

**TSGENCO
4 X 270 MW BHADRADRI TPS**

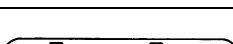
VOLUME II B

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

SPECIFICATION NO. : PE-TS-411-556-E003, REV. 02



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

	TECHNICAL SPECIFICATION FOR ELECTRICAL LAB EQUIPMENT (METERING & TESTING)	Doc. No. PE-TS-411-556-E003 R02	
		Volume	Section
		IIB	
	CONTENTS	Rev. : 00 DATE-24.05.2019	

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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		Rev. : 00 DATE-24.05.2019	

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

Quantity requirement shall be as per 'BOQ cum price schedule' enclosed in NIT.

3.0 SPECIFIC TECHNICAL REQUIREMENT

S.No.	Reference Clause No. of Section-II (if any)	Specific Requirement/Change
1	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. "

4.0 DRAWING & DOCUMENTS TO BE SUBMITTED

- 4.1 Following documents/drawings for each Electrical Laboratory Equipment shall be submitted after placement of order for BHEL & customer's approval in addition to the documents/drawings listed in clause No. 8.2 of section-II:

Sl. No.	Drawings/Document description	Drawings/Document Number
1	Technical Data Sheet	PE-Vx-411-556-E0yy
2	Catalogue	PE-Vx-411-556-E1yy

Complete Document numbers shall be provided after order placement.



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Annexure-I of SECTION-I DETAILED TECHNICAL
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1. Insulation Tester(Megger) 5 KV : 2 Nos

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. Insulation Tester (Megger) 2.5 KV : 1 No

Purpose:	For Checking the Insulation level, Polarization index of HV/MV Electrical equipment
Test Voltages:	2.5 KV DC either continuously or variable in steps of 500/1000/2500 V
Display:	Digital or Analogue Display
Display information:	Resistance, Voltage.
Mega Ohm Range:	500 GΩ or More
Accuracy :	± 5 %.
Safety Standards:	IEC 61010-1,
EMI/EMC Standards:	IEC 61326-1
Ingress Protection:	IP 54
Safety Standards:	As per IEC
Power Supply:	240 V, 1 Phase, AC and Rechargeable DC Battery.
Accessories:	Test leads set with insulated clips, Carrying case, Instruction manual, Test/Calibration certificates.

3. LV Insulation Tester (Megger) 1000V : 5 No

Purpose:	For Checking the Insulation level of LV Electrical equipment
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Test Voltages: 1000 V DC variable in steps of 500/1000 V
 Display: LCD 3 ½ Digit and/or Analogue.
 Display information: Resistance & Voltage
 Mega Ohm Range: 1000 MΩ
 Accuracy : +/-5% of Scale length
 Safety Standards: As per IEC
 EMC Standards: IEC 61326-1
 Power Supply: Hand Crank
 Accessories: Test Leads, Carrying case, Instruction manual, Test/Calibration certificates.

OR

Purpose: For Checking the Insulation level, polarization Index of LV Electrical equipment
 Test Voltages: 1000 V DC variable in steps of 500/1000 V
 Display: LCD 3 ½ Digit and/or Analogue.
 Display information: Resistance, Voltage & Battery status
 Mega Ohm Range: 1000 MΩ
 Accuracy : +/-3 %
 Safety Standards: As per IEC
 EMC Standards: IEC 61326-1
 Power Supply: Battery operated
 Accessories: Test Leads, Carrying case, Instruction manual, Test/Calibration certificates.

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

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.

5. Battery operated Insulation Tester (Megger) : 4 Nos

Purpose: For Checking the Insulation level, Polarization index of HV & LV Electrical equipment
 Test Voltages: 1000 V DC variable in steps of 500/1000



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Display: LCD 3 ½ Digit and/or Analogue.
Mega Ohm Range: 500 MΩ or More
Accuracy : ± 3%.
Safety Standards: IEC 61010-1
EMC Standards: IEC
Power Supply: 240 V, 1 Phase, AC and Re-chargeable Battery.
Accessories: Test Leads, Carrying case, Instruction manual, Test/Calibration certificates.

6. Mega Ohmmeter 10 KV : 1 No

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.

7. Clip on Ammeter (AC): 5 Nos

Purpose: For carrying out AC/DC Current measurements
Range: 200A/600A (for AC) and DC (Available range)
Accuracy: ±2 % to ±3 %.
Resolution: 0.1A/1A
Voltage test range: Up to 600V AC/DC.
Resistance Range: 200 Ω.
Power Supply: Alkaline Battery.
Min. Safety Standards: IEC 61010-1 and IEC 61010-2-31



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Accessories: Carrying case, Instruction Manual, Battery

8. Clip on ammeter (DC): 2 Nos.

Purpose: For carrying out AC/DC Current measurements
 Measuring Method: Dual integration Method with true RMS reading.
 Measuring Function: DC Current, AC Current (true RMS)
 Display: 3½digit LCD
 Display functions: Min. Hold, Max. Hold and Data Hold.
 Range: AC/DC 200 mA, 2000mA, 10A
 Accuracy: $\pm 2\%$ to $\pm 3\%$.
 Resolution: 0.1mA/1mA/0.01A
 Power Supply: Alkaline Battery.
 Min. Safety Standards: IEC 61010-1 and IEC 61010-2-31.
 Accessories: Carrying case, Instruction Manual, Battery

9. Analog Multi meters (AVO Meters): 5 Nos

Purpose: For carrying out measurements of Electrical parameters (Voltage, Current and Resistance)
 1. DC Voltage 0-600 Volts .Accuracy $\pm 2\%$
 2. AC Voltage 0-600 Volts. Accuracy $\pm 3\%$
 3. DC Current 0-10 Amps Accuracy $\pm 2\%$
 4. AC Current: 0-10 Amps, Accuracy $\pm 3\%$
 5. Resistance: 0-20 M Ohm, Accuracy $\pm 3\%$
 6. Accessories: The instrument shall be housed in a Bakelite/Standard Enclosure having multiple Scale, and supplied with leather carrying case, Probes, Instruction Manual and warranty certificate.

10. AC Milli- ammeter: 2 Nos

Purpose: For Calibration of Meters and Transducers.
 Type: RMS Measurement, Digital type, Desktop model, 3½ Precision Display.
 Range: 0-1 A in multi range with smallest range.
 Accuracy: $\pm 1.5\%$.
 Power Supply: Battery/AC
 Accessories: Rugged carrying case, Mains leads, Probes, etc.

11. AC Milli- Voltmeter : 2 Nos

Purpose: For Calibration of Meters and Transducers.
 Type: RMS Measurement, Digital type, Desktop model, 3½ Precision Display.



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Range: 0-250 V in multi range.
Accuracy: ± 0.5 %.
Power Supply: Battery/AC
Accessories: Rugged carrying case, Mains leads, Probes, etc.

12. Digital Time Counter: 2 No

Purpose: intended to use in substation
Time Range: 0-999.99 Sec
Resolution: 1 milli second
Accuracy Class: ± 0.05 %
LVD/EMC Standards: CE Marking/Standard
Supply Voltage: 220 V ± 10 % AC/DC
Trigger: Potential free NO/NC contact or voltage application for start/Stop.
Accessories: Rugged carrying case, Manual etc.,

13. Portable cable core identification Kit: 2 Nos

- i. The equipment shall be capable of identifying 16 or more cores in a multicore cable. The display shall be either LED or LCD.
- ii. The instrument will consist of two units namely sender and receiver. The receiver unit shall be protected against in-advertant connection of live terminals.
- iii. The instrument shall be capable of identifying faulted cores.
- iv. Power Supply: Batteries

14. Phase Sequence indicator: 5Nos

Purpose: To indicate Phase rotation sequence of 3 phase power circuits and motors.
Voltage: 60 to 500V (Line to Line)
Frequency: 40-60 Hz
Accessories: The instrument shall have encapsulated circuitry incorporating neon indicators for phase continuity/phase sequence and shall be supplied with carrying case, colour coded and insulated 1 meter long fused leads **with clip Probes**, Manuals, warranty certificate etc.

15. Portable recording meters: 2 Nos

The recording meter shall be of multi speed and direct acting/ transducer interfaced. Chart width of the recorder shall not be less than 100mm. These recorders shall be electric clock wound.

No. of Channels: 5 (min)
AC Voltage: 0-125 volts



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AC Current: 1 mA to 10 Amps
 Frequency: 45-55 Hz
 Kilowatts: 1-5 amps (of CT secondary), 110 volts, 3 phase and 220 V signal phase
 KVAR: 1-5 amps (of CT secondary), 110 volts, 3 phase and 220 V signal phase
 Accuracy: +/- 2.5% of the full scale.
 Single recorder unit with separate transducer units shall also be considered.

16. Moving Iron Ammeters (0-5A range): 6 Nos

Purpose: for Current Measurements
 Range: 0-1A and 0-5A (Duel Scale)
 Frequency: 45 – 55 Hz.
 Accuracy: ±1%
 Accessories: The instrument shall be housed in a Bakelite/Standard enclosure and shall be supplied with Rugged carrying case, Probes, Manuals, warranty certificate etc.

17. Moving Iron Ammeters (0-100 A range): 6 Nos

Purpose: for Current Measurements
 Range: 0-10A/25A/50A/100A (Quadruple Scale)
 Frequency: 45 – 55 Hz.
 Accuracy: ±1%
 Accessories: The instrument shall be housed in a Bakelite/Standard enclosure and shall be supplied with Rugged carrying case, Probes, Manuals, warranty certificate etc.

18. Precision Portable Digital Frequency Meter: 1 No

Purpose: for Measurement of Frequency and calibration of Frequency Meters
 Range: 0-100 KHz/0-1000Hz.
 Resolution: 1 KHz/0.1 Hz.
 Maximum Load: 5mA
 Accuracy: ±0.5% of reading.
 Display: LED Display
 Auxiliary Power Input: 230V, 1Ph, 50Hz, AC.
 Accessories: The instrument shall be housed in a rugged and shall be supplied with carrying case, Test leads, Battery, Manuals, warranty certificate etc.

19. Portable Multi range Capacitance meter: 2 Nos



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Range: 0-199.9 pico farads
0-199.9 Nano Farads
0-199.9 Micro- farads
0-1999 Micro farads in Multi range

Accuracy: $\pm 0.5\%$ up to 200 Micro Farads & 2% or better for higher Ranges.

20. Digital Tachometer (Non-Contact type)(Photoelectric optical): 2 No

Purpose: for Measuring RPM.

Features: HOLD/ LOW Battery Indication.

Type: Non-Contact, Photo Electric Optical

Range: 10-99999 RPM

Resolution: 0.1RPM to 999 RPM.

Accuracy: $\pm 0.1\%$ to $\pm 0.15\%$.

Display: 5 Digit LED Display

Optical Range: up to 300 mm

Auxiliary Power Input: Battery

Accessories: The instrument shall be supplied with carrying case, Battery, Manuals, warranty certificate etc.

21. Relay Repair Tool Kit: 3 No

Comprising following Minimum tools:

- a. Spring Setting Tool
- b. Inspection Mirror and torch
- c. Ring Spanners
- d. Box Spanners
- e. Contact Pressure Guage
- f. Factor Gauges
- g. Test Plugs and link Plugs
- h. Screw drivers
- i. Nose Pliers
- j. Scissors.

22. Earth Resistance Tester : 2 Nos

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.



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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.

23. Portable Digital Multi meters : 10No

Purpose:	For Measurement of Electrical parameters.
Functions:	SELECT, RANGE, HOLD/LIGHT, REL, HZ, MAX/MIN
Display	6000 Count LCD display with white backlit.
Power Supply	Alkaline Batteries, with low battery indication and auto power off function.
Protection:	Fuse Protection for mA and A input terminals.
Accessories	Pair of Test leads, User Manual, calibration certificate, Warranty certificate Battery, Fuses and Carrying Bag.

Measurements:

- | | |
|---------------------------|--|
| 1. DC Voltage | mV Range: 60/600 mV, 0.01/0.1 mV resolution, ±1% Accuracy.
V Range: 6/60/600/1000V, 0.1/0.1/10/100/1000mV resolution, ±1% Accuracy. |
| 2. DC Current | Range: 60mA/600mA/6A/20A, 0.01/0.1/1/10 mA Resolution, ±1.2 % Accuracy. |
| 3. AC Voltage | mV Range: 60/600 mV, 0.01/0.1 mV resolution, ±2% Accuracy.
Voltage Range: 6/60/600/750V, 01/10/100/1000mV resolution, 2% Accuracy. |
| 4. AC Current | Range: 60mA/600mA/6A/20A, 0.01/0.1/1/10 mA Resolution, ±2 % Accuracy. |
| 5. Resistance | Range: 600 Ω/6KΩ/60KΩ /600KΩ/6MΩ/60MΩ, 0.1 Ω/1Ω/10Ω/100Ω/1KΩ /10KΩ resolution, ±3 % Accuracy. |
| 6. Capacitance | Auto Range |
| 7. Frequency | Auto Range |
| 8. Diode Test | Range: 6V, 1mV resolution, Test current < 1mA. |
| 9. Continuity Test | Range: 600 Ω, 0.1Ω resolution, Beeps<60 Ω. |
| 10. Applicable standards: | CE & IEC 61010-1, IP54 |



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11. EMI/EMC Standards EMC 2004/104/EC

24. DC Milli Ammeter : 2Nos

Purpose: for Current Measurements
Range: 0- 300 mA.
Resolution: 0.5%.
Accuracy: ±1% of Full Scale
Type: Table Mounted, Digital Type, 3½Digit Precision LCD Display.
Accessories: The instrument shall be supplied with Rugged carrying case, Probes, Manuals, warranty certificate etc.

25. DC Milli Voltmeter : 2Nos

Purpose: for Voltage Measurements
Range: 0- 500V AC & DC in Multi range and shall have one range to measure mV.
Accuracy: ±1% of Full Scale
Type: Table Mounted, Digital Type, 3½Digit Precision LCD Display, RMS measurement.
Accessories: The instrument shall be supplied with Rugged carrying case, Probes, Manuals, warranty certificate etc.

26. DC Moving Coil Micro-Ammeter : 1No

Purpose: for Current Measurements
Range: 0- 500 µA and 0-1 mA (Duel Scale)
Accuracy: ±1%
Accessories: The instrument shall be housed in a Bakelite/Standard enclosure and shall be supplied with Rugged carrying case, Probes, Manuals, warranty certificate etc.

27. DC Moving Coil Milli Ammeter : 1No

Purpose: for Current Measurements
Range: 0- 500 mA and 0-1000 mA (Duel Scale)
Accuracy: ±1%
Accessories: The instrument shall be housed in a Bakelite /Standard enclosure and shall be supplied with Rugged carrying case, Probes, Manuals, warranty certificate etc.

28. Portable Light Intensity Meter (Lux Meter) : 1No

Purpose: for measuring Lux level.
Range: 0-3000 Lux in multiple ranges.
Accuracy: ±5% of reading.
Accessories: The instrument shall be supplied with Rugged carrying case, Selenium Photo cell, leads of sufficient length, Manuals, warranty certificate etc.

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29. Digital Sound Level Meter: 1No

Purpose: For measuring Sound level

Brief Description: Having condenser type microphone, frequency and time weighting functions, AC & DC outputs supplied with 9V battery and calibration screw driver.

30. Digital Ducter Ohmmeter : 1 No

Low resistance digital Ohmmeter (Micro-Ohmmeter)

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.



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EQUIPMENT**

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SECTION II

REVISION 00

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SECTION-II

STANDARD TECHNICAL SPECIFICATION



TECHNICAL SPECIFICATION FOR ELECTRICAL LABORATORY (METERING & TESTING) EQUIPMENT

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VOLUME II

SECTION II

REVISION 00

DATE: 24.05.2019

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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.



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

SPECIFICATION NO. PE-TS-411-556-E003 R02

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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:

- a) Compliance to Technical parameters of various equipment as specified in Annexure-I of Section-I in Data Sheet – B (as enclosed).
- b) 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:

- a) Technical Datasheet for each equipment
- b) Technical leaflets/ Catalogues/Product Manual of the Equipment
- c) Tests Reports and calibration certificate
- d) General arrangement drawing showing constructional features, accessories, connections, range and rating, mounting arrangement, space requirement etc.
- e) Detail instructions for application, assembly & testing of equipment.
- f) Wiring and schematic diagrams (if applicable).
- g) Instruction manual/ O&M manual of individual equipment

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



4X270 MW BHADRADRI TPS
TECHNICAL SPECIFICATION FOR ELECTRICAL
LABORATORY EQUIPMENTS (Metering & Testing)

Doc. No. PE-TS-411-556-E003 R02

Volume

IIB

Section

II

ANNEXURE-I OF SECTION – II
DEMONSTRATION & HANDING OVER CHARGES

Rev. : 00 DATE-24.05.2019

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]
- *: To be certified by BHEL site
- Bidder to note that provision of maximum 3 visits amounting to total 9 man days is envisaged for respective bidders.

4X270 MW BHADRADRI TPS							
TECHNICAL SPECIFICATION FOR ELECTRICAL LABORATORY EQUIPMENTS							
PE-TS-411-556-E003							
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 ESSNTIAL 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							
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. Insulation Tester (Megger) 2.5 KV : 1 No							
Purpose: For Checking the Insulation level, Polarization index of HV/MV Electrical equipment							
Test Voltages: 2.5 KV DC either continuously or variable in steps of 500/1000/2500 V							
Display : Digital or Analogue Display							
Display information: Resistance, Voltage.							
Mega Ohm Range: 500 GΩ or More							
Accuracy : ± 5 %.							
Safety Standards: IEC 61010-1,							
EMI/EMC Standards: IEC 61326-1							
Ingress Protection: IP 54							
Safety Standards: As per IEC							
Power Supply: 240 V,1 Phase ,AC and Rechargeable DC Battery.							
Accessories: Test leads set with insulated clips, Carrying case, Instruction manual, Test/Calibration certificates.							
3. LV Insulation Tester (Megger) 1000V : 5 No							
Purpose: For Checking the Insulation level of LV Electrical equipment							
Test Voltages: 1000 V DC variable in steps of 500/1000 V							
Display : LCD 3 ½ Digit and/or Analogue.							
Display information: Resistance & Voltage							
Mega Ohm Range: 1000 MΩ							
Accuracy : ± 5% of scale length							
Safety Standards: As per IEC							
EMC Standards: IEC 61326-1							
Power Supply: Hand Crank							
Accessories: Test Leads, Carrying case, Instruction manual, Test/Calibration certificates.							
OR							
Purpose: For Checking the Insulation level, Polarization Index of LV Electrical equipment							
Test Voltages: 1000 V DC variable in steps of 500/1000 V							
Display : LCD 3 ½ Digit and/or Analogue.							
Display information: Resistance , Voltage & Battery status							
Mega Ohm Range: 1000 MΩ							
Accuracy : ± 3%							
Safety Standards: As per IEC							
EMC Standards: IEC 61326-1							
Power Supply: Battery Operated							
Accessories: Test Leads, Carrying case, Instruction manual, Test/Calibration certificates.							
4. LV Insulation Tester (Megger) 500V : 10 No							
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.							
5. Battery operated Insulation Tester (Megger) : 4 Nos							
Purpose: For Checking the Insulation level, Polarization index of HV & LV Electrical equipment							
Test Voltages: 1000 V DC variable in steps of 500/1000							
Display : LCD 3 ½ Digit and/or Analogue.							
Mega Ohm Range: 500 MΩ or More							
Accuracy : ± 3%.							
Safety Standards: IEC 61010-1							
EMC Standards: IEC							
Power Supply: 240 V,1 Phase ,AC and Re-chargeable Battery.							
Accessories: Test Leads, Carrying case, Instruction manual, Test/Calibration certificates.							
6. Mega Ohmmeter 10 KV : 1 No							
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.							
7. Clip on Ammeter (AC): 5 Nos							
Purpose: For carrying out AC/DC Current measurements							
Range: 200A/600A (for AC) and DC (Available range)							
Accuracy : ±2 % to ±3 %.							
Resolution: 0.1A/1A							
Voltage test range : Upto 600V AC/DC.							
Resistance Range: 200 Ω							
Power Supply: Alkaline Battery.							
Min.Safety Standards: IEC 61010-1 and IEC 61010-2-31							
Accessories: Carrying case, Instruction Manual, Battery							

8. Clip on ammeter (DC): 2 Nos.							
Purpose: For carrying out AC/DC Current measurements							
Measuring Method: Duel integration Method with true RMS reading.							
Measuring Function: DC Current, AC Current (true RMS)							
Display: 3½digit LCD							
Display functions: Min.Hold, Max.Hold and Data Hold.							
Range: AC/DC 200 mA, 2000mA, 10A							
Accuracy : ±2 % to ±3 %.							
Resolution: 0.1mA/1mA/0.01A							
Power Supply: Alkaline Battery.							
Min.Safety Standards: IEC 61010-1 and IEC 61010-2-31.							
Accessories: Carrying case, Instruction Manual, Battery							
9. Analog Multimeters (AVO Meters): 5 Nos							
Purpose: For carrying out measurements of Electrical parameters (Voltage,Current and Resistance)							
1. DC Voltage 0-600 Volts .Accuracy ± 2%							
2. AC Voltage 0-600 Volts. Accuracy ± 3%							
3. DC Current 0-10 Amps Accuracy ± 2%							
4. AC Current: 0-10 Amps,. Accuracy ± 3%							
5. Resistance: 0-20 M Ohm, Accuracy ± 3%							
6. Accessories: The instrument shall be housed in a Bakelite/Standard enclosure having multiple Scale, and supplied with leather carrying case, Probes, Instruction Manual and warranty certificate.							
10. AC Milli- ammeter: 2 Nos							
Purpose: For Calibration of Meters and Transducers.							
Type: RMS Measurement, Digital type, Desktop model, 3½ Precision Display.							
Range: 0-1 A in multi range with smallest range.							
Accuracy : ±1.5 %.							
Power Supply: Battery/AC							
Accessories: Rugged carrying case, Mains leads, Probes, etc.,							
11. AC Milli- Voltmeter : 2 Nos							
Purpose: For Calibration of Meters and Transducers.							
Type: RMS Measurement, Digital type, Desktop model, 3½ Precision Display.							
Range: 0-250 V in multi range.							
Accuracy : ±0.5 %.							
Power Supply: Battery/AC							
Accessories: Rugged carrying case, Mains leads, Probes, etc.							
12. Digital Time Counter: 2 No							
Purpose: intended to use in substation							
Time Range: 0-999.99 Sec							
Resolution: 1 milli second							
Accuracy Class : ±0.05 %							
LVD/EMC Standards: CE Marking/Standard							

Supply Voltage: 220 V ±10 % AC/DC							
Trigger: Potential free NO/NC contact or voltage application for start/Stop.							
Accessories: Rugged carrying case, Manual etc.,							
13. Portable cable core identification Kit: 2 Nos							
i. The equipment shall be capable of identifying 16 or more cores in a multicore cable. The display shall be either LED or LCD.							
ii. The instrument will consist of two units namely sender and receiver. The receiver unit shall be protected against in-advertant connection of live terminals.							
iii. The instrument shall be capable of identifying faulted cores.							
iv. Power Supply: Batteries							
14. Phase Sequence indicator: 5Nos							
Purpose: To indicate Phase rotation sequence of 3 phase power circuits and motors.							
Voltage: 60 to 500V (Line to Line)							
Frequency : 40 – 60 Hz.							
Accessories: The instrument shall have encapsulated circuitry incorporating neon indicators for phase continuity/phase sequence and shall be supplied with carrying case, colour coded and insulated 1 meter long fused leads with clip Probes, Manuals, warranty certificate etc.							
15. Portable recording meters: 2 Nos							
The recording meter shall be of multi speed and direct acting/ transducer interfaced.Chart width of the recorder shall not be less than 100mm. These recorders shall be electric clock wounds							
No. of Channels: 5 (min)							
AC Voltage: 0-125 volts							
AC Current: 1 mA to 10 Amps							
Frequency: 45-55 Hz							
Kilowatts: 1-5 amps (of CT secondary), 110 volts, 3 phase and 220 V signal phase							
KVAR: 1-5 amps (of CT secondary), 110 volts, 3 phase and 220 V signal phase							
Accuracy: +/- 2.5% of the full scale.							
Single recorder unit with separate transducer units shall also be considered.							
16. Moving Iron Ammeters (0-5A range): 6 Nos							
Purpose: for Current Measurements							
Range: 0-1A and 0-5A (Duel Scale)							
Frequency : 45 – 55 Hz.							
Accuracy: ±1%							
Accessories: The instrument shall be housed in a Bakelite/Standard enclosure and shall be supplied with Rugged carrying case, Probes, Manuals, warranty certificate etc.,							
17. Moving Iron Ammeters (0-100 A range): 6 Nos							
Purpose: for Current Measurements							
Range: 0-10A/25A/50A/100A (Quadruple Scale)							
Frequency : 45 – 55 Hz.							

Accuracy: ±1%							
Accessories: The instrument shall be housed in a Bakelite/Standard enclosure and shall be supplied with Rugged carrying case, Probes, Manuals, warranty certificate etc.							
18. Precision Portable Digital Frequency Meter: 1 No							
Purpose: for Measurement of Frequency and calibration of Frequency Meters							
Range: 0-100 KHz/0-1000Hz.							
Resolution: 1KHz/0.1 Hz.							
Maximum Load: 5mA							
Accuracy: ±0.5% of reading.							
Display: LED Display							
Auxiliary Power Input: 230V,1Ph, 50Hz, AC.							
Accessories: The instrument shall be housed in a rugged and shall be supplied with carrying case, Test leads, Battery, Manuals, warranty certificate etc.							
19. Portable Multi range Capacitance meter: 2 Nos							
Range: 0-199.9 pico farads							
0-199.9 Nano Farads							
0-199.9 Micro- farads							
0-1999 Micro farads in Multi range							
Accuracy: ±0.5% upto 200 Micro Farads & 2% or better for higher ranges.							
20. Digital Tachometer (Non-Contact type)(Photoelectric optical): 2 No							
Purpose: for Measuring RPM.							
Features: HOLD/ LOW Battery Indication.							
Type: Non-Contact, Photo Electric Optical							
Range: 10-99999 RPM							
Resolution: 0.1RPM to 999 RPM.							
Accuracy: ±0.1% to±0.15 %.							
Display: 5 Digit LED Display							
Optical Range: up to 300 mm							
Auxiliary Power Input: Battery							
Accessories: The instrument shall be supplied with carrying case, Battery, Manuals, warranty certificate etc.							
21. Relay Repair Tool Kit: 3 No							
Comprising following Minimum tools:							
i. Spring Setting Tool							
j. Inspection Mirror and torch							
k. Ring Spanners							
l. Box Spanners							
m. Contact Pressure Guage							
n. Factor Gauges							
o. Test Plugs and link Plugs							
p. Screw drivers							
q. Nose Pliers							
r. Scissors.							

22. Earth Resistance Tester : 2 Nos							
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.							
23. Portable Digital Multimeters : 10No							
Purpose: For Measurement of Electrical parameters.							
Functions: SELECT, RANGE, HOLD/LIGHT, REL, HZ, MAX/MIN							
Display: 6000 Count LCD display with white backlit.							
Power Supply: Alkaline Batteries, with low battery indication and auto power off function.							
Protection: Fuse Protection for mA and A input terminals.							
Accessories Pair of Test leads, User Manual, calibration certificate,Warranty certificate Battery, Fuses and Carrying Bag.							
Measurements:							
1. DC Voltage-mV Range: 60/600 mV, 0.01/0.1 mV resolution, ±1% Accuracy.							
V Range: 6/60/600/1000V,0.1/01/10/100/1000mV resolution, ±1% Accuracy.							
2. DC Current Range: 60mA/600mA/6A/20A, 0.01/0.1/1/10 mA Resolution,±1.2 % Accuracy.							
3. AC Voltage- mV Range: 60/600 mV, 0.01/0.1 mV resolution, ±2% Accuracy.							
Voltage Range:6/60/600/750V,01/10/100/1000mV resolution, 2% Accuracy.							
4. AC Current Range: 60mA/600mA/6A/20A, 0.01/0.1/1/10 mA resolution,±2 % Accuracy.							
5. Resistance Range: 600 Ω/6KΩ/60KΩ /600KΩ/6MΩ/60MΩ, 0.1 Ω/1Ω/10Ω/100Ω/1KΩ /10KΩ resolution,±3 % Accuracy.							
6. Capacitance Auto Range							
7. Frequency AutoRange							
8. Diode Test Range: 6V, 1mV resolution, Test current < 1mA.							
9. Continuity Test Range: 600 Ω,0.1Ω resolution, Beeps<60 Ω .							
10. Applicable standards: CE & IEC 61010-1, IP54							
11. EMI/EMC Standards EMC 2004/104/EC							
24. DC Milli Ammeter : 2Nos							
Purpose: for Current Measurements							

Range: 0- 300 mA.							
Resolution: 0.5%.							
Accuracy: ±1% of Full Scale							
Type: Table Mounted, Digital Type, 3½Digit Precision LCD Display.							
Accessories: The instrument shall be supplied with Rugged carrying case,Probes, Manuals, warranty certificate etc.,							
25. DC Milli Voltmeter : 2Nos							
Purpose: for Voltage Measurements							
Range: 0- 500V AC & DC in Multi range and shall have one range to measure mV.							
Accuracy: ±1% of Full Scale							
Type: Table Mounted, Digital Type, 3½Digit Precision LCD Display, RMS measurement.							
Accessories: The instrument shall be supplied with Rugged carrying case,Probes, Manuals, warranty certificate etc.,							
26. DC Moving Coil Micro-Ammeter : 1No							
Purpose: for Current Measurements							
Range: 0- 500 µA and 0-1 mA (Duel Scale)							
Accuracy: ±1%							
Accessories: The instrument shall be housed in a Bakelite/Standard enclosure and shall be supplied with Rugged carrying case, Probes,Manuals, warranty certificate etc.,							
27. DC Moving Coil Milli Ammeter : 1No							
Purpose: for Current Measurements							
Range: 0- 500 mA and 0-1000 mA (Duel Scale)							
Accuracy: ±1%							
Accessories: The instrument shall be housed in a Bakelite /Standard enclosure and shall be supplied with Rugged carrying case, Probes,Manuals, warranty certificate etc.							
28. Portable Light Intensity Meter (Lux Meter) : 1No							
Purpose: for measuring Lux level.							
Range: 0-3000 Lux in multiple ranges.							
Accuracy: ±5% of reading.							
Accessories: The instrument shall be supplied with Rugged carrying case, Selenium Photo cell, leads of sufficient length, Manuals, warranty certificate etc							
29. Digital Sound Level Meter: 1No							
Purpose: For measuring Sound level							
Brief Description: Having condenser type microphone, frequency and time weighting functions, AC & DC outputs supplied with 9V battery and calibration screw driver.							

30. Digital duction Ohmmeter : 1 No							
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.							