

**TSGENCO
1 X 800 MW KOTHAGUDEM TPS**

**TECHNICAL SPECIFICATION
FOR
ELECTRICAL LAB EQUIPMENT**

SPECIFICATION NO. : PE-TS-410-556-E002, REV. 0



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

	1X800 MW KOTHAGUDEM TPS TECHNICAL SPECIFICATION FOR ELECTRICAL LABORATORY EQUIPMENTS	Doc. No. PE-TS-410-556-E002	
		Volume	Section
		IIB	
	CONTENTS	Rev. : 00 DATE-01.09.2017	

CONTENTS

<u>S. NO.</u>	<u>DESCRIPTION</u>	<u>NO. OF SHEETS</u>
01	SECTION – I	
a)	COMPLIANCE CERTIFICATE	01
b)	SPECIFIC TECHNICAL REQUIREMENTS	03
c)	ANNEXURE-I OF SECTION-I (DETAILED TECHNICAL PARAMETERS)	07
d)	ANNEXURE-II OF SECTION-I (INSPECTION & TESTING)	03
e)	ANNEXURE-III OF SECTION-I (QA SPECIFIC REQUIREMENTS)	04
02	SECTION – II	
a)	STANDARD TECHNICAL SPECIFICATION	04
b)	ANNEXURE- I TO SECTION-II (DEMONSTRATION & HANDING OVER CHARGES)	01
c)	ANNEXURE-II OF SECTION-II (DATA SHEET-B FORMAT)	05
TOTAL NO. OF SHEETS= (INCLUDING COVER/ SEPARATOR SHEETS)		30

	1X800 MW KOTHAGUDEM TPS TECHNICAL SPECIFICATION FOR ELECTRICAL LABORATORY EQUIPMENTS	Doc. No. PE-TS-410-556-E002	
		Volume	IIB
		Section	I
	COMPLIANCE CERTIFICATE	Rev. : 00 DATE-01.09.2017	

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

	1X800 MW KOTHAGUDEM TPS TECHNICAL SPECIFICATION FOR ELECTRICAL LABORATORY EQUIPMENTS		Doc. No. PE-TS-410-556-E002	
			Volume	IIB
			Section	I
	SPECIFIC TECHNICAL REQUIREMENTS		Rev. : 00 DATE-01.09.2017	

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 w.r.t. Section-II 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 Inspection & Testing of Electrical laboratory equipment are listed in Annexure – II of Section-I.
- 1.6 QA Specific requirements of Electrical laboratory equipment are listed in Annexure – III of Section-I.

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	Specific Requirement/Change
1.	4.1	Clause 4.1 to be read as follows: "All equipment to be tested as per latest edition of relevant standards. Further, testing shall include verification of physical, functional & technical parameters of equipment & accessories, in line with approved datasheet. Further, refer ANNEXURE-II OF SECTION-I (INSPECTION & TESTING) and ANNEXURE-III OF SECTION-I (QA SPECIFIC REQUIREMENTS) for inspection & testing requirements".
2.	1.6	Refer Note No.1, 2 and 3 of Annexure-I of Section-I (DETAILED TECHNICAL PARAMETERS)
3.	1.8	Refer Note No.1, 2 and 3 of Annexure-I of Section-I (DETAILED TECHNICAL PARAMETERS)

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:

	1X800 MW KOTHAGUDEM TPS TECHNICAL SPECIFICATION FOR ELECTRICAL LABORATORY EQUIPMENTS		Doc. No. PE-TS-410-556-E002	
			Volume	IIB
			Section	I
	SPECIFIC TECHNICAL REQUIREMENTS		Rev. : 00 DATE-01.09.2017	

S.NO.	ITEM DESCRIPTION	Document no. of Technical Datasheet	Document no. of Technical Catalogue
1	Portable 10KV Digital Automatic Insulation Tester	PE-V0-410-556-E001	PE-V0-410-556-E033
2	Portable HV Decade Resistance Box in Polystyrene case with lid and carrying handle	PE-V0-410-556-E002	PE-V0-410-556-E034
3	Portable HV AC Test Set	PE-V0-410-556-E003	PE-V0-410-556-E035
4	Automatic Capacitance and Tan-Delta Test Set	PE-V0-410-556-E004	PE-V0-410-556-E036
5	Portable Karl-Fischer Test Set	PE-V0-410-556-E006	PE-V0-410-556-E038
6	Portable Digital DC Resistance Meter	PE-V0-410-556-E008	PE-V0-410-556-E040
7	Portable High Current Digital Micro Ohm Meter	PE-V0-410-556-E009	PE-V0-410-556-E041
8	Portable Primary & Secondary Current Injection Test Kit with Separate Control & Loading Units	PE-V0-410-556-E010	PE-V0-410-556-E042
9.i)	Portable Three Phase Universal Protective Relay Test Set	PE-V0-410-556-E012	PE-V0-410-556-E044
9.ii)	Relay Tool Kit		
10	Precision Digital Multi-meter	PE-V0-410-556-E013	PE-V0-410-556-E045
11	Digital Tachometer	PE-V0-410-556-E016	PE-V0-410-556-E048
12	Cable Fault Locator (upto 11kV)	PE-V0-410-556-E017	PE-V0-410-556-E049
13	Portable Vacuum Tester	PE-V0-410-556-E020	PE-V0-410-556-E052
14	Portable Circuit Breaker Motion Analyser	PE-V0-410-556-E022	PE-V0-410-556-E054
15	Portable, Hand-held Thermal Imaging Camera	PE-V0-410-556-E023	PE-V0-410-556-E055
16	Portable High Voltage/Live Line Detector	PE-V0-410-556-E024	PE-V0-410-556-E056
17	Tong Testers		
i)	0-25A, 0-600V	PE-V0-410-556-E025	PE-V0-410-556-E057
ii)	0-5A, 0-600V	PE-V0-410-556-E027	PE-V0-410-556-E059
iii)	0-1000A, 0-600V	PE-V0-410-556-E030	PE-V0-410-556-E062
18	HV Discharge Rod & Portable Earthing Equipment	PE-V0-410-556-E028	PE-V0-410-556-E060

4.2 The requirement of copies of Drawings/Documents for projects is as detailed below:

S.NO.	DESCRIPTION	NOS.(HARD COPY)	SOFT COPY (Through DMS)	CD ROM
1.	All Drgs./docs.- First submission/resubmission	-	YES IN PDF	-

	1X800 MW KOTHAGUDEM TPS TECHNICAL SPECIFICATION FOR ELECTRICAL LABORATORY EQUIPMENTS		Doc. No. PE-TS-410-556-E002	
			Volume	IIB
			Section	I
	SPECIFIC TECHNICAL REQUIREMENTS		Rev. : 00 DATE-01.09.2017	

2.	Docs. / drgs. for approval (Second & subsequent submission till approval)	-	YES IN PDF	-
3.	Final Drgs./docs. after approval for distribution purpose	10	YES IN PDF	1

	1X800 MW KOTHAGUDEM TPS TECHNICAL SPECIFICATION FOR ELECTRICAL LABORATORY EQUIPMENTS	Doc. No. PE-TS-410-556-E002	
		Volume	Section
		IIB	
	ANNEXURE-I OF SECTION-I (DETAILED TECHNICAL PARAMETERS)	Rev. : 00 DATE-01.09.2017	

ANNEXURE-I OF SECTION-I
DETAILED TECHNICAL PARAMETERS

	1X800 MW KOTHAGUDEM TPS TECHNICAL SPECIFICATION FOR ELECTRICAL LABORATORY EQUIPMENTS	Doc. No. PE-TS-410-556-E002	
		Volume	IIB
		Section	I
	ANNEXURE-I OF SECTION-I (DETAILED TECHNICAL PARAMETERS)	Rev. : 00 DATE-01.09.2017	

ITEM No.	ITEM DESCRIPTION	QTY.	UNIT
1	Portable 10KV Digital Automatic Insulation Tester Complete with test leads, mains lead, carrying case, PC down load software, instruction manual, test/calibration certificate etc.	1	No.
	Measuring Ranges :		
	Resistance: 200 Kilo ohm to 1 Terra Ohm		
	Max. 5mA for test voltage 0.5, 1KV and more than 5mA allowed for test voltage 2.5 , 5 & 10 KV		
	Test Voltages : 0.5,1,2.5, 5 & 10kV		
	Accuracy: 5% upto 5 G ohm, 20% for > 5 G ohm.		
	Test Time shall be adjustable		
	Display : LCD 3½ digit with analog bar graph for resistance, test voltage, current, PI		
	Data Storage / Memory		
	Power Supply : 240V (± 10%), 50 Hz (± 5%) and rechargeable dc battery		
	MMI : Via RS232 / USB.		
	Printer/ PC Interface / Built in printer		
	Safety Standard : IEC 61010-1		
	Relevant EMC Standard		
2	Portable HV Decade Resistance Box in Polystyrene case with lid and carrying handle	1	No.
	Overall range : 1 K ohms to 1 Terra Ohms		
	Accuracy: 0.1 % - 2%		
	Connection : Shielded Plugs with 1 Metre Cable		
3	Portable HV AC Test Set	1	No.
a)	An epoxy cast / oil filled, single phase, 50-200KV/240V, 5KVA(continuous with duty cycle 1hr ON / 1 hr OFF) and 10KVA (5 minute) rated low discharge transformer with maximum discharge level of 10 PC mounted in a steel tank fitted with swivel castor wheels, HV bushing.		
b)	A control unit with microprocessor based automatic control (programming key pad) / manual control, with digital display analog / digital ammeter & voltmeter, trip pushbutton, safety protections etc.		
c)	A zero interlock circuit shall be provided to prevent energization of HV output on less voltage control is set to zero. Necessary power & metering cables, removable earth link fuses etc. shall be provided.		
4	Automatic Capacitance and Tan-Delta Test Set	1	No.
	Fully automatic, microprocessor-based, accurate ac voltage bridge.		

	1X800 MW KOTHAGUDEM TPS TECHNICAL SPECIFICATION FOR ELECTRICAL LABORATORY EQUIPMENTS		Doc. No. PE-TS-410-556-E002	
			Volume	IIB
			Section	I
	ANNEXURE-I OF SECTION-I (DETAILED TECHNICAL PARAMETERS)		Rev. : 00 DATE-01.09.2017	

	Input: 120/240V ($\pm 10\%$), 50 Hz ($\pm 5\%$)		
	Output : 25V -12KV, 100 mA (Cont.), 200mA (15 min) Extendible with resonating Inductor		
	Capacitance: 1.6 pF to 8 μ F (with Std. Capacitor to be supplied).		
	Inductance 6 H to 10 MH, 0.01 H maximum resolution. Power factor 0-100% (0-1), 0.01% maximum resolution with accuracy $\pm 0.5\%$. Dissipation factor 0-100 (0-10,000%), 0.01% maximum resolution with accuracy $\pm 0.5\%$		
	Measurement		
	Oil Test Cell		
	Digital Display / With PC/laptop		
	Test voltage, capacitance, Tan-delta		
	Interface port for PC		
5	Portable Karl-Fischer Test Set	1	No.
	Coulometric test set for oils with specific gravity ranging from 0.6 to 1.4, with a built-in printer		
	Titration Method: Coulometric, Karl-Fischer		
	Display:40 character alphanumeric backlit LCD		
	Moisture range:1 ppm – 100%		
	Measuring range:1 μ g – 10 mg water		
	End point detection: ac polarization		
	End point indication: Visual display/ printout/acoustic beep		
	Titration speed:2 mg/min maxm.		
	Maximum current:400 mA		
	Drift compensation: Automatically controlled		
	Start delay:10 Sec.		
	Stirrer speed: Microprocessor-controlled		
	Accuracy: $\pm 3 \mu$ g to $\pm 0.5\%$		
	Calculation mode: Volume/density or weight/weight		
	Printer: High Speed Thermal		
	Power supply:90-264V ac, 12V dc rechargeable Battery		
6	Portable Digital DC Resistance Meter	1	No.
	Dual channel, direct-reading ohm meter; having a safe discharge circuitry, software for remote PC control, operating manual, test/calibration certificate, transportable case and along with all accessories. Having following features :		
	Measuring ranges :		
	Nom. Range: 100 micro ohm to 200 ohm.		
	Accuracy: + 0.25 % of reading over entire range		
	Digital Display		

	1X800 MW KOTHAGUDEM TPS TECHNICAL SPECIFICATION FOR ELECTRICAL LABORATORY EQUIPMENTS	Doc. No. PE-TS-410-556-E002	
		Volume	IIB
	ANNEXURE-I OF SECTION-I (DETAILED TECHNICAL PARAMETERS)	Section	I
Rev. : 00 DATE-01.09.2017			

	Data Storage Interface for remote: Upto 700 measurements		
	Port for PC connectivity.		
7	Portable High Current Digital Micro Ohm Meter	1	No.
	Suitable for carrying out measurements in charged substation of 400KV. Supplied with built-in charger, mains lead, operating manual, test/calibration certificate, mounted in a light weight portable case with clip-on clamps and voltage leads for 4-wire measurement system. Having following features :		
	Measurement ranges :		
	Offers: 0.1 micro ohm to 19.9 milli ohm.		
	LED/LCD Display		
	Shall have adequate data storage facility.		
	Port for PC connectivity.		
	Max. 200 A in various steps		
8	Portable Primary & Secondary Current Injection Test Kit with Separate Control & Loading Units	1	No.
	Control Unit		
	Current Output: 0-20A/0-50A (cont.) 0-50A/0-100A (up to 1 min)		
	Voltage Output: 0-230V/300V		
	Current & Voltage Measurement : By true RMS, Digital/Analog meters		
	Timing Units Range:0 – 999.9 Sec.		
	Power supply : 230V ±10% 1-Phase		
	Digital Display		
	Loading Unit		
	Ranges:0-3000A in various steps		
9.i)	Portable Three Phase Universal Protective Relay Test Set	1	No.
	Microprocessor-based user-friendly with digital signal processing. Having display with programmable menu. Having programmable output current & voltage waveforms and phase angles. Having following additional features and specifications :		
	Input Power : 1 Ph, AC, 50 Hz		
	Outputs: One ac Current 0-100A		
	One ac Voltage 0-300V		
	Selectable Output Frequency.		
	Output ac Voltage: 0-360 deg. Independently controlled		
	Port for PC & Printer connectivity.		
9.ii)	Relay Tool Kit comprising tools as per OEM recommendation of Item No.9.i) (Bidder to furnish list)	2	No.

	1X800 MW KOTHAGUDEM TPS TECHNICAL SPECIFICATION FOR ELECTRICAL LABORATORY EQUIPMENTS		Doc. No. PE-TS-410-556-E002	
			Volume	IIB
			Section	I
	ANNEXURE-I OF SECTION-I (DETAILED TECHNICAL PARAMETERS)		Rev. : 00 DATE-01.09.2017	

10	Precision Digital Multi-meter	1	No.
	7½digit precision multi-meter, having a large 24-digit display, a bar graph function allowing user programming of high and low pass/fail limits, audible & visual indication of component specification and Auto Dynamic Filter (ADF) to enable automatic selection of suitable filter.		
	Input Power: 110/220/240V AC 50 Hz		
	DC Voltage Measurement Range: 3 mV to 10 KV.		
	DC Current Measurement		
	Range: 3 µA to 30A		
	Resistance		
	Resistance Measurement: 30 meg ohm to 1 G ohms		
	Frequency		
	Measurement: 1 Hz to 100 KHz		
	AC Voltage		
	Measurement: 3mV to 3 KV		
	AC Current		
	Measurement: 3 Micro Amp to 30A		
	Capacitance		
	Measurement: 0-300 Microfarad		
	Special Features: Self Test, Diode/Zener Test, Max/Min functions, continuity testing AC/DC coupled facility count down and sample beep on long filter periods.		
11	Digital Tachometer	1	No.
	Non-contact photoelectric optical type. Having features such as reading hold, memory recall & low battery indication.		
	Range: 10-99,999 RPM		
	Resolution: 0.1 RPM to 1 RPM		
	Accuracy: ±0.1% ±1 digit to ±0.15%±1 digit		
	Display: 5 digit LCD		
12	Cable Fault Locator (upto 11kV)	1	No.
	Working on pulse reflection (echo) technique. Capable of discriminating between inter-core and core to earth fault with facility to detect high resistance faults complete with surge generator, acoustic receiver, input filters, head phones etc.		
	Input: 240V (± 10%), 1 phase, 50 Hz (± 5%)		
	Surge Generator: 15KV		
	Digital Display		
13	Portable Vacuum Tester	1	No.

	1X800 MW KOTHAGUDEM TPS TECHNICAL SPECIFICATION FOR ELECTRICAL LABORATORY EQUIPMENTS		Doc. No. PE-TS-410-556-E002	
			Volume	IIB
			Section	I
	ANNEXURE-I OF SECTION-I (DETAILED TECHNICAL PARAMETERS)		Rev. : 00 DATE-01.09.2017	

	For testing the condition of vacuum in medium voltage switchgear with automatic discharging facility and high voltage screened cable and over load/overvoltage protection. Input: 1 phase AC Output: 400 V - 60 KV DC in steps with adjustable limit of leakage current.		
14	Portable Circuit Breaker Motion Analyser For analyzing performance of SF6/Vacuum/air Circuit breakers. Microprocessor-based capable of measuring and printing opening/closing times and velocity, coil currents, dynamic contact resistance of main/aux. & arcing contacts. The instrument shall have user-friendly menu driven software for easy operation and reduced set up time. It shall have communication ports for down loading of data from memory on to a PC. It should have a built-in DC battery and optional printer. Other specifications shall be as follows : Input Supply: 110-240V ($\pm 10\%$), 50Hz ($\pm 5\%$) with builtin DC battery backup with charger Current injection: up to 100A DC Suitable timing range having accuracy of $\pm 0.05\%$ Adequate channels for complete testing. Digital display	1	No.
15	Portable, Hand-held Thermal Imaging Camera Having voice recording & alarm facility, double ocular view finder and clear CCD lens, Multi-spot (Minimum 4) temperature measurement and High End image analysis software capable of generating wizard guided reports and trend analyses etc. Battery operated. Temp. Range: (-)10 Deg.C to (+) 2000 Deg.C Detector Type: Uncooled Focal Plane Array Thermal Sensitivity: 0.08°C @ 30°C Frame Rate: 50 Hz Spectral Response: 8 to 14 microns Battery Operation: For sufficient period	1	No.
16	Portable High Voltage/Live Line Detector Electronic type, giving audio-visual indication for presence of voltage/charge. Having in-built self-diagnostic check feature. Insulating stick shall be class 'F' insulated Measuring range offered should be in single or combination covering 6.6V to 300KV with permissible voltage variation.	1	No.

	1X800 MW KOTHAGUDEM TPS TECHNICAL SPECIFICATION FOR ELECTRICAL LABORATORY EQUIPMENTS	Doc. No. PE-TS-410-556-E002	
		Volume	IIB
			Section
	ANNEXURE-I OF SECTION-I (DETAILED TECHNICAL PARAMETERS)	Rev. : 00 DATE-01.09.2017	

17	Tong Testers		
	Digital clamp-on volt-ammeters Ranges :		
i)	0-25A, 0-600V	1	No.
ii)	0-5A, 0-600V	1	No.
iii)	0-1000A, 0-600V	1	No.
18	HV Discharge Rod & Portable Earthing Equipment. Measuring range offered should be in single or combination covering 6.6V to 400KV with permissible voltage variation.	2	No.
	Equipment Class 'F' insulated. Having non-linear carbon film resistor.		

Note: 1. For all Laboratory instruments the Customer approved makes are as mentioned below:

- a. Meggar (UK)
- b. Tinsley (UK)
- c. Vettiner (France)
- d. Fluke (USA)
- e. Omicron
- f. Doble
- g. Kusem Meco
- h. Shivananda
- i. Motwane
- j. AE

2. For all Laboratory instruments (except for items mentioned at S.No.3 & 10 in ANNEXURE-I OF SECTION-I (DETAILED TECHNICAL PARAMETERS)) the bidder to quote only 'one' make/model out of any of the Customer approved makes as mentioned at Note. No.1 above, against each equipment best to suit specification requirement:

3. For items mentioned at S.No.3 & 10 in ANNEXURE-I OF SECTION-I (DETAILED TECHNICAL PARAMETERS) bidder to quote 'one or more' make/model best to suit specification requirement. Offers with any of the Customer approved makes as mentioned at Note. No.1 above shall be considered for evaluation. Further, any make of equipment quoted by bidders different from the makes mentioned at Note No.1 above shall be subject to the approval of BHEL/BHEL's customer and offers with makes acceptable to BHEL/BHEL's customer only shall also be considered for evaluation. Bidders to make their offers accordingly.

	1X800 MW KOTHAGUDEM TPS TECHNICAL SPECIFICATION FOR ELECTRICAL LABORATORY EQUIPMENTS	DOCUMENT : PE-TS-410-556-E002 NUMBER
		REVISION NUMBER 00 DATE: 01.09.2017
	ANNEXURE-II OF SECTION-I	SHEET 1 OF 3

ANNEXURE-II INSPECTION & TESTING

The minimum quality assurance plan/test of various Electrical Laboratory Instruments and their accessories is listed below. However, Bidder shall conduct any other tests/inspection required at the manufacturer's works to ensure that the equipment being supplied shall conform to the requirement of this specification and other applicable standards and codes. The detail of checks to be carried out in various stages of manufacturing and erection of various items of the system shall be submitted to Owner's approval in the form of quality assurance plans, field quality plans and Test procedure as applicable.

The items covered under the scope of supply and erection shall be of Owner's approved makes. Bidder has to ensure that the proposed bought out makes have proven track record. Bidder to submit the proposal of sub vendors of bought outs for Owner's approval along with their offer and no deviation with regard to approved sub vendors shall be acceptable.

The general quality assurance requirements as detailed in this technical specification (Annexure-III) shall be necessarily complied with.

The testing and inspection requirements shall be in line with technical specifications and other related standards. And no deviation in this regard is acceptable.

Material tests like physical, chemical and functional test on various components being used shall be done as per relevant standards. Manufacturer's test certificates shall be submitted for all those tests for the review and approval of Owner.

All raw materials including the bought out shall be subjected to bidders inspection/ TC review as per their procedure / approved QAP for total compliance. The same shall not be limited to mechanical, physical, electrical, operational, aesthetic and functional checks but shall confirm to the best engineering practice and strict adherence to the specifications and standards. Bidders QAP shall indicate all such tests and procedures.

The in process checks for various components shall confirm to the bidders internal procedures which shall confirm to best manufacturing practices, national and international standards. QAP shall reflect all such tests/ standards and procedures in detail. Internal test records / test reports shall be produced to Owner as required.

Type test certificates for all items in – line with the relevant standards and technical specifications shall be submitted for Owner's review and approval.

	1X800 MW KOTHAGUDEM TPS TECHNICAL SPECIFICATION FOR ELECTRICAL LABORATORY EQUIPMENTS	DOCUMENT : PE-TS-410-556-E002 NUMBER
		REVISION NUMBER 00 DATE: 01.09.2017
	ANNEXURE-II OF SECTION-I	SHEET 2 OF 3

Flammability and explosion proof equipment shall be of type tested design. Necessary certificates demonstrating this for similar item/equipment shall be submitted during bid.

All the tests mentioned herein shall be applicable to spares also.

The Bidder shall provide all test and maintenance equipment required at the site in duly calibrated condition.

The Bidder shall perform all the applicable tests in accordance with the latest revisions of pertinent codes.

For equipment not covered by these codes the Bidder shall apply his standard factory tests.

However Test procedures for these standard tests shall be prepared by the Bidder and shall be submitted for The Owner's review at least prior to the scheduled test. The tests shall be conducted, reported and certified by the Bidder.

All routine and acceptance tests shall be conducted on various components as applicable for the offered instruments. Acceptance and type tests shall be conducted as per applicable standards.

Bidder shall conduct Preliminary system testing and burn-in testing (where ever applicable) as per the approved test procedure.

Bidder shall obtain all statutory requirements required for the operation of the Instruments in a power plant.

The manufacturer, prior to system assembly shall functionally test all electronic modules and components, used within the system as per relevant standards and specific requirement clauses mentioned in this specification and approved test procedure.

Calibration certificates clearly establishing the calibrating instruments tractability to national / International standard acceptable to client shall be submitted along with. All Primary standard test instruments used for Calibration shall be calibrated by instruments confirming to the above criteria and the same shall be demonstrated by the bidder to the complete satisfaction of Client.

	1X800 MW KOTHAGUDEM TPS TECHNICAL SPECIFICATION FOR ELECTRICAL LABORATORY EQUIPMENTS	DOCUMENT : PE-TS-410-556-E002 NUMBER
		REVISION NUMBER 00 DATE: 01.09.2017
	ANNEXURE-II OF SECTION-I	SHEET 3 OF 3

Initial checks like mechanical assembly checks harness connection checks shall be conducted by the bidder.

All painted surfaces shall be tested for shade, finish and DFT as per specifications.

TYPE TESTS

Bidder to submit the Type test certificates for the type tests (as per technical specifications and other applicable standards) conducted on similar equipment, which is not older than five years to the review and approval of Purchaser. However if these certificates are not acceptable to purchaser, bidder may have to repeat these type tests in presence of Purchaser. There shall be no delivery and cost implications to BHEL/Owner on account of these type tests.

SITE TESTS

The performance tests and calibration tests shall be conducted at site to demonstrate guaranteed performance and rectification of all defects shall be done satisfactorily. If any equipment fails to meet the guaranteed performance, the performance test shall be repeated after rectifications / replacements are made till guaranteed performance is demonstrated satisfactorily by the Bidder. The Bidder in the presence of the BHEL/Owner or his representative shall conduct the performance test.

All tests shall be carried out as per relevant codes and standards and as specified in the data sheet.

ANNEXURE-III OF SECTION-I

QA - SPECIFIC REQUIREMENTS

Sl. No.	Item	Make	Model	Type	Range	Rating, accuracy & resolution	Functional checks	Calibration checks	Completeness with all accessories	Compliance to specification requirements
1	Portable 10KV Digital Automatic Insulation Tester	Y	Y	Y	Y	Y	Y	Y	Y	Y
2	Portable HV Decade Resistance Box	Y	Y	Y	Y	Y	Y	Y	Y	Y
3	Portable HV ac Test Set	Y	Y	Y	Y	Y	Y	Y	Y	Y
4	Automatic Capacitance and Tan-Delta Test Set (Schering Bridge) with oil resistivity test cell	Y	Y	Y	Y	Y	Y	Y	Y	Y
5	Portable Karl-Fischer Test Set	Y	Y	Y	Y	Y	Y	Y	Y	Y
6	Portable Digital dc Resistance Meter	Y	Y	Y	Y	Y	Y	Y	Y	Y
7	Portable High Current Digital Micro Ohm Meter	Y	Y	Y	Y	Y	Y	Y	Y	Y

Sl. No.	Item	Make	Model	Type	Range	Rating, accuracy & resolution	Functional checks	Calibration checks	Completeness with all accessories	Compliance to specification requirements
8	Portable Primary & Secondary Current Injection Test Kit	Y	Y	Y	Y	Y	Y	Y	Y	Y
9.i)	Portable Three Phase Universal Protective Relay Test Set	Y	Y	Y	Y	Y	Y	Y	Y	Y
9.ii)	Relay Tool Kit	Y	Y	Y	Y	Y	Y	Y	Y	Y
10	Precision Digital Multimeter	Y	Y	Y	Y	Y	Y	Y	Y	Y
11	Digital Tachometer	Y	Y	Y	Y	Y	Y	Y	Y	Y
12	Cable Fault Locator	Y	Y	Y	Y	Y	Y	Y	Y	Y
13	Portable Vacuum Tester	Y	Y	Y	Y	Y	Y	Y	Y	Y
14	Portable Circuit Breaker Motion Analyser	Y	Y	Y	Y	Y	Y	Y	Y	Y
15	Portable, Hand-held Thermal Imaging Camera	Y	Y	Y	Y	Y	Y	Y	Y	Y

Sl. No.	Item	Make	Model	Type	Range	Rating, accuracy & resolution	Functional checks	Calibration checks	Completeness with all accessories	Compliance to specification requirements
16	Portable High Voltage/Live Line Detector	Y	Y	Y	Y	Y	Y	Y	Y	Y
17	Tong Testers	Y	Y	Y	Y	Y	Y	Y	Y	Y
18	HV Discharge Rod & Portable Earthing Equipment	Y	Y	Y	Y	Y	Y	Y	Y	Y

Note:

1. All instruments shall be supplied with Guarantee and warrantee certificates, user manuals and applicable catalogues (English language).
2. Calibration certificates clearly establishing the calibrating instruments trace ability to national/ International standard acceptable to BHEL/client shall be submitted along with.
3. Compliance to various standards as mentioned in the Technical specification shall be ensured in totality without any deviation.
4. All original software supporting the instruments shall be provided to the owner with user / upgrading rights.
5. Transformers tests in line with the applicable standards shall be done and certificates submitted. Microprocessor shall also be subjected to routine and acceptance tests as applicable.
6. Interface port for PC/printer shall be checked / tested.
7. Printer connectivity/In Built Printer and Battery shall be checked for functional requirements.
8. Tested for EMI & EMC as per relevant standards.
9. Remote interface check.
10. Memory and Interface checks.
11. Special Features as indicated in the specification shall be checked for compliance.
12. Loading time check.

- 13. Sensitivity check.
- 14. Software check.
- 15. Thermal Sensitivity and Battery checks.
- 16. In-built self- diagnostic check and Class of Insulation checks.
- 17. Minimum tooling check.
- 18. Insulation, self check and carrying case.
- 19. Visualization and communication protocol compliance



**1X800 MW KOTHAGUDEM TPS
TECHNICAL SPECIFICATION FOR ELECTRICAL
LABORATORY EQUIPMENTS**

Doc. No. PE-TS-410-556-E002	
Volume	IIB
Section	II
Rev. : 00 DATE-01.09.2017	

SECTION-II

STANDARD TECHNICAL SPECIFICATION

	Doc. No. PE-TS-410-556-E002	
	Volume	IIB
	Section	II
	Rev. : 00 DATE-01.09.2017	

**1X800 MW KOTHAGUDEM TPS
TECHNICAL SPECIFICATION FOR ELECTRICAL
LABORATORY EQUIPMENTS**

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 confirm 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.

	Doc. No. PE-TS-410-556-E002	
	Volume	IIB
	Section	II
	Rev. : 00 DATE-01.09.2017	

**1X800 MW KOTHAGUDEM TPS
TECHNICAL SPECIFICATION FOR ELECTRICAL
LABORATORY EQUIPMENTS**

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, calibration, diagnostics etc. 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.
- 3.3.1 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 All equipment to be tested as per latest edition of relevant standards. Further, testing shall include verification of physical, functional & technical parameters of equipment & accessories, in line with approved datasheet.
- 4.2 The tests shall be carried out by the vendor at in-house lab/ OEM lab/ Third party govt. accredited lab. Charges for all these tests shall be deemed to be included in the bid price.
- 4.3 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 at contract stage.
- 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.

	1X800 MW KOTHAGUDEM TPS TECHNICAL SPECIFICATION FOR ELECTRICAL LABORATORY EQUIPMENTS	Doc. No. PE-TS-410-556-E002	
		Volume	IIB
		Section	II
		Rev. : 00 DATE-01.09.2017	

8.0 DRAWING DATA & MANUAL

8.1 To be submitted with the bid as technical offer:

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

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.

	1X800 MW KOTHAGUDEM TPS TECHNICAL SPECIFICATION FOR ELECTRICAL LABORATORY EQUIPMENTS	Doc. No. PE-TS-410-556-E002	
		Volume	IIB
		Section	II
	<u>ANNEXURE-I OF SECTION – II</u> <u>DEMONSTRATION & HANDING OVER CHARGES</u>	Rev. : 00 DATE-01.09.2017	

**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 2 visits amounting to total 6 man days is envisaged for respective bidders.



1X800 MW KOTHAGUDEM TPS

Doc. No. PE-TS-410-556-E002

Volume: IIB

TECHNICAL SPECIFICATION FOR ELECTRICAL LABORATORY EQUIPMENTS

SECTION

Rev. : 00

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

ITEM No.	ITEM DESCRIPTION	QTY.	UNIT	MAKE	MODEL No	COUNTRY OF MANUFACTURE	EQUIPMENT & ACCESSORIES CONFIRMS TO ALL TECHNICAL REQUIREMENTS IN TOTALITY - (YES/NO)	REMARKS
1	Portable 10KV Digital Automatic Insulation Tester Complete with test leads, mains lead, carrying case, PC down load software, instruction manual, test/calibration certificate etc.	1	No.					
	Measuring Ranges :							
	Resistance: 200 Kilo ohm to 1 Terra Ohm							
	Max. 5mA for test voltage 0.5, 1KV and more than 5mA allowed for test voltage 2.5 , 5 & 10 KV							
	Test Voltages : 0.5,1,2.5, 5 &10kV							
	Accuracy: 5% upto 5 G ohm, 20% for > 5 G ohm.							
	Test Time shall be adjustable							
	Display : LCD 3½ digit with analog bar graph for resistance, test voltage, current, PI							
	Data Storage / Memory							
	Power Supply : 240V (± 10%), 50 Hz (± 5%) and rechargeable dc battery							
	MMI : Via RS232 / USB.							
	Printer/ PC Interface / Built in printer							
	Safety Standard : IEC 61010-1							
	Relevant EMC Standard.							
2	Portable HV Decade Resistance Box in Polystyrene case with lid and carrying handle	1	No.					
	Overall range : 1 K ohms to 1 Terra Ohms							
	Accuracy : 0.1% to 2%							
	Connection : Shielded Plugs with 1 Metre Cable							
3	Portable HV AC Test Set	1	No.					
a)	An epoxy cast / oil filled, single phase, 50-200KV/240V, 5KVA(continuous with duty cycle 1hr ON / 1 hr OFF) and 10KVA (5 minute) rated low discharge transformer with maximum discharge level of 10 PC mounted in a steel tank fitted with swivel castor wheels, HV bushing.							
b)	A control unit with microprocessor based automatic control (programming key pad) / manual control, with digital display analog / digital ammeter & voltmeter, trip pushbutton, safety protections etc.							
c)	A zero interlock circuit shall be provided to prevent energization of HV output on less voltage control is set to zero. Necessary power & metering cables, removable earth link fuses etc. shall be provided.							
4	Automatic Capacitance and Tan-Delta Test Set							
	Fully automatic, microprocessor-based, accurate ac voltage bridge.							
	Input : 120/240V (± 10%), 50 Hz (± 5%)							
	Output : 25V -12KV, 100 mA (Cont.), 200mA (15 min) Extendible with resonating Inductor							
	Capacitance : 1.6 pF to 8 µF (with Std. Capacitor to be supplied).							



1X800 MW KOTHAGUDEM TPS

Doc. No. PE-TS-410-556-E002

Volume: IIB

TECHNICAL SPECIFICATION FOR ELECTRICAL LABORATORY EQUIPMENTS

SECTION

Rev. : 00

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

ITEM No.	ITEM DESCRIPTION	QTY.	UNIT	MAKE	MODEL No	COUNTRY OF MANUFACTURE	EQUIPMENT & ACCESSORIES CONFIRMS TO ALL TECHNICAL REQUIREMENTS IN TOTALITY - (YES/NO)	REMARKS
	Inductance 6 H to 10 MH, 0.01 H maximum resolution Power factor 0-100% (0-1), 0.01% maximum resolution with accuracy $\pm 0.5\%$ Dissipation factor 0-100 (0-10,000%), 0.01% maximum resolution with accuracy $\pm 0.5\%$	1	No.					
	Measurement							
	Oil Test Cell							
	Digital display / With PC/ Laptop							
	Test voltage, capacitance, Tan-delta							
	Interface port for PC							
5	Portable Karl-Fischer Test Set							
	Coulometric test set for oils with specific gravity							
	ranging from 0.6 to 1.4, with a built-in printer							
	Titration Method:Coulometric, Karl-Fischer							
	Display:40 character alphanumeric backlit LCD							
	Moisture range:1 ppm – 100%							
	Measuring range:1 μg – 10 mg water							
	End point detection:ac polarization							
	End point indication:Visual display/ printout/acoustic beep							
	Titration speed:2 mg/min maxm.							
	Maximum current:400 mA							
	Drift compensation:Automatically controlled							
	Start delay:10 Sec.							
	Stirrer speed:Microprocessor-controlled							
	Accuracy: $\pm 3 \mu\text{g}$ to $\pm 0.5\%$							
	Calculation mode:Volume/density or weight/weight							
	Printer:High Speed Thermal							
	Power supply:90-264V ac, 12V dcrechargeable Battery							
6	Portable Digital DC Resistance Meter							
	Dual channel, direct-reading ohm meter; having a safe discharge circuitry, software for remote PC control, operating manual, test/calibration certificate, transportable case and along with all accessories. Having following features :							
	Measuring ranges :							
	Nom. Range : 100 micro ohm to 200 ohm.							
	Accuracy: +0.25 % of reading over entire range							
	Digital Display							
	Data Storage Interface for remote: Upto 700 measurements							
	Port for PC connectivity.							
7	Portable High Current Digital Micro Ohm Meter							



1X800 MW KOTHAGUDEM TPS

Doc. No. PE-TS-410-556-E002

Volume: IIB

TECHNICAL SPECIFICATION FOR ELECTRICAL LABORATORY EQUIPMENTS

SECTION

Rev. : 00

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

ITEM No.	ITEM DESCRIPTION	QTY.	UNIT	MAKE	MODEL No	COUNTRY OF MANUFACTURE	EQUIPMENT & ACCESSORIES CONFIRMS TO ALL TECHNICAL REQUIREMENTS IN TOTALITY - (YES/NO)	REMARKS
	Suitable for carrying out measurements in charged substation of 400KV. Supplied with built-in charger, mains lead, operating manual, test/calibration certificate, mounted in a light weight portable case with clip-on clamps and voltage leads for 4-wire measurement system. Having following features :	1	No.					
	Measurement ranges :							
	Offers: 0.1 micro ohm to 19.9 milli ohm.							
	LED/LCD Display							
	Shall have adequate data storage facility.							
	Port for PC connectivity.							
	Max. 200 A in various steps							
8	Portable Primary & Secondary Current Injection Test Kit with Separate Control & Loading Units	1	No.					
	Control Unit							
	Current Output:0-20A/0-50A (cont.)0-50A/0-100A (up to 1 min)							
	Voltage Output:0-230V/300V							
	Current & Voltage Measurement : By true RMS, Digital/Analog meters							
	Timing Units Range:0 – 999.9 Sec.							
	Power supply : 230V ±10% 1-Phase							
	Digital Display							
	Loading Unit							
	Ranges:0-3000A in various steps							
9.i)	Portable Three Phase Universal Protective Relay Test Set	1	No.					
	Microprocessor-based user-friendly with digital signal processing. Having display with programmable menu.Having programmable output current & voltage waveforms and phase angles. Having following additional features and specifications :							
	Input Power : 1 Ph, AC, 50 Hz							
	Outputs: One ac Current 0-100A							
	One ac Voltage 0-300V							
	Selectable Output Frequency.							
	Output ac Voltage: 0-360 deg. Independently controlled							
	Port for PC & Printer connectivity.							
9.ii)	Relay Tool Kit comprising tools as per OEM recommendation of Item No.9.i) (Bidder to furnish list)	2	No.					
10	Precision Digital Multi-meter							
	7½ digit precision multi-meter, having a large 24-digit display, a bar graph function allowing user programming of high and low pass/fail limits, audible & visual indication of component specification and Auto Dynamic Filter (ADF) to enable automatic selection of suitable filter.							
	Input Power: 110/220/240V AC 50 Hz							
	DC Voltage Measurement Range: 3 mV to 10 KV.							
	DC Current Measurement							
	Range: 3 µA to 30A							



1X800 MW KOTHAGUDEM TPS

Doc. No. PE-TS-410-556-E002

Volume: IIB

TECHNICAL SPECIFICATION FOR ELECTRICAL LABORATORY EQUIPMENTS

SECTION

Rev. : 00

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

ITEM No.	ITEM DESCRIPTION	QTY.	UNIT	MAKE	MODEL No	COUNTRY OF MANUFACTURE	EQUIPMENT & ACCESSORIES CONFIRMS TO ALL TECHNICAL REQUIREMENTS IN TOTALITY - (YES/NO)	REMARKS
	Resistance	1	No.					
	Resistance Measurement: 30 meg ohm to 1 G ohms							
	Frequency							
	Measurement: 1 Hz to 100 K Hz							
	AC Voltage							
	Measurement: 3m V to 3 KV							
	AC Current							
	Measurement: 3 Micro Amp to 30A							
	Capacitance							
	Measurement:0-300 Microfarad							
	Special Features: Self Test, Diode/ZenerTest, Max/Min functions, continuity testing AC/DC coupled facility count down and sample beep on long filter periods.							
11	Digital Tachometer	1	No.					
	Non-contact photoelectric optical type. Having features such as reading hold, memory recall & low battery indication.							
	Range: 10-99,999 RPM							
	Resolution: 0.1 RPM to 1 RPM							
	Accuracy: $\pm 0.1\%$ ± 1 digit to $\pm 0.15\%$ ± 1 digit							
	Display:5 digit LCD							
12	Optical Range: Minimum 300 mm	1	No.					
	Cable Fault Locator (upto 11kV)							
	Working on pulse reflection (echo) technique. Capable of discriminating between inter-core and core to earth fault with facility to detect high resistance faults complete with surge generator, acoustic receiver, input filters, head phones etc.							
	Input: 240V (+ 10%) , 1 phase, 50 Hz (+ 5%)							
	Surge Generator:15KV							
	Digital Display	1	No.					
13	Portable Vacuum Tester							
	For testing the condition of vacuum in medium voltage switchgear with automatic discharging facility and high voltage screened cable and over load/overvoltage protection.							
	Input: 1 phase AC							
	Output: 400V - 60 KV DC in steps with adjustable limit of leakage current.							
14	Portable Circuit Breaker Motion Analyser	1	No.					
	For analyzing performance of SF6/Vacuum/air Circuit breakers.							
	Microprocessor-based capable of measuring and printing opening/closing times and velocity, coil currents, dynamic contact resistance of main/aux. & arcing contacts.The instrument shall have user-friendly menu driven software for easy operation and reduced set up time. It shall have communication ports for down loading of data from memory on to a PC. It should have a built-in DC battery and optional printer.							
	Other specifications shall be as follows :							

	1X800 MW KOTHAGUDEM TPS						Doc. No. PE-TS-410-556-E002
							Volume: IIB
	TECHNICAL SPECIFICATION FOR ELECTRICAL LABORATORY EQUIPMENTS						SECTION
							Rev. : 00

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

ITEM No.	ITEM DESCRIPTION	QTY.	UNIT	MAKE	MODEL No	COUNTRY OF MANUFACTURE	EQUIPMENT & ACCESSORIES CONFIRMS TO ALL TECHNICAL REQUIREMENTS IN TOTALITY - (YES/NO)	REMARKS
	Input Supply: 110-240V ($\pm 10\%$), 50Hz ($\pm 5\%$) with builtin DC battery backup with charger							
	Current injection: up to 100A DC							
	Suitable timing range having accuracy of $\pm 0.05\%$							
	Adequate channels for complete testing.							
	Digital display							
15	Portable, Hand-held Thermal Imaging Camera							
	Having voice recording & alarm facility, double ocular view finder and clear CCD lens, Multi-spot (Minimum 4) temperature measurement and High End image analysis software capable of generating wizard guided reports and trend analyses etc. Battery operated.	1	No.					
	Temp. Range: (-) 10 Deg.C to (+) 2000 Deg.C							
	Detector Type: Uncooled Focal Plane Array							
	Thermal Sensitivity: 0.08°C @ 30°C							
	Frame Rate: 50 Hz							
	Spectral Response: 8 to 14 microns							
	Battery Operated for sufficient period							
16	Portable High Voltage/Live Line Detector							
	Electronic type, giving audio-visual indication for presence of voltage/charge. Having in-built self-diagnostic check feature. Insulating stick shall be class 'F' insulated	1	No.					
	Measuring range offered should be in single or combination covering 6.6KV to 300KV with permissible voltage variation.							
17	Tong Testers							
	Digital clamp-on volt-ammeters Ranges :							
i)	0-25A, 0-600V	1	No.					
ii)	0-5A, 0-600V	1	No.					
iii)	0-1000A, 0-600V	1	No.					
18	HV Discharge Rod & Portable Earthing Equipment. Measuring range offered should be in single or combination covering 6.6KV to 400KV with permissible voltage variation.	2	No.					
	Equipment Class 'F' insulated. Having non-linear carbon film resistor.							
NOTE :-								
1) EQUIPMENT TO BE SUPPLIED ALONG WITH ESSENTIAL 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.								