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1 Circulation List

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1	Research & Development Manager
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0.2 Amendment Record

Rev No.	Date (YYYY-MM-DD)	Description of Change	Prepared by (Name & Signature)	Approved by (Name & Signature)
1	2011/10/07	Revised the scope to include 315KVA transformers	S.K. Nguli	G. Owuor
2	2011/10/21	Revised to in include 100kva and 200kva 11/0.433tx	S.K NGULI	G. OWUOR
3				

FOREWORD

This specification has been prepared by the Research and Development Department in collaboration with Technical Services Department and the Distribution Division of The Kenya Power (KP) and it lays down the requirements for three phase, ground mounted distribution transformers. It is intended for use by Kenya Power in purchasing the transformers.

It shall be the responsibility of the manufacturer to ensure adequacy of the design and good engineering practice in the manufacture of the distribution Transformers for Kenya Power. The manufacturer shall submit information, which confirms satisfactory service experience with products which fall within the scope of this specification.

It is expected that suppliers will provide energy efficient standard design that will provide high level of efficiency, significant initial cost saving and deter vandalism.

1. SCOPE

This specification is for ground mounted three phase transformers oil-immersed, air cooled for 11kV and 33KV distribution systems operated at 50 Hz.
The specification covers transformers of the following voltage ratios and ratings:

(i) 100 KVA to 1000KVA: 11000/0.433 KV

(ii) 630 and 1000KVA 33/0.433KV

2. REFERENCES

The following standards contain provision which, through reference in this text, constitute provisions of this specification. Unless otherwise stated, the latest edition of the referenced document (including and amendments) applies.

IEC 60076: Power Transformers

IEC: 60354: Loading guide for oil immersed power transformers

IEC60269: specification for unused mineral insulating oil for transformers and switch gear

BS 381C: Specification for colors for identification, coding and special purposes

ISO1461: Hot dip galvanized coating on fabricated iron and steel

BS 6436: specification for ground mounted distribution transformers for cable box.

3. TERMS AND DEFINITIONS

For the purpose of this specification the terms and definitions given in the reference standards shall apply.

4. REQUIREMENTS

4.1. SERVICE CONDITIONS

4.1.1 Operating conditions

The transformers shall be suitable for continuous operation indoor/outdoor in tropical areas with the following conditions.

(a) Altitudes: up to 2200m above sea level,

(b) Humidity: up to 95%,

©Temperature: average ambient temperature of +30°C with a minimum of -1°C and a maximum of +40°C

(d)Pollution: design level to be taken as heavy (pollution level III) and saline conditions along the Coast.

(e)Isokeraunic level: 180 thunderstorm days a year.

4.1.2 System characteristics

4.1.2.1 The primary system is having a nominal voltage 11KV and 33KV 50Hz and highest system voltages of 12KV and 36KV, while the secondary shall be 433V 50Hz, with the neutral solidly earthed.

4.1.2.2 The 11kV and 33kV overhead systems are of unearthed construction (i.e. without aerial earth wire).

4.1.2.3 The transformers will be operated at high loading factor

4.2 DESIGN AND CONSTRUCTION

4.2.1 General

4.2.1.1 The transformer shall be three phase, oil cooled (ONAN), core type, (lamination stacking), indoor/outdoor and shall be designed, manufactured and tested as per IEC 60076 and this specification. Any deviations /additional requirements shall be stated in this specification

4.2.1.2 The transformer shall be either free breathing type or hermetically sealed with bolted top cover.

4.2.1.3 The transformer shall be a two winding type three phase integral unit

4.2.1.4 Free breathing transformers shall be provided with a conservator and dehydrating breather (cobalt free). The conservator shall be in such a position as not to obstruct the electrical connections. The oil gauge shall be

shall be 5mm, 5mm, 3.15mm respectively .All joints of tank and fittings shall be oil tight and no bulging should occur during service.

4.2.2.2 The internal clearance of tank shall be such that is shall facilitate easy lifting of core with windings from the tank. Inside the of the tank shall be painted with varnish /hot oil resistant paint

4.2.2.3 The main tank body shall be pressure tested and certificates issued by ISO/IEC 17025 Accredited Laboratory ascertain the soundness of all welded joints. A certified copy of the certificates shall be submitted with the tender.

4.2.2.4 The tank shall be complete with lifting lugs suitable for lifting the complete transformer with oil. The lifting lugs shall be mounted top cover and shall be heavy duty type of mild steel plate at least 8mm thick suitably reinforced with a factor of safety of at least 2.

4.2.2.5 Steel radiators of adequate thickness to deter oil vandalism shall be used for cooling .The transformer shall be capable of giving continuous rated output without exceeding the specified temperature rise.

4.2.2.6 The top tank cover shall be such of design and construction as to prevent accumulation of water and shall be bolted to the flange on tank top to from a weatherproof joint. The top cover fixing shall be hot dip galvanized steel bolts and synthetic rubber-and cork composition gasket 6mm minimum thickness. The bolts and nuts shall each have two flat washers and one spring washer

4.2.2.7 The top cover shall include 8no. Non standard shearing bolts (evenly distributed on top cover) to deter unauthorized opening. The required

key/tool for opening the special nuts shall be provided to Kenya Power during delivery.

Core and Flux density

4.2.3 **(A) Core**

4.2.3.1 The cores shall be constructed from laminations of high grade cold rolled non aging grain oriented silicon steel M-4 or Hi-B grade or superior grad sheets steels of maximum 0.27mm or less lamination thickness especially suitable for transformer core. The grade /type of core steel shall be stated in the did

4.2.3.2 The design of the magnetic circuit shall be such that as to avoid static charges development of short circuit path within itself or to the earthed or to the clamping structure and the production of flux components at right angles to the plane of laminations which may cause local heating.

4.2.3.3 Every care shall be exercised in the selection, treatment and handling of core steel to ensure that as far as practical, the laminations are flat and the finally assembled core is free from distortion.

4.2.3.4 Adequate cooling shall be provide for the core

4.2.3.5 The cores shall be clamped effectively with metal cross-arms and be fitted with core lifting lugs. During factory acceptance testing, the manufacturer shall demonstrate experimentally or via previous test reports that the whole structural frame-work supporting the transformer windings and the core can definitely withstand repeated transformer short-circuits. All steel sections used for supporting the core shall be thoroughly sand blasted or shot blasted after cutting, drilling and welding. Any non magnetic or high resistance alloy shall be of established and approved quality

4.2.3.6 Adequate lifting lugs shall be provided to enable core and windings to be lifted. The lifting lugs shall allow a factor of safety of at least 2.

4.2.3.7 There shall no movement of the core assembly relative to the tank during transport, installation as well as service due to sudden jerks caused by short circuits and fluctuating loads.

4.2.3.8 The supporting framework of the cores shall be so designed as to avoid the presence of pockets which would prevent complete empting of the tank, or cause trapping of air during filling

4.2.3.9 The insulation structure for the core to bolts and core to clamp plate shall be such as to withstand a voltage of at least 2KV 50Hz for one minute

(b) Flux Density

4.2.3.10 the primary voltage variation which may affect the flux density at every tap, shall be kept in view while designing the transformer.

4.2.3.11 the transformer shall be designed such that the working flux density shall not exceed 1.6 Testla at normal voltage, frequency and ratio. Tenders with higher flux density than specified shall not be considered.

4.2.3.12 Tenderers shall indicate in their bids the continuous allowable maximum flux for one minute and five seconds.

4.2.3.13 The successful tenderer shall be required to furnish magnetization curve of the core material design calculations and such other data /documents deemed fit by the purchaser for being satisfied that flux density is desired

4.2.4 Windings and connections

4.2.4.1 The transformer shall be wound be wound Dyn11 with respect to the 11kv windings and low voltage windings(433V) as per IEC 60076.The star point of the low voltage winding shall be brought out to a neutral bushing.

4.2.4.2 The primary windings shall be of full electrolytic copper coils as opposed to segmented winding and the secondary windings shall be coil copper or foil of aluminum

4.2.4.3 The transformer shall be capable of operation without danger on any particular tapping at the rated KVA when the voltage may vary by ±10% of the corresponding to the tapping

4.2.4.4 The windings and connections shall be properly braced to withstand shocks during transportation or due to short circuit and other transient conditions during service.

4.2.4.5 The windings and connections as well as the insulating materials shall not soften, ooze shrink or collapse during service. The materials shall be non catalytic and chemically inactive in transformer oil during service

4.2.4.6 The HV and LV windings shall be separated so as to allow for cooling and ease of repair. Insulating sleeves for the transformer tapings shall be in crepe paper or better

4.2.4.7 The radial spacer blocks must be pre-compressed pressboard material, which will not soften while contact with oil or fray out into fibers or edges. The slots should be dimensioned so that the blocks will not come out of the slots.

4.2.4.8 All joints shall be brazed /crimped considering the vibrations due to short circuits and load fluctuations.

4.2.4.9 The transformer core and electrical parts inside the transformer shall be sufficiently submerged in oil by no less than 120mm for the minimum oil level mark.

4.2.4.10 KPLC may inspect built up windings for its quality, weight of copper, insulation and overall weight of coil assembly. The size of conductor used

for different windings shall also be checked during stage inspection to check the current density.

4.2.5 Tapping

4.2.5.1 The high voltage windings shall have tapings at ± 2 X 2.5% operated by an off-circuit self-positioning tapping switch with marked position indicators. Tapping details shall be included on the transformer nameplate.

4.2.5.2 The switch shall be located on the transformer top cover or side with sufficient electrical clearance and well submerged in oil. Switch position No. 1 shall correspond to highest voltage on the HV side.

The make contacts of the tap changer shall be robust and of sufficient surface area. The tap switch shall comply with relevant requirements of IEC60214 and 60512.

4.2.5.3 Where the request is for transformers without conservators, the transformers core and electrical parts inside the transformer shall be sufficiently submerged in oil and no less than 180mm for 11KV and 280mm for 33KV from the minimum oil level tank

4.2.6 Vector Group

4.2.6.1 The three-phase transformer shall be wound to IEC vector reference Dyn11.

4.2.6.2 The star point of the secondary winding shall be brought out to a neutral bushing. The neutral bushing shall be rated as the phase bushing. The LV configuration shall be **n r y b**.

4.2.7 Cable boxes, bushings and clearances

4.2.7.1 The ground mounted transformers shall be fitted with cable boxes.

4.2.7.2 The high voltage and low voltage cable boxes shall be mounted on opposite sides of the tank by bolting and arranged for cables entering vertically from below (bottom). Each bushing shall have a separate insulator molding.

4.2.7.3 The HV cable box (11KV) shall be suitable for three core cables up to 95mm² 3/C XLPE cable on a clamp pad. It shall be unfilled type suitable for heat/cold terminations.

4.2.7.4 The LV cable box (both 11KV &33KV transformers) shall be suitable for terminating up to 7nos (for 630KVA and 1000KVAtransformers) and 4no (for 315KVA transformers) single core 600mm² PVC cables on a clamp pad.

4.2.7.5 The bushings shall be constructed, arranged and fitted in such a manner as to be changed without opening the transformer.

4.2.7.6 The 33KV bushings shall be open and shall have outdoor brown glazed weatherproof bushings provided with external clamps for conductor sizes from 7.8mm to 18.2mm diameter mounted on the tank top cover.

4.2.7.7 The 33kV bushings shall be fitted with adjustable double gap arcing horns set at 2 X55mm gaps.

4.2.7.8 The minimum electrical clearances and minimum Creepage distances of the 33kv bushings shall be as indicated below corrected in accordance with service conditions given in clause 4.1

Nominal system voltage between phases	11KV	33KV
Minimum clearances between phase to earth	300	480mm
minimum clearance between phases	250	435mm
minimum Creepage distance	300	900mm

4.2.7.9 The minimum Creepage distances of the bushings shall not be less than 25mm/KV

4.2.8 **Insulation & Cooling**

4.2.8.1 The transformer cooling shall be by natural circulation of air (ONAN). Loading will be as per IEC 60905.

4.2.8.2 The transformer shall be supplied filled with oil. The oil shall be new unused and shall comply with the requirements of IEC 60296 (class 1: un-inhibited oil).

4.2.9 **Fittings and Accessories**

4.2.9.1 Each transformer shall be complete with a winding temperature indicator in a visible and secure position.

4.2.9.2 Pressure relief device fitted on the top cover in a visible secure position.

4.2.9.3 No drain valve shall be fitted unless specified

4.2.9.4 Oil gauge shall be provided on all transformers and shall be of dial type (direct oil level inspection glass window) mounted on the side. The oil gauge shall be clearly readable by an operator standing at a distance of 5 meters from the transformer. The maximum and minimum oil level marks shall fall within 50% of the full range of the gauge with the nominal level being at the centre of the range.

4.2.9.5 Two earthing bimetal terminals on the body of the transformer at the bottom diagonally opposite each other.

4.2.9.6 For bolted transformer covers, provision shall be made in form of removable jumper to provide good electrical connection between the top cover and the transformer tank. The jumper shall be sufficiently rated to carry the fault currents without damage.

4.2.9.8 Off circuit tap changer, mounted on top cover.

4.2.9.9 Rating and diagram plate (as per IEC 60076 and this specification).

All fittings and accessories shall be designed and secured in such a manner that it makes it impossible for vandals to siphon oil from the transformer even after forceful breakage of the fitting /accessory

4.2.10 **Rating**

4.2.10.1 The transformer shall be capable of carrying its full normal rated current continuously under the tropical conditions stated (maximum ambient temperature of 40°C) and at any tapping without the temperature rise in the hottest region in the winding exceeding 75°C. Documents to support this shall accompany the tender.

4.2.10.2 The transformer shall be capable of sustaining a three-phase symmetrical short circuit on the secondary side with power maintained on the primary side without damage or distress for 2 seconds .Kenya Power design distribution fault level for 11KV and 33KV is 25kA and 21kA respectively

4.2.10.3 The thermal ability to withstand short circuits shall be demonstrated by calculation as per IEC 60076-5 and the calculation shall be submitted with tender. The duration of the current to be used for the calculation of thermal ability to withstand short circuit shall be 2 seconds while the maximum permissible value of the average temperature of each winding shall be as per IEC 60076-5. As a minimum the short circuit apparent power of 11kv systems shall be taken as 500MVA in order to obtain the value of the symmetrical short circuit to be used for the design and tests.

4.2.10.4 The ability of the transformer to withstand the dynamic effects of short circuit shall be demonstrated by tests and complete test repots (including oscillograms and records of the condition of the transformer before and after the short circuit tests) shall be submitted for tender evaluation

4.2.10.5 The rated withstand voltages for the transformers shall be as follows:

transformer voltage ratio	Highest system voltage (rms)	Rated short duration power frequency withstand voltage (r.m.s.)	Rated lightning impulse withstand voltage (peak)
11/0.433kV	12KV	38kV	95kV
33/0.433KV	36KV	95KV	200KV

4.2.11 **Impedance Voltage**

4.2.11.1 The impedance voltage measured at the principal tap shall not exceed the values indicated in the following table:

transformer voltage ratio(KV)	Rating KVA	Impedance Voltage %
11/0.433	100- 315	4.5
	630	5.0
	1000	5.0
33/0.433	630	5.0
	1000	5.0

4.2.12 Losses

4.2.12.1 The maximum sum total of the transformer losses, measured at full load operation, unity power factor and rated voltage shall not exceed values

indicated in the table below. Measured values of the iron losses and the full load copper losses shall be adjusted to 75 degree Celsius.

Transformer ratio	Rating KVA	TOTAL TRANSFORMER LOSSES (Fe + Cu) Watts
11/0.433kv	100	1650
	200	2900
	315	4300
	630	6800
	1000	8000
33/0.433	630	8500
	1000	11600

Transformers with losses exceeding the above values shall be rejected.

4.2.12.2 No-load and Load Losses submitted in the tender shall be treated as maximum values. Any increase in these values after award and at the time of factory acceptance testing shall not be accepted.

4.2.13 **Paint work**

4. 2.13.1 External and internal surfaces of the transformer tanks and other fabricated steel items shall be cleaned of scale, rust and surface dirt by short blast cleaning or other suitable approved method. After cleaning, these surfaces should be immediately covered with paint.

4.2.13.2 The exterior shall be thoroughly cleaned by shoot blasting or other approved method and given priming coat followed by two coats of contrasting colors of durable weather –resisting paint. The final color of the exterior surfaces shall be

dark Admiralty Grey color No. 632 as per BS 381C with a total dry film thickness of between 100 and 130microns.

4.2.13.3 The interior of all transformer tanks and other oil filled chambers shall be cleaned of all scale and rust by shot blasting or other approved method. Hot oil resistant varnish/paint shall be used for painting the inside transformer tank and oil filled chambers.

4.2.13.4 Radiators shall be thoroughly degreased and treated externally by phosphating or other rust inhibiting process

4.2.13.5 Radiators shall be flood –painted with primer and two coats of durable weather and oil resisting paint. The final external coat shall be high gloss of shade no. 632 (Admiralty Grey) according to BS381C .The total paint thickness shall not be less than 85µm at any point

4.2.14 Quality management system

4.2.14.1 The supplier shall submit a quality assurance plan (QAP) that will be used to ensure that the transformer design, material, workmanship, tests, service capability, maintenance and documentation, will fulfill the requirements stated in the contract documents, standards, specifications and regulations. The QAP shall be based on and include relevant parts to fulfill the requirements of ISO 9001:2008

4.2.14.2: The manufacturer's declaration of conformity to reference standards and copies of quality management certificates including copy of valid and relevant ISO 9001:2008 certificate shall be submitted with the tender for evaluation

5.0 TESTS AND INSPECTION

5.1 Type tests and routine tests shall be done in accordance with the requirement of IEC 60076 and this specification. It shall be the responsibility of the manufacture to perform or to have performed all the tests specified. Tenderers shall confirm the manufacturer's

capabilities in this regard when submitting tenders. Any limitations shall be clearly specified.

5.2 Certified true copies of previous type test reports by the relevant International or National Testing/Standards Authority of the country of manufacture (or ISO/IEC 17025 /ILAC accredited laboratory) shall be submitted with the offer for evaluation (all in English Language). A copy of accreditation certificate for the laboratory shall also be submitted. Any translations of certificates and test reports into English language shall be signed and stamped by the testing authority

5.3 Copies of type test certificates and type test reports to be submitted for tender evaluation shall include:

- Dielectric tests to IEC 60076 (Lightning Impulse Tests and power frequency withstand voltage tests) ,
- Temperature Rise Tests to IEC 60076,
- short circuit withstand tests to IEC60076
- sound level tests for similar rated transformers.

Type test reports for a transformer of identical or higher voltage and KVA rating and within the range of 11/0.433KV and 33/0.433kv shall be accepted as a representative for ground mounted distribution transformer on tender.

5.4 The transformers shall be subject to acceptance tests at the manufacturers' works before dispatch .Acceptance tests shall be witnessed by two engineers appointed by Kenya Power and shall include:

- All routine tests to IEC60076(to be done during acceptance testing at the factory)
- Measurement of winding resistance
- Ratio test
- Vector group

- Separate source voltage withstand
- Induced overvoltage
- Insulation resistance
- Oil leakage on fully assembled transformer for 12hrs
- Measurement of impendence voltage
- Measurement of no load loss current
- Measurement of load loss(at normal and extreme taps)
- Tests on off load tap changer

5.5 Type test to IEC 60076(to be done on one unit during acceptance testing at the factory)

- Temperature rise
- Lightning Impulse withstand test

5.6 Additional tests (to be done during acceptance testing at the factory)

- Visual inspection(verification of documents, fittings and accessories, markings and name plates, paint work ,workmanship and finish)
- Acoustic and sound level
- Paint thickness
- Tank pressure test

5.7 **Testing Facility**

The manufacturer shall provide current e-mail address, fax and telephone numbers and contact person of the international or national standard and testing facility of the country where the transformer is manufactured and tested

5.8 Complete test reports for each transformer (including individual components) shall be submitted to Kenya Power for approval before shipment.

5.9 On receipt of the transformers Kenya Power will inspect them and may perform any of the relevant tests in order to verify compliance with specification. The manufacturer shall replace /rectify without charge to Kenya Power, transformers which upon examination, test or use fail to meet any or all of the requirements of this specification.

6.0 MARKING AND LABELLING

6.1 The transformer and accessories shall be package in a manner as to protect them from any damage during transportation and handling. The transformer shall first be mounted and bolted to a wooden base pallet and then covered with polythene cover. The transformer with the base pallet shall then be secured tightly in the container to avoid transit movements.

6.2 In addition to markings and labels required elsewhere in this specification, each transformer shall be provided with a rating plate of weatherproof material, fitted in a visible position on the enclosure, showing the appropriate details listed in IEC60076 The entries on the plate shall be indelibly marked by engraving.

6.3 The transformer shall be dispatched fully assembled and oil filled.

6.4 In addition, the ratings and diagram plate shall include load and no load losses for the highest, lowest and principle tap positions, temperature class of insulation, connection diagram and the inscription 'PROPERTY OF KENYA POWER ' all marked indelibly as in 6.2

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ANNEX A

SCHEDULE OF GUARANTEED TECHNICAL PARTICULARS FOR GROUND MOUNDED 100 to 1000KVA 11/0.433kv DISTRIBUTION TRANSFORMER OFFERED

No.	REQUIREMENTS	BIDDERS OFFER
1	Name of manufacturer and country of origin	
2	Applicable standards	
3	service(indoor/outdoor),altitude, temperature range, humidity and environment(pollution severity level)	
4	KVA rating	
5	Rated no load voltage	
	(a) HV-kV	
	(b)LV-V	
6	Temperature rise of top oil(˚C)	
7	Temperature rise of winding measured by resistance	
8	System Frequency(HZ)	
9	No. of windings	
10	Number of phases	
11	connection symbol & vector group	
12	Tap changer type, step and range	
13.	Losses corrected to 75° C	
	a) no-load losses, W b) full load cu losses, W c) full load total losses d) 75% Loading, W e) 125% Loading, W Transformer efficiency at unity power factor, rated voltage and full load at (75˚C)	

14	% impedance voltage at rated current and frequency	
15	Resistance at 75°C of	
	(a) HV windings(At normal and extreme taps)	
	(b)LV windings in ohms	
16	(a)short time thermal ratings of HV windings in kA 2sec	
	(b) Overload capacity for 2hrs after continuous full load run	
17	Thermal time constant in hours	
18	internal and external insulation level of offered transformer	
	HV Winding	
	LV winding	
19	Test voltage at factory	
	(i)Lightning impulse KV (peak)	
	(ii) Power frequency voltage withstand KV(rms)	
	(iii)Altitude of the factory	
20.	Noise level when energized at normal voltage and frequency at no load.	
21	Approximate weights	
	(i) core ,Kg (ii)windings (copper + insulation),Kg (iii) tank & fittings ,Kg (iv)oil, Kg (v) total weight, Kg	
22	Details of oil and quantity in liters	
23.	Net core area in m^2	
24	Type of transformer (Stack core type required)	

25	Maximum flux density at rated voltage and frequency in Tesla/lines/cm²	
26.	Material of laminations a) Grade of CRGO b) Thickness of lamination c) Stack factor d) Specific weight e) Specific loss watts/kg f) Core clamping	
27.	conductor area in cm² and current density in Amps/cm²	
	(i)HV	
	(ii) LV	
28.	Type of windings	
	(i)HV	
	(ii)LV	
29	Winding Insulation	
	HV	
	LV	
30	(a)Insulating material	
	Turns insulation	
	HV side	
	LV side	
	(b)between HV and LV	
	©For core bolts, washers and end plates	
	(d)Tapping connection	
31	(i)Type of axial support : HV&LV windings	
	(ii) type of radial coil support:-HV winding LV winding	
32	Details of tank	
	(i) material of tank	

	(ii) Type of the tank(sealed type required) (iii)Thickness of sides, mm (iv)Thickness of top cover, mm (v) Thickness of radiators, mm (vi)Tank sealing(bolted type required)	
33	Details of bushings(indicate details of HV,LV and neutral bushings	HV LV Neutral
	(i) type(porcelain, brown color required) (ii) one minute dry power frequency withstand voltage(rms) (iii) 1.2μs lighting impulse withstand voltage(peak) positive (iv) total Creepage distance (v)Maximum current rating of each bushing (vi) position of bushing (vii) Terminations:(a) HV(**11KV:cable box**) (b)LV(cable box)	
34	cooling system (i)Grade and standard of oil (ii) type and make of material used for radiators (iii) total radiating surface (iv)Total weight of radiators	
35	Overall dimensions of complete transformer (a) length, mm (b)breadth, mm ©Height, mm (d)transformer external paint, μm	

	(e) Reference drawing	
36	Type & features of oil level indicator	
37	(a)Type &make of pressure relief device (b)minimum pressure which the device operates at (kPA)	
38	manufacturers guarantee and warranty	
39	List of catalogues, brochures, technical data and drawings submitted to support the offer	
40	list customers sales records submitted to support the offer	
41	List Type Test Certificates and Type Test Reports submitted with the tender(indicate test report numbers, date voltage & KVA rating, Testing institution and contact addresses) • Dielectric test to IEC60076 • Impulse and power frequency withstand test • Short circuit tests to IEC60076 • Temperature rise test to IEC60076	
42	List acceptance test to be witnessed by Kenya Power engineers.	
43	List test reports (for transformer and components) to be submitted for approval before shipment	
44	copy of ISO 9001:2008 certificate submitted(indicate validity)	
45	Quality Assurance plan	
46	manufacturer's declaration of conformity to standards(including IEC60076)	

47	statement of compliance to tender specifications	
48	comment on tender specifications	
49	deviations from tender specifications and supporting data test reports and technical documents	
50	inspection of the transformers and components at Kenya Power stores	
51	List and details of fittings and accessories to be fitted and features to be provided to deter oil vandalism.(note: Fittings and accessories other than those specified are prohibited)	

Manufacturer's Declaration: I .....on behalf of.....

Declare that the above submitted information conforms to the distribution transformer rated .....kV.....kVA, being offered for this tender.

Signature.....

Date.....Stamp/Seal.....

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ANNEX B

SCHEDULE OF GUARANTEED TECHNICAL PARTICULARS FOR GROUND MOUNDED 630 & 1000KVA 33/0.433kv DISTRIBUTION TRANSFORMER OFFERED

No.	REQUIREMENTS	BIDDERS OFFER
1	Name of manufacturer and country of origin	
2	Applicable standards	
3	service(indoor/outdoor),altitude, temperature range, humidity and environment(pollution severity level)	
4	KVA rating	
5	Rated no load voltage	
	(a) HV-kV	
	(b)LV-V	
6	Temperature rise of top oil(˚C)	
7	Temperature rise of winding measured by resistance	
8	System Frequency(HZ)	
9	No. of windings	
10	Number of phases	
11	connection symbol & vector group	
12	Tap changer type, step and range	
13.	Losses corrected to 75° C	
	f) no-load losses, W g) full load cu losses, W h) full load total losses i) 75% Loading, W j) 125% Loading, W Transformer efficiency at unity power factor, rated voltage and full load at (75˚C)	
14	% impedance voltage at rated current and	

	frequency	
15	Resistance at 75°C of	
	(a) HV windings(At normal and extreme taps)	
	(b)LV windings in ohms	
16	(a)short time thermal ratings of HV windings in kA 2sec	
	(b) Overload capacity for 2hrs after continuous full load run	
17	Thermal time constant in hours	
18	internal and external insulation level of offered transformer	
	HV Winding	
	LV winding	
19	Test voltage at factory	
	(i)Lightning impulse KV (peak)	
	(ii) Power frequency voltage withstand KV(rms)	
	(iii)Altitude of the factory	
20.	Noise level when energized at normal voltage and frequency at no load.	
21	Approximate weights	
	(i) core ,Kg (ii)windings (copper + insulation),Kg (iii) tank & fittings ,Kg (iv)oil, Kg (v) total weight, Kg	
22	Details of oil and quantity in liters	
23.	Net core area in m^2	
24	Type of transformer (Stack core type required)	
25	Maximum flux density at rated voltage and	

	frequency in Tesla/lines/cm²	
26.	Material of laminations g) Grade of CRGO h) Thickness of lamination i) Stack factor j) Specific weight k) Specific loss watts/kg l) Core clamping	
27.	conductor area in cm² and current density in Amps/cm²	
	(i)HV	
	(ii) LV	
28.	Type of windings	
	(i)HV	
	(ii)LV	
29	Winding Insulation	
	HV	
	LV	
30	(a)Insulating material	
	Turns insulation	
	HV side	
	LV side	
	(b)between HV and LV	
	©For core bolts, washers and end plates	
	(d)Tapping connection	
31	(i)Type of axial support : HV&LV windings	
	(ii) type of radial coil support:-HV winding LV winding	
32	Details of tank	
	(i) material of tank	

	(ii) Type of the tank(sealed type required) (iii)Thickness of sides, mm (iv)Thickness of top cover, mm (v) Thickness of radiators, mm (vi)Tank sealing(bolted type required)	
33	Details of bushings(indicate details of HV,LV and neutral bushings	HV LV Neutral
	(i) type(porcelain, brown color required) (ii) one minute dry power frequency withstand voltage(rms) (iii) 1.2μs lighting impulse withstand voltage(peak) positive (iv) total Creepage distance (v)Maximum current rating of each bushing (vi) position of bushing (vii) Terminations:(a) HV(**33KV:OPEN**) (b)LV(cable box)	
34	cooling system (i)Grade and standard of oil (ii) type and make of material used for radiators (iii) total radiating surface (iv)Total weight of radiators	
35	Overall dimensions of complete transformer (a) length, mm (b)breadth, mm ©Height, mm (d)transformer external paint, μm	

	(e) Reference drawing	
36	Type & features of oil level indicator	
37	(a)Type &make of pressure relief device (b)minimum pressure which the device operates at (kPA)	
38	manufacturers guarantee and warranty	
39	List of catalogues, brochures, technical data and drawings submitted to support the offer	
40	list customers sales records submitted to support the offer	
41	List Type Test Certificates and Type Test Reports submitted with the tender(indicate test report numbers, date voltage & KVA rating, Testing institution and contact addresses) • Dielectric test to IEC60076 • Impulse and power frequency withstand test • Short circuit tests to IEC60076 • Temperature rise test to IEC60076	
42	List acceptance test to be witnessed by KPLC engineers.	
43	List test reports (for transformer and components) to be submitted for approval before shipment	
44	copy of ISO 9001:2008 certificate submitted(indicate validity)	
45	Quality Assurance plan	
46	manufacturer's declaration of conformity to standards(including IEC60076)	

47	statement of compliance to tender specifications	
48	comment on tender specifications	
49	deviations from tender specifications and supporting data test reports and technical documents	
50	inspection of the transformers and components at Kenya Power stores	
51	List and details of fittings and accessories to be fitted and features to be provided to deter oil vandalism.(note: Fittings and accessories other than those specified are prohibited)	

Manufacturer's Declaration: I .....on behalf of.....

Declare that the above submitted information conforms to the distribution transformer rated .....kV.....kVA, being offered for this tender.

Signature.....

Date.....Stamp/Seal.....

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