

VOLUME II

3 X 800 MW NTPC PATRATU TPP

TECHNICAL SPECIFICATION

FOR

FIELD QUALITY LABORATORY EQUIPMENTS

SPECIFICATION NO: *PE-TS-434-571-E001*

REVISION: 0



BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA, UP (INDIA) – 201301



DOCUMENT TITLE

TECHNICAL SPECIFICATION FOR FIELD
QUALITY LABORATORY EQUIPMENTS

SPECIFICATION NO. PE-TS- 434-571-E001

VOLUME II

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DATE: 13.12.2019

SHEET 1 OF 1

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DOCUMENT TITLE

**TECHNICAL SPECIFICATION FOR
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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 'BOQ-Cum-Price schedule' of the specification shall not be considered (i.e., technical description & quantities as per the specification shall prevail).

BIDDER'S STAMP & SIGNATURE



3X800 MW PATRATU TPS

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Volume

Section

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SECTION-I

SPECIFIC TECHNICAL REQUIREMENT

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1. SCOPE

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

2. BILL OF QUANTITIES

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

3. SPECIFIC TECHNICAL REQUIREMENT

Clause No.	Reference Clause No. of Section-II (if any)	Specific Requirement/Change
Clause.1.0	The bill of quantities shall be as per enclosed Annexure – A with technical specification.	To be read as "Quantity requirement shall be as per 'BOQ cum price schedule' enclosed in NIT".
Clause.1.0	Technical requirements of Field Quality Laboratory Equipment shall be as per Annexure – II of Section-C with technical specification	To be read as "Detailed Technical Parameters of Field Quality Laboratory Equipment shall be as per Annexure-I of Section-I with technical specification".
Clause.2.0 (vii)	Any other relevant National/ International standards as mentioned in the Annexure – II of Section-C with technical specification.	To be read as "Any other relevant National/ International standards as mentioned in the Annexure-I of Section-I with technical specification".
Clause.6.1	Drawing Data & Manual to be submitted with the bid: a) Compliance to Technical..... b) General arrangement drawing.... c) Technical leaflets/ Catalogues on following:	To be read as To be submitted with the bid as technical offer in addition to documents as per NIT: a) Compliance to Technical parameters of various equipment as specified in Annexure-I of Section-I in Data Sheet – B (as enclosed as Annexure-B of Section-II).

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		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.
Clause.6.4	Number of copies of document/data to be submitted by the successful bidder shall be as per enclosed ANNEXURE – I.	To be read as “Number of copies of document/data to be submitted by the successful bidder shall be as per NIT.
Clause.9.0	Bidder shall furnish unit rate for each item in the “Schedule of prices for Field Quality Lab Equipment” enclosed in Technical Specification as Annexure –A. Purchaser reserves the right to add/ delete any item during detailed engineering as finally required for the project. Unit rate quoted shall be applicable for price adjustment in such cases	To be read as “Bidder shall furnish unit rate for each item in the “Schedule of prices for Field Quality Lab Equipment” as per BOQ cum price schedule of NIT. Purchaser reserves the right to add/ delete any item during detailed engineering as finally required for the project. Unit rate quoted shall be applicable for price adjustment in such cases”.
Clause.6.2	To be submitted after award of contract for BHEL/customer approval: a) ... b) g) ... Technical documentation such as.....bidder for BHEL approval.	Drawing/ document to be submitted after award of contract for BHEL/customer approval shall be as per clause no:4 below.
Clause.12.0	Bidders to identify the equipment requiring commissioning by expert(s) from vendor. The charges for the same has been fixed as per enclosed “Annexure- B”.	To be read as “After award of contract BHEL/Customer shall identify the equipment requiring commissioning by expert(s) from vendor. The charges for the same has been fixed as per enclosed Annexure- A to Section-II”.

4. DRAWING & DOCUMENTS TO BE SUBMITTED AFTER AWARD OF CONTRACT

Following documents/drawings for each Field Quality Laboratory Equipment shall be submitted after placement of order for BHEL & customer’s approval.

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S. No.	Drawing Title	BHEL Drawing No	Primary/ Secondary	Drg. Submission Schedule for Vendors	
1	Data sheet/GA of equipment with detailed BOM	PE-VX-434-571-A001	Primary	R-0 within 21 days from PO.	Subsequent revisions within 10 days of comments received from BHEL
2	CATALOGUE of equipment	PE-VX-434-571-A002	Primary		
3	O & M Manual (IF APPLICABLE)	PE-VX-434-571-A004	Secondary	Before making the final payment.	
4	CALIBRATION/TC	PE-VX-434-571-A003	Secondary		

Above document nos. are indicative only, the same may change during detailed engineering.

All drawings/ documents indicated above shall be submitted through Document Management System (DMS).

Document/drawing submission/re-submission schedule shall be submitted by vendor as required.

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Annexure-I of SECTION-I

DETAILED TECHNICAL PARAMETERS

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1. Tachometer-Digital Non-Contact Type.

Range: 10-99999 RPM
Resolution: 0.1RPM up to 999 RPM.
1RPM over 1000 RPM
Accuracy: $\pm 0.1\%$ to $\pm 0.15\%$
Display: 5 Digit LED/LCD Display

2. Tong tester (AC)-4000A

Resolution 10mA TO 1A

3. Tong tester (DC)-4000A

Accuracy $\pm 0.5\%$ rdg. + 1 dgt. Minimum

4. Wattmeter (1No.)

Current: up to 1000 A
Input Voltage: up to 600 V, AC/DC
Frequency range: 45-55 HZ
Accuracy: $\pm 3\%$ minimum

5. Ammeter (Tong tester) (Digital)

Range: upto 600A AC/DC
Voltage test range: Upto 600V AC/DC
Accuracy: $\pm 3\%$ minimum

6. Voltmeter (Digital)

Range: 0- 500V AC & DC
Accuracy 0.2% minimum
Frequency range: 45-55 HZ

7. Fully automatic AC high voltage test kit, upto 100kV/5A

Voltage Range: 0-100 kV AC
Current Range: 0-5 A

8. Resistance bridge: Kelvin Bridge (Along with essential accessories)

Resistance range: 0.02 micro ohm – 1.1 ohm
Resolution: 0.02 micro ohm
Accuracy: $\pm 0.5\%$ minimum
Current range up to 25A

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9. Fault Locator (Cable Test Kit):

Working on pulse reflection (echo) technique. Capable of discriminating between inter-core and core to earth fault with facility to detect high resistance faults (>10 ohms) complete with surge generator, acoustic receiver, input filters, head phones etc.

Shall be suitable to test up to & including 11 KV, XLPE insulated armoured cable.

Surge generator output energy shall be minimum 500 joules.

Equipment shall have RS-232/ USB ports for interfacing with PC.

10. Relay Test Kit:

Suitable for testing current, voltage, time and power relays

Input Voltage: 240V AC, 50 Hz single phase AC

Output current: 0-30A continuously variable in multiple ranges

AC voltage output: 0-250 V continuously variable

11. Grounding device/Earthing device

Voltage rating: up to 420 KV, Class F insulated

Length: 1250 mm (main rod and each extension)

Total Length: 5 Meters (Up to 420 KV)

12. Tan delta test kit

Input Power Supply: 240V, 50Hz 1 Phase AC

Output Voltage: 0 to 12 K Volts Continuously adjustable

Tan delta range: 0-200%

Capacitance range: 0 to 0.24 microfarad in multi range

Output current: Minimum 100mA (continuous)

13. BDV tester for oil

Test Voltage: 0-90 KV

Accuracy: $\pm 3\%$

Resolution: 0.1 KV

Temperature Range

(operational): 0°C to 40°C (32 to 104°F)

14. Spirit level

Size: 30 cm

Accuracy: 1 mm/Meter (minimum)

15. Digital Vibration meter

Displacement: 0-2500 microns peak to peak

Velocity: 0-250 mm/sec

Acceleration: 0-250 m/sec²

16. Noise level meter

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For measuring sound level with following details:

Having condenser type microphone,
frequency and time weighting functions,
AC and DC outputs supplied with battery and calibration screw driver.

Sound measurement
range: 30-130 dB in multiple range

17. Micrometer

Range: 0-25mm

18. Vernier Caliper (150 mm)

19. Measuring Tape

Length- 50 m
Non-conducting type
With high quality covered case

20. Magnifying glass

With (10X) zoom & diameter not less than 8 cm

21. Ductor for Transformer. Winding

Resistance Range: upto 1999 ohm
Current Range: upto 10A

22. Variable AC source (0-220V)

Purpose: for calibration of meters/ electrical instruments.
Input Power: 230 V,50 Hz,1 Phase,50 HZ
Voltage Ranges: 200mV,2V,20V,200V,1000V
Load: 10mA
Current Range: 20mA,200mA,2A,20A,50A
Burden: 50VA
Frequency Range: 40 to 400 HZ
Accuracy: $\pm 1\%$ of Setting.

23. Variable DC source (0-220V)

Current range: 0-1A

24. Dead Weight Test

Range: 1 to 600 Ksc
Accuracy class: min 0.05%

25. Pressure gauge

10" dial with accuracy class 0.25%
Each set consisting of 8 Nos.

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0 to 1 ksc, 0 to 10 ksc, 0 to 25 ksc, 0 to 40 ksc, 0 to 100 ksc, 0 to 250 ksc, 0 to 400 ksc, 0 to 600 ksc

26. Electro pneumatic calibrator with Accessories

Pressure sensor range: -0.8 to 2.5 bar
Accuracy: 0.1% of full scale minimum

27. Fluidised Temp bath

Temperature Range: 100-600 deg. C
Stability: +/- 0.2 deg. C

28. Thermocouple test furnace

Temperature Range:
Up to 1400°C with uncertainty of 1 °C

29. Barometer (aneroid)

Pressure Range: 660 to 800 mmHg
Accuracy: +/- 0.3% of full scale

30. Mercury thermometer

Temperature Range: 0 to 150°C
Accuracy: up to 0.1 °C

31. Manometer

1 set consisting of one no. Test manometer(0-1500 mm WC range) and
One no. U tube manometer (1500-0-1500 mm WC Range)

32. Hygrometer

RH Range: 10 to 95 %

33. Portable Voltmeter Calibrator

34. Resistance Thermometer

Range: Bridge type 0-2000 ohm,
Resolution: 0.001 ohm,
Accuracy: +/-0.005 ohm,
Sensitivity: 0.001%,
Amb. Temp.: 50 °C +/- 0.005% of span per 1°C

35. Rheostat

- (i) Rheostat 100 ohm, 5A (1No.)
- (ii) Rheostat 1000 ohm, 1A (1No.)

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36. Test (reference) RTD

Temperature Range: -50 to 160 Deg. C

37. Digital Storage Oscilloscope

Input Power supply: 100- 240 V, 50 Hz, 1 phase AC

Bandwidth: 100 MHz

Channels: 2

Display: LCD/LED

Interface: RS 232 with cable

Features: Automated voltage measurement: Vpp, Vamp, Vavg, Vrms, Vhi, Vlo, Vmax, Vmin

Automated Time measurement:

Freq., Period, Rise Time, Fall Time, Positive Width, Negative width, Duty Cycle.

It should have facility for storage for analysis.

38. Power Pack

0-6 VDC

Current up to 10A

Ripple max 5mV

Load regulation 0.01%

39. RCL meter

for Resistance, Capacitance, Inductance measurement)

Accuracy: 2% of FSD or better

Capacitance: 1pF to 1000μF

Inductance: 1μH to 1000H

Resistance: 0.001Ω to 1MΩ

Q-Factor: 0 to 10 at 1 kHz

Demo required: No

40. pH Simulator

41. Portable TC Thermo couple, RTD calibrator, simulator

42. Function generator

Frequency Range: 1Hz to 1MHz

Waveforms: Sine, Square, Triangle, DC-Offset Adjustment etc.

Distortion Factor < 0.5%

Display: LED/LCD

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It shall be provided with frequency counter.

43. Portable high speed trend recorder

44. Portable multifunction counter

45. Non-contact Laser Temperature Gun

Temperature Range: up to 1000 °C

Note-

1. All the above equipment should be suitable for power plant applications.



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SECTION-II

STANDARD TECHNICAL SPECIFICATION

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1.0 SCOPE OF SUPPLY

Field Quality Laboratory Equipment mentioned in this section along with all essential accessories required for the successful operation of the equipment.

The bill of quantities shall be as per enclosed Annexure – A with technical specification.

Technical requirements of Field Quality Laboratory Equipment shall be as per Annexure – II of Section-C with technical specification.

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.

- 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 the Annexure – II of Section-C with technical specification.

3.0 DESIGN CRITERIA:

- 3.1 Field Quality Laboratory Equipment shall be used for testing 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.
- 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. 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's shall be complete with applicable accessories like power supply, mains leads, screened guard test leads, screened line test leads, earth leads, connectors and clips leather carrying case, input card, clip on current transformers with measurement leads and connectors, suitable hand spikes, main adopter, spare fuses, range extending devices, acoustic calibrator, extension cable input lead, microphones of suitable capacities, vibration pickup, probe pick up cable, camera, external hull detector, hammer, test cell with spherical and mush room type electrodes, spacing gauges, stirrers, inductive sensing heads suitable for different cable sizes etc.
- 4.3 The instrument shall be suitable for satisfactory operation at an ambient temp. from 0°C to 50°C.
- 4.4 The Analog instruments shall be provided with knife-edge pointer and anti – parallax mirror.

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- 4.5 Instrument/ meters suitable for DC supply should be provided with re-chargeable batteries, chargers and low battery charge indication.
- 4.6 All bidders to be advised to quote only 'one' make/model against each equipment best to suit specification requirement.
- 4.7 The instrument shall be suitable for hand held operation, rugged in construction and suitable for field use.
- 4.8 Power supply for AC operating instruments shall be 240V AC, 50Hz, single phase.
- 4.9 **Bidder to note that "In case any recommended make / model become obsolete or is stopped manufacturing by manufacturer, next higher make / model of the same company may be considered for ordering / supply at contract stage and no additional cost shall be paid by BHEL to supplier. Bidder is required to furnish confirmation that "next higher make / model is technical equivalent or better" in case of above condition.**

5.0 **TESTS:**

- 5.1 All acceptance and routine tests as per relevant standards and specification shall be carried out by the manufacturer. Charges for all these routine and acceptance tests for all the material shall be deemed to be included in the bid price.
- 5.2 Equipment shall be completely assembled, wired, adjusted and tested in factory as per the latest edition of relevant standards.
- 5.3 Bidder shall follow his standard procedure for quality control. However, the said procedure/ quality checks shall be submitted for purchaser's approval.

6.0 **DRAWING DATA & MANUAL:**

- 6.1 To be submitted with the bid
- Compliance to Technical requirement of various equipments as specified in technical specification. Also, bidder to furnish Data Sheet – B.
 - General arrangement drawing showing constructional features, accessories, connections, range and rating, mounting arrangement, space requirement etc.
 - Technical leaflets/ Catalogues on following
 - Testing of equipment
 - Instruments
 - Misc. Equipment
 - "No Technical deviation"/Deviation sheet as per Annexure II of GCC (General Conditions of contract). Deviations from the technical specification are generally not acceptable. In case of deviations from technical specification, the bidder shall give cost of with drawl of such deviation in sealed cover as per Annexure II of GCC. In absence of any cost of withdrawal by bidder in sealed envelope, price implication on any deviation withdrawal by bidder shall not be acceptable.

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.

- 6.2 To be submitted after award of contract for BHEL/customer approval:
- General arrangement drawing showing constructional features, accessories, connections, range and rating, mounting arrangement, space requirement etc.
 - Detail instructions for application, assembly & testing of equipments.
 - Wiring and schematic diagrams.
 - Tests Reports and calibration curve

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- e) Technical Catalogues & leaflets.
- f) Instruction manual of individual equipment
- g) Technical datasheet.

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.

6.3 Instruction manual of individual 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.

6.4 Number of copies of document/data to be submitted by the successful bidder shall be as per enclosed ANNEXURE – I.

6.5 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.

6.6 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 acceptance & routine test as per relevant standard. Test certificates/ Test reports shall be furnished by bidder to BHEL at contract stage for review/acceptance. No additional cost for the same shall be payable by BHEL.

7.0 **PACKING:**

The equipment shall be properly packed in Galvanized sheet steel trunk/box with proper lock & key arrangement.

8.0 **DELIVERY:**

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

9.0 Bidder shall furnish unit rate for each item in the "Schedule of prices for Field Quality Lab Equipment" enclosed in Technical Specification as Annexure –A. Purchaser reserves the right to add/ delete any item during detailed engineering as finally required for the project. Unit rate quoted shall be applicable for price adjustment in such cases.

10.0 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.

11.0 The modality of approval of technical documentation & priority of supply shall be mutually discussed & agreed upon with successful bidder in kick – off meeting after placement of LOI.

12.0 **Demonstration & Handing over to BHEL / BHEL's Customer**

The bidder shall be responsible for demonstration of the supplied equipment at site to BHEL / BHEL's customer and ensure handing over the same to the satisfaction of BHEL / BHEL's Customer.

Bidders to identify the equipment requiring commissioning by expert(s) from vendor.

The charges for the same has been fixed as per enclosed "Annexure- B".

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13.0 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.

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ANNEXURE – A TO SECTION-II

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:

1. 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.
2. Bidder to note that provision of maximum 4 visits amounting to total 15 man days is envisaged for respective bidders.

BIDDER'S STAMP & SIGNATURE

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S.N.	ITEM DESCRIPTION	QTY. (No)	UNIT	MAKE	MODEL No	COUNTRY OF MANUFACTURE	EQUIPMENT & ACCESSORIES CONFIRMS TO ALL TECHNICAL REQUIREMENTS IN TOTALITY - (YES/NO)	ADDITIONAL ACCESSORIES RECOMMENDED	REMARKS
1	Tachometer	1	No.						
2.a	Tongtester (AC)-4000A	1	No.						
2.b	Tongtester (DC)-4000A	1	No.						
3.a	Wattmeter	1	No.						
3.b	Ammeter (Tong Tester)	1	No.						
3.c	Voltmeter	1	No.						
4	HV Tester (0-100KV) DC	1	No.						
5	Resistance bridge: Kelvin Bridge	1	No.						
6	Fault Locator (Cable test kit)	1	No.						
7	Relay Test Kit	1	No.						
8	Grounding device/Earthing device	2	No.						
9	Tan delta test kit	1	No.						
10	BDV tester for oil	1	No.						
11	Spirit level	2	No.						
12	Vibration meter	1	No.						
13	Noise level meter	2	No.						
14.a	Micrometer	2	No.						
14.b	Vernier Calliper	2	No.						
14.c	Measuring Tape	2	No.						
15	Magnifying glass	4	No.						

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ANNEXURE-B TO SECTION-II (DATA SHEET-B)

S.N.	ITEM DESCRIPTION	QTY. (No)	UNIT	MAKE	MODEL No	COUNTRY OF MANUFACTURE	EQUIPMENT & ACCESSORIES CONFIRMS TO ALL TECHNICAL REQUIREMENTS IN TOTALITY - (YES/NO)	ADDITIONAL ACCESSORIES RECOMMENDED	REMARKS
16	Ductor for Trf. Wdg, "R"	1	No						
17.a	Variable AC source (0-220V)	1	No.						
17.b	Variable DC source (0-220V)	1	No.						
18	Dead Weight Test (accuracy class min 0.05%)	1	No.						
19	Pressure gauge (accuracy class 0.25%)	2	No.						
20	Electro pneumatic calibrator (accuracy 0.1% of full scale)	1	No.						
21	Fluidised Temp bath (100-600 deg. C, stability +/- 0.2% deg. C)	1	No						
22	Thermocouple test furnace up to 1400 °C with uncertainty of 1 °C	1	No.						
23	Barometer (aneroid) 660 to 800 mm/dg accuracy, +/- 0.3% of full scale	2	No.						
24	Mercury thermometer (accuracy up to 0.1 deg C	2	No.						
25	Manometer (test & U tube)	1	No.						
26	Hygrometer	1	No.						
27	Portable V. meter Calibrator	1	No.						
29	Resistance Thermometer (bridge 0-2000, resolution 0.001, accuracy +/-0.005, sensitivity 0.001%, amb. Temp. 50 °C +/- 0.005% of span per 1°C	1	No.						

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ANNEXURE-B TO SECTION-II (DATA SHEET-B)

S.N.	ITEM DESCRIPTION	QTY. (No)	UNIT	MAKE	MODEL No	COUNTRY OF MANUFACTURE	EQUIPMENT & ACCESSORIES CONFIRMS TO ALL TECHNICAL REQUIREMENTS IN TOTALITY - (YES/NO)	ADDITIONAL ACCESSORIES RECOMMENDED	REMARKS
30	Rheostat		No.						
a	Rheostat 100 ohm,5A	1	No.						
b	Rheostat 1000 ohm,1A	1	No.						
31	Test (reference) RTD	2	No.						
32	Digital Storage Oscilloscope	1	No.						
33	Power Pack 0-6 VDC Current up to 10A ripple max 5MW load regulation 0.01%	1	No.						
34	RCL meter (for Resistance, Capacitance, Inductance measurement) Accuracy 2% of FSD or better	2	No.						
35	pH Simulator	1	No.						
36	Portable TC Thermo couple / RTD calibrator / simulator	1	No.						
37	Function generator	1	No.						
38	Portable high speed trend recorder	1	No.						
39	Portable multifunction counter	1	No.						
40	Non-contact Laser Temperature Gun (up to 1000 oC	2	No.						

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 APPLICABLE.
- 3) IN ADDITION TO NORMAL PACKING OF THE EQUIPMENTS, THE EQUIPMENTS TO BE PROPERLY PACKED IN GALVANIZED SHEET STEEL TRUNK/BOX WITH PROPER LOCK & KEY ARRANGEMENT.
- 4) 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.