



Kenya Power

**LIVE LINE TOOLS TEST & CALIBRATION LABORATORY
EQUIPMENT - SPECIFICATION**

A Document of the Kenya Power & Lighting Co. Ltd
February 2022

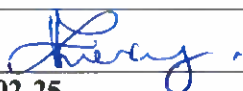
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TITLE:

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Issue No.

1

Revision
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0.1 Circulation List

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1	Manager, Standards
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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)
Issue 1	2022-02-15	NEW ISSUE	Eng. F. Gicugu	Eng. S. Kimitei

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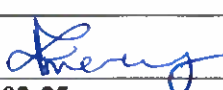
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REVISION OF KPLC STANDARDS

To keep abreast of progress in the industry, KPLC Standards shall be regularly reviewed. Suggestions for improvements to approved standards, addressed to the Manager, Standards department, are welcome.

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FOREWORD

This specification has been prepared by Connectivity & Turnkey projects department of Infrastructure Division and Distribution Network department of Network Management Division in collaboration with Standards Department and lays down specification for design, manufacture and testing of live line tools test and calibration laboratory equipment.

This specification is intended for procurement of materials and does not include provision of contract.

The specification stipulates the minimum requirements for live line tools test and calibration laboratory equipment acceptable for use in the company and it shall be the responsibility of the suppliers and manufacturers 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 these equipment for KPLC.

There are no other specification(s) in this series.

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

This specification is only for this tender and does not supersedes all previous specifications for Protective relays.

The following are members of the team that developed this specification.

Name	Department
Eng. Nicholas Kiminda	Turnkey/ID
Richard Kioko	Distribution Network
Eng. Faith Gicugu	Standards

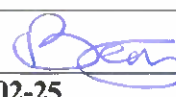
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1. SCOPE

- 1.1. This specification is for test & calibration equipment for rubber gloves, sleeves, Line hose, Rubber insulating blanket, Rubber goods washer, Rubber goods dryer and AC and DC Hipot operating at 50Hz.
- 1.2. This specification covers the following equipment:-
 - a) Rubber glove and sleeve tester
 - b) Line hose and Hood tester
 - c) Rubber insulating blanket tester
 - d) Hot Stick tester
 - e) Rubber goods washer
 - f) Rubber goods dryer.
 - g) Bucket Liners Tester
 - h) Kilo voltmeter
- 1.3. The specification also covers inspection and test of the equipment as well as schedule of Guaranteed Technical Particulars to be filled, signed by the supplier and submitted with the Bid for evaluation.
- 1.4. The specification stipulates the minimum requirements for Rubber glove and sleeve tester, Line hose and hood tester, Rubber insulating blanket tester, Hot stick tester, Rubber goods washer, Rubber goods Dryer, Bucket Liner Tester and Kilo voltmeter. The supplier shall 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 equipment for The Kenya Power & Lighting Company.

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2. NORMATIVE REFERENCES

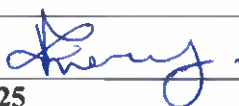
The following standards contain provisions which, through reference in this text, constitute provisions of this specification. Unless otherwise stated, the latest edition of the referenced documents (including any amendments) applies.

IEC 60855-1:	Live working – Insulating foam-filled tubes and solid rods – Part 1: Tubes and rods of a circular cross-section;
IEC 61235:	Live working - Insulating hollow tubes for electrical purposes;
ASTM F712:	Electrically Insulating Plastic Guard Equipment Specification and test Method
IEC 60832-1:	Live Working: Insulating Sticks and attachable devices: Part 1- Insulating sticks
IEC 60832-2:	Live Working: Insulating Sticks and attachable devices: Part 2: Attachable devices
IEC 61479:	Live Working flexible conductor covers (Line Hoses) of insulating materials.
IEC 61112:	Live Working: Electrical Insulating Blankets
ASTM F496:	Standard Specification for In-Service Care of Insulating Gloves and Sleeves
ASTM D120:	Standard Specification for Rubber Insulating Gloves
ASTM D1051:	Standard Specification for Rubber Insulating Sleeves
ASTM D1048:	Standard Specification for Rubber Insulating Blankets
ASTM D1049:	Standard Specification for Rubber Insulating covers
ASTM D1050:	Standard Specification for Rubber Insulating Line Hose
ASTM F711:	Standard Specification for Fiberglass Reinforced Plastic (FRP) Rod and Tube used in Live Line Tools
OSHA Regulation 1910.269: Part J:	Live Line Tool
ANSI A92.2	Specification for Vehicle- Mounted Elevating and Rotating Aerial Devices

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3. DEFINITIONS AND ABBREVIATION

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

3.2 Abbreviations

- a) **IEC:** International Electro-technical Commission
- b) **ISO:** International Standards Organization
- c) **OSHA:** Occupational Safety and Health Act
- d) **ASTM:** American Society for Testing and Materials
- e) **CFM:** Cubic feet per minute
- f) **ANSI:** American National Standards Institute

4. REQUIREMENTS

4.1. SERVICE CONDITIONS

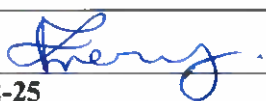
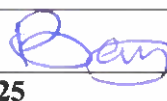
4.1.1. Physical conditions

4.1.1.1. The equipment shall be tropicalized, designed and constructed for continuous indoor operation in areas with the following atmospheric conditions: -

Maximum ambient temperature:	+40° C
Minimum ambient temperature:	-1° C
Daily average ambient temperature:	+30° C
Relative Humidity (%):	95%
Altitude above sea level (meters):	2200 m
Average Annual Rainfall (mm):	1000 mm
Max wind pressure (kg. /mm ²):	130 kg. /mm ²
Isockeraunic level (days/year.):	180 thunderstorm days per year
Average no. of rainy days / annum:	120 rainy days / annum
Induced electromagnetic disturbance:	1.6 kV
Pollution class:	“Very Heavy” (Level IV), “Heavy” (Level III) as per IEC/TS 60815
Seismic Zone:	Zone V, as per IEEE 693
Acceleration due to gravity, g:	0.5 g

4.1.2. Safety and environmental requirements

4.1.2.1. The equipment shall be designed and manufactured in accordance with IEC 601010-1 and OIML D 11 safety and environmental standard requirements such that:

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- 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.

- 4.1.2.2. Software controlled equipment that are complex in their functionality shall require that the user is guided for the correct use and for achieving correct measurement results.
- 4.1.2.3. The manufacturer shall specify the limiting conditions; storage and transport conditions for each specified influence quantity - quantity that is not the subject of the measurement and whose change affects the relationship between the indication and the result of the measurement.
- 4.1.2.4. Measuring equipment shall have a valid calibration status prior to being confirmed, within a specified metrological requirement.
- 4.1.2.5. The equipment shall also be designed manufactured and tested in conformity with the following safety and environmental design requirements and standards as per Table 1;

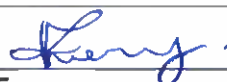
Table 1: Safety and Environmental Design Requirements

Performance tests	Test category		Test method	Severity level	Test Severity
Climatic	Static temperatures	Dry Heat	IEC 60068-2-2, IEC 600683-1 – Dry Heat (non- condensing)	2	40°C for 2 hours
		Cold	IEC 60068-2-1, IEC 600683-1 – Cold	1	+5°C for 2 hours
	Damp Heat	Steady state	IEC 60068-2-78, IEC 60068-3-4 – Damp heat, steady state	1	30°C, 85% RH for 2 days
		Cyclic	IEC 60068-2-30, IEC 60068-3-4 – Damp heat, cyclic	1	40°C for 2 cycles
	Water		IEC 60068-2-18, IEC 60512-14-7, IEC 60529 – Water falling drops and impacting water	2	Flow rate of 0.07 L/min for 10mins at $\pm 180^\circ$
	Atmospheric pressure	Static	OIML 11 Annex B	1	-2.5kPa (± 0.15) - +2.5kPa (± 0.15)
		Variable	OIML 11 Annex B	2	10kPa ± 1

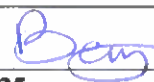
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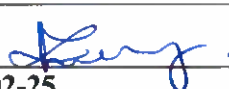
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	Sand and Dust		IEC 60512-11-8, IEC 60529, IEC 60721-2-5 – Sand and Dust	1	1 No. of cycles
	Salt mist		IEC 60068-2-11, IEC 60721-2-5 – Salt mist	2	24 hours
Mechanical	Vibration	Random	IEC 60068-2-47, IEC 60068-2-64, IEC 60068-3-8	1	10-150 Hz
					RMS level – 1.6ms ⁻²
					ASD level 10-20Hz – 0.05ms ⁻²
		Sinusoidal	IEC 60068-2-6, IEC 60068-2-47, IEC 60068-3-8	1	10-150Hz
	2 ms ⁻²				
	20 cycles				
Shock		IEC 60068-2-31 – Dropping on to a face	1	Height of fall – 25mm for 1 fall	
Electrical, general	RF immunity, EMF	Origin	IEC 61000-4-3 – Annex F – Radiated electromagnetic fields	E2 - 3	26-800 MHz – 10V/m 960-1400 MHz – 10V/m
		Digital radio telephones	IEC 61000-4-3 – Annex F – Radiated electromagnetic fields	E2 - 3	960-1400MHz-10V/m 1400-2000MHz-10V/m
	Conducted Radio Frequency Fields		IEC 61000-4-6 – Conducted electromagnetic fields	3	RF amplitude (50Ω) – 10V Frequency range – 0.15-80 MHz Modulation – 80% AM, 1 kHz sine wave
	Electrostatic discharge		IEC 61000-4-6 - ESD	3	Contact discharge – 6kV Air discharge – 8kV
	Power frequency magnetic field		IEC 61000-4-8 – PFMF (50Hz)	4	Magnetic Field Strength: Continuous – 30A/m Short duration (1s to 3s) – 300A/m
	Bursts (transients) on signal, data and control lines		IEC 61000-4-1, IEC 61000-4-4 – Electrical bursts	3	Peak value – 1kV Repetitive rate – 5kHz

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	Surges on signal, data and control lines	IEC 61000-4-5 – Electrical surges	3	Unbalanced lines: -Line to line – 1 kV -Line to earth – 2 kV Balanced lines: -Line to line – N/A -Line to earth – 2.0 kV
Electrical – mains power	DC mains voltage variation	IEC 60654-2 – Variation in DC mains power voltage	N/A	Specified max/min permissible levels by Manufacturer.
	AC mains voltage variation	IEC/TR 61000-2-1, IEC 61000-4-1 – Variation in AC mains power voltage (single phase)	1	Mains voltage: Upper limit – $U_{nom}+10\%$ Lower limit – $U_{nom}-15\%$
	AC mains frequency variation	IEC/TR 61000-2-1, IEC 61000-2-2, IEC 61000-4-1	1	Mains frequency: Upper limit – $f_{nom}+2\%$ Lower limit – $f_{nom}-2\%$
	AC mains voltage dips, short interruptions and voltage variations	IEC 61000-4-11, IEC 61000-6-1, IEC 61000-6-2 – Short time reductions in mains voltage	3	As specified in Table 13.4 of OIML D 11
	Voltage dips, short interruptions and voltage variations on DC mains power	IEC 61000-4-29	1	As specified in Table 13.6 of OIML D 11
	Bursts (transients) on AC and DC mains	IEC 61000-4-1, IEC 61000-4-4 – Electrical bursts	3	Peak value – 2kV Repetition rate – 5 kHz
	Ripple on DC mains power	IEC 61000-4-17	1	% of nominal DC voltage – 2%
	Surges on AC and DC mains power lines	IEC 61000-4-5 – Electrical surges	3	Line to line – 1.0kV Line to earth – 2.0kV
Electrical (battery power)	Low voltage of internal battery (not connected to mains power)	Variation in supply voltage	1	Lower limit of the voltage – Lowest voltage specified No. of cycles - 1
	Power from external 12V and 24V road vehicle batteries	ISO 16750-2 - Variation in supply voltage	12V – C 24V – F	12V – 9V to 16V 24V – 16V to 32V
	Electrical transient conduction along supply lines	ISO 7637-2	IV	As specified in Table 14.2.2 of OIML D 11

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	Electrical transient conduction via lines other than supply lines	ISO 7637-3	IV	As specified in Table 14.2.3 of OIML D 11
Safety	Rated Impulse Voltage for equipment -1.2/50 μ s	IEC 60664-1, table 1		6000 V
	Overvoltage category	IEC 61010-1		At least Class IV 600 V
	Pollution category	IEC 60664-1 clause 2.5.1		At least Degree 2
	Insulation material group	IEC 60112 and IEC 60664-1 clause 2.7.1		At least Group II - 400<CTI<600 (PLC=1)
	Minimum clearances for equipment to withstand steady state voltages, temporary over voltages and to avoid partial discharge	IEC 60664-1 section 3, clause 3.1 and Table 1		At least 5.5mm
	Partial discharge requirements	IEC 60664-1 Annex C		At least 10pC
	Solid insulation design	IEC 60664-1 clause 3.3		Shall withstand short term and long term stresses

4.2. GENERAL REQUIREMENTS

- 4.2.1 All cabinets for the test equipment shall be made of cold-rolled steel, with 3mm minimum thickness conforming to IEC 61439-1, primed and painted with two urethane topcoats for rust prevention.
- 4.2.2 All panel and access doors for the equipment shall be electrically interlocked so that any attempted entry into the test set while it is in operation will cause the power to shut down.
- 4.2.3 The equipment shall have an excellent ozone removal system with direct free air intake and circulating system. The systems size will depend on the number of test positions required.
- 4.2.4 The equipment shall be a modular design with the test chambers separated from the power supply and control panel. Different configurations shall allow for more flexibility in installation use.

4.3. DESIGN AND CONSTRUCTION

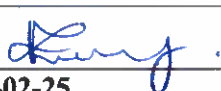
4.3.1. Power Supply

- 4.3.1.1. The Power Supply module shall house a high voltage transformer, a regulator, and control panel. The design shall meet the safety and environment requirements specified in clause 4.1.2.

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- 4.3.1.2. The system shall be configured with both AC and DC to meet applicable test standards. The AC test system shall be rated up to 50kV AC at 50Hz and the DC test system shall be rated up to 100kV DC.
- 4.3.1.3. The input voltage for the equipment shall be 240V at 50 Hz A.C Single phase.
- 4.3.1.4. The output test voltage shall be 0-50kV A.C and 0-100kV D.C. The equipment shall contain a transfer switch for changing between the two voltages. The test voltage shall be variable.

4.3.2. Control Panel

- 4.3.2.1. Each system's Control Panel shall have a Programmable interface with provision to use a computer.
- 4.3.2.2. The active current leakage as well as the peak current is displayed on output devices both digitally and with on bar graph.
- 4.3.2.3. The functions to be performed shall include: -
- a) Instantly change the parameters of the test to meet the specified standard
 - b) Switch testing from one product to another; such as, gloves to sleeves or blankets
 - c) Change the testing requirements for different classes of rubber
- 4.3.2.4. The Control panel shall be able to display precise, easy-to-read test results and will immediately indicate any failure of the test.
- 4.3.2.5. All test results and reports shall be generated and downloaded to a computer.
- 4.3.2.6. The computer interface shall meet the requirements of the safety and environmental requirements specified in clause 4.1.2.

4.3.3. Rubber Glove and Sleeve Tester

- 4.3.3.1. Lineman's gloves, sleeves or line jumpers shall be tested to ASTM D120, F496 and IEC 60903 standards
- 4.3.3.2. The equipment shall be capable of testing up to 50 kV AC and 100kV DC.
- 4.3.3.3. The equipment shall be fully automated, microprocessor controlled glove and sleeve tester for rubber goods up to class IV.
- 4.3.3.4. The machine adjustments shall be programmed for a single selection of the test voltage, current limit, depth, water fill level, test time, blower speed and exhaust fan speed. It also shall select which type (class, length, new or retest) of glove is to be tested.
- 4.3.3.5. The machine shall be capable of testing six (6) gloves of sizes 280mm through 460mm long in accordance with the latest IEC 60903, ASTM D120 and F496 standards. Clothespin type holders shall be provided which do not pinch the gloves or sleeves.
- 4.3.3.6. The machine shall also be capable of testing six (6) sleeves of sizes up to 762mm in accordance with the latest ASTM D1051 and F496 standards.

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- 4.3.3.7. The equipment shall also be capable of testing bypass line jumpers.
- 4.3.3.8. High Voltage Test Tank shall be constructed of minimum 3mm stainless steel. The outer lip and all edges shall be smooth and rounded to a minimum 20mm radius to eliminate corona from the tank at voltages to 50kV A.C. and 100kV D.C. A drain valve shall be provided in the tank to drain excess water into an overflow basin.
- 4.3.3.9. The design of Chamber Ventilation shall include sufficient air flow, directed into each glove/sleeve to remove the ozone generated inside it while testing.
- 4.3.3.10. The exhaust manifold at the rear of the machine shall pull air across the surface of the water through an inlet from the top of the high voltage tank. This removes ozone generated on the outside of each glove/sleeve.
- 4.3.3.11. The enclosure shall be designed in accordance with IEC 61439-1 and shall incorporate eyebolts on the top for lifting by a crane.
- 4.3.3.12. An interlocked access door shall be provided to the enclosure testing area at the end opposite the power supply and control area so that the operator can go inside the machine for cleaning and maintenance. Fluorescent lamps shall also be provided inside the unit and wired so that they can be operated when the unit is turned off. An interlocked front access door will be provided in the power supply and control area.
- 4.3.3.13. Water Fill: Each glove test point shall be provided with a tube to permit simultaneous filling of each glove.
- 4.3.3.14. Indicators: current display shall show the leakage current, as well as the peak current. After a failure, the display shall also indicate which gloves failed.

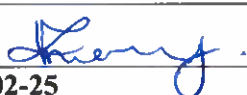
4.3.4. Rubber Insulating blankets Tester

- 4.3.4.1. The equipment shall conform to the safety and environmental requirements of clause 4.1.3 and shall allow testing of rubber insulating blankets to IEC 61112, ASTM D1048 and F479 Standards.
- 4.3.4.2. The unit shall have four (4) test positions and shall allow testing of all standard rubber blankets as large as 1160mm x 1160mm, shall test up to class IV.
- 4.3.4.3. Tests shall be timed with an audible alarm sounds for failures or test complete and a bright flashing coloured lights signalling which position failed or test complete.
- 4.3.4.4. The equipment shall have an exhaust fan on the top rear of the blanket testing cabinet to remove ozone gases generated during the testing.
- 4.3.4.5. The machine should be capable handling slotted and solid blankets.
- 4.3.4.6. The equipment control system shall be menu based, positioned at the front of the control panel. All tests specified in IEC 61112, ASTM D1048 and F479 shall be predefined and set in the machines settings to automatically run the test on the specified class of blanket.

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4.3.4.7. There shall also be user defined test modes, as well as a mode for manual control of the entire system.

4.3.4.8. Indicators: current display shall show the current leakage current, as well as the peak current. After a failure, the display shall also indicate which Blanket failed.

4.3.5. Line Hose and Hood tester

4.3.5.1. The equipment shall conform to the safety and environmental requirements of clause 4.1.3 and shall allow testing of rubber Line hoses to IEC 61479, ASTM D1050 and F478 Standards.

4.3.5.2. The unit shall have six (6) test positions and shall allow testing of all standard line hoses/hoods, up to class IV.

4.3.5.3. Tests shall be timed with an audible alarm sounds for failures or test complete and a bright flashing colored lights signaling which position failed or test complete.

4.3.5.4. The equipment shall have an exhaust fan to remove ozone gases generated during the testing.

4.3.5.5. The machine will automatically and simultaneously test six line hoses/hoods at voltages to 50kV A.C. or 70kV DC.

4.3.5.6. The machines shall be capable for testing lines hoses of length up to 1.8 M and inner diameter of 38 mm.

4.3.5.7. The test equipment shall be designed to handle all types and Styles line hoses.

4.3.5.8. The equipment control system shall be a menu based positioned at the front of the control panel. . All tests specified in IEC 61112, ASTM D1048 and F479 shall be predefined and set in the machines settings to automatically run the test on the specified class of hoses/hoods

4.3.6. Hot Stick tester

4.3.6.1. The equipment shall conform to the safety and environmental requirements of clause 4.1.3 and shall allow testing of Hot stick to IEC 60832 and ASTM F712 Standards.

4.3.6.2. The unit shall have six (6) test positions and shall allow testing of all standard hot sticks.

4.3.6.3. Tests shall be timed with an audible alarm sounds for failures or test complete and a bright flashing colored lights signaling which position failed or test complete.

4.3.6.4. The machine will automatically and simultaneously test six hot sticks at voltages up to 75 kV per ft.

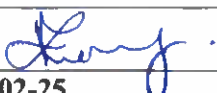
4.3.6.5. The machines shall be capable of testing hot sticks of length up to 6.4m

4.3.6.6. The equipment control system shall be a menu based positioned at the front of the control panel. All tests specified in ASTM F711 and F712 or equivalent shall be predefined and

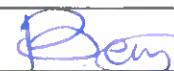
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shall set all the machines settings to automatically run the test on the specified class of hot sticks.

- 4.3.6.7. There shall also be user defined test modes, as well as a mode for manual control of the entire system.

4.3.7. Rubber Goods Washer

- 4.3.7.1. The rubber goods washer shall be designed to clean all types of personal protective rubber gear such as gloves, blankets, hoses and sleeves before dielectric testing.

- 4.3.7.2. The washer shall have an automated wash cycle with Programmable Logic controls and a rubber gear of low speed RPM(Revolutions per Minute) to avoid any wear or damage to the rubber goods.

- 4.3.7.3. Standard design features shall include:

- a) Circuit breaker for main power
- b) Wash chamber has safety interlock
- c) Cartridge-type inline water filter
- d) Recirculation pump for hot water supply
- e) Auto-fill feature
- f) Wash / rinse timer with audible alarm
- g) Drum jog feature
- h) Solid brass drain valve
- i) Water tight pushbuttons
- j) Solidly constructed of 316-grade stainless steel
- k) two lightweight latching access doors

- 4.3.7.4. The washer shall have rotating drum.

- 4.3.7.5. The washer shall be capable of handling all types of different rubber goods up to 100kgs.

4.3.8. Rubber goods Dryer

- 4.3.8.1. The dryer shall be of static-type design to dry rubber gear after either washing or electrical testing.

- 4.3.8.2. The dryer shall have open corrosion resistant racks for positioning the rubber items to allow free air circulation for drying.

- 4.3.8.3. The dryer shall have an exhaust fan to remove humidity, heat and moisture.

- 4.3.8.4. The dryer shall have see-through doors for visual inspection.

- 4.3.8.5. The dryer shall have fans for hot air circulation and an electric heater

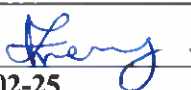
- 4.3.8.6. The dryer shall be able to handle rubber goods of maximum sizes and carry a minimum of 50 gloves, 50 sleeves, 12 blankets, 35 hoses or 25 hoods.

- 4.3.8.7. The dryer cabinet shall be made of 12-gauge primed and painted cold rolled steel.

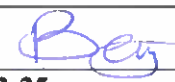
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4.3.8.8. The construction of the fryer floor shall be made of 12-gauge stainless steel.

4.3.9. Bucket Liner Tester

- 4.3.9.1. The equipment shall conform to the safety and environmental requirements of clause 4.1.3 and shall allow testing of Aerial Devices Buckets to ANSI A92.2 Standards or equivalent.
- 4.3.9.2. The unit shall have two test positions and shall allow testing of all standard bucket Liners.
- 4.3.9.3. Tests shall be timed with an audible alarm sounds for failures or test complete and a bright flashing coloured lights signalling which position failed or test complete.
- 4.3.9.4. The equipment will test the two bucket Liners at a voltage of 50 kV A.C for a period of 1 minute.
- 4.3.9.5. The equipment shall be capable of testing buckets with a depth of 1143 mm totally enclosed.
- 4.3.9.6. The input voltage for the equipment shall be 240V at 50-hertz A.C. single phase.
- 4.3.9.7. The output test voltage shall be 0-50kV A.C and 0-100kV D.C. The equipment shall contain a transfer switch for changing between the two voltages. The test voltage shall be variable.
- 4.3.9.8. The test voltage shall be variable.
- 4.3.9.9. The equipment shall have a user defined test modes, as well as a mode for manual control of the entire system.

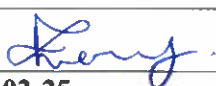
4.3.10. Kilo voltmeter

- 4.3.10.1. The Kilo voltmeter shall be used together with other calibration equipment (Multi-meter and multifunction calibrator) for calibration of high voltage equipment
- 4.3.10.2. The input voltage for the equipment shall be 240V at 50 hertz A.C. single phase
- 4.3.10.3. The equipment shall have high voltage input of 0 to 300KV Ac/DC
- 4.3.10.4. The Kilo voltmeter shall have an impedance divider with resistance from 0 to 1200Mohms and capacitance up to 200pF.
- 4.3.10.5. The Kilo voltmeter weight shall not exceed 50kgs
- 4.3.10.6. The Kilo voltmeter shall be supplied with the following cables:-
 - i. Input power approx. 4m
 - ii. Metering Interconnection Approx. 8m
 - iii. 2no. Ground cables approx. 3M
- 4.3.10.7. The Kilo voltmeter shall have the following voltage measurement functions AC(Average, RMS, PEAK) and DC (Average and peak)

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APPENDIX A: TESTING & INSPECTION

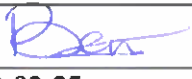
- A1. The manufacturers shall carry out all the routine tests of the Live line Laboratory equipment on offer at the factory. The tests equipment shall be inspected and tested in accordance with the requirements of IEC 60888-1, IEC 61235, IEC 60832-1&2, ASTM F711-02, OSHA Regulation 1910.269: Part J standards and this specification. It shall be the responsibility of the manufacturer to perform or to have performed all the tests specified.
- A2. Tests to be witnessed by KPLC Engineers at the factory before shipment shall be in accordance with IEC 60885-1, 60832-1 & 2, IEC 61235, ASTM F711-02, ASTM and OSHA Regulation 1910.269: Part J standards and this specification
- A3. Copies of test reports shall be packaged together with the respective Live line Laboratory equipment before delivery to KPLC.
- A4. Copies of previous type test Reports for the Live line Laboratory equipment issued by 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 certification for the third party laboratory shall also be submitted with the tender (all in English Language).
- A5. The Live line Laboratory equipment shall be inspected at the store upon delivery. Upon inspection at the store, the supplier shall replace any equipment, which fail to meet any of the requirements during inspection/test.

APPENDIX B: QUALITY MANAGEMENT SYSTEM (NORMATIVE)

- B.1. The supplier shall submit a quality assurance plan (QAP) that will be used to ensure that the Equipment design, material, workmanship, tests, service capability, maintenance and documentation, will fulfil the requirements stated in the contract documents, standards, specifications and regulations. The QAP shall be based on and include relevant parts to fulfil 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 manufacturer shall indicate the delivery time of the equipment; manufacturer's monthly & annual production capacity and experience in the production of the type and size of items being offered. A detailed list & contact addresses (including e-mail) of the manufacturer's previous customers for similar type of items 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.

APPENDIX C: TECHNICAL DOCUMENTATION (NORMATIVE)

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

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- a) Fully-filled clause by clause Guaranteed Technical Particulars (GTPs)- Appendix D - stamped and signed by the manufacturer.
- b) Copies of the Manufacturer's catalogues, brochures, drawings and technical data for the equipment;
- c) Details of the manufacturer's experience; Sales records for the last five years and at least four customer reference letters.
- d) Copies of previous test certificates and test reports (As given in Clause A.2) by the relevant International or National Testing/Standards Authority of the country of manufacture (or ISO/IEC 17025 accredited independent laboratory) shall be submitted with the offer for evaluation. A copy of accreditation certificate for the laboratory shall also be submitted (all in English Language);
- e) Marking & Packaging details (including packaging materials).

C.2. The successful bidder (supplier) shall submit the following documents/details to The Kenya Power & Lighting Company for approval before manufacture:

- a) Fully filled clause by clause Guaranteed Technical Particulars (GTPs) stamped and signed by the manufacturer (**these are not the ones submitted with the tender**);
- b) Technical details and design drawings of the equipment 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 fulfil the requirements stated in the contract documents, standards, specifications and regulations.
- d) Detailed test program to be used during factory testing;
- e) Marking details and method to be used in marking 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 equipment for The Kenya Power & Lighting Company;
- g) Packaging details (including packaging materials).

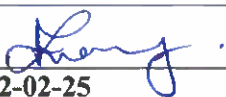
C.3. Each equipment package shall be supplied with detailed user's manual printed in English language to Kenya Power stores. All information shall be unambiguous. All documentation necessary for safety of the equipment as specified in IEC 61010-1 clause 5.4 shall be provided with the equipment.

C.4. The supplier shall submit recommendations for use, care, storage and routine inspection/testing procedures, all in the English Language, during the installation of the Equipment.

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APPENDIX D: PACKING AND DELIVERY

D.1. PACKING

- (i) Each item shall be packed properly or protected for shipment from the place of manufacture to the KPLC store or designated installation site.
- (ii) Each crate of package shall contain a packing list in a waterproof envelope and a copy in triplicate shall be forwarded to KPLC prior to dispatch. All items of material shall be clearly marked for easy identification against the packing list.
- (iii) All cases, packages, etc., shall be clearly marked on the outside to indicate the total weight, to show where the weight is bearing and the correct position of the slings and shall bear an identification mark relating them to the appropriate shipping documents.
- (iv) All Accessories necessary for mounting the Relays, Instruments and Control Devices on to the panels, for terminations of cables or for labelling of LED indications shall be provided with the Relays, Instruments and Control Devices.

D.2. MARKING

D.2.1 All equipment shall be permanently marked with a manufactures trademark and a serial number on a top part of the equipment for traceability in English Language. The following information shall be indelibly marked on each equipment: -

- a) Manufacturer's name and / or Logo
- b) Equipment type reference number
- c) The standard of manufacture (IEC 60885-1, IEC 60832, IEC 61235, ASTM F711-02, OSHA Regulation 1910.269: Part J)
- d) Words "**PROPERTY OF KPLC**".

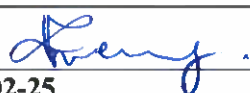
D.2.2 The packaging shall be marked as detailed below.

- (a) Consignee: **THE KENYA POWER & LIGHTING CO. LTD.**
- (b) Name of Project: **PROTECTIVE RELAYS AND CONTROL DEVICES AND INSTRUMENTS FOR PROJECTS**
- (c) Contract No.:
- (d) Port of destination:
- (e) Item Number, Package number and quantity per package:
- (f) Description of Contents:
- (g) Net and gross weight, cubic measure:

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APPENDIX E: GUARANTEED TECHNICAL PARTICULARS (GTPS)

(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, four customer reference letters, the manufacturer's experience and copies of complete type test reports for tender evaluation, all in English Language)

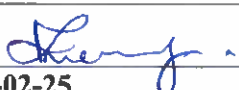
Tender No.

CLAUSE NO.	CLAUSE REQUIREMENTS	KPLC REQUIREMENTS	MANUFACTURER/SUPPLIERS OFFER
	Manufacturers Name and address	State	
	Country of Manufacture	State	
	Bidder's Name and address	State	
1	Scope	Specify	
2	Terms and definitions	Specify	
3	Applicable standard(s)	State	
4	REQUIREMENTS		
4.1	SERVICE CONDITIONS	Specify	
4.1.2	Physical conditions	Specify	
4.1.2	Safety and environmental requirements	State compliance	
4.2	GENERAL REQUIREMENTS		
4.2.1	cabinets for the test equipment shall be made of cold-rolled steel,	Specify	
	Thickness of steel	3mm	
	Standard of manufacture	IEC 61439-1	
	primed and painted with two urethane topcoats for rust prevention	Specify	
4.2.2	Panel and access doors for the equipment shall be electrically interlocked so that any attempted entry into the test set while it is in operation will cause the power to shut down	Specify	
4.2.3	Equipment shall have an excellent ozone removal system with direct free air intake and circulating system.	Specify	
	The systems size will depend on the number of test positions required.	Specify	
4.2.4	equipment shall be a modular design with the test chambers separated from the power supply and control panel	Specify	

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CLAUSE NO.	CLAUSE REQUIREMENTS	KPLC REQUIREMENTS	MANUFACTURER/SUPPLIERS OFFER
	Different configurations shall allow for more flexibility in installation use	Specify	
4.3	DESIGN AND CONSTRUCTION		
4.3.1	Power Supplies		
4.3.1.1	Power Supply module shall house a high voltage transformer, a regulator, and control panel	Specify	
	The design shall meet the safety and environment requirements specified in clause 4.1.2.	Specify	
4.3.1.2	both AC and DC configuration meeting applicable test standards		
	AC test system Rating	≤50kV AC at 50 Hz	
	DC test system Rating	≤100kV DC	
4.3.1.3	Input voltage	240V AC, 50 Hz	
4.3.1.4	Output test voltage shall be variable	Specify	
	AC output Voltage	0-100kV DC	
	DC output voltage	0-50kV AC, 50 Hz	
4.3.2	Control Panel		
4.3.2.1	Control Panel shall have a Programmable interface with provision to use a computer.	Specify	
4.3.2.2	Output devices to display leakage as well as peak current	Provide	
4.3.2.3	Instantaneous change of parameters of test	Specify	
	Switch testing from one product to another	Specify	
	Change of testing requirement for different classes	Specify	
4.3.2.4	Control panel shall be able to display precise, easy-to-read test results	Specify	
	immediately indicate any failure of the test	Specify	
4.3.2.5	All test results downloadable to a computer	Specify	
4.3.2.6	Computer interface shall meet the requirements of the safety and environmental requirements specified in clause 4.1.2.	Specify	
4.3.3	Rubber Glove and Sleeve Tester	Specify	
4.3.3.1	Line man's gloves, sleeves and line jumper – test standards	ASTM D120, F496, IEC 60903	
4.3.3.2	Test voltage capability	50 kV AV, 100kV DC	

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Kenya Power

TITLE:

**LIVE LINE TOOLS TEST &
CALIBRATION LABORATORY
EQUIPMENT - SPECIFICATION**

Doc. No.

KP1/13D/4/1/TSP/09/116

Issue No.

1

Revision
No.

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CLAUSE NO.	CLAUSE REQUIREMENTS	KPLC REQUIREMENTS	MANUFACTURER/SUPPLIERS OFFER
4.3.3.3	fully automated, microprocessor controlled glove and sleeve tester for rubber goods	Specify	
	Equipment class	Class IV	
4.3.3.4	Machine adjustment programming	Specify	
	Single selection for all parameters as per clause	Specify	
	Type selection parameters as per clause	Specify	
4.3.3.5	Machine test capability in accordance with IEC 60903, ASTM D120 and F496 standards	6 gloves of sizes 280 – 460mm	
	Clothespin type holders	Provide	
4.3.3.6	Machine test capability in accordance with the latest ASTM D1051 and F496 standards	6 sleeves of sizes up to 762mm	
4.3.3.7	equipment shall also be capable of testing bypass line jumpers	Specify	
4.3.3.8	High Voltage Test Tank construction	≥3mm stainless steel	
	The outer lip and all edges shall be smooth and rounded	≥20mm radius	
	drain valve to drain excess water into an overflow basin	Provide	
4.3.3.9	Chamber Ventilation shall have sufficient air flow, directed into each glove/sleeve	Specify	
4.3.3.10	Exhaust manifold at the rear of the machine shall pull air across the surface of the water through an inlet from the top of the high voltage tank	Specify	
4.3.3.11	Enclosure design standard	IEC 61439-1	
	incorporate eyebolts on the top for lifting	Provide	
4.3.3.12	Interlocked access door for the testing area	Provide	
	Fluorescent lamps inside the unit operable when the unit is OFF	Provide	
	Interlocked front access door for the in the power supply and control area	Provide	
4.3.3.13	Water Fill:	Provide	
	Tube for each glove test point	Provide	
4.3.3.14	Indicators		
	Peak current as well as leakage current	Specify	
	Shall indicate the failed glove	Specify	
4.3.4	Rubber blankets		

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CLAUSE NO.	CLAUSE REQUIREMENTS	KPLC REQUIREMENTS	MANUFACTURER/SUPPLIERS OFFER
4.3.4.1	Testing standard	IEC 61112, ASTM D1048 and F479	
4.3.4.2	Test positions	4	
	Allow testing of standards rubber blankets size	1160mm x 1160mm	
	Testing Class	Up to class IV	
4.3.4.3	Test timing	Specify	
	audible alarm for failures or test completion	Provide	
	bright flashing coloured lights	Provide	
4.3.4.4	exhaust fan on the top rear of the blanket testing cabinet	Provide	
4.3.4.5	capable handling slotted and solid blankets	Specify	
4.3.4.6	Equipment control system shall be a menu based positioned at the front of the control panel.	Specify	
	All tests specified in IEC 61112, ASTM D1048 and F479 shall be predefined and set in the machines settings	Specify	
	Tests shall run automatically	Specify	
4.3.4.7	user defined test modes	Specify	
	manual control mode for the entire system	Specify	
4.3.4.8	Indicators	Specify	
	Peak current as well as leakage current display	Specify	
	Failure display	Specify	
4.3.5	Line Hose tester		
4.3.5.1	conforms to the safety and environmental requirements of clause 4.1.3	Specify	
	Testing standards	IEC 61479, ASTM D1050 and F478	
4.3.5.2	Test positions number	6	
	allow testing of all standard line hoses/hoods up to class IV	Specify	
4.3.5.3	Test timing	Specify	
	audible alarm for failures or test completion	Provide	
	bright flashing coloured lights	Provide	
4.3.5.4	exhaust fan	Provide	
4.3.5.5	Automatic and simultaneous testing of 6 line hoses/hoods	Specify	
	Test voltages up to 50kV or 70kV	Specify	
4.3.5.6	capable for testing lines hoses of length up to 1.8 M and inner diameter of 38 mm.	Specify	

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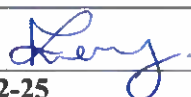
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CLAUSE NO.	CLAUSE REQUIREMENTS	KPLC REQUIREMENTS	MANUFACTURER/SUPPLIERS OFFER
4.3.5.7	designed to handle all types and Styles line hoses	Specify	
4.3.5.8	Equipment control system shall be a menu based positioned at the front of the control panel.	Specify	
4.3.6	Hot Stick tester		
4.3.6.1	conforms to the safety and environmental requirements of clause 4.1.3	Specify	
	Testing standards for hot stick	IEC 60832 and ASTM F712	
4.3.6.2	Number of test points for the unit	6	
	Test timing	Specify	
4.3.6.3	audible alarm for failures or test completion	Provide	
	bright flashing coloured lights	Provide	
4.3.6.4	automatically and simultaneously test six hot sticks	Specify	
	Test voltage per ft	75kV	
4.3.6.5	Hot stick length	Up to 6.4m	
	Equipment control system shall be a menu based positioned at the front of the control panel.	Specify	
4.3.6.6	All tests specified in ASTM F711 and F712 or equivalent shall be predefined and shall set all the machines settings	Specify	
	Tests shall run automatically	Specify	
4.3.6.7	Also has user defined test modes	Specify	
	Has manual control mode for the entire system	Specify	
4.3.7	Rubber Goods Washer		
4.3.7.1	Designed to clean all types of personal protective rubber gear such as gloves, blankets, hoses and sleeves before dielectric testing	Specify	
4.3.7.2	automated wash cycle with Programable Logic controls	Specify	
	rubber gear of low speed RPM	Specify	
	Standard design features	≥IP 52	
4.3.7.3	a) Circuit breaker for main power	Specify	
	b) Wash chamber has safety interlock	Specify	
	c) Cartridge-type inline water filter	Specify	
	d) Recirculation pump for hot water supply	Specify	
	e) Auto-fill feature	Specify	
	f) Wash / rinse timer with audible alarm	Specify	
	g) Drum jog feature	Specify	

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CLAUSE NO.	CLAUSE REQUIREMENTS	KPLC REQUIREMENTS	MANUFACTURER/SUPPLIERS OFFER
	h) Solid brass drain valve	Specify	
	i) Water tight pushbuttons	Specify	
	j) Solidly constructed of 316-grade stainless steel	Specify	
	k) 2 lightweight latching access doors	Specify	
4.3.7.4	Rotating drum	Provide	
4.3.7.5	capable of handling all types of different rubber goods upto 100kgs	Specify	
4.3.8	Rubber goods Dryer	Specify	
4.3.8.1	Dryer design	Static type	
4.3.8.2	Shall have open corrosion resistant racks	Specify	
4.3.8.3	Shall have an exhaust fan to remove humidity, heat and moisture	Provide	
4.3.8.4	Shall have see-through doors for visual inspection	Provide	
4.3.8.5	Shall have fans for hot air circulation and an electric heater	Provide	
4.3.8.6	Shall be able to handle rubber goods of maximum sizes carry a minimum of 50 gloves, 50 sleeves, 12 blankets, 35 hoses or 25 hoods	Specify Specify	
4.3.8.7	Dryer cabinet shall be made of 12-gauge primed and painted cold rolled steel	Specify	
4.3.8.8	Construction of the fryer floor shall be made of 12-gauge stainless steel	Specify	
4.3.9	Bucket Liner Tester		
4.3.9.1	conforms to the safety and environmental requirements of clause 4.1.3	Specify	
	Testing standards for Aerial Devices Buckets	ANSI A92.2	
4.3.9.2	Number of test points	2	
	allow testing of all standard bucket Liners	Specify	
4.3.9.3	Test timing	Specify	
	audible alarm for failures or test completion	Provide	
	bright flashing coloured lights	Provide	
4.3.9.4	Equipment will test the two bucket Liners at a voltage of 50 kV A.C for a period of 1 minute.	Specify	
4.3.9.5	Shall be capable of testing buckets with a depth of 1143 mm totally enclosed	Specify	
4.3.9.6	Voltage input for the equipment	240V, 50-hertz A.C	
4.3.9.7	Output test voltage shall be variable	Specify	

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CLAUSE NO.	CLAUSE REQUIREMENTS	KPLC REQUIREMENTS	MANUFACTURER/SUPPLIERS OFFER
	AC output Voltage	0-100kV DC	
	DC output voltage	0-50kV AC, 50 Hz	
4.3.9.8	Variable test voltage	Specify	
4.3.9.9	user defined test modes	Specify	
	manual control mode for the entire system	Specify	
4.3.10	Kilo voltmeter		
4.3.10.1	Shall be used together with other calibration equipment	State	
4.3.10.2	Input voltage	240V AC, 50Hz	
4.3.10.3	High voltage input	0-300kV AC/DC	
4.3.10.4	shall have an impedance divider	Specify	
	impedance divider resistance	0 to 1200Mohms	
	impedance divider capacitance	upto 200pF	
4.3.10.5	Kilo voltmeter weight	≤50kgs	
	Cables Lengths		
4.3.10.6	i. Input power	Approx. 4m	
	ii. Metering Interconnection	Approx. 8m	
	iii. 2no. Ground cables	Approx. 3M	
	voltage measurement function		
4.3.10.7	AC	Average, RMS, Peak	
	DC	Average, peak	
Appendix A	TESTING & INSPECTION	State	
A.1.	Responsibility of carrying out tests		
A.2.	Acceptance tests to be witnessed by KPLC at factory before shipment	State	
A.3.	Copies of test reports shall be packaged together with the respective SCADA equipment	State	
A.4.	Copies of Type Test Reports submitted with tender	State	
A.5.	Inspection at the stores and replacement of rejected items	State	
Appendix B	QUALITY MANAGEMENT SYSTEM		
B.1.	Quality Assurance Plan (QAP)	State	
B.2.	Copy of ISO 9001:2008 Certificate	State	
	Manufacturer's experience	State	
B.3.	Manufacturing Capacity (units per month)	State	
	List of previous customers	State	
	Customer reference letters	State	

Issued by: Head of Section, Standards Development

Authorized by: Head of Department, Standards

Signed:



Signed:



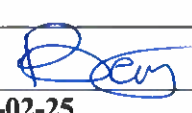
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Date: 2022-02-25

CLAUSE NO.	CLAUSE REQUIREMENTS	KPLC REQUIREMENTS	MANUFACTURER/SUPPLIERS OFFER
Appendix C	TECHNICAL DOCUMENTATION		
C.1.	Documents submitted with tender	State	
C.2.	Documents to be submitted by supplier to KPLC for approval before manufacture	State	
C.3.	No of copies of technical manuals to be provided.	State	
C.4.	Recommendations for use, care, storage and routine maintenance	Provide	
Appendix D	PACKAGING AND DELIVERY		
D.1.	Specify mode of packaging to be used	Specify	
D.2.	Specify mode of Marking to be used	Specify	

Note: Words like 'agreed', 'Yes', 'confirmed', 'As per KPLC specifications', etc. shall not be accepted and shall be considered non-responsive.

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Manufacturer's Name, Signature, Stamp and Date

Issued by: Head of Section, Standards Development	Authorized by: Head of Department, Standards
Signed: 	Signed: 
Date: 2022-02-25	Date: 2022-02-25