



Kenya Power

TITLE:
**SPECIFICATION FOR OVERHEAD LINE
HIGH VOLTAGE TEST INSTRUMENT**

Part2: Voltage detector (Tester), 1kV - 245 kV

Doc. No.	KP1/3CB/TSP/09/085
Issue No.	1
Revision No.	0
Date of Issue	2015-02-10

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Issued by: Head of Section, Standards Development

Signed:

Date: 2015-02-10

Authorized by: Head of Department, Standards

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Date: 2015-02-10



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0.1 Circulation List

COPY NO.	COPY HOLDER
1	Head of department, Standards
2	Head of department Procurement
Electronic copy (pdf) on Kenya Power server (http://172.16.1.40/dms/browse.php?fFolderId=23)	

0.2 Amendment Record

Rev No.	Date (YYYY-MM-DD)	Description of Change	Prepared by (Name & Signature)	Approved by (Name & Signature)
0	2015-02-10	New Issue	Nancy Wairimu 	Dr.Eng Peter Kimemia

Issued by: Head of Section, Standards Development

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FOREWORD

This specification has been prepared by the Standards Department in collaboration with Transmission Department, both of The Kenya Power and Lighting Company Limited (KPLC) and it lays down requirements for overhead line instrument (high voltage detector) for use on transmission power lines. It is intended for use by KPLC in purchasing the high voltage detector.

The supplier shall submit information which confirms satisfactory service experience with products which fall within the scope of this specification.

1. SCOPE

- 1.1 This specification is for high voltage test instrument for use on transmission power lines operated at 50 Hz.
- 1.2 The specification covers the Voltage Detector, (1 kV - 245 kV).
- 1.3 The specification also covers inspection and tests of the high voltage detector as well as schedule of Guaranteed Technical Particulars to be fully filled, signed by the manufacturer and submitted for tender evaluation.
- 1.4 The specification stipulates the minimum requirements for high voltage detector (tester) acceptable for use in the company and it shall be the responsibility of the Supplier & Manufacturer to ensure adequacy of the design, good workmanship and good engineering practice in the manufacture of the high voltage detector for KPLC.



The specification does not purport to include all the necessary provisions of a contract.

2. REFERENCES

The following standards contain provisions which, through reference in this text constitute provisions of this specification. Unless otherwise stated, the latest editions (including amendments) apply:

IEC 61243: Live working –Voltage detectors – Part 1: Capacitive type to be used for voltages exceeding 1 kV a.c;

IEC 60832: Live working - Insulating sticks and attachable devices - Part 1: Insulating sticks
Part 2: Attachable devices

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- IEC 61235: Live working – insulating hollow tubes for electrical purposes
- IEC 60855: Live working - Insulating foam-filled tubes and solid rods - Part 1: Tubes and rods of a circular cross-section
- IEC 601010-1: Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements
- IEC 61326: Electrical equipment for measurement, control and laboratory use - EMC requirements.
- IEC 61000: Electromagnetic compatibility (EMC)
- IEC 60801-2: Electromagnetic compatibility for industrial-process measurement and control equipment - Electrostatic discharge requirements
- IEC 60068: Environmental testing
- IEC 60529: Degrees of protection provided by enclosures (IP Code)
- OIML D 11: General Requirements for High voltage detectors - Environmental Conditions

3. TERMS AND DEFINITIONS

For the purposes of this specification, the definitions given in the reference standards shall apply.

4. REQUIREMENTS

4.1. Service Conditions

4.1.1. Physical conditions

The high voltage detector (0-245kV) shall be tropicalized, designed and constructed for continuous outdoor operation in tropical areas and harsh climatic conditions including areas exposed to:

- a) Sea spray (along the coast),
- b) Humidity of up to 95%

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

d) Altitude of up to 2000m above sea level

4.2. Safety and environmental requirements

4.2.1. High voltage detector shall be designed and manufactured in accordance with IEC 601010-1 and OIML D 11 standard such that:

- a) Their errors do not exceed the maximum permissible errors under rated operating conditions.
- b) When they are exposed to disturbances, either:
 - (i) Significant faults shall not occur, or
 - (ii) Significant faults shall be detected and corrected by means of inbuilt checking facility.

4.2.2. Instruments powered by a battery (stand-alone, rechargeable auxiliary or back-up batteries) shall have the type (-s) and capacity (-ies) of the batteries allowed to be used in the applicable High voltage detectors specified by the manufacturer.

4.2.3. Instruments powered by the mains power and provided with a back-up battery for data-storage only, shall also comply with the requirements for mains powered high voltage detector.

4.2.4. High voltage detectors shall be constructed in such a way that possibilities for unintentional, accidental, or intentional misuse are minimal.

4.2.5. Software controlled high voltage detector that is complex in their functionality shall guide the user for the correct use and for achieving correct measurement results.

4.2.6. The manufacturer shall specify the limiting conditions; storage and transport conditions for each specified influence quantity - quantity which is not the subject of the measurement and whose change affects the relationship between the indication and the result of the measurement.

4.2.7. Measuring equipment shall have a valid calibration status prior to being confirmed, within a specified metrological requirement.

4.2.8. The High voltage detectors shall also be designed manufactured and tested in conformity with the following safety and environmental design requirements and standards as per Table 1;

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Table 1: Safety and Environmental Design Requirements

No	Particulars	Test Performance
1	Environmental conditions	Operating temperature
		- 5°C--- +55°C
		Storage temperature
		-5 ... +60 °C
		Humidity range - Rel. humidity
		20% -- 96%, non-condensing
		Altitude
		Up to 2000m above sea level.
		Shock (operating)
		15 g / 11 ms half sine as per IEC 60068-2-27
2	EMC tests	Vibration (operating)
		IEC 60068-2-6: Test Fc (Test level 2) Frequency range from 10 Hz to 150 Hz, continuous acceleration 2 g (20 m/s ²), 20 cycles per axis
		Dry heat test
		IEC 60068-2-2: Type A test (Test level 2) Temperature - 55°C ± 2°C Duration of exposure – 2 h
		Damp heat test
		IEC 60068-2-30: Test Db Test level 2 Temperature - 55°C ± 2°C Relative humidity – 93 % Duration of exposure – 4 h
		Salt mist test
		IEC 60068-2-11 – Test level 4 Saline solution – 5 % NaCl, pH value- 6.5 – 7.2 %, Temperature – 35°C Duration – 96 h
		Flammability test
		IEC 60695-2-11 – Needle flame test
3	Safety	Emission standards for residential, commercial and light-industrial environments
		IEC 61000-6-3 - Class A
		Electrostatic discharge requirements
		IEC 61000-4-2 – Test level 3 Air discharge - 8kV, Contact discharge - 6kV
		Radiated, radio-frequency, electromagnetic field immunity tests
		IEC 61000-4-3 – Test level 3 10 V/m (80 MHz bis 1 GHz)
		Fast Transients/Bursts
		IEC 61000-4-4: Test level 2 Min Values ±1 kV (5/50 ns, 5kHz)
		Surges on signal, data and control lines
		IEC 61000-4-5- Test level 3 Line to ground voltage – 2.0 kV Line to Line voltage – 1.0 kV
3	Safety	Rated Impulse Voltage for equipment -1.2/50µs
		6000 V as per IEC 60664-1, table 1
		Overvoltage category
		Class IV 600 V as per IEC 61010-1
		Pollution category
3	Safety	Degree 2 as per IEC 60664-1 clause 2.5.1
		Insulation material group
		Group II - 400≤CTI<600 (PLC=1) as per IEC 60112 and IEC 60664-1 clause 2.7.1
3	Safety	Minimum clearances for
		5.5mm as per IEC 60664-1 section 3, clause 3.1

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No	Particulars	Test Performance
	equipment to withstand steady state voltages, temporary over-voltages and to avoid partial discharge	and Table 1
	Partial discharge requirements	As per IEC 60664-1 Annex C
	Solid insulation design	Shall withstand short term and long term stresses as per IEC 60664-1 clause 3.3

- * If the internal emission source(s) is operating at a frequency below 9 kHz then measurements need only to be performed up to 230 MHz

NOTE: The tests results shall be as per the Performance Criteria A specified in IEC 61326-1 for the respective tests.



4.3. SPECIFIC REQUIREMENTS

4.3.1. Design and construction

- 4.3.1.1. The voltage detector shall be of the capacitive type, to be used in contact with the conductor, equipment or cable to be tested and shall conform to the requirements of IEC 61243-1.
- 4.3.1.2. The voltage detector shall be a complete device which shall include at least the following elements: handle, hand guard, insulating element, limit mark, indicator, and contact electrode with or without contact electrode extension as per IEC 61243-1 Figure 1a).
- 4.3.1.3. The voltage detector shall have the testing element built-in i.e. not utilising a testing element separately installed between the detector and the item to be tested.

4.3.2. Operating Voltage Range and Electrical Characteristics

- 4.3.2.1. The voltage detector shall not be fitted with a voltage selection switch shall be suitable for use with system nominal voltages ranges as follows:
- Minimum nominal voltage, $U_n \text{ min.} = 1 \text{ kV}$.
 - Maximum nominal voltage, $U_n \text{ max.} = 245 \text{ kV}$.
- 4.3.2.2. The voltage detector and its components shall be rated for making contact with live conductors at a potential of U_n maximum continuously and with unlimited time duration.

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The maximum duration of live contact shall be specified and shall not be less than 5 min refer IEC 61243-1 Section 4.2.9.

- 4.3.2.3. The voltage detector shall be able to withstand without damage and thus not affect its operational functionality, transient voltages that may appear on KPLC AC distribution system up to 50% greater than U_n maximum.
- 4.3.2.4. The accuracy of the voltage detector shall be 2% or better over the range U_n minimum to U_n maximum and shall operate between 97% and 103% of the nominal operating frequency of 50Hz.
- 4.3.2.5. The type of detector to be supplied shall comply with the threshold voltage of Section 4.2.1.2 of IEC 61243-1. The voltage detector shall shut down after 3 minutes of inactivity i.e. enter a sleep mode.
- 4.3.2.6. The voltage detector shall comply with all the safety, environmental and design requirements of clause 4.2 and Table 1 of this specification

4.3.3. Indication

The voltage detector shall provide:

- a) Clear perceptibility under normal light, at night, in all weather conditions, and in high ambient noise conditions from a distance of at least 6 m from the user.
- b) Clear perceptibility when held with the electrode pointing to the sun, i.e. glare shall not prevent a person from reading the indicator.
- c) Clear indication of the state "voltage present" and/or "voltage not present" as per IEC 61243-1 section 4.1.2 and 4.2.1.
- d) The tester shall have both visual and audible indications (Group I) as per IEC 61243-1 section 4.2.2.
- e) The tester shall have digital voltage readout between 0 and U_n maximum V AC
- f) An audible alarm shall be initiated when the detected voltage is U_n min or greater.
- g) Low Battery warning indication when incorporating a built-in power source
- h) A Sleep Mode function when incorporating a built-in power source.

4.3.4. Self-testing Facility

- 4.3.4.1. Self-testing facilities shall be provided to ensure that the voltage detector functions properly before and immediately after each voltage detection as per IEC 61243-1 section 4.2.7.

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- 4.3.4.2. It is preferred that an "in-built" self-testing function is utilised and shall verify that:
- The contact electrode and contact electrode extension if applicable are tested for continuity,
 - "Live" indications provided by the detector are activated and proved to be working.

4.3.5. Attachment to Insulating Stick

The voltage detector shall be designed to mount onto an insulating stick fitted with a universal adaptor in accordance with IEC 60832-2 Appendix A.

4.3.6. Insulating Stick

Insulating sticks for use with the voltage detector shall comply with the requirements below;

a) Insulating Element and Handle

- The insulating element and handle shall meet or exceed the requirements of all applicable sections of IEC 61243-1 and in particular sections 4.3, 4.4 and 4.5.
- The handle section may be of the same material as the insulating element and integrated with it, or may be separate. Hollow or foam-filled handles shall be sealed at the end, with a rubber crutch tip or similar, to keep water out.
- The insulating element shall be of a length, which ensures that a minimum distance of 6,000 mm is achieved between the hand guard and the indicator.
- The handle shall not be less than 800 mm long.

Note: For this measurement, the voltage detector shall be so oriented that the measured voltage can be easily read by the person holding the voltage detector.

b) Hand Guard and Limit Mark

- A hand guard shall be provided and it shall constitute a raised physical lip or barrier of at least 20 mm in height.
- There shall be a limit mark, identifiable by a red ring about 20mm wide, which is permanent and clearly recognizable by the user. The limit mark indicates the safe insertion depth of the voltage detector which assists to prevent adverse effects of interference fields.

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c) Operating Head

The operating head shall be a universal adaptor in accordance with IEC 60832-2 Appendix A. The universal adaptor shall be permanently fixed to the insulating stick by suitable means.

4.3.7. Probe

4.3.7.1. General

The detectors shall be supplied complete with the required probe that enables its use on the following:

- (i) Overhead lines.
The probe shall be a pointed knurled type, suitable for conductors up to 33mm in diameter and be removable to allow replacement due to wear.
- (ii) Exposed busbars of outdoor substations.
A special probe shall be provided to be used to make contact with exposed busbars of sizes up to 100mm for outdoor substations.
- (iii) Cables

4.3.7.2. Mechanical Strength

The length and mass of all probes, in conjunction with the method of fixing the contact electrode to the detector case and internal circuits, shall be designed to ensure the integrity of the detector system under normal field use for a minimum of ten years.

4.3.8. Silicone Cloths

If the operating instructions of the voltage detector require the use of a silicone oil impregnated cloth, then these shall be supplied. A silicone impregnated cloth shall be used to keep the surface of the insulating sticks clean and hydrophobic. The cloths shall be reusable. The supplier shall provide information regarding:

- a) The number of times the cloths may be re-used.
- b) Methods for cleaning and re-impregnating the cloths.

4.3.9. Wet Weather Use

The detectors shall be designed to be used in outdoor wet weather conditions. The voltage detector shall be certified for use in wet weather (outdoor) conditions in accordance with sections 6.1.1 and 7.1.2 of IEC 61243-1. Full instructions shall be provided regarding any special procedures and conditions that may be required during wet weather use.

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4.3.10. Specific Features

Table 2: Insulation rod mechanical and electrical parameters of the voltage detector

Item	Value
Insulating stick design (Insulating element and handle)	Shall be modular, three piece design of approximately 2,200mm per module.
Insulating stick material	Composite material with polyurethane and shall either be hollow as per IEC 61235 or foam filled as per IEC 60855-1 or both.
Frequency withstand voltage test	100kV/3mm
Maximum leakage current, μ A	30
Impact resistance, MPa/cm	>147
Buckling resistance, MPa	>343
Surface resistivity (after water-immersed), Ω	$>10 \times 10^{11}$
Volume resistivity, Ω /cm	$.10 \times 10^{31}$
Frequency range	0 – 200 Hz
Response Time	< 1 s
Auto- OFF, min	\pm 3 minutes
Bridging protection	Yes
Spark protection	Yes
Power source	9 V block IEC 6 LR61 alkali-manganese indication of battery condition
Battery low	>7 V
Battery current	< 30 mA
Green - Armed	Yes
Red – V detected	Yes
Test/Arming button	Yes
Self-test	Continuous and automatic testing
Construction	For indoor and outdoor installations
Protection against enclosure	IP 65, device suitable for use in moist environments
Rated acoustic signal	60dB/2m
Red flashing electro luminescent diodes	4

4.4. QUALITY MANAGEMENT SYSTEM

- 4.4.1. The supplier shall submit a quality assurance plan (QAP) that will be used to ensure that the high voltage test high voltage detector design, physical properties, tests and documentation, will fulfil the requirements stated in the contract documents, standards,

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specifications and regulations. The QAP shall be based on and include relevant parts to fulfil the requirements of ISO 9001:2008.

- 4.4.2. The Manufacturer's Declaration of Conformity to applicable standards and copies of quality management certifications 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. The high voltage detector shall be inspected and tested in accordance with the requirements of IEC 61243, IEC 60832, IEC 61235, IEC 60855-1, IEC 61010-1, IEC 61481, IEC 60664- 1 & 3, IEC 61326, IEC 60112, IEC 60068, IEC 61000, IEC 60965 and IEC 60529 standards. It shall be the responsibility of the supplier to perform or to have performed the tests specified and whatever other tests he normally performs at works.
- 5.2. Copies of previous Type Tests Reports issued by a third party testing laboratory that is accredited to ISO/IEC 17025 shall be submitted with the tender for the purpose of technical evaluation. The accreditation certificate to ISO/IEC 17025 for the same third party testing laboratory used shall also be submitted with the tender document (all in English Language)
- 5.3. Copies of type test reports to be submitted with the tender (by bidder) for evaluation shall be as stated below:

a) Type tests for equipment performance

- Electromagnetic compatibility (EMC)
- Impulse overvoltage tests on the equipment -Clearances
- Dielectric voltage withstand tests on the equipment - Controlled overvoltage
- Functional tests on the high voltage detector that shall include:
 - ❖ Clear indication
 - ❖ Clear perceptibility of visual indication
 - ❖ Clear perceptibility of audible indication
 - ❖ Frequency dependence
 - ❖ Response time
 - ❖ Power source dependability
 - ❖ Check of testing element
 - ❖ Non-response to d.c voltage
 - ❖ Time rating

b) Type tests for printed circuit board coating performance

- Environmental, humidity and thermal conditioning tests

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- Dielectric voltage withstand tests
 - ❖ Protection against bridging for indoor/outdoor type
 - ❖ Protection against bridging for outdoor type
 - ❖ Spark resistance
- Comparative tracking index (CTI)
- Resistance to soldering heat test
- Flammability test
- Coating adhesion test
- Insulation resistance between conducting parts

- 5.4. Routine and sample test reports for the high voltage detector to be supplied shall be submitted to KPLC for approval before shipment/delivery of the goods. KPLC Engineers will witness tests at the factory before shipment.
- 5.5. On receipt of the goods KPLC may perform any of the tests specified in order to verify compliance with this specification. The supplier shall replace without charge to KPLC the test unit which upon examination, test or use; fail to meet any of the requirements in the specification.
- 5.6. Tests to be witnessed at the factory before shipment shall be in accordance with IEC 61243, , IEC 61235, IEC 60855-1, IEC 60832, IEC 61010-1, IEC 61481, IEC 60664- 1 & 3, IEC 61326, IEC 60112, IEC 60068, IEC 61000, IEC 60965 and IEC 60529 standards and this specification and shall include the following:
- a) Visual and dimensional inspection
 - b) Grip force and deflection (only applicable for instrument as a complete device)
 - c) Vibration resistance
 - d) Torsion and tension of the adaptor.
 - e) Drop resistance
 - f) Shock resistance
 - g) Climatic dependence
 - h) Degree of protection
 - i) Durability of markings
 - j) Functional tests on the high voltage detector as per clause 5.3a

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6.0. MARKING AND PACKING

6.1. PACKING

6.1.1. The high voltage detector shall be carried in a sturdy tubular polyester bag case with two (2) black strap belts, one (1) shoulder strap; a lid with zipper and transparent pockets inside for instruction for use.

6.1.2. The accessories shall be packed in suitable matching bag with a shoulder carrying strap and a hand grip.



NOTE:

- a) *All equipment shall be suitably packed for protection against damage during loading, unloading, transport and storage.*
- b) *Parts subject to damage due to vibration shall be removed and separately packed if necessary.*

6.2. MARKING

The high voltage detector and its accessories shall be marked in a permanent manner with the following information (in English Language):

- a) Product name and name of manufacturer
- b) Type of instrument (description of type, number and overall size of sections)
- c) Model: for indoor or outdoor use.
- d) Nominal voltage range of operation
- e) Assembly information for the high voltage instrument i.e. "Only to be used by insulating sticks".
- f) Explanation visual and audible indication
- g) Date for next periodic testing
- h) Year of construction and serial number
- i) Nominal frequency
- j) Type number of high voltage instrument.
- k) Standard to which the instrument complies
- l) Marking of accessories and devices suitable for live working
- m) Indication of high voltage instrument:
 - Group I: Indication with at least two distinct active signals, which give an indication of the condition "voltage present" and "no voltage present".
- n) Climatic conditions (usage and storage)
- o) Design: High voltage detector with contact electrode extension are marked "Category S".
This instrument may be used in substations and on overhead lines.

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- p) Indication of battery type or self-powering.
- q) Maximum permissible measurement limits
- r) The words "**Property of Kenya Power & Lighting Co**" shall be engraved permanently on each instrument while the other parameters shall be marked on a permanent label.
- s) The overvoltage protection category and duty rating e.g. category IV-field.

7.0. DOCUMENTATION,

- 7.1. The bidder shall submit its tender complete with technical documents required by Annex A (Guaranteed Technical Particulars) 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 description of the item on offer as per Annex A (Guaranteed Technical Particulars) and signed by the manufacturer;
 - b) Copies of the Manufacturer's catalogues, brochures, detailed design drawings 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 relevant type test reports by a third party testing laboratory accredited to ISO/IEC 17025;
 - f) Copy of accreditation certificate to ISO/IEC 17025 for the third party testing laboratory;
 - g) Manufacturers letter of authorization, ISO 9001:2008 certificate and other technical documents required in the tender.
 - h) A full list of deliverables required under the contract regarding the number of sets of equipment required, including:
 - Insulating sticks;
 - Probe;
 - Silicone cloths;
 - Carry cases; and
 - Spares.
- 7.2. The successful bidder (supplier) shall submit the following documents/details to The Kenya Power & Lighting Company for approval before manufacture:
- a) Guaranteed Technical Particulars signed by the manufacturer;
 - b) Design drawings with details of the high voltage detector to be manufactured for KPLC.
 - c) Quality assurance plan (QAP) that will be used to ensure that the 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

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- d) Detailed test program to be used during factory testing;
- e) All documentation necessary for safety of the equipment as specified in IEC 61010-1 clause 5.4 shall be provided with the equipment.
- f) Manufacturer's undertaking to ensure adequacy of the design, good engineering practice, adherence to the specification and applicable standards and regulations as well as ensuring good workmanship in the manufacture of the test set for The Kenya Power & Lighting Company;
- g) The manufacturer shall be required to also provide detailed information regarding the high voltage detector:
 - (i) Maintenance Requirements
The supplier shall advise on the following requirements in relation to:
 - Before-use inspection.
 - Periodic maintenance and test including but not limited to the frequency and details of maintenance and test requirements of all components of the high voltage detector and components such as the insulating stick, battery, etc. It is preferred that the battery be user replaceable without the need for special tools or re-calibration.
 - (ii) Essential Spares
The supplier shall advise the minimum quantity of essential spares to be kept by the purchaser (KPLC) to ensure repair of the high voltage detector can be carried out properly.
 - (iii) Instructions for Use
The supplier shall provide comprehensive instructions, drawings and information for use of the high voltage detector and their adaptors. As a minimum, the instructions shall address the following:
 - Correct operation.
 - Care and maintenance by the operator.
 - Service, testing and repair.

Where the manufacturer's standard brochures and instructions do not meet this requirement, the supplier shall provide the necessary information as a supplement to that of the brochure.

7.3. The supplier shall submit recommendations for use, care, storage and routine inspection/testing procedures, all in the English Language, during delivery of the high voltage detector to KPLC store

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Kenya Power

TITLE:
**SPECIFICATION FOR OVERHEAD LINE
HIGH VOLTAGE TEST INSTRUMENT**

Part2: Voltage detector (Tester), 1kV - 245 kV

Doc. No.	KP1/3CB/TSP/09/085
Issue No.	1
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ANNEX A: GUARANTEED TECHNICAL PARTICULARS (to be filled and signed by the supplier and submitted together with copies of the Manufacturer's catalogues, brochures, drawings, technical data, sales records and copies of test certificates for tender evaluation)

Tender No Bidder's Name & Address

	Description	Bidder's Offer	
1	Name of the manufacturer and country of origin	specify	
	Type Reference Number or Model Number	specify	
2	Applicable Standards	specify	
3	Terms and Definitions	specify	
4	Requirements		
4.1	Service conditions	specify	
4.1.1	Physical conditions	specify	
4.1.2	Approach & Insulation Distance Information	specify	
4.2	Safety and environmental requirements	specify	
	4.2.1 – 4.2.8	Prove compliance by attaching type test	
Safety and environmental design requirements			
	Particulars	KPLC Requirements	
	Operating temperature	-25°C--- +55°C	specify
	Storage temperature	-5 ... +60 °C (23 ... +140 °F)	specify
	Humidity range - Rel. humidity	20% -- 96%, non-condensing	specify
	Shock (operating)	15 g / 11 ms half sine as per IEC 60068-2-27	Prove compliance by attaching type test
	Vibration (operating)	IEC 60068-2-6: Test Fc (Test level 2) Frequency range from 10 Hz to 150 Hz, continuous acceleration 2 g (20 m/s ²), 20 cycles per axis	
	Dry heat test	IEC 60068-2-2: Type A test (Test level 2) Temperature - 55 ⁰ C ± 2 ⁰ C Duration of exposure – 2 h	
	Damp heat test	IEC 60068-2-30: Test Db Test level 2 Temperature - 55 ⁰ C ± 2 ⁰ C Relative humidity – 93 % Duration of exposure – 4 h	
Salt mist test	IEC 60068-2-11 – Test level 4	Prove compliance by attaching type test	

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		Saline solution – 5 % NaCl, pH value- 6.5 – 7.2 %, Temperature – 35°C Duration – 96 h	
	Flammability test	IEC 60695-2-11 – Needle flame test	
	Emission standards for residential, commercial and light-industrial environments	IEC 61000-6-3 - Class A	
	Electrostatic discharge requirements	IEC 61000-4-2 – Test level 3 Air discharge - 8kV, Contact discharge - 6kV	
	Radiated, radio-frequency, electromagnetic field immunity tests	IEC 61000-4-3 – Test level 3 10 V/m (80 MHz bis 1 GHz)	
	Fast Transients/Bursts	IEC 61000-4-4: Test level 2 Min Values ± 1 kV (5/50 ns, 5kHz)	
	Surges on signal, data and control lines	IEC 61000-4-5- Test level 3 Line to ground voltage – 2.0 kV Line to Line voltage – 1.0 kV	
	Rated Impulse Voltage for equipment - 1.2/50 μ s	6000 V as per IEC 60664-1, table 1	
	Overvoltage category	Class IV 600 V as per IEC 61010-1	
	Pollution category	Degree 2 as per IEC 60664-1 clause 2.5.1	
	Insulation material group	Group II - 400 \leq CTI<600 (PLC=1) as per IEC 60112 and IEC 60664-1 clause 2.7.1	
	Minimum clearances for equipment to withstand steady state voltages, temporary over-voltages and to avoid partial discharge	As per IEC 60664-1, section 3, clause 3.1 and Table 1	
	Partial discharge requirements	As per IEC 60664-1 Annex C	
	Solid insulation design	Shall withstand short term and long term stresses as per IEC 60664-1 clause 3.3	
4.3	Specific Requirements		
4.3.1	General		
	4.3.1.1. - 4.3.1.3		specify
4.3.2	Operating voltage range & electrical characteristics		
	4.3.2.1 - 4.3.2.7		specify
4.3.3	Indication		
	a - h		specify
4.3.4	Self-Testing Facility		
	4.3.4.1. - 4.3.4.2		specify
4.3.5	Attachment to insulating stick		

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	4.3..5.1 - 4.3..5.4	specify
4.3.6	Insulating stick	
	a. Insulating element handle	specify
	b. Hand guard and limit mark	specify
	c. Operating head	specify
4.3.7	Probe	specify
4.3.7.1	General	specify
4.3.7.2	Overhead mechanical strength	Prove compliance-attach type test
4.3.8	Silicon cloths	specify
4.3.9	Wet weather use	specify
4.3.10	Specific features	

Technical particulars of Voltage Detector (Tester)

System Voltage	220 kV	Indicate offered values per item attaching the test reports, drawings and catalogues to support the offer
Highest system Voltage	245	
Voltage range	(1 – 245 kV)	
Maximum leakage current	30μA	
Measurement accuracy	Manufacturer to state	
Indication group	Group I	
Frequency range	0 – 200 Hz	
Response Time	< 1 s	
Auto- OFF, min	± 3 minutes	
Bridging protection	Yes	
Spark protection	Yes	
Impact resistance, MPa/cm	>147	
Buckling resistance, MPa	>343	
Surface resistivity (after water-immersed), Ω	>10 x 10 ¹¹	
Volume resistivity, Ω/cm	.10 x 10 ³¹	
Frequency range	0 – 200 Hz	
Power source	9 V block IEC 6 LR61 alkali-manganese indication of battery condition	
Battery low	<7 V	
Battery current	< 30 mA	
Green - Armed	Yes	
Red – V detected	Yes	
Test/Arming button	Yes	
Self-test	Continuous and automatic testing	
Construction	For indoor and outdoor installations	
Protection against enclosure	IP 65, device suitable for use in	

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	moist environments	
	Insulation stick mechanical and electrical parameter	
	Insulating stick material	Composite material with polyurethane
4.8	Quality Management System	
	Quality Assurance Plan	provide
	Copy of ISO 9001:2008 Certificate	provide
	Manufacturer's experience	provide
	Manufacturing Capacity (units per month)	specify
	List of previous customers	provide
	Customer reference letters	provide
5.1	Test standards and responsibility of carrying out tests	provide
5.2	Copies of Type Test Reports submitted with tender	provide
5.3	Acceptance tests to be witnessed by KPLC at factory before shipment	provide
5.4	Test reports to be submitted by supplier to KPLC for approval before shipment	provide
5.5	Replacement of rejected transmission line maintenance tools and implements	specify
6.1	Marking	specify
6.2	Packing	specify
7.1	Documents submitted with tender	provide
7.2	Documents to be submitted by supplier to KPLC for approval before manufacture	provide
	Statement of compliance to specification	provide

.....
Manufacturer's Name, Signature, Stamp and Date

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