembly & testing of equipment.
 - Wiring and schematic diagrams (if applicable).
 - Instruction manual/ O&M manual of individual equipment

- 8.3 Instruction manual/O&M Manual of individual equipment



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(METERING & TESTING) EQUIPMENT**

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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.

- 8.4 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 / BHEL's customer at the time of handing over the same to BHEL / BHEL's Customer.
- 8.5 Bidder to note that quoted item cost shall include cost of main item, cost of all accessories required for successful operation of equipment and testing cost of all equipment test as per relevant standard.

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				Section	II
				<u>ANNEXURE-I OF SECTION – II</u> <u>DEMONSTRATION & HANDING OVER CHARGES</u>	

**SCHEDULE OF PRICES FOR DEMONSTRATION & HANDING OVER TO
BHEL / BHEL'S CUSTOMER**

SL. NO.	DETAILS	ACTIVITY	UNIT CHARGES
1	LUMP SUM ALL INCLUSIVE CHARGES PER VISIT FOR EXPERIENCED / CAPABLE ENGINEER (EXCEPT DAILY CHARGES)	1 VISIT	20000/-
2	LUMP SUM ALL INCLUSIVE CHARGES FOR EXPERIENCED / CAPABLE ENGINEER PER DAY	1 DAY	5000/-

Note:

- TOTAL CHARGES = (Charges as per S.No.1) + [No. of Days(*) x Unit Charges as per Sl. No. 2]
- Bidder to note that provision of maximum 1 visit amounting to total 4 man days is envisaged for respective bidders.

*: To be certified by BHEL site

4X270 MW BHADRADRI TPS							
TECHNICAL SPECIFICATION FOR ELECTRICAL LABORATORY EQUIPMENT							
PE-TS-411-556-E003 R04							
DATA SHEET-B (Annexure-II of Section-II)							
Item description	Whether Quoted or not (Yes/No)	Make	Model no	Country of Manufacture	EQUIPMENT & ACCESSORIES CONFIRMS TO ALL TECHNICAL REQUIREMENTS IN TOTALITY - (YES/NO)	Catalogue (attached or not)	Remarks
NOTE :-							
1) EQUIPMENT TO BE SUPPLIED ALONG WITH ESSSNTIAL ACCESSORIES FOR SUCCESSFUL OPERATION OF EQUIPMENT AT SITE .i.e. CLAMPS, CLIPS,LEADS ,CARRYING CASE etc.							
2) ALL EQUIPMENTS SHALL BE SUPPLIED WITH VALID CALIBRATION CERTIFICATE, WHEREVER APLLICABLE.							
3) All equipment shall be properly packed in Galvanized sheet steel trunk/ box with proper lock & key arrangement except for equipment which are trolley mounted or are already available in rugged steel/wooden box packing. Further, any damage (reading error/calibration error/broken parts/missing parts etc) found on receipt at site, leading to replacement of parts/whole item, shall be to bidder’s account							
1. Insulation Tester (Megger) 5 KV : 2 Nos							
Make: MEGGER, OMICRON, DOBLE, ISA OR EQUIVALENT							
Purpose: For Checking the Insulation level, Polarization index, Di-electric absorption ratio, Step Voltage, di-electric discharge, of HV/EHV Electrical equipments in Switchyard.							
Test Voltages: 5 KV DC either continuously or variable in steps of 500/1000/2500/5000 V							
Display : Digital Display							
Display information: Resistance, Voltage, Leakage current.							
Mega Ohm Range: 1 TΩ or More							
Noise Rejection: 4 mA and software filtering.							
Charge Current: 5 mA.							
Accuracy : ± 5 %.							
Safety Standards: IEC 61010-1, IEC 60364							
EMI/EMC Standards: IEC 61326-1							
Ingress Protection: IP 54							
Interface: RS 232/USB							
Data Storage: Yes							
Power Supply: 240 V, 1 Phase, AC and Rechargeable DC Battery of 4Hrs continuous capacity.							
Accessories: 15 M length Test leads set with insulated clips, RS 232/USB cable, Carrying case, software, Instruction manual, Test/Calibration certificates.							

2. LV Insulation Tester (Megger) 500V : 10 No							
Make: MEGGER, OMICRON, DOBLE, ISA OR EQUIVALENT							
Purpose: For Checking the Insulation level, Polarization index of LV Electrical equipment							
Test Voltages: 500 V DC variable in steps of 250/500V							
Display: LCD 3 ½ Digit and/or Analogue.							
Mega Ohm Range: 500 MΩ							
Accuracy : ± 3%.							
Safety Standards: As per IEC							
EMC Standards: IEC							
Power Supply: Battery operated or Hand Crank							
Accessories: Test Leads, Carrying case, Instruction manual, Test/Calibration certificates.							
3. Mega Ohmmeter 10 KV : 1 No							
Make: MEGGER, OMICRON, DOBLE, ISA OR EQUIVALENT							
Purpose: For Checking the Insulation level, Polarization index, Di-electric absorption ratio, Step Voltage, di-electric discharge , of HV/EHV Electrical equipments in Switchyard.							
Test Voltages: 10 KV DC either continuously or variable in steps of 500/1000/2500/5000/10000 V							
Display : Digital/Analogue Back lit Display							
Display information: Resistance, Voltage, Leakage current & Battery Status.							
Mega Ohm Range: 1 TΩ or More							
Noise Rejection: 4 mA and software filtering.							
Charge Current: 5 mA.							
Accuracy : ± 5 %.							
Safety Standards: IEC 61010-1,IEC 60364							
EMI/EMC Standards: IEC 61326-1							
Ingress Protection: IP 54							
Interface: RS 232/USB							
Data Storage: YES							
Power Supply: 240 V,1 Phase ,AC and Rechargeable DC Battery							
Accessories: 15 M length Test leads set with insulated clips, RS 232/USB cable, Carrying case, software, Instruction manual, Test/Calibration certificates.							
4. Earth Resistance Tester : 2 Nos							
Make: MEGGER, OMICRON, DOBLE, ISA OR EQUIVALENT							
Purpose: To measure earth electrode resistance and soil resistivity in substation/switchyard having low earth values.							
Power Supply: From Batteries.							
Earth Test Technique: 2 Pole, 3 Pole and 4 Pole earth measurement Ac.							
Earth Resistance: 0-20 /20-200/200-1000/1000-10000 Ohm.							
Resolution: 0.01/0.1/1/10 Ohm.							
Accuracy: ±5%.							
Test Frequency: Frequency 128 HZ							
Test Current 20 mA							
Maximum Output voltage < 50 V (RMS) Noise Rejection: 40 V							

Display: 3½ Digit Alpha numeric Display							
Standards: IEC							
Accessories: Whether and dust proof case to IP 54, O& M manual, 4 GI Spikes, Hammer, 4 sets of cable on a cable winder,Crocodile clip test wire.							
5. Digital ducer Ohmmeter : 1 No							
Make: MEGGER, OMICRON, DOBLE, ISA OR EQUIVALENT							
Low resistance digital Ohmmeter (Micro-Ohmmeter)							
Purpose: For carrying out measurements in charged EHV(>400 KV)							
Range: Upto 200 Ohm available starting from 1μΩ.							
Accuracy : ±0.2 % to ±0.5 %.							
Current test range : 0-10 A. Display: Digital							
Safety Standards: IEC 61010-1							
EMI/EMC Standards: IEC 61326-1							
Ingress Protection: IP 54							
Power Supply: 240 V,1 Phase ,AC							
Accessories: supplied with built in charger, main leads, Test leads of 15M Length, operating manual, test/calibration certificate, mounted in a light weight portable case with clip on clamps and voltage leads for 4 wire measurement system.							
6. Power Analyser : 1 No							
Make: MEGGER, OMICRON, DOBLE, ISA OR EQUIVALENT							
Purpose: for Measurement of Power in Single and three phase Circuits at the same time.							
Input Voltage up to 600 V, AC/DC							
Current: up to 2000 A							
0-5 A range shall also be provided for measuring power from CT Secondary							
Frequency range: 45-55 HZ							
Accuracy: ±2.5%							
Accessories: The instrument shall be supplied with Rugged carrying case, Probes, Manuals, warranty certificate etc.							