Kenya Power

SPECIFICATION FOR THREE PHASE POWER TRANSFORMER WINDING ANALYZER

A Document of the Kenya Power & Lighting Co. Ltd

~~February~~ 2026

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0.1 CIRCULATION LIST

COPY NO.	COPY HOLDER
1	E/Plant
2	

0.2 AMENDMENT RECORD

Issued by: Head of Section, E/Plant	Authorized by: Head of Department, E/Plant
Signed:	Signed:
Date: 2026-01-19	Date: 2026-01-19

Rev No.	Date (YYYY-MM-DD)	Description of Change	Prepared by (Name & Signature)	Approved by (Name & Signature)
0	2026-01-19	New issue	George Welimo	

FOREWORD

This specification has been prepared by the Electrical Plant of The Kenya Power and Lighting Company Limited (KPLC) and it lays down requirements for Three phase power transformer winding analyzer.

The Three phase power transformer winding analyzer is intended for use by the Electrical Plant for measuring turns ratio, winding resistance, demagnetization, short-circuit impedance transformer efficiency, phase shift, polarity, excitation current and vector validation in transformers.

This specification was prepared to establish and promote uniform requirements for Three phase power transformer winding analyzer to be used at Kenya Power and Lighting Company Ltd.

There are no other specifications in this series.

This specification stipulates the minimum requirements for Three phase power transformer winding analyzer acceptable for use in the company and it shall be the responsibility of the suppliers and manufacturer to ensure that the offered design is of the highest quality and guarantees excellent service to KPLC, good workmanship and good engineering practice in the manufacture of the Three phase power transformer winding analyzer for KPLC.

Users of Kenya Power specifications are responsible for their correct interpretation and application.

1. SCOPE

1.1. This specification is for Three phase power transformer winding analyzer for use by company's Electrical Plant.

1.2. The specification covers requirements, design, inspection and tests and schedule of Guaranteed Technical Particulars of Three phase power transformer winding analyzer.

2. NORMATIVE REFERENCES

The following standards contain provision which, through reference in this text, constitute provisions of this specification. For dated editions the cited edition will apply; for undated editions the latest edition of the referenced document shall apply.

IEC 61557: Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c - Equipment for testing, measuring or monitoring of protective measures - Part 1: General requirements;

IEC 60815: Selection and dimensioning of high voltage insulators intended for use in polluted conditions –Part 1: Definitions, information and general principles

OIML D 11: General Requirements for Measuring Instruments - Environmental Conditions

IEC 61000: Electromagnetic Compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test; – Part 6-2: Generic standards – Immunity for Industrial environment.

IEC 60529: Degrees of protection provided by enclosures (IP code)

ISO 9001: Quality Management systems – Requirements

ISO/IEC 17025: General Requirements for the competence of testing and calibration laboratories

IEC 61010 - Safety requirements for electrical equipment for measurement, control, and laboratory use. During a test, software will perform safety checks before applying full test voltage.

3. DEFINITIONS AND ABBREVIATIONS

For the purpose of this specification, the definitions and abbreviations given in the reference standards shall apply together with the following abbreviations.

3.1. ABBREVIATIONS

KPLC- Kenya Power and Lighting Company Limited

ISO – International Organization for Standardization.

LED –Light Emitting Diode

Kg –Kilogram

KV - Kilovolt

IP – Ingress Protection

LV – Low Voltage

EMC – Electromagnetic Compatibility

EU – European Union

AC-Alternating Current

DC-Direct Current

IEC-

4. REQUIREMENTS

4.1. SERVICE CONDITIONS

4.1.1 The Three phase power transformer winding analyzer shall be suitable for use outdoors in tropical areas and harsh climatic conditions including areas exposed to:

a) Altitudes of up to 2000m above sea level;

b) Humidity of up to 95%;

c) Average ambient temperature of +30°C with a minimum of -1°C and a maximum of +40°C

d) Pollution: Degree 2

4.2. DESIGN AND CONSTRUCTION

4.2.1. The Three phase power transformer winding analyzer shall be able to perform three phase step up ratio testing that removes the inaccuracy associated with test voltage

4.2.2. The Three phase power transformer winding analyzer shall be able to perform three phase winding resistance and demagnetization test

4.2.3. The Three phase power transformer winding analyzer shall perform turns ratio, winding resistance, short-circuit impedance and efficiency tests with the same one-time three phase lead-set connection

4.2.4. The Three phase power transformer winding analyzer shall not require the user to know the proper test voltage to obtain a valid result, the test set shall decide for the user

4.2.5. The Three phase power transformer winding analyzer shall have the capability for automatic vector group detection to validate the expected nameplate vector configuration.

4.2.6. The Three phase power transformer winding analyzer shall have the capability to check for correct polarity between high and low side windings.

4.2.7. The Three phase power transformer winding analyzer shall have the capability to test Phase angle deviation

4.2.8. The Three phase power transformer winding analyzer shall have the capability to perform automatic demagnetization after each winding resistance test.

4.2.9. The Three phase power transformer winding analyzer shall have the capability to perform winding resistance tests across multiple OLTC taps to verify continuity of the tap changer connections.

4.2.10. Three phase power transformer winding analyzer shall have the following

4.2.10.1. User interface of a built in Screen 10 inch and above color touch display

4.2.10.2. Built in storage and printing/downloading capabilities of the test results to a USB memory device.

4.2.10.3. Can be operated from Personal Computer.

4.3. It shall have the technical particulars as shown in table 1 below:

Table 1: Technical particulars of Three phase power transformer winding analyzer

Parameter	**Requirement**			
Input Power	Mains power supply			90-260 V_{AC} 47-60Hz
Output Power	Voltage			3 phase, 1 - 100V
	Frequency			DC, 40-480 Hz
	current			0.1mA – 1 A @ 100 V 0.1 mA – 32 A @ 24 V
Turns Ratio Measurement Methods				3 phase Step Up 3 phase Step Down 1 phase Step Up 1 phase Step Down
Turns Ratio Range and Accuracy	Step Down measurement	**Voltages**	**Turns**	**Accuracy**
		25-100V	0.8 - 1000	±0.05%
			1001 - 2000	±0.10%
			2001 - 15000	±0.30%
			15001 – 50000	±1%
		1-24V	0.8 - 1000	±0.10%
			1001 - 2000	±0.20%
			2001 - 15000	±0.60%
	Step Up Measurement	25-250V	0.8 - 200	±0.05%
		1-24V	0.8 - 200	±0.10%
Excitation Current Measurement	Resolution			0.1mA, 0.1mA - 100mA 1mA 101mA-11A
	Accuracy:			± 1% ±0.1 mA

Parameter	Requirement	
Frequency Measurement	Resolution:	0.1 Hz
	Accuracy:	±0.1% ±0.1 Hz
Transformer Phase Measurement	Range:	0 - 360 Degrees
	Accuracy:	± 0.05 Degrees
Transformer testing standards	IEEE C57.152-2013 IEC 60076-1:2011 AS/NZS 6076 1:2014 CIGRE 445 2 011	
Resistance measurement methods	1 phase wye, delta, zigzag 2 phase wye w/neutral 3 phase wye w/neutral Dual winding excitation	
DC Measurement voltage	Upto 100V	
Current and resistance ranges	Current 32 A 16 A 8 A 1A 100 mA	Min Ω Max Ω 1.0 μΩ 400 mΩ 0.1 mΩ 1.0 Ω 1.0 Ω 2.0 Ω 2.0 Ω 20 Ω 1.0 Ω 100 kΩ
Dynamic resistance measurement method	Dynamic voltage Dynamic current Dynamic resistance	
Accessories for Three phase power transformer winding analyzer	**Description**	**Quantity**
	AC power cord	1
	USB 2.0 Cable	1
	OLTC Tap Changer cable - 9m (30ft)	2
	OLTC Tap Changer cable adapters	2
	Cable bag - backpack	1
	Ground Cable - 5m (16ft)	1

Parameter	Requirement	
	3 phase 18meters universal shielded test lead sets complete with color-coded Kelvin Clamps	2 sets
	16 Amp H leads with red jacket and red, yellow, blue, and white clamps (4 total)- 18 m (60 ft) H	2 sets
	32 Amp X leads with black and white stripe jacket and red, yellow, blue, and white clamps (4 total)- 18 m (60 ft) X leads	2 Sets
	9m (30ft) X extensions	2 Sets
	9m (30ft) H extensions	2 Sets
	Transit Case (for instrument)	1
	software accessories	Transformer efficiency measurements Frequency response stray losses measurements Dynamic resistance measurements Transformer heat run measurement
	PC and PC software PC specifications • 8 core CPU with 4 performance cores • 8GB RAM memory • 512GB SSD storage	1

4.4. DOCUMENTATION AND SUPPORT

4.4.1. **Warranty and training**

4.4.1.1. The Three phase power transformer winding analyzer shall be backed by a minimum of 12-months factory warranty.

4.4.1.2. Technical support and software upgrade, where applicable shall be provided free of charge to KENYA POWER for a period of not less than 36 months.

4.4.1.3. The Bidder shall submit a clause by clause statement of compliance with the specifications together with copies of the manufacturer's catalogues, brochures, technical data and proven test reports clearly marked to support each clause, all in English for evaluation. The manufacturer's type reference/designation of the item offered shall be indicated

5. TESTS REQUIREMENTS

5.1. The Three phase power transformer winding analyzer shall be inspected and tested in accordance with standards and this specification. It shall be the responsibility of the manufacturer 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. Copies of previous Test/calibration Reports issued by own or a third party testing laboratory that is accredited to ISO/IEC 17025:2005 or 17025:2017 confirming accuracy and compliance of the Three phase power transformer winding analyzer offered shall be submitted with the offer for evaluation (all in English Language). A copy of the **accreditation certificate** and the **scope of accreditation** of the testing/calibrating laboratory shall also be submitted. Any translations of certificates or reports into English language shall be signed and stamped by the Testing/Calibrating Authority that carried out tests/calibration. Copies of test/calibration reports for the Three phase power transformer winding analyzer offered to be submitted for tender evaluation shall include the following

5.2.1. Measured values of the standard equipment

5.2.2. Indicated values of the unit under test (Three phase power transformer winding analyzer offered)

5.2.3. Expanded Relative uncertainty

5.2.4. Details of standard and reference equipment used in calibration tests.

6. MARKING AND PACKING

6.1. MARKING

The following information shall be marked legibly and in a permanent manner on the Three phase power transformer winding analyzer:

a) The manufacturer's name or trade mark;

b) The type reference number / model number;

c) The serial number;

d) Letters "PROPERTY OF KENYA POWER"

e) The instructions for handling and use (in the English Language).

6.2. PACKING

6.2.1. The Three phase power transformer winding analyzer shall be packed in a carrying case so as to protect it from damage and entry of moisture during transportation, handling and storage.

6.2.2. The carrying case shall shock proof and impact resistant and shall be able to withstand a fall of one meter without damage to Three phase power transformer winding analyzer.

APPENDICIES

A: TESTS AND INSPECTION (Normative)

A.1 It shall be the responsibility of the supplier to test or to have all the relevant tests performed.

A.2 Copies of previous Test/calibration Reports of Three phase power transformer winding analyzer issued by own or a third party testing laboratory that is accredited to ISO/IEC 17025:2005 or 17025:2017 shall be submitted with the tender for the purpose of technical evaluation. A copy of the accreditation certificate for the testing laboratory shall also be submitted with the tender (all in English Language). Any translations of certificates and test reports into English language shall be signed and stamped by the Testing Authority.

A.3 On receipt of the Three phase power transformer winding analyzer, Kenya Power will inspect them and may perform or have performed any of the relevant tests in order to verify compliance with the specification. The supplier shall replace without charge to Kenya Power, any Three phase power transformer winding analyzer which upon examination, test or use fail to meet any or all of the requirements in the specification.

B: QUALITY MANAGEMENT SYSTEM (Normative)

B.1 The supplier shall submit a quality assurance plan (QAP) that will be used to ensure that the Three phase power transformer winding analyzer physical properties, tests 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: 2015.

B.2 The Manufacturer's Declaration of Conformity to applicable standards and copies of quality management certifications including copy of valid and relevant ISO 9001:2015 certificate shall be submitted with the tender for evaluation.

B.3 The bidder shall indicate the delivery time of the equipment, manufacturer's monthly & annual production capacity and experience in the production of the Three phase power transformer winding analyzer being offered. A detailed list & contact addresses (including e-mail) of the manufacturer's previous customers for similar type of the Three phase power transformer winding analyzer sold in the last five years as well as reference letters from at least four of the customers shall be submitted with the tender for evaluation.

C: DOCUMENTATION AND DEMONSTRATION (Normative)

C.1 The bidder shall submit its tender complete with technical documents for tender evaluation. The technical documents to be submitted (all in English language) for tender evaluation shall include the following:

a) Fully filled clause by clause guaranteed technical particulars (GTP) signed by the manufacturer;
b) Copies of the Manufacturer's catalogues, brochures, drawings giving all relevant dimensions, Wiring diagram / Schematic Diagram and technical data;
c) Sales records for the last five years and at least four customer reference letters;
d) Details of manufacturing capacity and the manufacturer's experience;
e) Copies of required test/calibration reports of testing/calibrating laboratory accredited to ISO/IEC 17025;
f) Copy of accreditation certificate to ISO/IEC 17025 for the testing/calibrating laboratory;
g) Manufacturers letter of authorization, ISO 9001:2015 certificate, and other technical documents required in the tender.

h) Manufacturer's warranty and guarantee; subject to 12 months from date of delivery to KPLC stores

i) Operational manual.

j) Service manual.

C.2 The supplier shall submit recommendations for use, care, storage and routine inspection/testing procedures, all in the English Language, during delivery of Three phase power transformer winding analyzer to KPLC stores

D: GUARANTEED TECHNICAL PARTICULARS (Normative)

To be filled and signed by the Manufacturer and submitted together with relevant copies of the Manufacturer's catalogues, brochures, drawings, technical data, sales records for previous five years, four customer reference letters, details of suppliers' capacity and experience; and copies of complete type test certificates and test reports for tender evaluation, all in English Language)

Tender No. .....

Bidder's name and Address.....

Clause number	Requirement	Bidder's offer
Manufacturer's Name and address		State
Country of Manufacture		State
Name and model Number		State
1.	Scope	State
2.	Normative References	State
3.	Definitions and Abbreviations	State
3.1.	Abbreviations	State
4.1.	SERVICE CONDITIONS	
4.1.1	The Three phase power transformer winding analyzer shall be suitable for use outdoors in tropical areas and harsh climatic conditions including areas exposed to:	
a)	Altitudes above sea level;	State
b)	Humidity ;	State
c)	Average ambient temperature	state
d)	Pollution:	state

Clause number	Requirement	Bidder's offer
4.2.	DESIGN AND CONSTRUCTION	
4.2.1.	Three phase step up ratio testing that removes the inaccuracy associated with test voltage	State
4.2.2.	Three phase winding resistance and demagnetization test	State
4.2.3.	Turns ratio, winding resistance, short-circuit impedance and efficiency tests with the same one-time three phase lead-set connection	State
4.2.4.	shall not require the user to know the proper test voltage to obtain a valid result, the test set shall decide for the user	State
4.2.5.	the capability for automatic vector group detection to validate the expected nameplate vector configuration.	State
4.2.6.	The capability to check for correct polarity between high and low side windings.	State
4.2.7	Capability to test Phase angle deviation	
4.2.8	The capability to perform automatic demagnetization after each winding resistance test.	
4.2.9	Capability to perform winding resistance tests across multiple OLTC taps to verify continuity of the tap changer connections.	
4.2.10.	Three phase power transformer winding analyzer shall have the following	State
4.2.10.1.	User interface of a built in Screen 10 inch and above color touch display	State
4.2.10.2.	Built in storage and printing/downloading capabilities of the test results to a USB memory device.	State
4.2.10.3.	Can be operated from Personal Computer.	State
4.3.	It shall have the technical particulars as shown in table 1 below:	

	Parameter	Requirement	
	Input Power	Mains power supply Voltage	Specify
	Output Power	Voltage	Specify
		Frequency	Specify
		current	Specify
	Turns Ratio Measurement Methods		Specify

Clause number	Requirement			Bidder's offer
	Turns Ratio Range and Accuracy		**Voltages**	
		Step Down Excitation	25-100V	Specify Turns ratio and accuracy
			1-24V	Specify Turns ratio and accuracy
		Step Up Measurement	25-250V	Specify Turns ratio and accuracy
			1-24V	Specify Turns ratio and accuracy
	Excitation Current Measurement	Resolution		Specify
		Accuracy		Specify
	Frequency Measurement	Resolution		Specify
		Accuracy:		Specify
	Transformer Phase Measurement	Range:		Specify
		Accuracy:		Specify
	Transformer testing standards			State
	Resistance measurement methods			State
	DC Measurement voltage			State
	Current and resistance ranges			State
	Dynamic resistance measurement method			State
	Accessories for Three phase power transformer winding analyzer	**Description**	**Quantity**	
		AC power cord	1	Specify
		USB 2.0 Cable	1	Specify
		OLTC Tap Changer cable - 9m (30ft)	2	Specify
		OLTC Tap Changer cable adapters	2	Specify
		Cable bag - backpack	1	Specify

Clause number	Requirement			Bidder's offer
		Ground Cable - 5m (16ft)	1	Specify
		3 phase 18meters universal shielded test lead sets complete with color-coded Kelvin Clamps	2 sets	Specify
		16 Amp H leads with red jacket and red, yellow, blue, and white clamps (4 total)- 18 m (60 ft) H	2 Sets	Specify
		32 Amp X leads with black and white stripe jacket and red, yellow, blue, and white clamps (4 total)- 18 m (60 ft) X leads	2 Sets	Specify
		9m (30ft) X extensions	2 Sets	Specify
		9m (30ft) H extensions	2 Sets	Specify
		Transit Case (for instrument)	1	Specify
		software accessories	1	Specify
		PC and PC software	1	Specify
4.4.1.	**Warranty and training**			
4.4.1.1.	The Three phase power transformer winding analyzer shall be backed by a minimum of 12-months factory warranty.			submit
4.4.1.2.	Technical support and software upgrade, where applicable shall be provided free of charge to KENYA POWER for a period of not less than 36 months.			State
4.4.1.3.	The Bidder shall submit a clause by clause statement of compliance with the specifications together with copies of the manufacturer's catalogues, brochures, technical data and proven test reports clearly marked to support each clause, all in English for evaluation. The manufacturer's type reference/designation of the item offered shall be indicated			state
5	**TESTS REQUIREMENTS**			
5.1.	The Three phase power transformer winding analyzer shall be inspected and tested in accordance with standards and this specification. It shall be the responsibility of the manufacturer 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.			State

Clause number	Requirement	Bidder's offer
5.2.	Copies of previous Test/calibration Reports issued by own or a third party testing laboratory that is accredited to ISO/IEC 17025:2005 or 17025:2017 confirming accuracy and compliance of the Three phase power transformer winding analyzer offered shall be submitted with the offer for evaluation (all in English Language). A copy of the accreditation certificate and the scope of accreditation of the testing/calibrating laboratory shall also be submitted. Any translations of certificates or reports into English language shall be signed and stamped by the Testing/Calibrating Authority that carried out tests/calibration. Copies of test/calibration reports for the Three phase power transformer winding analyzer offered to be submitted for tender evaluation shall include the following	submit
5.2.1.	Measured values of the standard equipment	submit
5.2.2.	Indicated values of the unit under test (Three phase power transformer winding analyzer offered)	submit
5.2.3.	Expanded Relative uncertainty	submit
5.2.4.	Details of standard and reference equipment used in calibration tests.	submit
6	**MARKING AND PACKING**	
6.1.	**MARKING**	
a)	The manufacturer's name or trade mark;	State
b)	The type reference number / model number;	State
g)	The serial number;	State
h)	Letters "PROPERTY OF KENYA POWER"	State
i)	The instructions for handling and use (in the English Language).	State
6.2.	**PACKING**	
6.2.1.	The Three phase power transformer winding analyzer should be packed in a carrying case so as to protect it from damage and entry of moisture during transportation, handling and storage.	State
6.2.2.	The carrying case shall shock proof and impact resistant and shall be able to withstand a fall of one meter without damage to the Three phase power transformer winding analyzer .	State
	APPENDICIES	
A:	**TESTS AND INSPECTION (Normative)**	

Clause number	Requirement	Bidder's offer
A.1	It shall be the responsibility of the supplier to test or to have all the relevant tests performed.	confirm
A.2	Copies of previous Test/calibration Reports of Three phase power transformer winding analyzer issued by own or a third party testing laboratory that is accredited to ISO/IEC 17025:2005 or 17025:2017 shall be submitted with the tender for the purpose of technical evaluation. A copy of the accreditation certificate for the testing laboratory shall also be submitted with the tender (all in English Language). Any translations of certificates and test reports into English language shall be signed and stamped by the Testing Authority.	submit
A.3	On receipt of the Three phase power transformer winding analyzer, Kenya Power will inspect them and may perform or have performed any of the relevant tests in order to verify compliance with the specification. The supplier shall replace without charge to Kenya Power, any Three phase power transformer winding analyzer which upon examination, test or use fail to meet any or all of the requirements in the specification.	State
B:	**QUALITY MANAGEMENT SYSTEM (Normative)**	
B.1	The supplier shall submit a quality assurance plan (QAP) that will be used to ensure that the Three phase power transformer winding analyzer physical properties, tests 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: 2015.	submit
B.2	The Manufacturer's Declaration of Conformity to applicable standards and copies of quality management certifications including copy of valid and relevant ISO 9001:2015 certificate shall be submitted with the tender for evaluation.	submit
B.3	The bidder shall indicate the delivery time of the equipment, manufacturer's monthly & annual production capacity and experience in the production of the Three phase power transformer winding analyzer being offered. A detailed list & contact addresses (including e-mail) of the manufacturer's previous customers for similar type of the Three phase power transformer winding analyzer sold in the last five years as well as reference	State

Clause number	Requirement	Bidder's offer
	letters from at least four of the customers shall be submitted with the tender for evaluation.	
C:	**DOCUMENTATION AND DEMONSTRATION (Normative)**	
C.1	The bidder shall submit its tender complete with technical documents for tender evaluation. The technical documents to be submitted (all in English language) for tender evaluation shall include the following:	
a)	Fully filled clause by clause guaranteed technical particulars (GTP) signed by the manufacturer;	submit
b)	Copies of the Manufacturer's catalogues, brochures, drawings giving all relevant dimensions, Wiring diagram / Schematic Diagram and technical data;	submit
c)	Sales records for the last five years and at least four customer reference letters;	submit
d)	Details of manufacturing capacity and the manufacturer's experience;	submit
e)	Copies of required test/calibration reports of testing/calibrating laboratory accredited to ISO/IEC 17025;	submit
f)	Copy of accreditation certificate to ISO/IEC 17025 for the testing/calibrating laboratory;	submit
g)	Manufacturers letter of authorization, ISO 9001:2015 certificate, and other technical documents required in the tender.	submit
h)	Manufacturer's warranty and guarantee; subject to 12 months from date of delivery to KPLC stores	submit
i)	Operational manual.	submit
j)	Service manual.	submit
C.2.	The supplier shall submit recommendations for use, care, storage and routine inspection/testing procedures, all in the English Language, during delivery of the Three phase power transformer winding analyzer to KPLC stores.	State

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Manufacturer's Name, Signature, Stamp and Date