Section IV T -Technical Specification

CENTRAL POWER RESEARCH INSTITUTE, BENGALURU/BHOPAL Web: www.cpri.res.in, www.tenderwizard.com/CPRI

Tender Enquiry No : CPRIBLR22SCL10C1079

Description of the Equipment/Goods/Services : Design, Supply, Installation & Commissioning of "Temperature Rise Test setup for Transformers up to 2.5MVA" at CPRI, Noida

Note : 1) The technical bid submitted in other than this format is liable to be rejected.

2) All blue fields are mandatorily to be filled in.

Name and address of the bidder	
Quotation Number and Date	

Sl.No.	Technical Specifications/Parameters	Qty	To be completed by the Bidder		
			Detials of guaranteed technical parameters offered by the bidder	Guaranteed Technical Particulars (GTP) Mention Complied/Not Complied	Deviations from GTP
1	**Place where equipment/service to be supplied/ provided :** Regional Test Laboratory (RTL), CPRI, Noida				
2	**Scope:** The scope covers Design, supply, Installation, commissioning & Training of Temperature Rise Test setup for Transformers (5KVA to 2.5MVA, single & Three phase, LV: 433V, HV : 3.3kV to 33kV) at CPRI, Noida. All equipment/Instruments, Software, Test bench/control desk, power and control cables, all necessary accessories for integrated test setup shall be in the scope of supply.	One complete integrated test setup			
3	**Qualifying requirement:** Performance certificate to substantiate the experience of the bidder to establish similar test facility (complete integrated test setup) not older than 5 years issued by the end user shall be submitted along with bid.				
4	**Application:** The following tests to be conducted as per IS:1180, IS:2026 series and IEC:60076 series IEEE Std C57.12.90 on Transformers (5KVA to 2.5MVA, Single & Three phase, LV: 433V , HV :3.3kV to 33kV) at Temperature Rise Test laboratory, CPRI, Noida. 1. Measurement of winding resistance 2. Measurement of short-circuit impedance and load loss 3. Measurement of no-load loss and current at rated voltage & at rated frequency. 4. Temperature Rise test				
5	**Schematic drawing of test setups:** Schematic drawings for No-load Loss measurement, Load Loss measurement & Temperature rise test are attached at Annexure-1 for reference.				
6	**Rating and details of Transformers under tests:** Rating and details of transformers under tests are as per IS 1180 (Part1)				
7	**Installation:** Indoor				
8	**Input supply:** 415V ± 5%, 3P+N, 50Hz				
9	**Ambient temperature:** 5 °C up to 50 °C				
10	**Altitude:** 200 m above Mean Sea Level (MSL)				
11	**Relative humidity:** 10 to 95 % (non-condensing)				
12	**Seismic zone:** suitable for Zone 3				

13	**Design recommendation and safety measures:** Test equipment have to be designed, supplied and tested in accordance with the best international engineering practices under stringent quality control to meet the requirement as per this technical specifications. Adequate safety margin with respect to thermal, mechanical, dielectric and electrical stress etc. are to be considered during design, selection of raw material, manufacturing process. The manufacturer shall take all necessary measures to ensure the safety of the test operator during the execution of the tests.This will be verifed during stage inspection and by conducting tests as listed in Sl No.16 p, 17 xxxvii & 28 during final inspection.				
14	**Approval of Drawings and documents:** Suppliers shall submit the drawings, reports & all relevent documents of whole system layout consisting of Auto Transformer (Dimmerstat), Intermediate Transformer, Capacitor bank, Control desk, Panels and general arrangement of equipment etc. for approval from CPRI within 30 days after acceptance of the purchase order. These drawings shall consists of all relevant technical details of the each equipment for example kVA, voltage, current, temperature category, relevant connection & vector diagrams, input and output terminal markings, losses and measuring meters details along with make of all equipment shall be submitted.				
15	**Control desk/Test bench of Automatic measuring system including display (Control desk/Test bench for No load loss, Load Loss & Temperature Rise test):** Fully integrated Test system is required for conducting Temperature rise test on transformers. It shall be capable of acquiring on-line data from Power Analyzer and Temperature data logger and further printing instant test reports in full compliance with standards such as IS, IEC & IEEE. Control desk/Test bench must be equipped with following features: • Operation of Auto Transformer (Dimmerstat) • CT, PT, Tap selection (secondary side) • Measuring range selection of the test Instrument • Visualization of all power circuits, relavant parameters, alarms on 15" LCD touch screen • In-built protection for equipment & Instruments • Industrial Computer (IPC) with 22" Monitor loaded with Testing Software. Note: Detailed technical specification and drawings to be specified by bidder along with bid.	One number with its complete accessories			
16	**Auto Transformer (Dimmerstat):** Reputed make like Automatic Electric/Seeco/Toshiba T&D/Rectifiers & Electronics Pvt. Ltd., etc.	One number with its complete accessories			
a.	**Motor Operated Variable Auto Transformer (Dimmerstat):** Output Current Rating : 400 A Input : 415V ± 10% AC 3 Ph&N, 50Hz Output : 0-470V AC 3 Ph				
b.	**Insulation Resistance and Dielectric Tests:** Insulation Resistance shall not be less than 5MΩ at 500V DC in nominal condition. All electrical live parts shall be capable of withstanding 3.0kVrms for 60s.				
c.	**Thermal rating:** 400A at 470V 50Hz Continuous				
d.	**Installation:** Indoor				

e.	**Unbalance Voltage in output:** The unbalance in the output voltage in 3-phase simultaneous operation should not be more than 0.5% with respect to the average value. .				
f.	**Type of Cooling:** Oil Natural Air Natural (ONAN)				
g.	**General Features:** 1.Motorised operable locally as well as remote operation with gang controlling and individual controlling of each phase to balance the voltage. 2. Rugged construction, tank type immersed in transformer oil in sheet steel tank with roller mounting 3. Core made from M4/High grade Laser scribed CRGO silicon steel & winding of 99.9% pure copper. This will be verified by measuring core thickness & raw material test certificates during stage inspection. 4. Main Busbars of electrolytic grade copper (with phase marking) shall be capable of carrying 500A continuously. This will be verified by measuring busbar sizes & raw material test certificates during stage inspection. 5. Smooth output voltage variation, continuous & linearly proportional to angular roation. 6. High Efficency (≥ 97%) 7. Total voltage harmonic distortion shall be less than 5%. 8. Short time overload capacity (140% for 30mins) 9. Good quality carbon brushes used for current collection. 10. Shall confirm to IS: 5142 standard				
h.	**Connections:** All the three phases to be brought out with suitable copper bus-bars on incoming & outgoing sides and to be properly marked for ease of connection.				
i.	**Drive for Auto Transformer:** 1. The drive shall be of Stepper motor. 2. Low speed, Instant Start-Stop, High Torque Motor. 3. Input Single Phase 220-240V, 50Hz 4. Speed 60rpm at 50Hz. 5. Standard gear ratio to be used to provide high torque at lower speed.				
j.	**Control of Voltage:** Provision of voltage control (increment/decrement) shall be made manual/remotely (motorised control from panel)				
k.	**LV Cable Box:** Shall be dust proof				

l.	**General Features of Control Desk for operating Auto Transformer:** 1.Control desk for remote operation shall consists of switching cabinet with push buttons and LT contactors of suitable rating. 2.Control desk shall be used to control and operate auto transformer to vary voltage from 0 to 470 V. 3.The voltage shall cumpulsorily Start from zero only during every start operation. This means whenever the auto transformer is switched off, it should come to zero Position auomatically. At the time of switching on, if it is in non-zero position,auto transformer shall not be energised. Energisation shall be possible only in zero positon. 4.Suitable digital measuring meters of reputed make (1.0 accuracy) for each phase to be provided for the measurement of incoming voltage and current. Note: Before inspection call, all the measuring meters are to be calibrated from ISO/IEC:17025 accredited laboratory. 5. Control desk shall have suitable connectors of good quality for measurement of voltage and current during test. Control desk should be elegant				
m.	**Emergency 'STOP' Switch:** An Emergency 'STOP' Switch shall be provided on control desk				
n.	**Safety Devices:** The control desk shall have provision to connect the following external devices: 1.Safety loop to connect external emergency switches. 2.Safety loop to control the safety fences. 3. "GREEN" & "RED" indicating lights shall be provided				
o.	**Spares/Accessories :** 1. It is mandatory to supply atleast one no. stepper motor and nine nos. carbon brushes, the cost of these items to be included in the cost of Autotransformer. 2. If any other spares/accessories for Autotransformer are needed for maintenance purpose along with long running upto 10 years, please suggest and quote separately.				
p.	**Testing:** Insulation resistance, Routine tests and Temperature Rise Test to be conducted as per latest IS/IEC/IEEE standards in presence of CPRI Official at manufacturer's work. Manufacturer should have facility to conduct these tests at own premises.				
q.	**Test Reports:** Factory test reports of all the tests mentioned in Sl. No. 16 p shall be provided by the supplier along with Dimmerstat.				
r.	**Inspection:** All the tests as per relevent standard shall be carried out on equipment in presence of CPRI's representative at manufacturer's works except, where agreed to otherwise. All the test reports should be submitted and should get approved from the CPRI before dispatch of the equipment. The supplier shall give 15 days advance intimation to enable the CPRI to depute the representative for witnessing the acceptance and routine tests. Inspection To and Fro charges, lodging & boarding expenses shall be borne by CPRI. The inspection will be carried out by the CPRI on the completion of job. Inspection and acceptance of any equipment under this specification by the CPRI shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specification and shall not prevent subsequent rejection if the equipment found to be defective and not complying with the GTP of CPRI.				

s.	**Installation & commissioning:** 1. Installation & commissioning of all the equipment/component/item with the trial testing at safe working load is in scope of supplier. 2. The transformer shall be supplied with initial fill of new transformer oil with BDV Value of minimum 60kV (average of atleast three) and conforming to IS 335: 2018 standard. Oil BDV test report will be verified during Stage inspection				
t.	**Quality plan, Inspection and Tests:** Tests mentioned in Sl. No. 16 p as per relevant standard (mentioned in Sl. no. 36) shall be carried out on equipment in presence of CPRI representative at the manufacturer's expenses at his works except, where agreed to otherwise. All test reports should be submitted and get approved from CPRI before dispatch of the equipment. The supplier shall forward the information in advance to CPRI, about the manufacturing program at the following stages: (a) On completion of core and winding assembly (Stage inspection) (b) After fabrication of the transformer tank & final assembly(Final inspection) The CPRI reserves the right to insist on witnessing the acceptance/routine testing including brought out items.				
17	**Intermediate Transformer:** Reputed make like Automatic Electric/Seeco/Toshiba/Kirloskar etc.	One Complete Set with all fittings			
i.	**Rated Power:** 315 kVA (continuous duty), Three Phase				
ii.	**Primary Voltage:** 433 V				
iii.	**Secondary Voltage:** 600-1200-2400-3600 V				
iv.	**Rated Primary Current:** 425 A				
v.	**Rated Secondary Current:** 305 - 152 - 76 - 51 A				
vi.	**Type of Cooling:** ONAN				
vii.	**Over loading Capacity:** 120% for two Hour				
viii.	**Operating Temperature:** less than 45 deg. C				
ix.	**Insulation Level:** LV: 3kV rms, HV: 10kV rms / LI: 40kV peak				

x.	**Connection:** YnYn0				
xi.	**Operating frequency:** 50Hz				
xii.	**% Impedance at 75°C:** < 4%				
Note: The following details have to be specified by the bidder for Auto Transformer & Intermediate Transformer					
xiii	**No load losses (W):** To be specified by bidder				
xiv.	**Load Loss at 75°C:** To be specified by bidder				
xv.	**Over fluxing factor:** 115%				
xvi.	**Maximum temp. rise in oil:** 40°C				
xvii.	**Maximum temp. rise in winding:** 45°C				
xviii.	**Type of Cooling:** ONAN				
xix.	**Details of Core:** The core of the transformer shall be M4/High grade Laser scribed CRGO laminations only. The core shall have low loss and good grain properties. The core should be coated with hot oil proof lamination insulation, bolted together and to the frame firmly to prevent undue vibration or noise. The complete design of the core must ensure permanency of the core losses with continuous working of the transformer. The operational flux density of the transformer shall be such as to provide a over-fluxing of 112.5% as per standard. Core thickness and core area will be verified during stage inspection and overfluxing will be verified during final inspection.				
xx.	**Operating flux density:** **less than** 1.5 T				
xxi.	**Insulation used for core clamping:** To be specified by Bidder				
xxii.	**Winding:** The HV and LV windings shall be of electrolytic copper. The insulating material used shall be non-hygroscopic. The manufacturer shall give the complete details about the active part of the				
xxiii.	**Material of winding conductor:** Copper				
xxiv.	**Type of winding:** To be specified by Bidder				
xxv.	**Maximum current density of HV Winding:** < 2 A/mm^2 . This will be verified during stage inspection				

xxvi.	**Maximum current density of LV Winding:** < 2 A/mm^2. This will be verified during stage inspection				
xxvii.	**Conductor cross section(area)Winding HV in Sq.mm :** To be specified by Bidder				
xxviii.	**Conductor cross section (area) LV winding in Sq.mm:** To be specified by Bidder				
xxix.	**No. of turns in primary:** To be specified by Bidder				
xxx.	**No. of turns in secondary:** To be specified by Bidder				
xxxi.	**Insulation details of HV windings:** To be specified by Bidder				
xxxii.	**Insulation details of LV windings:** To be specified by Bidder				
xxxiii.	**Tank Details**				
	Tank dimensions: To be specified by Bidder				
	Overall dimensions: To be specified by Bidder				
	Tank plate thickness (in mm): To be specified by Bidder				
xxxiv.	**Painting:** The transformer tank should be sand blasted or cleaned by chemical process before painting. The transformer tank, Conservator, Radiators, Breather and related Pipe work and base plate should be given two coats of red lead (not red-oxide) or other suitable anticorrosive paints and after drying two coats of light grey shade of weather resistant quality. Paint adhesiveness will be verified by Paint Adhesion test as per ASTM D 3359 Standard.				
	Accessories: The transformer shall have the following accessories of standard make and good quality conforming to relevant IS/IEC. Following Details to be specified by Bidder(s).				
	Conservator tank				
	Detachable radiators				
	Pressure Release Vent/ Valve				
	Two earthing terminals with the stanadard earthing symbols				
	Oil level gauge indicating oil level minimum, 30°C and maximum operating temperature				
	Rating and terminal marking plates				

xxxv.	Drain cum sampling valve (¾ nominal size thread) preferably steel with plug for three phase transformers required				
	Thermometer pocket with cap				
	Dehydrating breather in lieu of plain breathing device (which should not permit ingress of rain water and insects) required				
	Lifting lugs for the complete transformer as well as for core and winding assembly				
	Terminal connectors and its material				
	Cable end box provided Please Confirm				
	The terminations of each phase of HV winding should be brought out for connections.				
	Oil temperature indicator and winding temperature indicators for transformers				
xxxvi.	Drawing and Instruction Manuals: Following drawings are to be submitted along with Transformer				
	General outlines drawings, showing dimension, front and side elevation and plan of the equipment.				
	LV & HV winding details and Name Plate drawings (Name plate details as per IS 1180) shall be provided.				
	Dimension and assembly of important auxiliaries.				
xxxvii.	**Quality Plan, Inspection and Tests:** All Routine tests, Temperature rise test, No load current at 112.5% rated voltage as per IS 1180 shall be carried out on equipment in presence of CPRI representative at the manufacturer's expenses at his works except, where agreed to otherwise. All test reports should be submitted and get approved from CPRI before dispatch of the equipment. The supplier shall forward the information in advance to CPRI, about the manufacturing program at the following stages: (a) On completion of core and winding assembly. (b) After completion of the transformer The CPRI reserves the right to insist on witnessing the acceptance/routine testing including brought out items.				
	NOTE: Transformer shall be supplied with fresh oil filled with BDV Value of about 60kV. BDV report either from factory or from third party lab shall be provided as per IS 335: 2018 standard				
18	**Current Transformers:** Reputed make like Kalpa/Automatic Electric/Pragati / Eltel etc. Applicable Standards: IEC 61869 -1 & IEC 61869-2				
a.	**CT for N0-load Loss, Load Loss & Temperature Rise tests:** 3.6kV, 500- 400-300-200-100-50-10/5A (Cast resin type) Insulation level : AC 10kV rms, LI 40kV peak operating frequency : 50Hz	Four numbers			

b.	**Accuracy Class:** 0.2				
c.	**Rated Burden (in VA):** 5				
d.	**Insulation Level of Secondary Winding:** 3.0 kV rms				
e.	**Insulation Class:** B				
f.	**Special Feature:** a) Required tapping shall be done in CT secondary side b) Proper marking for the ratios to be given in elegant looking terminal box with good quality nut-bolts.				
19	**Potential Transformers:** Reputed make like Kalpa/Automatic Electric/Pragati etc. Applicable standards: IEC 61869-1 & IEC 61869-3				
a.	**PT for load loss & Temperature rise measurements:** ((3.3 - 2.2 - 1.1)/√3)kV / 110/√3V (Cast resin type) Insulation level : AC 20kV rms, LI 60kV peak, operating frequency : 50Hz	Four numbers			
b.	**Accuracy Class:** 0.2				
c.	**Rated Burden (in VA):** 10				
d.	**Rated Voltage Factor:** 1.2 times continuous, 1.5 times for 30 s.				
e.	**Insulation Level of Secondary Winding:** 3.0kV rms				
f.	**Termination:** Proper Marking for terminations to be given in elegant looking terminal box with good quality nut-bolts.				
20	**Capacitor bank with stand and suitable arrangement for Star/Delta, sereis/parallel connection:** Capacitor bank configuration of connection for each standard rating of transformer to achieve 90% current compansation. Bank will be installed in panel with suitable contactors for different combination selections. Control panel with push buttons for remote switching of capacitors shall be provided. Applicable standard: IEC 63210				
a.	**HT capacitor:** Reputed make like Schneider/ABB/TDK India/Shreem etc.	6			
	Rated Voltage: 2200 V				

	Capacitor unit: 63 kVAR , Single Phase				
	Losses: Less than 0.5 watts/kVAR				
	Rated Frequency: 50HZ				
	Discharge: Discharge resistance (inside tank) to be provided for discharging to 50 V or less than within 60 Sec.				
	Protection: 1. Internal element fuses 2. External HRC fuse for every unit				
	Permissible overload: 110% of rated volatge or 130 % of rated output				
b.	**LT capacitor:** APP type; Reputed make like Schneider/ABB/TDK India/Shreem etc.	15			
	Rated Voltage: 440 V				
	Capacitor unit: 25 kVAR , 3 Phase				
	Losses: Less than 0.5 watts/kVAR				
	Rated Frequency: 50 Hz				
	Discharge: Discharge resistance (inside tank) to be provided for discharging to 50 Vor less than within 60 Sec.				
	Protection: Internal element fuses				
	Permissible overload: 110% of rated volatge or 130 % of rated output				
21	**Three phase Digital Power Analyser:** Reputed make like Yokogawa/Hioki/Haefely/N4L etc.	1			
a	**Number of input channels:** Three				
b	**Maximum current input:** 30A or more AC & DC (in steps, floating) direct input				
c	**Maximum voltage input:** 1000V or more AC & DC (in steps, floating) direct input				
d	**Measurement Bandwidth:** DC, 0.1 Hz to 1 MHz				
e	**Accuracy:** Voltage and Current : ±0.2%, Power at 0.2/0.5 pf lag : ±1%				
f	**Display:** 8.4-inch or more color TFT LCD monitor				
g	**A/D converter:** Simultaneous voltage and current conversion and 16-bit or more resolution				
h	**Features:** Data Update rate: 50 ms to 20 sec, Holds the data display, Integration, trigger, store function, Harmonic measurement upto 30(THD), USB/Ethernet interface, Advanced computation function: Waveform computation, FFT analysis, waveform sampling data saving, over voltage protection.				
i	**Wiring:** 1P2W (single phase, two-wire), 1P3W (single phase, 3 wire), 3P3W (3 phase, 3 wire), 3P4W (3 phase, 4 wire) etc.				

j	**Measurement function:** Vrms, A, W, VA, VAR, pf, phase angle, HZ, Vrectified mean, THD etc.				
k	**Accessories:** Power cord, Spare power fuse, Rubber feet, Current input protective cover, User's manual, Currents & Voltages measurement Leads sets with connector, Application software, etc.				
22	**Winding Resistance Meter:** Reputed make like Raytech/Haefely/Keysight Technology etc.	1			
a	**Measurement Channels:** Two channels shall be provided for measurement. It shall be possible to select either single or both channels for taking measurements.				
b	**Display:** As per selection, either the single or dual channel measurements shall be displayed on LCD . It shall be possible to display the injected current, resistance values and time etc				
c	**Data logging:** Data logging and storage of measurements shall be possible at the specified interval				
d	**Interface:** USB, RS232 interface shall be provided for downloading the stored data to a computer or external printer				
e	**Printer:** Shall have built-in printer to print the readings and corresponding time.				
f	**Current source:** Shall be of constant current regulated supply to eliminate the effects of Ldi/dt				
g	**Protection:** Shall have over temperature protection and fuse protected				
h	**Driving Voltage:** Shall be 50 V or better, DC supply				
i	**Current to be injected:** User selectable and Max Currents up to 50 A or more				
j	**Input power Supply:** Suitable to use with 230 – 250 V , 50 Hz				
k	**Resistance Range:** Measuring range: 0 to 1Ω with the Resolution: 0.05 μΩ or better Accuracy: ± 0.1% rdg ±0.05 μΩ or better Measuring range: 1 Ω to 10 Ω with the resolution: 0.5 μΩ or better Accuracy: ± 0.1% rdg ± 0.5 μΩ or better,< 1Ω may be possible in this range Measuring Range: 10 Ω to 100 Ω with Resolution:5 μΩ or better Accuracy: ± 0.1% rdg ± 5 μΩ or better <10Ω may be possible in this range Measuring Range: 100 Ω to 2 kΩ with Resolution:20 μΩ or better Accuracy: ± 0.1% rdg ± 20 μΩ <100Ω may be possible in this range Measuring Range: 2kΩ to10kΩ with Resolution:200mΩ or better Accuracy: ± 0.2% rdg ± 200 mΩ or better < 2000Ω may be possible in this range				

l	**Features:** 1. Demagnetizing Circuit, internal storage, Data exchange via USB-Key or USB / RS 232 Connection 2. Complete automatic calibration system and system diagnostics, Temperature channels with automatic resistance correction, Pure filtered DC Power source for the highest accuracy readings, Automatic, high efficiency cooling system to dissipate internal heat. 3. Automatic shut-off for over-temperature condition. Panel mounted Emergency Stop Switch, Mounted in rugged case , Fastest discharge time. Suitable protection devices shall be provided to protect the meter from internal/external faults. 4. Meter should also be suitable for temperature rise test application. 5. Cooling curve plotting facility				
m	**Accessories:** Current Cable: 2 x 10m, Potential Cable: 2 x 2 x 10m, Earthing cable: 1 x 10m, Cable bag, USB Memory stick, Power cord, Spare fuse, Software for Data Exchange and Analysis. User manual etc.				
23	**Multimeter:** 1. Direct and alternating voltages from 100µV to 1000V 2. Direct and alternating currents from 10µA to 10A 3. Capacitance from 1pF to 40mF 4. Resistance from 100mΩ tp 60MΩ 5. Frequency from 10Hz to10MHz Four and half digit true rms for all above parameters 6. Diode measurement and continuity testing 7. Hold measurement & Relative measurement 8. Temperature measurement 9. Reputed make like Fluke/Keysight etc. 10. Accuracy < ±1% : Make : Reputed make like Fluke/Rishab/Haefely/Keysight Technology etc., Detailed Technical specification to be specified by bidder.	Two numbers			
24	**30 Channel Data Logger** **(Temperature Scanner):** Reputed make like Fluke/Keysight/Hioki/Yokogawa etc 30 Channel Data Logger (Temperature Scanner) T-Type Thermocouple (10 m - 30 nos.) RTD (PT-100) (10 m - 10 nos.) Temperature sensors (T-Type & RTD-PT-100) shall be suitable to measure surface temperature and oil temperature.	One Set			
a	**Analog Inputs:** 30 channel isolated to chassis (plug-in/screw type terminal)				
b	**Max allowable inputs:** ± 100V(Maximum voltage between input terminals), Isolation voltage 250V DC (between channels), 300V AC/DC(between terminal and chassis)				
c	**Temperature Measurement with** **T type Thermocouple :** Range 0 to 500 °C with resolution-0.05 & accuracy ± 1°C				

d	**Internal Memory:** 16 MB or higher; 16GB or more external memory stick				
e	**Measurement Parameters:** Measurement of Temperature using thermocouples(J,K,E,T,N,R,S,B,W), RTD, Voltage etc.				
f	**Recording Interval & sampling rate:** 10ms to 1Hr, Time axis selection100ms to 24Hr with repeat recording and Sampling rate: 10ms/S or higher				
g	**Communication:** LAN Interface - Data download via FTP, Remote control via HTTP, USB-Transfer data to CF card, PC.				
h	**Software required:** Display : waveform, numerical values, alarm status, waveform scroll etc. Data save : Real time data transfer to excel, event marks, data conversion, data calculation(include standard deviation, integration) Search mode : Event time /date, max/min positon, alarm printing function, waveform processing				
i	**Display:** Atleast 5.7" TFT color LCD , backlight , Brightness change option. At least 6 numerical value of temperature to be displayed with respect to 30 channel.				
j	**Conforming standards:** EN61010-1, EMC:EN61326-1, EN61000-3-2, EN61000-3-3, Anti vibration JIS D1601: 1995 5.3(1) Corresponds to class A				
k	**Calculation & other functions:** Max, Min, Average, peak,time at max, time at min., four arithmetic calculation between four channel, display and saving of data, event marking(search & move , Max 100 per meaurment). Cursor (y=mx+b), scaling, rate adjustment, comment input, start/stop, key lock alarm etc.				
25	**Power and control Cable with clamps or lugs:** All Interconnecting input & output power and control copper cable of suitable cross section for connecting all equipment, CT's, PT's, Auto Transformer, Intermediate Transformer, Capacitor bank shall be in the scope of supply of adequate length for connections along with lugs. Copper cable of suitable cross section for temperature rise test/load loss (10m approx.) and no load (10m approx.) with clamps shall be in the scope of supplier.				
26	**Software:** Necessary software for conducting automated sequencing for computer aided testing. Software for calculation of losses, temperature rise test calculation/graph and report preperation.				
27	**Inspection:** 1. All the routine tests listed in IS 1180 shall be conducted in accordance with latest issue. 2. The Temperature rise tests, no load current at 112.5 % of rated voltage which are essential to prove the performance of the equipment/ system shall be conducted as required. 3. The test charges for conducting all tests shall be borne by the bidder. 4. For pre-dispatch inspection/clearance, bidder shall notify CPRI 15 days in advance and allow full access to CPRI representatives to witness the tests. 5. The switchgear used in the system shall be tested in accordance with the relevant IEC Standards and the type test report of the same not older than 5 years shall be submitted along with bid.				

28	**Acceptance Test:** The Acceptance Tests at customer's site are aimed to demonstrate that all supplied equipment were correctly assembled, fulfils its technical specification and complies with the relevant standards. Acceptance tests shall be demonstrated by conducting the following tests on 2.5 MVA transformer or depends on the availabilty of rating of the transformer at CPRI, but not limited to: 1. Measurement of winding resistance 2. Measurement of short-circuit impedance and load loss 3. Measurement of no-load loss and current at rated voltage & at rated frequency 4. Temperature rise test				
29	**Documents and Drawings:** 1.Supplier shall submit three sets of hard copies of operating manuals, Maintenance Manual consists of all relevant technical specifications, general drawings, electrical schemes, installation drawings and circuit diagrams of whole system along with intermediatory inspection reports during manufacturing. 2.Supplier shall submit reports of routine and acceptance tests all equipment/instruments. All the documents shall be communicated in ENGLISH only. Documents are to be issued both on paper and soft copy.				
30	**Calibration:** All the measuring instruments [Panel meters (voltmeter, ammeter) in dimmerstat & Intermediate Transformer, Power Analyser, Winding Resistance meter, Current Transformer, Voltage Transformer, Multimeter, Digital Temperature Datalogger along with thermocouple] shall be calibrated from independent accredited laboratory as per ISO/IEC:17025:2017. Calibration shall cover all the parameters and ranges of the instruments.				
31	**Installation, Commissioning & Training:** The installation/Commissioning of all equipment/instruments shall be carried out by supplier at CPRI, Noida Premises. All busbars, power /control cables, insulators, clamp and connectors etc. for interconnection and output power cables of complete set up shall be provided by the supplier. After successful commissioning at CPRI laboratory, training on operation and maintenance of the test system shall be given to CPRI officials by experienced professionals for atleast 3 days.				
32	**Warranty:** The complete Lab equipment/instruments shall be guaranteed for 12 months after successful installation at CPRI, Noida.				
33	**Mandatory spares:** Bidder shall specify the spares required for the successful operation of complete test setup for a period of five years as optional and price for the same shall be quoted separately.				
34	**Delivery:** All equipment including necessary accessories should be delivered to CPRI, Noida				
35	**Pre-bid meeting requirement:** The bidder may write to Purchase Section, CPRI, Bengaluru for clarification if required.				

36	**Reference Standards:** All the above mentioned equipment used with the system shall confirm to the latest edition of the following standards 1) IS 1180 (Part 1) & IS 1180 (Part3) 2) IS 2026 -1 & IS 2026-2 3) IEC 60076-1, IEC 60076-2 & IEC 60076-3 4) IEEE C57.12.00, C57.12.20 & C57.12.90 5) IEC 60947 series of standards relavance to MCCBs, ACBs, Contactors, Switches, Switch Disconnectors etc. 6) IEC 61869-1, IEC 61869-2, IEC 61869-3 7) IEC 60269-1 & IEC 60282-1 8) IEC 63210 9) IEC 61010-1 10) IEC 61439-1 & IEC 61439-2				
Note: The supplier can discuss with Joint Director, CPRI, Noida for the place/size of existing room for installation before commissioning the set -up.					

PN: 1) Mere statement of "Complied" do not suffice the requirement. The details of technical parameters in proof of CPRI requirements shall be furnished along with technical write-up, catalogues, brouchers, literatures, phamplates, or any other documents shall be submitted in hard copy along with technical bid.
2) Calibration reports/certificates, factory test reports/certificates from an accreditated agencies/facilites shall be submitted wherever applicable.
3) CPRI reserves the right to conduct "predispatch inspection" prior to dispatch at the works of the supplier and the expenditure towards PDI shall be borne by CPRI. However information regarding the rediness of the equipment/machinary for the PDI shall be communicated in writing at lease 70 days in advance.

Annexure-1

Schematic Diagrams

No-load loss test (Figure 1 & Figure 2)

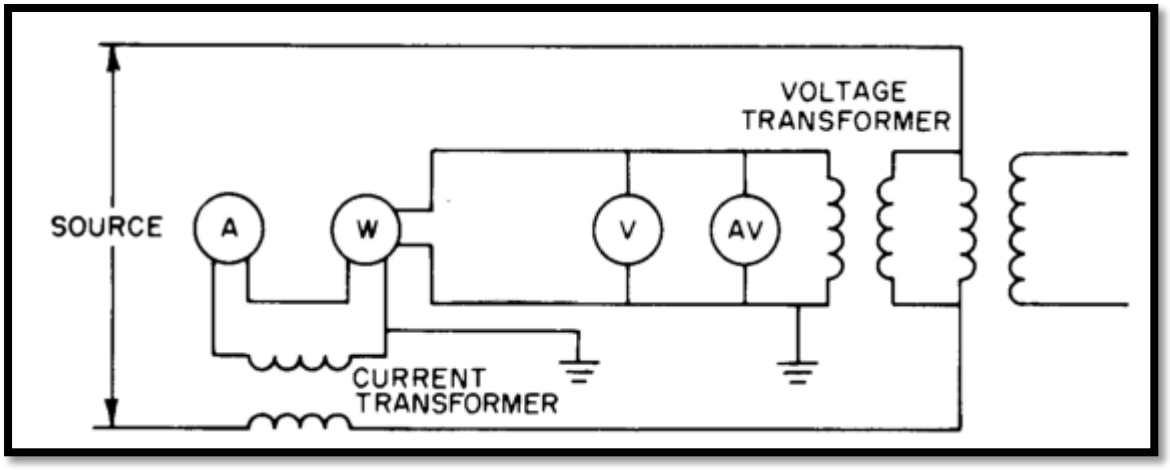

Figure 1 —Connections for a no-load loss test of a single-phase transformer with instrument transformers

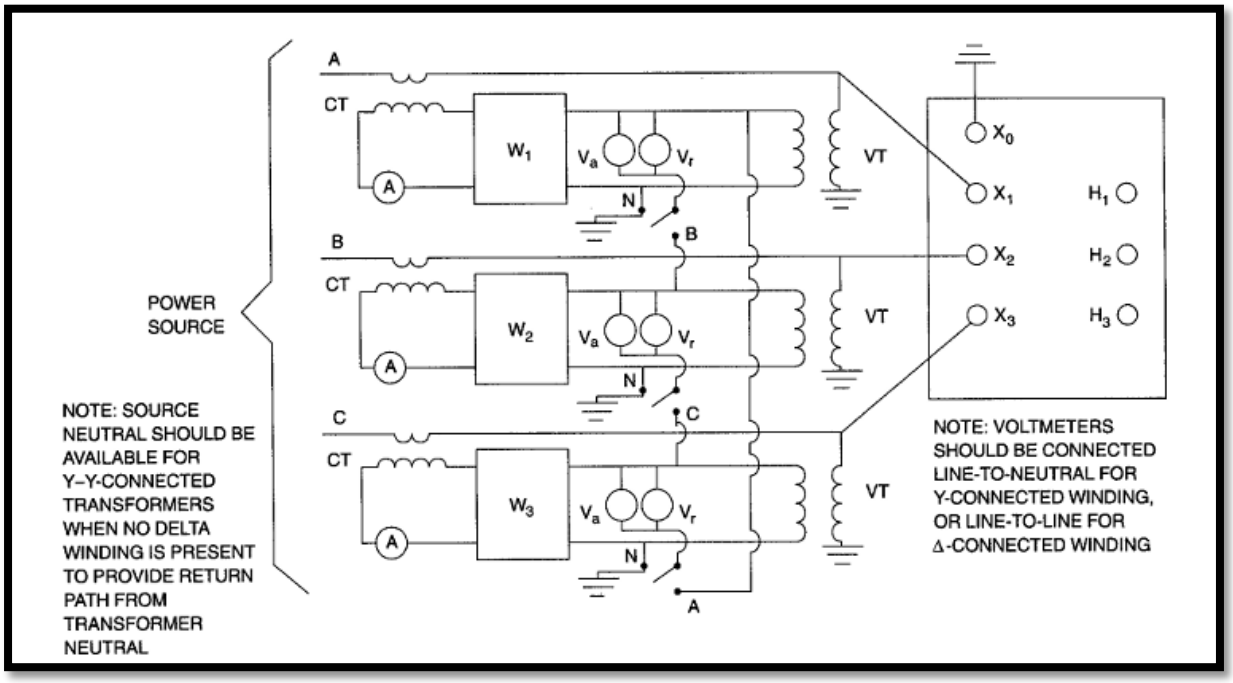

Figure 2 —Three-phase transformer connections for no-load loss and excitation current tests using three-wattmeter method

Reference: IEEE Std C57.12.90-2021
IEEE Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers

Annexure-1
Schematic Diagrams

Load loss, Impedance voltage & Temperature-rise test (Figure 3 & Figure 4)

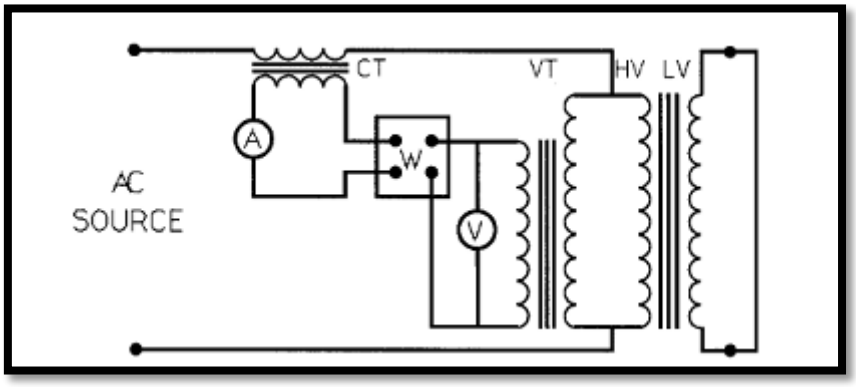

Figure 3 —Single-phase transformer connections for load loss and impedance voltage tests with instrument transformers

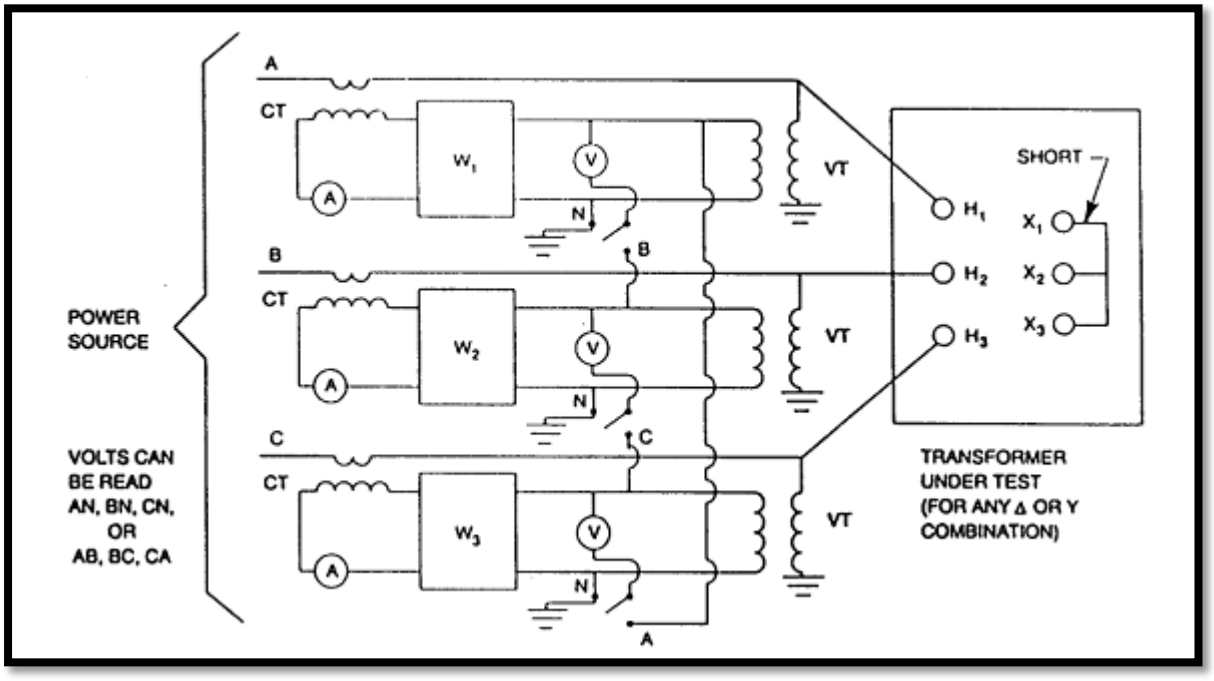

Figure 4 —Three-phase transformer connections for load loss and impedance voltage tests using three-wattmeter method

Reference: IEEE Std C57.12.90-2021
IEEE Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers