Section IV L - Price Bid for local supplies

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

Tender Enquiry No : STDS/12-01/2020-21/PUR/RTL-NK-13

Description of the Equipment/Goods/Services: Transformer Routine and Temperature Rise Test Lab for Distribution and Power Transformers.

Name and address of the Bidder *	
Quotation Number and Date*	
HSN code (Harmonized system nomenclature)*	
GSTIN No*	
SAC code (Services Accounting Code)*	
Income Tax permanent account number(PAN)*	
Details of EMD submitted*	

Sl.No	Particulars	Qty	Unit Rate in Rupees	Total Amount in Rupees
1	**Basic Price (Including mandatory spares, packing and forwarding charges)** **(The list of mandatory spares shall be provided in the technical bid without mentioning the price)** **Insurance is under Supplier's Scope**	**1**		**0.00**
1(a)	*GST rate as applicable in percentage only*			
	IGST			**0.00**
	CGST			**0.00**
	SGST			**0.00**
	UTGST			**0.00**
	CESS if any			**0.00**
2	**Transportation Charges (To be Quoted in Lumpsum ,if applicable)**			**0.00**
2(a)	*GST rate as applicable in percentage only*			
	CGST			**0.00**
	IGST			**0.00**
	SGST			**0.00**
	UTGST			**0.00**
	CESS if any			**0.00**
3	**Installation and Commissioning Charges (To be Quoted in Lumpsum ,if applicable)**			**0.00**
3(a)	*GST rate as applicable in percentage only*			
	CGST			**0.00**
	IGST			**0.00**
	SGST			**0.00**
	UTGST			**0.00**
	CESS if any			**0.00**
	TOTAL LANDED COST			**0.00**
	Total Landed Cost in Words			

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4	**OPTION-1 :** **Post warrenty comprehensive AMC including, Labour, Travel, Spare Parts etc. in INR (lumpsum)** (This cost is optional hence will not to be considered for cost comparission evaluations.)			
5	**OPTION-2 :** **Optional accessories in INR (lumpsum)** **List of items with breakup price to be furnished in case CPRI demands for the same.**			
6	**Guarantee/Warrantee period**			
7	**After sales and service facility (location of the facility and address to be furnished)**			
8	**Delivery period**			
9	**Validity of the offer**			
10	**Payment terms** **(as per CPRI payment terms)**			
11	**Details of enlistment if any under Department of expenditutre , Minsitry Of Finance , GOI.**			
12	**Name and address of the customer, if any to whome a similar equipment/items has been supplied with their purchase order number and date (as per the APPENDIX I).**			
13	**Whether a similar equipment could be demonstrated to our representative in case required.**			
15	**Acceptance for submission of security deposit in the event of placement of order.**			

PN:
1) The price bid shall be submitted in this format only.
2) All blue fields are madatorily to be filled in.
3) As a policy of CPRI High Sea Sales bids are not acceptable and shall be rejeced.
4) 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.
5)UNDER TAKING: THE OFFER MADE IS IN STRICT COMPLAINCE WITH THE QUALITY AND OTHER TECHNICAL REQUIREMENT MENTIONED IN SECTION - IV T.

Section IV T -Technical Specification

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

Tender Enquiry No : STDS/12-01/2020-21/PUR/RTL-NK-13

Description of the Equipment/Goods/Services : Transformer Routine and Temperature Rise Test Lab for Distribution and Power Transformers.

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 of the Vendor	
Quotation Number and Date	

Sl.No.	Parameters	CPRI Specification / Requirements	Qty	To be completed by the Bidder		
				Detials of guaranteed technical parameters offered by the bidder	Guaranteed Technical Particulars (GTP)	Specify deviations/ Remarks if any
1	Place where equipment/service to be supplied/ provided	Regional Test Laboratory (RTL), CPRI, Nasik				
2	Scope	The scope covers Design, supply, Installation, commissioning and Testing of Transformer Routine & Temperature rise Test laboratory for Distribution and Power transformers (5KVA to 10MVA, single & Three phase, LV Voltage 110V to 3300V, HV Voltage 3.3kV to 36kV) at CPRI, Nasik. All equipments/Instruments, PC, Software, test bench, all power and control cable, busbar connectors /clamps etc. shall be in the scope of supplier. Earthing pits for the lab shall be in the scope of supplier.	1 complete setup			
3	Qualifying requirement	Performance certificate to substantiate the experience of the bidder to establish similar laboratory (complete system & Instruments) 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 (all parts) and IEC:60076 (all parts) latest, on Distribution and Power Transformers (5KVA to 10MVA, single & Three phase, LV Voltage 110V to 3300V, HV Voltage 3.3kV to 36kV) at Transformer Routine and Tempewrature Rise Test laboratory, CPRI, Nasik. : • Measurement of Insulation resistance • Measurement of winding resistance • Measurement of voltage ratio and check of phase displacement • Measurement of short-circuit impedance and load loss • Measurement of no-load loss and current at rated voltage & frequency. • Dielectric routine tests (IEC 60076-3): i) Applied voltage test ii) Induced Voltage tests • Temperature rise tests.(IEC 60076-2)				
5	Schematic drawing of test setups	Schematic drawing No. 1 for No Load Loss measurements & Induced over voltage test and Schematic drawing No. 2 for Load Loss measurements & Temperature rise test are attached for reference.				
6	Rating and details of transformers under tests	Rating and details of transformers under tests are attached in Annexure 1 for reference.				

7	Installation	Indoor				
8	Input supply	415V, Three phase, 50Hz				
9	Ambient temperature	5 °C up to 50 °C				
10	Altitude	986 m above MSL				
11	Relative humidity	10 to 95 % (non-condensing)				
12	Seismic zone	suitable for Zone 3				
13	Design recommendation and safety measures	The testing equipments have to be designed, supplied and tested in accordance with the best international engineering practices under stringent quality control to meet the requirement stipulated in the technical specifications. Active harmonic compensation regulates the THD ≤ 3% and to symmetric test voltage, even on highly non-linear loads. Built-in alarms for safe operation. Transformer templates for easy test object data input. 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.				
14	Approval of Drawings and documents	The Drawings along with rating/technical details of the each equipment i.e. KVA, Voltage, current, losses and instruments i.e. accuracy, range,etc. along with make and model for the Transformer Routine & temperature rise test lab and system for conducting all the above mentioned tests sucessfully on transformers up to 10MVA rating shall be submitted with bid. Suppliers shall submiit the drawings, reports & all relevent documents of whole system layout, MG Set, Auto Transformer, Intermidiate Transformers, capacitor bank, Panels and General arrangement of equipments in lab. etc for approval form CPRI within 30 days after acceptance of the purchase order.				
15	Test bench Automatic measuring system including display a) Test bench 1: for Operation of M G Set for No Load & Induced Over Voltage test. b) Test Bench 2 : for operation of Auto Transformer for measurement of Load Loss & Temperature Rise test	Two Fully integrated Test Bench is required for conducting Routine Tests & Temperature rise test on transformers. It shall be capable of acquiring on-line data from Power Analyzer and temperature data logger, printing reports in full compliance with international standards such as IS, IEC & ANSI. Each Test bench must be equipped with following features: • Operation of M G Set (Test bench 1) • Operation of Auto Transformer (Test bench 2) • CT, PT, Tap selection (secondary side) • Measuring range selection of the test Instrument • Visualization & Control of all power circuits, their parameters, alarms on 15" LCD touch screen • In-built Protection for user, Equipments & Instruments . • Desktop Computer with 18.5" Monitor for Transformer measurement calculation Software. Detailed Technical specification and drawings to be furnished by bidder along with bid.	Two			
16	**Auto Transformer**	**(0-470)V, 300A, 3-phase, Motor Operated Variable Auto Transformer (Dimmerstat)**	One No. With Complete Accessories			
a.	Motor Operated Variable Auto Transformer (Dimmerstat)	Output Current Rating : 300 Amps Input : 415V ± 10% AC 3 Ph – 4 wire, 50Hz Output : 0-470V AC 3 Ph Make of Autotransformer (Dimmerstat) also to be mentioned by the bidder				
b.	Insulation Resistance and Dielectric Tests	Insulation Resistance Not Less than 5M ohms at 500V DC in Nominal Condition. All electrical live parts shall be capable of withstanding 3.0kVrms for one minute.				
c.	Thermal rating	300A @ 470Volts Continuous				
d.	Installation	Indoor				
e.	Unbalance in output	1. The unbalance in the output voltage in 3-phase simultaneous operation should not be more than 0.5% with respect to the input voltage. 2. Motorised operable locally as well as remote operation with gang controlling and individual controlling of each phase to balance the voltage.				
f.	Type of Cooling	Oil Natural Air Natural (ONAN)				

g.	General Features	**1.** Simple Rugged Construction, Tank Type immersed in Oil in sheet steel tank with roller mounting (Oil Cooled) **2.** Core Made from High Grade CRGO Silicon Steel & Winding 99.9% pure Copper. **3.** Main Busbars shall be capable of carrying 300 Amps of Electrolytic Grade Copper with proper Phase Marking **4.** Smooth Output Voltage Variation, continuous, Breakless, & Linearly Proportional to angular roation. **5.** High Efficency. **6.** Negligible waveform & power factor distortion. **7.** Excellent Short time Overload Capacity. 8. High quality Carbon Brushes used for current collection.				
h.	Connections	All the Three phases to be brought out and Incoming and outgoing to be proprly marked for ease of connection.				
i.	Drive for Auto Transformer	**1.** The drive shall be Stepper motor. **2.** Low speed - Instant Start, Stop - High Torque Motor. **3.** Input 220V, 50Hz, Single Phase. **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 Increase and Decrease of Voltage control shall be made manual/Motorised and remotely control from panel				
k.	LV Cable Box	Dust and water proof				
l.	General Features of Control Desk for operating Auto Transformer	**1.** Control Desk for remote operation shall consists of switching cabinet and LT contactors of suitable rating. **2.** The control desk shall be used to control and operate auto transformer to vary voltage from 0 to 470 Volts. **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 **[Accuracy: 1.0]** 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 should have dummy female banana connectors of good quality for measurement of voltage and current during test. Control desk should be dust and water proof.				
m.	Emergency Switch	An EMERGENCY SWITCH shall be provided on control desk whenever abrupt increase of current of the test object occurs.				
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.** Warning lamps to signal operating conditions. "GREEN" - "Ready for operation". MAIN SWITCH ON. "RED" - "Operting" - PRIMARY and Secondary ON				
o.	Spares/Accessories	(i). 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. (ii). If any other spares/accessories for variac are needed for maintenance purpose and long running upto 10 years, please suggest and quote separately.				
p.	Testing	***Type Test:*** Temperature Rise Test ***Routine Tests:*** **1.** No-load current test; **2.** Variation of output voltage test; **3.** Load Losses test; **4.** Insulation resistance test; **5.** High voltage test and **6.** Induced Voltage test. **NOTE: 1.** All the mentioned tests are to be conducted as per latest IS: 5142 and other relevent latest IS standards in presence of CPRI Representative at manufacturer's work. **2.** Manufacturer should have facility to conduct all above tests in its own premises.				
q.	Test Certificates	All the relevent test certificates shall be provided by the bidder along with supply of Dimmerstat.				

r.	Inspection/Tests	All the tests as per relevent standard shall be carried out on equipment in presence of CPRI's representative at his works except, where agreed to otherwise. All the test reports should be submitted and should be got approved from the CPRI before dispatch of the equipments. The supplier shall give FIFTEEN (15) days advance intimation to enable the CPRI to depute his representative for witnessing acceptance and routine tests. The inspection may 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. Inspection charges shall be born by CPRI.				
t.	Installation & commissioning	1. Installation & commissioning of all the components/items 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 Indian Standard.				
u.	Quality plan, Inspection and Tests	Tests as per relevant standard shall be carried out on equipment in presence of CPRI representative 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 fabrication of the transformer tank.				
		The CPRI reserves the right to insist on witnessing the acceptance/routine testing including bought out items.				
17	**MG Set**	100kVA Motor- Generator Set with AC Drive and Control Desk	**One set**			
i.	General Arrangement	Motor-Generator Set will be mounted on a common base plate and coupled to each other through flexible coupling. The complete MG Set will be mounted on Anti Vibration mounts.				
ii.	**A. C. Generator**	100kVA, 0-470V, 123A. 3ph, 50Hz, 0.3 pf(lag) 750rpm separately excited 8 pole revolving armature type (brush type) synchronous generator. ClassF insulated,IP-21, The generator should have 6 terminals in its terminal box for making connections either 3ph, 4 wire. The generator should be also suitable for 100 kVA,470 V, 3phase 100Hz at 1500 RPM. DC excitation required for voltage variation.				
	a. Rating	100 kVA,3 Phase,50Hz and 100kVA,3Phase,100Hz				
	b. Output Voltage	0-470V				
	c. Rated current	123 A				
	d. Rated pf	0.3 lag				
	e. Class of insulation	'F'				
	f. Enclosure	IP-21				
	g. Prime mover	AC motor				
	h. Obtainable Frequency	50Hz & 100 Hz				
	i. Method of Cooling	IC01				
	j. THD	<3%				
	k. Over Load Capacity	10%				
	l. Voltage regulation	± 1%				
	m. Temperature range	For Stator winding:105°C, For Stator iron core: 60°C & For Rotor winding:105°C				
	n. Vibration	As per IS: 12075				
	o. Noise	As per IS: 12065				
	p. Duty	Continuous				
	q. Output	50 Hz.750 rpm,100kVA and 100 Hz,1500rpm,100kVA				
	r. Make	To be furnished by the bidder				
iii.	**A. C. motor**	Squirrel cage induction motor developing 45kW or higher. At approx. 750rpm and suitable for operation on 415V, 3Ph., 50Hz. Supply. The motor will be suitable for AC Variable speed drive and the speed will be increased to 1500 RPM at constant power for 100 Hz genrerator output.				
	a. Rating	45 kW or higher, 415V, 50Hz, 3 Ph				
	b. Type of Motor	Squirrel cage induction motor				
	c. Enclosure	IP-21 with class F Insulation				
	d. Duty	Continuous				

	e. Frequency measurement	Should be on display				
	f. Make of the Main Components of A.C. Drive	To be furnished by the bidder				
iv.	**AC Motor - Generator Control Panel**	A floor mounting sheet steel cubicle with Powder coated paint as per shade RAL 7035 for external, Surface, and white for internal surface will incorporate required components.				
	a. AC Motor Panel	MCCB, 160 Amps, 25 kA, 3P				
		AC Drive O/P, AC Voltmeter with selector switch, AC Ammeter with selector switch with suitable CT's, Frequency Meter, Semiconductor Fuses				
		AC Variable speed drive				
		Local/ Remote Selector Switch				
		Potentiometer for motor speed				
		Motor START/STOP push button				
		Indication Lamps for Mains, Motor ON/OFF				
		MCCB ON/OFF Push button				
		Connections by Copper cables/ busbars				
	b. AC Generator Panel	Contactors for selection				
		HRC fuses				
		Over load relays, over voltage relays, Annuciator				
		Load OFF & Emergency OFF push button with indications				
		Digital AC voltmeter, AC ammeter with suitable CT's, frequency-meter				
		Door limit switch, interlock lamps, Panel lamps, Lifting hook, Earthing Provision				
		4 Nos. Contactors/Switchfuse units (SFC) for four outputs. The outgoing feeder shall be feeding either directly to the transformer under test or it will be connected to various interposing transformers, connected between generator & transformer under test.				
		Make : To be furnished by the bidder				
v.	Erection & Commissioning of M-G Set (To be done by the bidder)	Erection/ commissioning / installation of AC Motor, Generator, A.C. Drive Control Panel, Generator Output Panel and Control Desk on concrete plinth. The space required shall be made available by CPRI RTL, Nashik in a well ventilated indoor room. Interconnection of above equipments and devices with suitable rating and size of cables shall be provided by supplier. The earthing of equipments to be done as per IS: 3043.				
		Commissioning of the individual equipments stated above as well as the complete integrated system. Routine tests and Trial run of the complete system.				
		The bidder shall intimate about the foundation plan & mounting details Civil construction requirements for Erection and Installation of MG Set, AC Drive , Control Panel and Control Desk (If required)				
		Trial test with under test transformer at the maximum rating stipulated in specification.				
		After successful erection & commissioning, the supplier has to arrange for imparting the training to designated technical personnel of the CPRI at RTL Nashik .				
vi.	Protection System	Provision to safeguard and protect the Generator set through reliable protective scheme shall be made, to meet the situation of overloads, short circuit, over voltages, exceeding temperature, stator earth fault and rotor earth fault, etc. The scheme for protection proposed with the setup shall be supplied with the offer.				
vii.	General	Adequate size lugs & connectors for power supply to A.C. Drive Control Panel, A C Motor, Generator Output Panel and Operating Control Desk. Routing of these cables through trenches/overhead trays to interconnect said equipments.				
		All the above items should be duly wired and suitable terminals will be provided for incoming and outgoing connections.				
		Stability of output voltage, current and frequency should be ensured by the bidder. Bidder should specify the Load regulation factor and influence of input voltage variation on the output parameters.				
		Noise levels due to MG Set, blowers etc. should be specified by the bidder for the safety of personnels.				
17 (a)	**Intermediate Transformer no.1 (for Load loss measurement and Temperature rise test)**	**200kVA, 433/1200-2400-3600V,3-phase, Oil filled Intermittent Transformer**	One Complete Set with all fittings			
i.	Rated Power	200kVA				
ii.	Primary Voltage	433 Volts				

iii.	Secondary Voltage	1200-2400-3600 Volts				
iv.	Rated Primary Current	266.68 Amps				
v.	Rated Secondary Current	96.23 - 48.11 - 32.07 Amps				
vi.	Type of Cooling	ONAN				
vii.	Over loading Capacity	120% for two Hour				
viii.	Operating Temperature	45/55 Degree C				
ix.	Insulation Level	LV: 3.0kVrms, HV: 10kVrms/LI: 40kVpeak				
x.	Connection	Star/star-star-star				
xi	Operating frequency	50Hz				
xii	% Impedance at 75°C	Not more than 6%				
17(b)	**Intermediate Transformer no.2 (for No Load loss measurement and Induced over voltage test)**	**100kVA, 433/1200-24000V,3-phase, Oil filled Intermittent Transformer**	One Complete Set with all fittings			
i	Rated Power	100kVA				
ii.	Primary Voltage	433 Volts				
iii.	Secondary Voltage	1200-24000 Volts				
iv.	Rated Primary Current	133.33Amps				
v.	Rated Secondary Current	48.11- 2.41 Amps				
vi.	Type of Cooling	ONAN				
vii.	Operating Temperature	45/55 Degree C				
viii.	Insulation Level	HV: 3.0kVrms(for1200V), 50.0kVrms/125kVpeak (for 24kV); LV: 3.0kVrms/--				
ix.	Connection	Star/Star-star				
x	Operating frequency	50Hz and 100Hz				
xi	% Impedance at 75°C	Not more than 6%				
	Note: The following details have to be furnished by the bidder for 17(a) & 17(b).					
xii	Total Losses at 50%	To be furnished by bidder				
xiii	Total Losses at 100%	To be furnished by bidder				
xiv.	No load current at rated voltage	To be furnished by bidder				
xv.	No load current with 112.5% over fluxing factor	To be furnished by bidder				
xvi.	No load losses (W)	To be furnished by bidder				
xvii.	Maximum temp. rise in oil	45°C				
xviii.	Maximum temp. rise in winding	55°C				
xix.	Type of Cooling	ONAN				
xx.	CORE QUALITY	The core of the transformer shall be high grade M4 CRGO laminations only. The core shall have low loss and good grain properties. The Operating Flux Density should be 1.6-1.7 Tesla. 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 12.5% as per standard.				
xxi.	Type and grade of CRGO Lamination	To be furnished by Bidder				
xxii.	Operating flux density in wb/m2	To be furnished by Bidder				
xxiii.	Insulation used for core clamping	To be furnished by Bidder				
xxiv.	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 transformer.				
xxv.	Material of winding conductor	To be furnished by Bidder				
xxvi.	Type of winding	To be furnished by Bidder				
xxvii.	Maximum current density of HV Winding	To be furnished by Bidder				
xxviii.	Maximum current density of LV Winding	To be furnished by Bidder				
xxix	Conductor cross section(area)Winding HV in Sq.mm	To be furnished by Bidder				
xxx.	Conductor cross section (area) LV winding in Sq.mm	To be furnished by Bidder				
xxxi.	No. of turns in primary	To be furnished by Bidder				
xxxii.	No. of turns in secondary	To be furnished by Bidder				
xxxiii.	Insulation details of HV windings	To be furnished by Bidder				
xxxiv.	Insulation details of LV windings	To be furnished by Bidder				
xxxv.	Tank Details					
	Tank dimensions	To be furnished by Bidder				
	Overall dimensions	To be furnished by Bidder				

	Tank plate thickness (in mm)	To be furnished by Bidder				
xxxvi.	PAINTING: The transformer tank should be sand blasted or cleaned by chemical process before painting. The transformer tank,					
xxxvii	ACCESSORIES: The transformer shall have the following accessories of standard make and good quality conforming to relevant IS/IEC.					
	Following Details to be furnished by Bidder(s)					
	Two earthing terminals with the earthing symbol ⏚					
	Oil level gauge indicating oil level minimum, 30°C and maximum operating temperature					
	Air release device (Yes/No)					
	Rating and terminal marking plates					
	Drain cum sampling valve (¾ nominal size thread) preferably steel with plug for three phase transformers (Yes/No)					
	Thermometer pocket with cap (Yes/No)					
	Dehydrating breather in lieu of plain breathing device (which should not permit ingress of rain water and insects) (Yes/No)					
	Lifting lugs for the complete transformer as well as for core and winding assembly. (Yes/No)					
	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 (Make: SUKURUT/EMCO)					
xxxviii.	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					
	Dimension and assembly of important auxiliaries.					
xxxix	QUALITY PLAN, INSPECTION and TESTS	Tests as per relevant standard shall be carried out on equipment in presence of CPRI representative 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 fabrication of the transformer tank.				
		The CPRI reserves the right to insist on witnessing the acceptance/routine testing including bought out items.				
	NOTE: Transformer shall be supplied with fresh oil filled with BDV Value of about 60kV					
18	**Current Transformers**	**Please furnish the make**				
a.	CT for load loss & Temperature rise measurements	3.6kV, 400-200/5A, 100-50/5A (cast resign type), Insulation level : AC 10kV, LI 40kVp, operating frequency : 50Hz and 100Hz	each ratio of 4 nos.			
b.	CT for No load loss measurements	24kV, 5/5A (Oil filled for No-load current measurement), Insulation level : AC 50kV, 125kVp, operating frequency : 50Hz and 100Hz				
c.	Accuracy Class	≤0.2				
d.	Rated Burden (in VA)	10				
e.	Insulation Level of Secondary Winding	It is to be isolated for 3.0kVrms (as per IS/IEC standard)				
f.	Rated short time current	13.1kA for 1 sec				
g.	Insulation Class	B				
h.	Type	Bar Primary				
i.	Special Feature	a) Required tapping shall be done in secondary side of the CT.				
		b) Proper marking for the ratios to be given in elegant looking terminal box with good quality nut-bolts.				
19	**Potential Transformers**	**Please furnish the make**				
a.	PT for load loss & Temperature rise measurements	((4.4–2.2)/√3)kV / 110/√3V (Cast resign type) Insulation level : AC 20kV, LI 60kVp, operating frequency : 50Hz and 100Hz	each ratio of 4 nos.			
b.	PT for No load loss measurements	((12–24)/√3)kV / 110/√3V (Oil filled type) Insulation level : AC 50kV, LI 125kVp, operating frequency : 50Hz and 100Hz				
c.	Accuracy Class	≤0.2				
d.	Rated Burden (in VA)	15				
e.	Rated Voltage Factor	1.2 times continuous, 1.5 times for 30 secs.				
f.	Insulation Level of Secondary Winding	It is to be isolated for 3.0kVrms (as per IS/IEC standard)				
h.	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. Please furnish the make.				

a.	type of capacitor	All Polypropylene(All Ppor Film +Foil)				
b.	Rated Voltage	2100 volts when connected in star : 3600Volts when connected in delta : 2100Volts				
c.	Capacitor unit	63KVAR				
d.	No.of. Units in Bank	24 (8 Units per Phase) + 6 nos. spare				
e.	Rated current of capacitor	30Amps (each unit)				
f.	Losses	Less than 0.5 watts/KVAR				
g.	Rated Frequency	50HZ				
h.	Discharge	Discharge resistance (inside tank) to be provided for discharging to 50 Vor less than within 60 Sec.				
i.	Protection	Internal element fuses				
j.	Permissible overload	110% of rated volatge or 130 % of rated output				
21	**Three phase Digital Power Analyser**	**Please furnish the make & model no.**	Two nos.			
a	Number of input channels	Three				
b	Direct Current input range	upto 30A in steps, floating				
c	Direct Volatge input range	upto 1000V in steps, floating				
d	Measurement Bandwidth	DC, 0.1 Hz to 1 MHz				
e	Accuracy	Voltage and Current : ±0.1%, Power at 0.1pf : ±0.1%				
f	Display	8.4-inch color TFT LCD monitor				
g	A/D converter	Simultaneous voltage and current conversion and 16-bit resolution				
h	Features	Data Update rate: 50 ms to 20 sec, Holds the data display, Integration, trigger, store function, Harmonic measurement upto 30th (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, V rectified 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**	**Please furnish the reputed make & model no.**	Two Nos			
a	Measurement Channels	Two				
b	Resistance Range	0.1mΩ ... 2 kΩ				
c	Accuracy	±0.2%				
d	Resolution	5 digits				
e	Test Current	25 mA - 50 Amps in steps				
f	Output Voltage	0-50 Vdc				
g	Display	Color LCD with back lighting and touch screen				
h	Features	Demagnetizing Circuit, internal storage, Data exchange via USB-Key or USB / RS Connection 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 Automatic shut off for over-temperature condition Panel mounted Emergency Stop Switch, Mounted in rugged case , Fastest discharge time. Suiatble portection devices shall be provided to protect the meter from internal/external faults. Winding resistance meter should also be suitable for temperature rise test application.				
i	Accessories	Current Cable: 2 x10m, 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	**Transformer Turn Ratio Meter**	**Please furnish the reputed make & model no.**	One No.			
a	Ratio measurement range	0.8 - 2000				
b	Accuracy	±0.1%				
c	Resolution	5 digits				
d	Current	0-2A				
e	Test Voltage	upto 250V in steps				
f	Display	Color LCD with back lighting and touch screen				

g	Features	Fully Automatic Turn ratio Meter Three phase, Automatic vector Group detection, Automatic measurements of Voltage/Turns Ratio, Current and Phase displacement, Internal storage, Simple touch screen operation, Load on test object <0.05 VA, Measures Power transformers, PT's and CT's, Enhanced heavy-duty protection circuitry, Extremely rugged, USB interface, Displays deviation from a nominal ratio, Automatic test voltage range,				
h	Accessories	H and X Lead Cable: 2 x 10m, Earting cable: 1 x 10m, Cable bag, USB Memory stick, Power cord, Spare fuse, Software for Data Exchange and Analysis. User manual etc.				
24	**Insulation Resistance Meter**	Test Voltage: 5 kV, Resistance: Up to 10 TΩ Accuracy: ± 5% up to 1 TΩ & ± 20% up to 10 TΩ Test programs: IR, PI, DAR, Test leads: 3 m in length. Please furnish the reputed make & model no.	One No.			
25	**HV AC Dielectric Test Set with peak voltmeter and divider and its Panel for operation**	**0-100kV, 500mA. Please furnish the make & model no.**	One Complete Set with all fittings			
i.	100kV, 500 milli Amps AC High Voltage Test Set	1. H. V. Test Transformer	One No			
		2. Auto Transformer (Voltage Regulator)	One No			
		3. Control Desk	One No			
		4. Measuring Capacitor Divider	One No			
		5. Digital AC Peak Voltmeter & RMS voltmeter	One No			
		6. Earthing Rod	Two Nos			
		7. H. V. Flexible Connectors and	1 set			
		8. Installation and commissioning of the H. V. test system.				
ii.	H. V. Test Set Up	The H. V. test setup shall consist of one H. V. test transformer, one autotransformer (i.e. Regulating transformer) suitable for the H. V. test				
iii.		**H. V. TEST TRANSFORMER:**				
a.	Rated Input Supply	415VAC, Single-Phase supply, 50Hz				
b.	Rated Input Current	120 Amps				
c.	Rated Output Voltage	Voltage Range (0 to 100kVrms continuously variable)				
d.	Rated Output Capacity	50 kVA Continuous rating				
e.	Output Current	500 milli Amps in steps of 50, 250 & 500 milli Amps settable by selector switch of good quality.				
f.	Type of Cooling	ONAN				
g.	Short Time Duty Cycle	100kVA, 1-Hour "ON" and 23-Hours OFF or a better duty cycle.				
h	Short Circuit Impedance Voltage	<10% (approx.) with respect to rated continuous kVA and rated voltage				
i.	Test Voltage	120kV at 50Hz, shall be capable of withstanding for 1.0 minute.				
iv.		**AUTO TRANSFORMER (Voltage Regulator)**				
a.	Rated Input Supply	415VAC, 50Hz				
b.	No. of Phase	2 – Phase				
c.	Rated Input Current	120Amps				
d.	Rated Output Voltage	Voltage Range (0 to 470Vrms continuously variable)				
e.	Rated Output Capacity	50 kVA, Continuous rating				
f.	Output Current Rating	120 Amps Continuous				
g.	Sweep Time	60.0 Secs.				
v.	Drive for Auto Transformer	Drive : Reversible Synchronous motor with Low speed – Instant Start, Stop and High Torque feature Input : 220 V, Single Phase, 50 hz Speed : 60 RPM at 50Hz Torque: > 10kg -cm				
vi.	Measuring System Voltage Divider(AC)	Oil insulated and hermetically sealed capacitor in FRP housing mounted on mobile platform and corona free HV electrodes with following specifications				
		Type : Capacitor				
		Rated Voltage : 100kV, 50Hz				
		Rated Test Voltage : 110kV				
		Rated Capacitance : 100pF ± 10%				
		Accuracy : < ± 1%				
vii.	Voltmeter(AC-Peak)	The AC Peak Volt Meter is to be used with Voltage Divider. Digital display with hold facility and provision for external oscilloscope waveform display, including one LV divider plug-in type with at least 10meter long measuring cable of 75W Mode of display shall be in Upeak positive or negative,Upeak/√2, URMS and Upulse for switching impulse voltage. Acc. Class : ± 0.5 Class or better Range : 0 – 100kVrms				

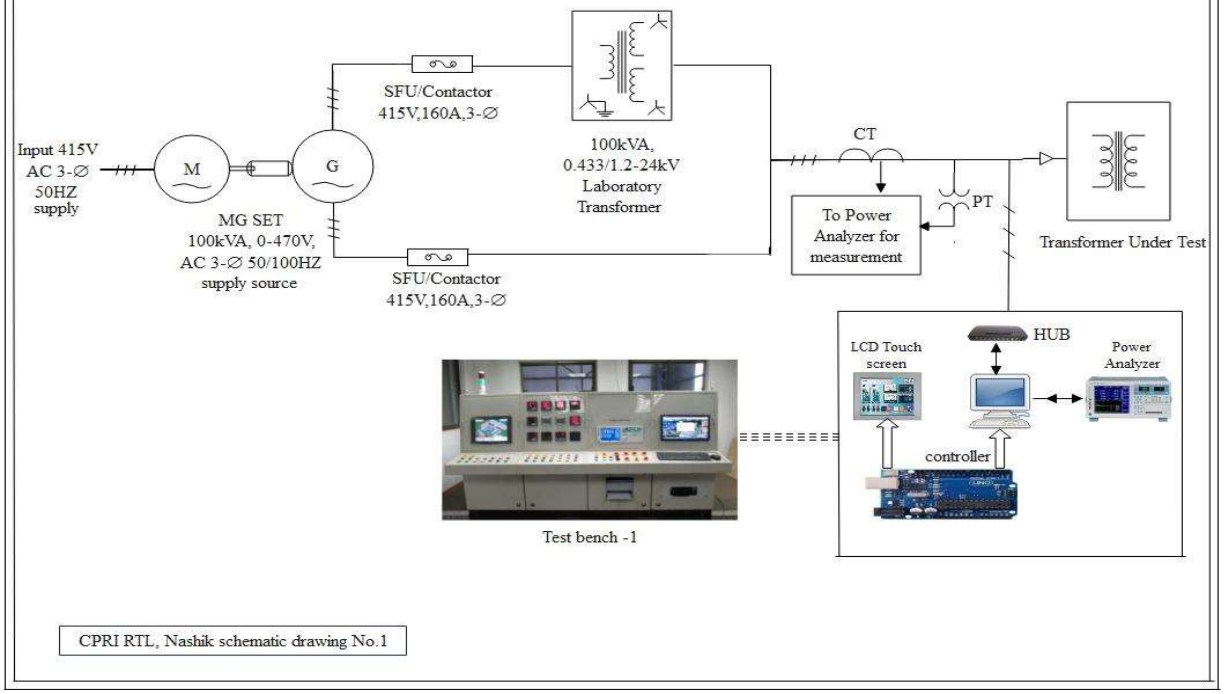
viii.	Ammeter	Panel type digital milli ammeter connected on earth side to indicate the leakage current of the equipment under test . Acc. Class : ± 0.5 Class or better Range : 0 – 50, 250 & 500 milli Amps with selective range selector switch.				
ix.	Timer Circuit	It shall have a digital timer of range up to 30min.minimum time resolution of 1.0 sec. Timer Acc. : ±1.0 sec.				
x.	General Features of Control Panel	The control panel shall be incorporated with push buttons to raise or lower the voltage.The control panel shall be equipped to operate the H. V. testing transformer and autotransformer with metering, protection, interlocking, HT-ON/LT-ON and fault indication by lamps (multiple LED type) etc. The panel shall also be provided with timer, ON/OFF switches and fuses etc.				
xi.	Protections	The control panel shall also be incorporated with a fast acting DC relay to isolate the circuit when HT current exceeds the preset level. An instantaneous over current relay shall be provided for over- current tripping of the test equipment i.e. for instant switching – off in case of flashover in the test object.				
xii.	Interlocking	The unit shall have zero start interlocking to avoid the transient/ surges of HV Transformer				
xiii.	Safety Alarm	HV kit shall have alarm, it shall alarm while starting test and again it should alarm when preset time come to end.				
xiv.	Termination	The H. T. output shall be terminated on suitable spherical electrode to suppress the corona and the terminal at earth potential.				
xv.	External Safety Device	Provisions shall be made in the control desk to connect the following external devices				
		Safety loop to connect external emergency switches.				
		Safety loop to control the safety fences.				
		Warning lamps to signal operating conditions.				
		"GREEN" – Ready for operation – Main Switch ON				
		"RED" – "Operating" primary and secondary ON.				
		Control panel should have foot pedal switch for switching OFF full HV test system in case of emergency.				
xvi.	Auxillaries	The unit shall be incorporated with necessary switches, push buttons, indicating lamps (multiple LED type), contactors, fuses etc for efficient operation of the test kit. In addition to it fast acting DC relay shall be provided to sense the H. T. current via current transformer connected on earth side of H. V. transformer. The unit shall also incorporate earthing rod of good insulating material having a length of 2.5meter with built in discharge resistance of 100 Ohms with 20meter suitable cable to connect between earthing rod and H. V. transformer earthing.All the above auxiliaries provided shall conform to relevant IS/IEC standards.				
xvii.	TESTS	Routine/type tests shall be carried out on H. V. Test transformer, control panel, voltage divider, peak voltmeter, earthing rod etc at manufacturer's works in presence of CPRI representative and all test certificates shall be submitted for CPRI approval. The performance of all the tests shall conform to IEC 60060/IS: 2071 standards and also to the concerned IS/IEC product standards (Latest edition).				
	(a) For H. V. Transformer/ Regulating Transformer/ Control Panel	1 Insulation resistance measurement with 500/1000 Volt megger on control circuit and main circuit of control panel and autotransformer.				
		2.Turns Ratio test.				
		3.High Voltage Power Frequency test at 2.5 kVrms for on min. on control panel.				
		4.Open circuit test of the unit for 5.0 min.				
		5.Temperature rise test of H. V. transformer by circulating rated HT current i.e. short circuit HT winding for a period of 15 minutes.				
		6.Tripping circuit test at various tripping current range.				
		7.Interlock check.				
		8.Operational test				
	(b) For Capacitive Voltage Divider (AC)	1.Measurement of C and tand at 20% voltage steps up to rated voltage.				
		2.One min. withstand test at 1.1 times the rated voltage.				
	(c) For AC Peak Voltmeter	1.Internal calibration for voltage verification.				
		2.Instrument voltage – sensitivity test at FSD and at CAL mark.				
		3.Instrument linearity characteristic check.				
		4.Measurement of output voltage of plotter terminal at FSD.				
		5.Measurement of Capacitance and Resistance of low voltage plug – in.				

26	**Multimeter**	Direct and alternating voltages from 100µV ... 1000V Direct and alternating currents from 10µA ... 10.00A Capacitance from 1pF ... 40.00 mF with zero correction. Resistance from 100mΩ... 60.00MΩ Frequencies from 10.00Hz ... 10MHz Accuracy ≤ 2.0% for all above parameters Diode measurement and continuity testing Hold measurement . Relative measurement Detailed Technical specification to be furnished by bidder. Please furnish the reputed make & model no.	Two Nos.			
27	**30 Channel Data Logger (Temperature Scanner)**	30 Channel Data Logger (Temperature Scanner) - one set T-Type Thermocouple (10 metre - 10Nos.) RTD (PT-100) (8metre) - 10 Nos Temperature sensors (T-Type & RTD-PT-100) shall be suitable to measure surface temperature.	One Set			
a	Analog Inputs	30 channel isolated to chassis(screw type terminal)				
b	Max allowable inputs	± 100V(Max voltage between input terminals), Isolation voltage 250V DC, 300V AC/DC(between terminal and chassis)				
c	Temperature Measurement withT type Thermocouple	Range 0 to 400, Resolution 0.05, Accuracy ± 0.6%				
d	Internal Memory	16 Mega-bytes				
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 1 Hr,Time axis 100ms to 1 day , repeat recording./ 10ms/S				
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, Hardcopy, 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 sving, Brightness change option. At least 6 numerical value of temp 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 arthmatic calculation between four channel, display and saving of data, mx+b function, Event marking(search & move , Max 100 per meaurment). A-B Cursor, scaling, rate adjustment, Comment input, save 10 satting , start/stop key lock, Alarm.				
28	Power and control Cable with clamp or lugs	All Interconnecting input and output Power and control copper Cable of suitable cross section for connecting all equipments, CT's, PT's, MG Set, Auto Transformer, intermidiate transformers, 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 & Induced over voltage tests (10m approx.) with clamps shall be in the scope of supply.				
29	Software	Necessary software for conducting automated sequencing for computer aided testing. Software for Calculation of losses, temperature rise test calculation/graph and report preperation etc.				
30	Inspection of MG Set, Auto transformer, intermediate transformers etc.	1. All the routine tests shall be conducted in accordance with latest issue of relavent IEC Standards. 2. The type tests, special tests or another such tests, 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 30 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.				

31	Acceptance Test	The Acceptance Tests at customer's site are aimed to demonstrate that the supplied equipment was correctly assembled, fulfils its technical specification and complies with the relevant standards. The Acceptance Tests shall also demonstrate the operation and the handling of the system and could be considered as a first training of customer's engineers. Acceptance tests on shall be demonstrated by conducting the following tests on 10MVA transformer or depends on the availabilty of rating of the transforemr under test, but not limited to: . Measurement of Insulation resistance • Measurement of winding resistance • Measurement of voltage ratio and check of phase displacement • Measurement of short-circuit impedance and load loss • Measurement of no-load loss and current at rated voltage & frequency. • Dielectric routine tests (IEC 60076-3): i) Applied voltage test ii) Induced Voltage tests • Temperature rise tests				
32	Documents and Drawings	Supplier shall submit three sets of all relevant technical specifications , operating instructions and General drawings, electrical schemes, installation drawings and Circuit diagrams of whole system, Reports on inspection during manufacturing. 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.				
33	Calibration	All the measuring instruments shall be Calibrated from Independent laboratory accriditated as per ISO/IEC:17025,2017. Calibration shall cover all the parameters and ranges of the instruments.				
34	Installation, Commissioning & Training	The installation/Commissioning of all equipments/instruments shall be carried out by supplier at CPRI, Nasik 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.				
35	Warranty	The complete Lab equipments/instruments shall be guaranteed for one year following the on-site start-up date. The supplier has to give undertaking regarding post warranty technical support, service and supply of spare parts for successful operation of the equipment's for ten years.				
36	Mandatory spares	Bidder shall specify the spares required for the successful operation of complete test setup for a period of five years.				
37	Delivery	All the equipments including necessary accessories should be delivered to CPRI, Nasik				
38	Pre-bid meeting requirement	The bidder may write to Purchase Section, CPRI, Bhopal for clarification if required.				

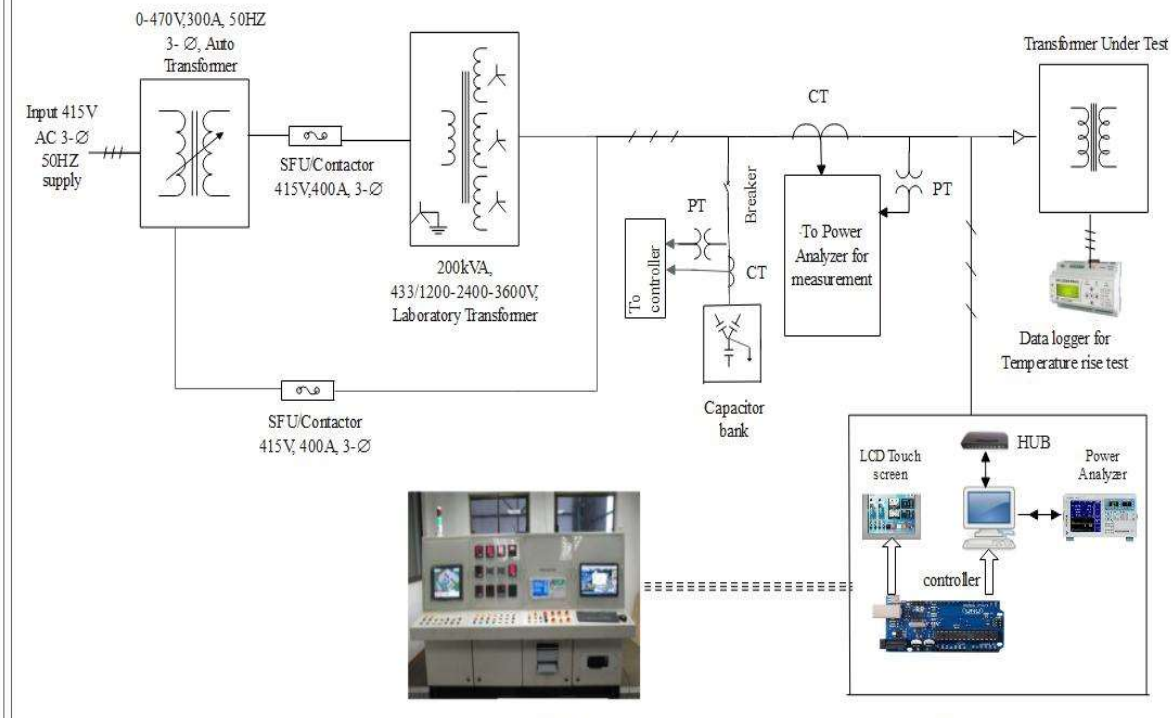
39	Reference Standards	All the above mentioned equipments used with the system shall confirm to the latest edition of the following standards 1) IS: 1180 , Distribution Transformers 2) IS:2026 all parts, Power Transformers – all parts 3) IEC Standard 60076-1, Power Transformers – Part 1: General; 4) IEC Standard 60076-2, Power Transformers – Part 2: Temperature rise; 5) IEC Standard 60076-3, Power Transformers – Part 3: Insulation levels and dielectric tests; 6) IEC Standard 60076-4, Power Transformers – Part 4: Guide to the lightning impulse and switching impulse testing - Power transformers and reactors; 7) IEC Standard 60076-5, Power Transformers – Part 5: Ability to withstand short circuit. 8) IEC Standard 60076-10, Power transformers - Part 10: Determination of sound levels; 9) IEC Standard 60076-11, Power transformers - Part 11: Dry type transformers; 10) IEC Standard 61869-1, Instrument Transformers – Part 1: General requirements; 11) IEC standard 61869-2, Instrument Transformers – Part 2: Additional requirements for current transformers; 12) IEC standard 61869-3, Instrument Transformers – Part 3: Additional Requirements for Inductive Voltage Transformers;				
		13) IEC359C Standard 61010 - Safety requirements for electrical equipment for measurement, control, and laboratory use. 14) CBIPManual on Transformers 15) IS/IEC: 61439, IS:8623 (Part-I/II), IS/IEC: 60034-1 -for contactors 16) BS 5000 Part 99, IS:4722 - Rotating electrical machines 17)IS: 12065, IS:12075, IS:6362, IS:12802 & All other standards of the associated equipments used. 18)IS: 3043 – Code of practice for earthing. 19)IS 13703 – HRC fuse links,IS 13947 – Specification for ACBs				

Laboratory Test Setup for Transformer No-load loss Measurement & IOV test



CPRI RTL, Nashik schematic drawing No.1

Laboratory Test Setup for Load Loss Measurement and Temperature Rise test



Annexure 1 - Rating and details of transformers under tests

Transformer MVA rating	0.016	0.025	0.04	0.063	0.1	0.16	0.2	0.25	0.315	0.5	0.63
Transformer primary voltage in kV	11	11	11	11	11	11	11	11	11	11	11
Transformer secondary voltage in kV	0.433	0.433	0.433	0.433	0.433	0.433	0.433	0.433	0.433	0.433	0.433
no.of phases	3	3	3	3	3	3	3	3	3	3	3
Transformer % impedance	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
HV current in Amps	0.840	1.312	2.100	3.307	5.249	8.398	10.498	13.122	16.534	26.244	33.067
LV current in Amps	21.335	33.335	53.336	84.005	133.341	213.346	266.682	333.353	420.025	666.7	840.0

Transformer MVA rating	0.8	1	1.25	1.6	2	2.5	3	2.5	2	0.2	0.5
Transformer primary voltage in kV	11	11	11	11	11	11	11	6.6	3.3	33	33
Transformer secondary voltage in kV	0.433	0.433	0.433	0.433	0.433	0.433	0.433	0.433	0.433	0.433	0.433
no.of phases	3	3	3	3	3	3	3	3	3	3	3
Transformer % impedance	4.5	5	5	6.25	6.25	6.25	6.25	6.25	6.25	4.5	4.5
HV current in Amps	41.990	52.488	65.610	83.981	104.976	131.220	157.464	218.700	349.920	3.499	8.748
LV current in Amps	1066.7	1333.4	1666.7	2133.4	2666.8	3333.5	4000.2	3333.5	2666.8	266.6	666.7

Transformer MVA rating	0.63	0.8	1	2	3.15	5	6.25	8	10
Transformer primary voltage in kV	33	33	33	33	33	33	28.05	33	33
Transformer secondary voltage in kV	0.433	0.433	0.433	0.433	11	11	0.86	11	11
no.of phases	3	3	3	3	3	3	3	3	3
Transformer % impedance	4.5	4.5	5	6.25	6.25	7.15	7.5	7.15	8.35
HV current in Amps	11.022	13.997	17.496	34.992	55.112	87.480	128.647	139.968	174.960
LV current in Amps	840.049	1066.729	1333.412	2666.823	165.337	262.440	4195.983	419.903	524.879