Maharashtra State Electricity Distribution Company Limited

MATERIAL SPECIFICATIONS CELL

TECHNICAL SPECIFICATION

FOR

AUTOMATIC CT/PT TEST SET UP HAVING DIGITAL CONTROL PANEL WITH COMPLETE SYSTEM

TECHNICAL SPECIFICATION NO.
CE/T-QC/MSC-II/2019/

Date: 13.06.2019

I N D E X

ANNEXURE D

TECHNICAL SPECIFICATIONS FOR AUTOMATIC CT/PT TEST SET UP HAVING DIGITAL CONTROL PANEL WITH COMPLETE SYSTEM

1.0 SCOPE :

Design, engineering, manufacture, delivery, installation and commissioning Automatic Computerized CT & PT Test System in the MSEDCL Laboratory. This specification covers the requirement of complete test system for automatic testing of instrument transformers. The system shall be self contained and comprise of the following.

i) Appropriate power source to generate the required test voltages & currents.
ii) Appropriate reference CTs & PTs.
iii) A set of burdens to load the CT/PT under test to the required operating point.
iv) An automatic CT/PT comparator to measure the errors of the test specimen transformer with respect to the reference transformer. used for testing of single phase Current Transformers 0.2,0.2s,0.5,0.5s,1 accuracy class & Potential Transformers of various accuracy class 0.2, 0.5, 1.0 generally conforming to relevant IS and IEC.
v) This comparator to measure composite error of protection class CTs at rated current as per IS 16227 (Part 2) 2016.
vi) An automatic CT demagnetizer to demagnetize CTs prior to conducting the accuracy tests.
vii) Accessories for PT testing such as Bi-pole standard PTs, potential transformer burden etc.
viii) Accessories for CT testing such as standard current transformer, CT burden for 1A & 5A.

In addition to above, the successful bidder / vendor (hereinafter referred to as Vendor) shall also be required to provide:

i. Operations Manuals including drawings. – 1 set in hard copy , plus 1 set in CD form giving the soft-copy version of all the manuals
ii. Training to at least 5 personnel from the Department on all aspects of operation and maintenance
iii. Continued technical support during Guarantee period and after warranty period.
iv. List of Spare Parts & Consumable items.
v. Related Softwares.

The Automatic CT/PT Testing system shall be a microprocessor controlled Instrument transformer test set. It shall be basically an automatic comparator, which compares two Instrument transformers (CTs or PTs) of normally same ratios. The comparator balances the two inputs from the standard transformer and the test transformer

automatically and small variations in the excitation voltages, currents & frequencies shall not affect the measurements. The Instrument shall be capable to test CTs having 1A and 5A secondary current as well as potential transformers.

The Automatic CT/PT Testing system shall have inbuilt RS-232/USB printer interface to enable the user to dump the measured values to a serial printer or to a computer with suitable communication software provided with the kit.

2.0 OBJECTIVE:

To provide complete and comprehensive facilities for doing routine, acceptance and certification tests pertaining to accuracy requirements on Current Transformer & Potential Transformer for types of various accuracy classes generally confirming to relevant IS & IEC.

3.0 SERVICE CONDITIONS:

The equipment to be supplied against this specification shall be suitable for satisfactory operation under the following tropical conditions.

2.1 Maximum ambient temperature (Degree C) … 50
2.2 Minimum ambient temperature (Degree C) … 3.5
2.3 Relative Humidity (%) … 10 to 100
2.4 Maximum altitude above mean sea level (meter) … 1000

4.0 STANDARDS:

Unless otherwise specified elsewhere in the specifications the equipment shall confirm to the relevant IEC/IS standard with the latest revisions if any at the time of placement of the order.

5.0 GENERAL TECHNICAL PARTICULARS:

The detailed technical specifications shall be as follows.

5.1 Automatic Instrument Transformer Test System

The CT/PT test system shall be designed to test CTs over the range of 5… 1000 amperes and PTs over the range of 100… 33,000 volts. The system is self contained and includes all the required power supplies to generate the test voltage & current, the appropriate reference CTs and PTs, a set of burdens to load the test CT/PT to the required operating point and an Automatic CT/PT comparator to measure the errors of the test specimen transformer with respect to the reference transformer. An automatic CT demagnetizer is provided so that the test CTs can be demagnetized prior to conducting the accuracy tests. The system arrangement is such that all the controls are provided on the front panel of the cabinet while all the connections to the test Including Connections for CT specimen/PT are made on the front of

the cabinet. The rear end of the cabinet can be fenced off for safety purposes.
The high voltage power supply for the PT test set-up and the Standard PT are provided externally to the cabinet.

- **Features**
  - Fully pre-wired comprehensive turn key CT-PT test setup.
  - Suitable for CTs upto 1000A & Single Phase PTs up to 33kV
  - Precision (0.05% Class) internal multi-ratio standard CT
  - Internal 2.4KA /16 kVA current source
  - State of the art Instrument Transformer Test Set with computer & printer interfaces
  - Bi-pole standard PTs to facilitate testing of single phase PTs with various ratios up to 33kV
  - Current & Potential Burden Boxes
  - Automatic CT Demagnetizer

- **The major components of the test system are:**
  - An Automatic Instrument Transformer Test Set
  - An adjustable power source.
  - An adjustable current source complete with a precision standard CT.
  - A set of CT burdens box.
  - An automatic CT demagnetizer.
  - A source of adjustable voltage for PT testing.
  - Bi-pole standard PTs
    11 kV/110V, Class 0.1 @ 5VA
    22 kV/110V, Class 0.1 @ 5VA
    33 kV/110V, Class 0.1 @ 5VA
  - A set of PT burdens box.
  - A set of leads for CT & PT connections.

AUTOMATIC INSTRUMENT TRANSFORMER TEST SET
The Instrument Transformer Comparator which is a fully automatic comparator capable of comparing both CTs and PTs. The input ranges of the instrument are upto 440 volts on the PT side and 0.05 to 20 amperes on the CT side (5 ampere input) or 0.01 to 4 amperes (1 ampere input). The comparator shall have a Ratio Error measuring range as per relevant IS/IEC for CTs and PTs. The instrument can be controlled through its keyboard and the RS232/USB port using compatible PC and Interface software. A USB printer port is available to drive a dedicated printer. The comparator is designed to compare CTs/PTs of nominally the same ratio. The Test Set measures the burden of the entire test–set up. It can be made to plot the accuracy error curves of CTs or PTs using windows software on the PC. The Test Set shall conform the accuracy classes of IS, IEC. In-built measurement feature to facilitate balancing of the Bridge for 1% of rating as per IS- S class specifications are available. After balancing the both inputs of CTs or PTs at selected burden, the set up should display ratio error, phase angle error, burden connected on

secondary and class for measured values as per related standard. These all values should be stored & printed on report.

AUTOMATIC INSTRUMENT TRANSFORMER TEST SET MAIN FEATURES :

- Micro processor based Comparator, fully automatic capable of comparing both CTs and PTs.
- The input ranges of the instrument are 1…. 440 volts on the PT side and 0.05 to 20 amperes on the CT side (5 ampere input) and 0.01 to 4 amperes (1 ampere input).
- The comparator shall have a Ratio Error measuring range as per relevant IS/IEC for CTs and PTs.
- In built feature for balancing for 1% of rated currents which is needed for testing CTs as per the revised IS- S class CT specifications.
- It measures the total burden connected to the test sample including the connecting wire burden.
- Graph plotting facility. It can be made to plot the accuracy curves of CTs or PTs.
- It should conform the accuracy classes of IS 16227, IEC 61869.
- Internal Data Storage facility – can store up to 200 readings in in-built memory.
- Provides Error messages on LCD display screen along with beeping alarm
- The instrument can be controlled through its keyboard and the RS232/USB port using compatible PC.
- A USB printer port &RS232 PC Port are available to connect to the printer and PC/ Laptop. The comparator is designed to compare CTs/PTs of nominally the same ratio.
- LCD display with backlight
- Suitable for testing CTs of 5A and 1A using a single 5A Std. CT with 1A Tapping.

Major Technical particulars of Automatic Transformer test setup:-

Sr. No.	Particulars	Requirement
1.	Power Input	440 V ± 10 %, 50 Hz, 40 VA
2.	Input Voltage	1.2 V to 480 V
3.	**Operating Conditions**	Max. Ambient Temperature upto 50 degree C Realtive Humidity 10 to 100 RH

Sr. No.	Particulars	Requirement
4.	Input current	0.05 to 20 Amp
5.	Input Burden (Consumption) Current Voltage	 <0.5 VA @ 5A, <0.1 VA @ 1A 0.02 VA @ 120 V
6.	Input Frequency For Current & Voltage	45 Hz to 65 Hz
7.	**RMV**	+/-0.5% of reading, +/-0.5% of nominal input true RMS
8.	Highest Resolution : Ratio Error Phase Error	 0.1 ppm 0.1 µrad
9.	Accuracy : CT - Ratio Error - Phase Error PT - Ratio Error - Phase Error	 ± 0.6% of reading ± 4ppm ± 0.6% of reading ± 4 µrad ± 0.6% of reading ± 4ppm ± 0.6% of reading ± 4 µrad
10.	Measuring Time	<5 Seconds
11.	Display	min 8"x4" dot matrix back lit-LCD panel
12.	Keyboard	20 key membrane keyboard
13.	Burden Measurement : Accuracy Voltage Burden Range	 ± 1% P.F. 0.8→2.5, 3.75, 6.25, 7.5, 10, 12.5, 15, 18.75, 25, 30, 37.5, 50, 75
14.	Current Burden Range	P.F. 1→1, 1.25, 1.875, 2.5, 3.75 VA P.F.0.8 → 5, 7.5, 10, 15, 30, 88.75
15.	Power Factor	0 – 1.000
16.	Computer Interface	RS-232/USB
17.	Printer Output	Lesser and ink jet printer of any reputed company
19.	Data Storage facility	Min. 200 readings
20.	Data Hold Facility	Facility to hold the reading by using keyboard

Sr. No.	Particulars	Requirement
21.	Error Plotting	Facility to Plot ratio & Phase Errors which is to be displayed on the LCD panel using keyboard
22.	PC Operation	Arrangement for controlling operation from PC using PC keyboard & Transfer of Data to PC monitor for storing.
23.	Key Board Controls	. 12 key numeric pad . CT/PT select. . 5A & 1A .Voltage Input . Centi radians/ Minutes . Auto Range . Range . Burden . Date . Serial Number . Dead Band . Data output (Print – 232/ USB)
24.	Displays & Indicators	. 8 Digit Display for error message/Data entry/ Measured Value . 3 & ½ Digit for ratio error . 3 & ½ Digit for Phase error . Indication of Balanced & unbalanced condition . Centi radians (CR) & Minute (Min) . Measured value Display in Volts, Amps, or Percentage of rated value (Selectable). .The full scale value entry through Keyboard
25.	Printing	. Date . Serial Number . Class of accuracy . Burden (VA) . Test condition . Ratio error in % or ratio Correction factor (RCF) . Phase Error in centiradian (CR) Or Minutes (min) (Selectable).

5.2 Adjustable Power Source :

Power Input :

The Input to the system is **440 volts 3 Phase, 4 Wire, ±10%, 50 Hz, 16KVA max.**

The Power Output: 0 - 440 volts, 50A maximum per Phase.

The adjustable power source having following Operating Controls &

Indicators:

- Digital voltmeter and ammeter indicating source voltage and source current.
- Digital voltmeter and ammeter indicating input voltage and input current.
- Indicators for line and output.
- Output Control circuit breaker.
- Line circuit breaker.
- Function switch
- Fine and coarse controls for adjusting test voltage/current
- Standard CT ratio selection switches.
- Burden selection switches.
- CT demagnetizer indicator & initiate switch
- Emergency OFF.
- Overload protection on line and regulator.
- Zero start safety interlock.
- Safety interlock switch for connecting to safety barrier.

5.3 Adjustable current source complete with a precision standard CT:

Standard Current Transformers shall have suitable ratios in the range from 5A to 1000A mounted in the test system with proper ratio selection arrangement. These CTs shall have accuracy of minimum 0.05 %.

The CT is equipped with a tapped primary, tapped secondary winding, thus providing a multiplicity of ratios. Using the above current outputs, the following ratios are available: 5, 10, 15, 25, 30, 50, 75, 100 with provided primary winding and 125, 150, 160, 175, 200, 250, 300, 400, 500, 750, 800, 1000.

5.4 A set of Current Transformer burden box

The Current Transformer burden as per IS/ IEC shall be 1 Amp and 5 Amp, 50 Hz. They are rated for 3.75, 2.5, 1.875, 1.25 & 1VA at 1.0 power factor and for 5, 7.5, 10, 15, 30, to 88.75 VA at 0.8 power factor. Current transformer burdens are rated for continuous operation and are rated for 200% rating –short term.

5.5 Automatic CT Demagnetizer

An Automatic CT demagnetizer is provided within the test system. The demagnetizer is suitable for demagnetizing CTs of all ratios, having either 5A or 1A secondary windings.

5.6 Source of adjustable voltage for PT testing

An adjustable Single Phase output of 0 – 50kV, 2.5kVA is provided for energizing the test PT & Standard PT. The 50kV supply transformer & standard PT are kept outside the racks for safety considerations.

5.7 Bi-pole Standard PTs :

11 kV/110V, Class 0.1 @ 5VA
22 kV/110V, Class 0.1 @ 5VA
33 kV/110V, Class 0.1 @ 5VA

5.8 Potential Transformer Burdens

Potential transformer burden IS/ IEC, Input 110V and 63.5V, 50 Hz are rated for 2.5, 3.75, 6.25, 7.5, 10, 12.5, 15, 18.75, 25, 30, 37.5, 50, 75 at 0.8 Power Factor.

The Potential transformer Burdens are rated for continuous operation and are rated for 200% rating –short term.

5.9 A Set of leads for CT & PT connections

The equipment is intended to be wired to a 440 volt 3 Phase, 4 Wire source capable of supplying 50 amperes. It comes complete with a 5 meter, three-wire power cable for this purpose.

The equipment includes all the typical leads required to connect CTs or PTs and conduct tests. Such leads include the following:

1. PT secondary leads, 4 conductor arrangements for avoiding lead drop in the test set up (5 metres).
2. PT primary leads (2x 5meters).
3. CT secondary leads designed to load the test CT secondary circuit to 1 VA (5 meters).
4. 100 ampere primary leads (5 meter).
5. 300 ampere primary leads (5 meter).
6. 1,000 ampere primary leads (5 meter).
7. Bus bars for testing toroidal CTs.
8. Clamps for fastening “bat-type” CTs.
9. Safety switch.

6 CALIBRATION TEST CERTIFICATE:-

6.01 The tenderer shall furnish detailed calibration certificates of all major required instruments and equipments for CT/PT testing as per IS 17025 with the offer from laboratories which are accredited by the National Accreditation Board for Testing and Calibration Laboratories (NABL) of Government of India to prove that the instruments offered meet the requirements of this specification. The calibration certificates should have been carried out within one year prior to the date of opening of the tender. The offer without

calibration certificates of all major required instruments shall not be considered for further evaluation. The calibration test certificates in manufacturers own laboratory and certified by testing institute other than NABL Accreditation shall not be acceptable. However, the tenderer who have supplied the offered system to MSEDCL against order from Material Management Cell of MSEDCL shall be exempted from submission of calibration test certificates against this tender provided that,

i) The offered instruments are already having calibration test certificates of all required instruments and equipments for testing CT PT from Laboratories accredited by the National Accreditation Board for Testing and Calibration Laboratories (NABL) within one year prior to the date of opening of the tender.

ii) There is no change in the design of required equipments/instruments and those offered against this tender.

iii) Such tenderer complying with (i) & (ii) above, shall furnish an undertaking in the format schedule 'F' enclosed herewith.

6.02 The Purchaser reserves the right to demand repetition of some or all the calibration tests in presence of purchaser's representative at purchaser's cost. For this purpose, the tenderer shall quote unit rates for carrying out each test. However, such unit rates will not be considered for evaluation of the offer. In case the unit fails in testing, the complete supply shall be rejected & expenditure incurred shall be recovered from the tenderer from his deposit.

6.03 The successful tenderer shall take approval of calibration test certificate of all the instrument & whole as Automatic CTPT Test Set from the Chief Engineer, MSEDCL, T-QC Cell, Prakashgad, Bandra (E), Mumbai – 400051 prior to commencement of supply.

In other cases where Indian / International Standards for the equipment are not available / specified, following test condition shall be made applicable against the type test.

"The tenderer shall furnish detailed Calibration reports of the offered instrument carried out at Standard NABL approved Laboratories on all of the equipments as per relevant standards to prove that the instrument offered meets the requirements of this specification. Tenderer shall take approval / waival of Calibration reports from the Chief Engineer, MSEDCL, T-QC Cell, Prakashgad, Bandra (E), Mumbai – 400051 prior to commencement of supply."

Automatic CTPT Test Set up shall be tested for minimum IP 40 for degree of protection for dust & water.

7.0 GUARANTEED TECHNICAL PARTICULARS

The tenderer shall furnish the particulars giving specific required details of Automatic CTPT Test Set in schedule `A' attached. The offers without the details in Schedule 'A' stand rejected.

8.0 INSTALLATION AND COMMISSIONING

The supplier shall be responsible to install and commission the CT & PT test equipment at MSEDCL Laboratory to be specified by the Purchaser. The supplier shall submit the layout plan, installation proposal and electric supply requirements within 4 weeks from the date of receipt of the detailed purchase order to the Purchaser.

The Purchaser will arrange the appropriate room, location, electric supply etc. before the supply of the system so as to permit the smooth and proper installation of the system immediately upon its delivery to the designated location/s.

9.0 DEMONSTRATION

Demonstration of the Automatic CTPT Test Set up and PC software shall be given by the manufacturer as and when required by purchaser.

10.0 CALIBRATION

A) The CT/PT System will be supplied with calibration test certificate from National Physical Laboratory or any NABL accredited Laboratory – valid for 12 months. Thereafter , after every 12 month period, the system will be calibrated at MSEDCL Laboratory and a NABL calibration certificate will be issued (once every 12 months – for 4 years). Confirmation about Calibration for 5 years shall be submitted by firm along with detail time table for calibration in writing at free of cost.

B) After Sales support during Guarantee and after guarantee period to be provided.

C) Bidders to indicate details of the various regional service centers in India along with their offers.

11.0 SPARES

The bidder should supply the essential spares for maintenance purpose. List of recommended spares for two years normal use with prices to be provided along with the offer by the bidder. List of spare parts and consumable items and related softwares.

12.0 TRAINING

The supplier shall provide training of the CT PT Testing System to at least five personnel from the Department on all aspects of operation and maintenance for upto three working days at the time of initial commissioning at various regional MRT Divisional Laboratories located in various regions of Maharashtra State or as and whenever required. All expenses for providing such training support shall be borne by the vendor. The successful bidder shall depute their representative for commissioning &

training to Engineers of purchaser as and when they will be called for at no extra cost.

13.0 GUARANTEE

The Test Bench shall be guaranteed for trouble free operation for a period of 5 years from the date of commissioning or five one and half years from the date of dispatch whichever is earlier. The equipment found defective within above guarantee period shall be replaced / repaired / rectified by the supplier free of cost, within one month of receipt of intimation. After the replacement / repairs / rectification, the accuracy shall not be affected. Test report and calibration certificate shall invariably be submitted after rectification / repairs.

If defective equipment is not replaced / repaired / rectified within the specified period as above, the Company shall recover an equivalent amount plus 15% supervision charges from any of the bills of the supplier.

14.0 AFTER SALES AND SERVICE

The bidder has to indicate clearly the after sales service to be provided by the supplier during guarantee period and after guarantee period (continued technical support) and Addresses of Sales Service Centre, details of Engineers, etc. shall be submitted along with the offer.

15.0 PRE-DESPATCH INSPECTIONS

The successful bidder shall offer Automatic CTPT testing set up at their works for inspection before dispatch, in accordance with this technical specification and the GTP, as well as the general terms and conditions of the relevant tender specifications, shall be done at manufacturer's Works. For imported equipments, the supplier / tenderer shall offer the equipments at the authorized service center / works of the original manufacturer in India or at the supplier's works / testing center. The offered lot shall be tested for acceptance tests and any other test as per relevant IS / IEC as required by inspecting officers. During inspection, if the instrument does not meet the required specification & test results found not satisfactory then it shall be liable for rejection. Calibration Certificates of all associated equipments shall be furnished at the time of factory inspection.

The manufacturer shall offer to the inspector representing the purchaser all the reasonable facilities, free of charge, for inspection and testing, to satisfy him that the material is being supplied in accordance with this specification. The MSEDCL's representative / Engineer attending the above testing shall carry out testing as per relevant IS / IEC & as per this technical

specification and issue test certificate approval to the manufacturer and give clearance for dispatch.

The Automatic CTPT testing set up shall be inspected jointly by the Executive Engineer, Testing Division & the Executive Engineer, Inspection Wing.

16.0 QUALITY CONTROL

The purchaser may send a team of experienced engineers for assessing the capability of the bidder or their principals for manufacturing of Automatic CTPT testing set up as per this specification. The team shall be given all assistance and co-operation for inspection and testing at the bidder's works.

Three tender samples shall be kept ready for assessing and testing. The tenderer has to give all facilities for carrying out the testing of these samples.

17.0 MINIMUM TESTING FACILITIES

The bidder or their principals / manufacturer shall have the necessary minimum testing facilities for carrying out various acceptance and routine tests. A list of machinery / equipment and testing facility available at their Works shall also be furnished along with the offer.

18.0 PACKING

The Automatic CTPT testing set up shall be suitably packed to avoid damage or disturbance during transit or handling. Each instrument may be suitably packed in the first instance to prevent ingress of moisture and dust and then placed in a cushioned carton of a suitable material to prevent damage due to shocks during transit. The lid of the cartoon may be suitably sealed. A suitable number of sealed cartons may be packed in a case of adequate strength with extra cushioning if considered necessary. The cases may then be properly sealed against accidental opening in transit. The packing cases may be marked to indicate the fragile nature of the contents.

The following information shall be furnished with the consignment:

- Name of consignee.
- Details of consignment.
- Destination
- Total Weight of consignment.
- Sign showing upper / lower side of the crate

- Sign showing fragility of the material.
- Handling and unpacking instructions.
- Bill of Materials indicating contents of each package and spare materials.

19.0 SCHEDULES

The tenderer shall fill in the following schedules which are part and parcel of the tender specification and offer. If the schedules are not submitted duly filled in with the offer, the offer shall be liable for rejection. The order copies of the order executed mentioned in the list of order shall be invariably enclosed along with the offer. Only those orders mentioned in the list shall be considered whose order copies shall be enclosed with the offer.

Schedule A – Guaranteed Technical Particulars.

Schedule C – Tenderer's experience.

Schedule F – Proforma undertaking.

The tenderer shall submit the list of orders for similar type of equipment, executed or under execution during the last three years, with full details in the schedule of tenderer's experience (Schedule - C) to enable the purchaser to evaluate the tender.

20.0 DOCUMENTATION

Two set of following documents in print form (hard copy) shall be supplied along with each test system.

- Operating manual
- Service manual
- Calibration certificate as per relevant reference standard of whole as Transformer Test Bench.
- Calibration certificate as per relevant reference standard of all instruments.
- Operating manual of each component of test equipment
- Calibration certificate / test certificate of complete test system / Test certificates of individual components of the system issued by the manufacturer

In addition, the successful bidder shall supply one CD set containing the soft-copies of the Operation Manuals and Test Reports, all the documents mentioned above.

SCHEDULE – C

SCHEDULE OF TENDERER'S EXPERIENCE

Tenderer shall furnish here a list of similar orders executed / under execution by him to whom a reference may be made by Purchaser in case he considers such a reference necessary.

Sr. No.	Name of client & Description	Value of order	Period of Supply and Commissioning	Name & Address to whom reference of item may be made
1	2	3	4	5

NAME OF FIRM_____

NAME & SIGNATURE OF TENDERER_____

DESIGNATION_____

DATE_____

SCHEDULE – F

PROFORMA OF UNDERTAKING

We hereby confirm that **Automatic CT/PT Test Set Up having Digital Control Panel with complete system** offered by us against this tender are of the same design and type as have been supplied to MSEDCL against earlier order No. Dtd. and all the type test reports thereof were approved by Chief Engineer, T-QC Cell vide letter No. dtd. (copy enclosed).

We further confirm that the said type tests have been carried out at the laboratories accredited by NABL within five years prior to the date of opening of present tender.

NAME OF FIRM_____

NAME & SIGNATUR TENDERER_____

DESIGNATION_____

DATE_____

SCHEDULE A

GAURANTEED TECHNICAL PARTICULARS FOR AUTOMATIC CT/PT TEST SET UP HAVING DIGITAL CONTROL PANEL WITH COMPLETE SYSTEM

SR.NO	GTP PARAMETERS	To be filled by bidder
1	Manufacturer's / supplier's name and address with works Address	Text
2	Make and Type of CT, PT test bench	Text
3	Applicable standards	Text
4	Operating Conditions • Maximum ambient temperature (Degree C) … 50 • Minimum ambient temperature (Degree C) … 3.5 • Relative Humidity (%) … 10 to 100 • Maximum altitude above mean sea level (meter) … 1000	Text
5	General Technical Parameters of test set up	
	Input frequency range	Text
	Range of input voltage	Text
	Range of input current	Text
	Input burden (for current and voltage)	Text
	Root mean voltage	Text
	CTs testing range	Text
	PTs testing range	Text
	Measuring Time	Text
	Accuracy for CT (ratio error & phase error)	Text
	Accuracy for CT (ratio error & phase error)	Text
	Power Factor	Text
	Internal data storage facility up to 200 readings in built memory & hold facility	Text
	Graph plotting facility	Text
	LCD display screen with backlit along with beeping alarm	Text
	RS 232/USB printer port for printing using laptop/compatible pc with interface software's	Text
	Key board 20 key membrane for control	Text
	Display and indicators	Text
	In built bridge for balancing for 1% of rated currents as per IS – S class CTs	Text
6	Major components of test set up	Text
	A) Adjustable power source B) Adjustable current source with precision CT (0.05 class) internal multi ratio standard CT	Text

	C) Adjustable voltage source for single phase PT up to 33 KV. D) Automatic instrument transformer test setup with computer and interface E) Microprocessor based comparator fully automatic. F) A set of CT burdens box G) Automatic CT demagnetizer H) A set of PT burden box I) Bi-pole Standard PTs J) A set of leads for CT, PT connections	
7	Power source technical details	Text
8	Details operating controls and indicators	Text
9	CT burden for 5amps & 1amps suitable as per IS,IEC	Text
10	Ratios available for Standard CTs current outputs	Text
11	Outputs of PT output source	Text
14	Technical detail of Bi-pole Standard PTs	Text
15	Burdens of potential transformer	Text
16	Rating of power leads and connecting cables	Text
17	Calibration test certificates submitted shall be as per relevant IS/IEC standards (y/n)	Text
18	The supplier shall provide training of the CT & PT testing system to at least five persons (y/n)	Text
19	Guarantee	Text
20	Packaging as per technical specification	Text