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Kenya Power

**12kV OUTDOOR PROTECTION AND METERING BREAKER
UNITS – SPECIFICATION**

A Document of The Kenya Power & Lighting Co. Ltd.
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TITLE:
**12kV OUTDOOR PROTECTION
 AND METERING VACUUM
 CIRCUIT BREAKER UNITS –
 SPECIFICATION**

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0.1 CIRCULATION LIST

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

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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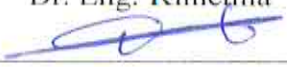
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0.2 AMENDMENT RECORD

Rev No.	Date (YYYY-MM-DD)	Description of Change	Prepared by (Name & Signature)	Approved by (Name & Signature)
Issue No. 1 Rev. No. 0	2018-09-12	New issue	Eng. S. Nguli	Dr. Eng. Kimemia 

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FOREWORD

The KPLC connects large power customers on medium and high voltage and the customers take care of the step-down to their desired voltages. In such cases energy metering is done on the high voltage.

In the past, medium and high voltage metering and protection has been of outdoor air insulated type apart from 12kV metering where indoor metering and protection has been applied.

With the increase of the demand for land resource, customers are finding it increasingly difficult to get the kind of land required for the outdoor metering and protection equipment. In other cases, it is uneconomical to use the required land sizes for this purpose. In indoor installations the space used is normally prime.

Additionally, outdoor metering enhances integrity of the metering system.

This specification stipulates the minimum requirements for the **12kV Outdoor Protection and Metering Vacuum Circuit Breaker Units** acceptable for use in the company and it shall be the responsibility of the supplier and manufacturer to ensure that the offered design is of the highest quality and guarantees excellent service to KPLC.

The manufacturer shall exhibit good workmanship and good engineering practice in the manufacture of the 12kV Outdoor Protection and Metering Vacuum Circuit Breaker Units for KPLC.

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

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

Name	Division
Stephen Nguli	Standards
Paul Mwangi	Network Maintenance

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1. SCOPE

- 1.1. This specification, 12kV Outdoor Protection and Metering Vacuum Circuit Breaker units (12kV VCB Cubicle), is intended to cover the design manufacture, assembly, testing at manufacturer's factory, supply, delivery of 12kV Vacuum Circuit Breaker Units with current transformers, potential transformers, protection relays and metering instruments, complete with all accessories, installation and commissioning for efficient and trouble-free operation to achieve the intended purpose
- 1.2. The equipment shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation up to the bidder's guarantee in a manner acceptable to the KPLC,
- 1.3. KPLC shall interpret the drawings and specifications and shall have the power to reject any work or material which in its judgment is not in accordance to the specification and relevant standards.
- 1.4. The offered equipment shall be complete with all components necessary for its effective and trouble-free operation along with associated equipment, interlocks, protection schemes etc. Such components shall be deemed to be within the scope of supply, irrespective of whether those are specially brought out in this Specification and/or the commercial order or not.

2. NORMATIVE REFERENCES

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

For this specification, the definitions and abbreviations given in the reference standards shall apply.

IEC 62271/100-200:	High Voltage Metal Enclosed Switchgear & Control gears.
IEC 60044-1:	Current transformers
IEC 60044-2:	Voltage transformers
IEC 60255:	Electrical Relays
IEC 60529:	Degrees of protection provided by enclosures (IP Code)
ANSI 37:	Medium voltage AC metal - enclosed switchgear and control gear
ISO 1461:	Hot dip galvanized coatings on fabricated iron and steel articles – Specifications and test methods

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3. DEFINITIONS

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

4. REQUIREMENTS

4.1. Service conditions

The 12kV Outdoor Protection and Metering Vacuum Circuit Breaker units shall be suitable for continuous outdoor operation in tropical areas and harsh climatic conditions including areas exposed to:-

- Altitudes of up to 2200m above sea level
- Humidity of up to 95%
- Average ambient temperature of +30°C with a minimum of -1°C and a maximum of +40°C, in direct sunlight,
- Isokeraunic levels of up to 180 thunderstorm days per year.
- Pollution (IEC 60815) Heavy; class III

4.2. GENERAL REQUIREMENTS.

- 4.2.1. The 12kV VCB Cubicle shall be used in high voltage system having characteristics listed in the specification.
- 4.2.2. The 12 kV Outdoor Protection and Metering Vacuum Circuit Breaker Unit shall be out-door type, designed for three phase operations and suitable for H-pole mounting. Single pole mounting shall also be accepted. The units shall be manufactured in accordance with IEC 62271/100-200 and all others relevant standards.
- 4.2.3. The equipment shall be capable of withstanding the dynamic and thermal stresses of prospective short circuit current without any damage or deterioration.
- 4.2.4. The equipment shall be installed outdoor in a hot, humid and tropical atmosphere. All equipment, accessories and wiring shall have tropical protection, involving special treatment of metal and insulation against fungus, insects and corrosion.
- 4.2.5. The design, dimensions and materials of all parts shall be such that they shall not suffer damage under the most adverse conditions nor result in deflections and vibrations, which might adversely affect the operation of the equipment. Mechanisms shall be constructed to avoid sticking due to rust or corrosion.

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- 4.2.6. The equipment and apparatus shall be designed and manufactured in the best and most substantial workmanship with materials best suited to their respective purpose and in accordance with up-to-date standards of good practice.
- 4.2.7. Whenever possible, all similar parts, including spare parts, shall be made interchangeable. Such parts shall be of the same materials and workmanship and shall be constructed to such tolerances as to enable substitution or replacement by spare parts easily and quickly.
- 4.2.8. Workmanship shall be of the highest class throughout to ensure reliable and vibrations free operations. The design, dimensions and materials of all parts shall be such that the stresses to which they may be subjected shall not cause distortion, undue wear, or damage under the most severe conditions encountered in service.
- 4.2.9. All equipment shall be designed to minimize the risk of fire and consequential damage, to prevent ingress of vermin and dust and accidental contact with electrically energized or moving parts.
- 4.2.10. The safety clearances of all live parts of the equipment shall be as per relevant standards.
- 4.2.11. The switchgear shall be capable of continuous operation with minimum attention and maintenance in the exceptionally severe conditions likely to be obtained in a tropical climate and where the switchgear is called upon to frequently interrupt fault currents on the system and also where the duty of operation is high.
- 4.2.12. All equipment and apparatus including the circuit breakers, protective relays, control devices and accessories, measuring and indicating instruments and electronic equipment shall be capable of satisfactory operation at 80% to 130% of the rated dc supply voltage.
- 4.2.13. Enclosures for the switchgear and for other electrical equipment shall have the following degree of protection (ref IEC 60034, IEC 60529 and IEC 60947)

Table 1: Degrees of protection

Equipment	Degree of protection
Medium voltage enclosed switchgear	IP 55
Control and relaying equipment	IP 65

4.3. ELECTRICAL CONTROLS, AUXILIARIES AND POWER SUPPLIES

- 4.3.1. The manufacturer shall provide all control, indication, alarm and protection devices and all auxiliary equipment with wiring and interconnecting cable which are integral parts of or are directly associated with or mounted on the switchgear units to be supplied.
- 4.3.2. The design of protection and control schemes for the switchgear shall be subject to approval by KPLC

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- 4.3.3. Suitable terminal blocks shall be provided for all outgoing power and control cables. All cable terminals shall generally be located for bottom entry and connections.
- 4.3.4. All wiring inside the switchgear shall be done with PVC insulated wire not less than 2.5 mm² s/c copper flexible cable.
- 4.3.5. A suitable wiring duct system having covers shall be installed and shall provide easy access for inspection and replacement of the wires.

4.4. OPERATION AND CONTROL

The Interlocking devices shall be incorporated in the control circuit to ensure safety, and proper sequence and correct operation of the equipment.

4.5. DESIGN DATA FOR MEDIUM VOLTAGE PLANT AND EQUIPMENT

4.5.1. 12kV VACUUM CIRCUIT BREAKER

- 4.5.1.1. The 12kV Vacuum Circuit Breaker (VCB) shall be triple pole horizontal fixed type enclosed units made of CRCA sheet steel of 3mm thickness for load bearing members and 2mm thickness for non-load bearing members and shall comply with latest edition of IEC 62271-100/200. The Units shall be vermin proof and dust tight.
- 4.5.1.2. The switchgears and control gears shall be complete with all necessary supporting frame works, nuts and bolts etc. for securing the same to three phases simultaneously. The operating mechanism links etc. shall be accessible for maintenance.
- 4.5.1.3. The circuit breaker and its operating mechanism shall be fully interlocked to prevent mal-operation.
- 4.5.1.4. All the breakers shall be supplied with necessary clamps and connectors suitable for appropriate current ratings.
- 4.5.1.5. Suitable arrangement of earthing the switchgears shall be provided. All the connecting bus bars and current carrying parts shall be made of electrolytic copper
- 4.5.1.6. The vacuum circuit breaker UNITS shall be suitable for outdoor installation. The duty of the circuit breaker shall involve satisfactory interruption of short circuit currents as listed in the specification.
- 4.5.1.7. The breaker shall be capable of Interruption of low reactive current (lagging/leading) without undue over voltage. The VCB shall be fitted with M-2 class mechanism.
- 4.5.1.8. Hinges of door shall be concealed type and of stainless steel material to avoid rusting and obstructive opening of the door.

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- 4.5.1.9. All the connecting bus bar and current carrying parts shall be made of copper.
- 4.5.1.10. All the gasket shall be of chemically treated neoprene.
- 4.5.1.11. Switchgear (Vacuum Circuit breakers etc.) and control gear (CTs, PTs, relays etc.) shall be mounted in the same UNITS.
- 4.5.1.12. Bus bars shall be air insulated with PVC sleeves on electrostatic powder coating. The bus bars shall be of electrolytic copper with permissible limits of current density.
- 4.5.1.13. The technical parameters of the 12kV Circuit breaker shall be as per Table 2.

Table 2: Technical Parameters of the 12kV Circuit Breaker

Item	Parameters	UNITS	12kV	
1	System frequency, No of phase	Hz, PH	50, 3	
2	Neutral point earthing		Solidly earthed	
3	Nominal system voltage	kV	11	
4	Highest system(Service) voltage as defined by IEC-60038	kV	12	
5	Highest Equipment Rated Voltage as defined by IEC-60071	kV	15.5	
6	Symmetrical Short – Circuit Rating	kA	25	
7	Short-circuit current withstand, not less than 3 second	kA	25	
8	Rated current of busbars and circuit	A	630	
10	Minimum rated continuous current of circuit breakers	A	630	
12	Rated making capacity	kA	40	
12	Operating duty for gang 3-phase operation		O-0.3Sec-CO-3 min-CO	
13	Lightning impulse withstand voltage (1.2/50 μ s kV _{peak})	kV	95	
14	Test voltage at power frequency 1 min dry and wet. To earth and between phases	kV	38	
15	Clearance	Phase to earth, min	mm	400
		Phase to phase, min	mm	400
17	Minimum nominal creepage distance as defined in IEC 60815, Table II	mm/kV	31	

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- 4.5.1.14. All the meters, instruments, relays etc. shall be mounted on the switchgear cubicle. The outdoor circuit breaker cubicle shall be suitable for AC shunt tripping arrangement.
- 4.5.1.15. The Cubicle shall have an arrangement for emergency shunt tripping from remote place in addition to arrangement for local emergency tripping (Mechanical).
- 4.5.1.16. The Cubicle shall also have a system to check the “Trip Circuit healthy check” in all the three phases. Necessary trip and closing coils shall be provided for operation of breakers
- 4.5.1.17. All the six terminals shall be brought out through high quality bushings.
- 4.5.1.18. The arcing contacts shall be made of homogenous special alloy so that surge voltages are reduced to negligible level and multiple re-ignitions is eliminated.
- 4.5.1.19. The cubicle shall have a provision for mounting of surge arresters and shall be supplied complete with surge arrestors.
- 4.5.1.20. The lifting arrangement shall not cause any effective loss of creepage distance/ phase to earth clearances as specified in the standard.
- 4.5.1.21. The main contacts shall have adequate area and contact pressure for carrying rated continuous and short time current without excessive heating liable to cause pitting and welding.
- 4.5.1.22. The breakers shall be provided with silver plated contacts, if necessary, to meet the requirement of IEC 62271-100/200 where higher temperature rise is permitted with silver plated contacts.
- 4.5.1.23. The quantity of silver facing shall be such that after carrying out one tenth of total number of operations specified for mechanical endurance tests, there is still continuous layer of silver on contacts
- 4.5.1.24. All electrical and mechanical interlocks which are necessary for safe and satisfactory operation of the circuit breaker shall be provided

4.5.2. OPERATING MECHANISM

- 4.5.2.1. The 12kV VCB shall be equipped with power operated mechanism to operate all three phases simultaneously using 220/240V AC Motor operated spring closing mechanism or magnetic actuator type.
- 4.5.2.2. It shall electrically and mechanically trip under various conditions. Cubicle shall also be provided with hand operated spring charging closing mechanism. Operation counter and mechanically ON-OFF indicator shall be provided suitable for 10,000 operations.

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4.5.2.3. The busses within the cubical shall be of high conductivity electrolyte grade copper. The bus bar joints shall be silver plated and bolted in such a manner that initial contact pressure around the square headed high tensile bolt shall remain substantially undiminished at all temperature up to rated full load temperature.

4.5.2.4. All the bus bar shall be sleeved with heat shrinkable sleeves of suitable voltage. Special care shall be taken in the design of the bus bar system to provide for thermal expansion and to minimize the chances of bus fault.

4.5.3. BUSHINGS

4.5.3.1. The outdoor circuit breakers shall be metal enclosed fitted with weather proof cyclo aliphatic type bushing conforming to relevant standard and shall be designed to have the necessary mechanical strength and rigidity required and shall be free from objectionable interference and external and internal corona.

4.5.3.2. The material of bushing shall be of non-hygroscopic type, homogenous, free from laminations and cavities or other flaws which could affect its chemical and mechanical strength and shall not be injuriously stressed by temperature change.

4.5.3.3. The material shall be thoroughly vitrified tough and impervious to moisture. The bushing shall be designed manufactured and tested in accordance with latest edition of relevant standard.

4.5.3.4. The bushing shall not be subjected to direct point loading. They shall be provided with neck around clamps for evenly distributed pressure. The bushing shall be mounted using suitable clamps arrangement to provide required degree of protection.

4.5.3.5. The bushing assembly shall be provided with lock nut and check nut which shall be non-magnetic and non-corrosive. The bushing shall have earthing point to earth its outer sheet to have evenly distributed voltage stresses. Sealing of the joints shall not be done using M-seal or other equivalent compounds.

4.5.4. VOLTAGE TRANSFORMERS

4.5.4.1. VTs shall be provided with HRC type fuses on the secondary side. The VT fuses on primary side shall also be provided with all safety precautions. One of the secondary terminals of the VTs shall be solidly earthed.

4.5.4.2. Three numbers single phase voltage transformer of the same rated output shall be required for each circuit breaker cubicle.

4.5.4.3. Voltage transformers shall be fixed type and shall be provided with open delta winding.

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4.5.4.4. Technical Parameters of the 12kV voltage transformers shall be as per Table 3.

Table 3: Technical Parameters of the 12kV Voltage Transformers

Parameter Description		UNITS	Value
Highest system Voltage		kV	12
Transformation Ratio		V	11000/110
Frequency		Hz	50
Rated Output		VA/phase	150
Impulse withstand Voltage		kV	95
One-minute power frequency withstand voltage on	Primary	kV	38
	Secondary		3
Accuracy Class			0.2
Rated Voltage factor			1.2 Continuous 1.5 for short time
Type of insulation			Cast resin

4.5.5. CURRENT TRANSFORMERS

- 4.5.5.1. Current transformers shall be Cast Resin Type and shall be single phase. The core shall be of grade non- ageing laminated silicon steel of low hysteresis loss and high permeability to ensure high accuracy at both normal and fault current.
- 4.5.5.2. The rating of secondary winding shall be 5 amps. Required transformers ratio can be achieved in any manner, however, the current transformers shall have to satisfy the requirement of rated VA burden, class of accuracy, accuracy limit factor and short time thermal rating as have been specified below at all transformation ratios.
- 4.5.5.3. The rating of current transformers of all classes regarding ratio error, knee point voltage, resistance of secondary winding etc. shall have to be co-ordinate with the requirement of protective relays and protection scheme without any extra cost.
- 4.5.5.4. All the wires shall be lugged before termination on to the terminal blocks and on the devices to ensure durability of the connections.
- 4.5.5.5. The class 0.5s current transformer cores shall be connected directly to the Energy Meter compartment using a 4mm², 4/C steel armored multi-core control cable.
- 4.5.5.6. Technical Parameters of the 12kV current transformers shall be as per table 4 below

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Table 4: Technical Parameters of the 12kV Current Transformers

Parameter Description	UNITS	Value
Highest system Voltage	kV	12
Frequency	Hz	50
Rated short time current	KA/s	25 / 3
Rated continuous Thermal current	A	1.2 In
Transformation Ratio of CTs:400-200-100/5A		
Core	Core I	Core II
Function	Protection /Relaying	Metering
Rated Output(VA)	15	15
Accuracy Class	5P	0.2
Accuracy Limiting factor	15	-
Maximum instrument security Factor	-	5
Insulation Level		
Impulse withstand Voltage	kV	95
One-minute power frequency withstand voltage on	Primary	38
	Secondary	3

4.5.6. PROTECTION RELAYS

- 4.5.6.1. The circuit breaker shall be fitted with numerical relay having shunt trip coil for operation on 3 over current & one earth fault element with standard open protocol/SCADA compatibility. The numerical relay to be provided with the 12kV Outdoor VCB Cubicle, shall be designed so as to operate/trip on earth fault as well as on over current faults.
- 4.5.6.2. The circuit breaker shall have suitable arrangement for power supply of relay and breaker operation through shunt trip coil using power pack. The power pack shall be suitable for closing/ tripping operations and for future remote communication as well as breaker testing during long time power failure. The output voltage may be as per manufacturer’s design. The charging of Power pack shall be through 230 V A.C. supply provide from a VT as specified in clause 4.5.7 below.
- 4.5.6.3. The Relay and Power Pack arrangement system shall be warranted for minimum 3 years (in line with warranty of breaker). The relays shall have broken conductor protection. The relay shall be able to store a minimum 100 previous fault values including fault level and phase.

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The relays shall be fully compatible to SCADA system and shall have facility for password protection.

- 4.5.6.4. The terminal block shall include a test switch (block), which enables the CTs circuits to be isolated from the relay and shorted without open-circuiting the CT, to facilitate relay testing in situ and to allow for isolation of VT circuits, alarm and trip circuits without disconnecting wires at the terminal block.
- 4.5.6.5. The numerical relays shall have following features: -
- (i) Self Diagnosis
 - (ii) Minimum last five abnormal events recording (over current & earth fault) including fault level and phase along with date and time.
 - (iii) On-line display of current.
 - (iv) Communicable with open Protocol having USB port.
 - (v) The relay shall contain four shots, three phases, programmable & auto reclose control feature. The relay shall have very low burden on CT (less than 0.5 VA)
- 4.5.6.6. The Measurement relays shall be flush mounted and of Numeric Design, with event recording, Fault recording, power measurement, and shall be in accordance to IEC 60255.
- 4.5.6.7. Besides the communication port, the relays shall have a human – machine interface facility (MMI) with LCD screen where one can easily access relay information.
- 4.5.6.8. Relay contacts shall be suitable for making and breaking the maximum currents, which they are required to control in normal service.
- 4.5.6.9. Operating time for auxiliary tripping relays shall not significantly affect the overall fault clearance time and short pick up time of less than 30ms.
- 4.5.6.10. Relay contacts shall make firmly without bounce and the relay mechanism shall not be affected by vibration or external magnetic fields.
- 4.5.6.11. Relays shall be provided with clearly inscribed labels describing their functions and IEC device function numbers.
- 4.5.6.12. To reduce the effect of electrolysis, relay coils operating on DC shall be so connected such that they are not continuously connected from the positive pole of the battery supply
- 4.5.6.13. The relay thermal rating shall be such that the fault clearance times on any combination of current and time multiplier settings shall not exceed the thermal withstand capability of the relay. (Max. fault current = 16 kA).

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4.5.6.14. All the relays shall be provided with test blocks, so designed that the relays may be tested at site. The relays shall have provision of testing either through test block or test plug easily accessible by injecting the voltage / current/frequency (as applicable) from external testing instruments /source without first disconnecting/ re-energizing the primary electrical circuit protected by the relays. Facilities for isolating the tripping circuit during such testing shall also be provided.

4.5.6.15. The relays shall be EMC 89/126/EEC compliant.

4.5.7. AUXILIARY POWER SUPPLY

4.5.7.1. The auxiliary supply for the recloser control shall be from a voltage transformer (VT).

4.5.7.2. The Ratio and Power rating of the power VT shall be 11000/230 VAC, 500VA limit output and a Minimum burden of 200 VA or other higher rating adequate to meet the auxiliary supply requirement for the equipment

4.5.7.3. The manufacturer shall specify the AC Power burden of the recloser control.

4.5.7.4. The VT will be delivered with the mounting frame. The secondary wiring of the VT shall be protected against short circuits with suitably rated fuses mounted on the VT secondary terminal box.

4.5.7.5. The normal life of the battery shall be at least 5 years. Upon loss of 230V AC auxiliary supply, the battery shall power the electronics and provide supply for at least 8 hours.

4.5.7.6. The battery capacity shall be >25AmpHour and this shall be demonstrated during factory acceptance testing in the presence of KPLC Engineers.

4.5.7.7. The supplier shall provide to KPLC a written guarantee for the batteries of at least 5 years.

4.5.7.8. Detailed manuals and drawings of the installation and control circuits and components shall accompany the tender (all in English Language)

4.5.8. TERMINAL BLOCKS (TBs)

4.5.8.1. Terminal blocks for control wiring shall be rated not less than 600V AC.

4.5.8.2. White or other light-colored marking strips, fitted to each terminal block, shall be provided for circuit designation.

4.5.8.3. The terminal arrangement, including the terminal blocks for VT and CT circuit connections, shall be subject to the employer's approval. A total of not less than 20 spare terminals shall be provided for future use.

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4.5.8.4. Shorting Links shall be provided on the current transformer (CT) circuits on the terminal block. It shall be possible to short the CTs under live system conditions without open-circuiting the CTs.

4.5.8.5. Isolation links (sliding Links) shall be provided on the trip circuits, alarm and on the VT circuits to allow easy isolation of these circuits without disconnecting the wires from the terminal block.

4.5.8.6. The terminal block shall be marked with a distinctive number, which shall be the same number used in the drawings, for identification purposes. The TB number shall be engraved in black numbers in white background and shall be durable so as to last the life time of the switchgear.

4.5.8.7. Each set of terminal blocks shall be identified by a label to distinguish it from another set of terminal blocks. The numbers used to mark the terminals on the terminal blocks shall be unique. The labels used shall match those used in the drawings.

4.5.9. SWITCHGEAR EARTHING

4.5.9.1. All the compartments including the hinged doors of the switchgear and all the earthing points of the equipment installed/mounted in the switchgear shall be connected to the grounding conductor at the bottom of the unit for external connection to the substation earthing system.

4.5.9.2. Earthing conductors shall be of annealed high conductivity copper stranded in accordance with BS.6346 and protected with an extruded PVC sheath of 1000 volts grade.

4.5.9.3. The earthing conductor on the equipment for external connection to the earthing grid shall be adequate to carry the rated switchgear short-circuit current of 25 kA for 3 seconds.

4.5.10. INDICATIONS AND INSTRUMENTS

4.5.10.1. All instruments shall be flush mounted and shall be in accordance with the requirement of IEC 60529

4.5.10.2. Indicating lamps shall be provided on the control board to indicate the following:

- (i) Visual indication of ON and OFF position of each circuit breaker.
- (ii) PT supply indication
- (iii) Trip circuit healthy indication.
- (iv) Auto trip indication

4.5.10.3. Each lamp body shall be of molded insulation and shall be able to withstand a high voltage test of appropriate value. All lamps shall be suitable for 240 V AC supply and shall have low

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power consumption and shall provide a wide angle of illumination of sufficient intensity for comfortable viewing.

4.5.10.4. A glass of appropriate color shall be screwed into the front of lamp body. The design of indication lamp shall be such as to facilitate replacement of burnt lamps. An engraved label indicating the purpose of the lamp shall be provided with each lamp.

4.5.11. HT TRIVECTOR METER

4.5.11.1. A 3 phase 4 wire A.C. Static meter of accuracy class 0.2 for measurement of energy as per latest specification of KPLC shall be provided on each 12KV outdoor VCB units.

4.5.11.2. The class 0.2 voltage transformer core shall be connected directly to the energy meter compartment using a 4mm², 4-core steel armored multi-core control cable.

4.5.11.3. In the energy meter compartment, the cable shall be terminated on a suitable 4-pole MCB with a normally closed auxiliary contact (closed when the MCB is off). The normally closed contact of the MCB shall be wired to trip the circuit breaker.

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APPENDICES

APPENDIX A: TESTS AND INSPECTION (NORMATIVE)

A.1. The 12kV outdoor metering cubicle shall be tested in accordance with IEC 62271-200, ANSI C37.60:2012, IEC 62271/100-200; IEC 60044-1; IEC 60044-2, IEC 60255 and ISO 1461 and the requirements of this specification. It shall be the responsibility of the manufacturer to perform or to have performed all the relevant tests. Routine tests shall be carried out on every 12kV outdoor metering Cubicle

A.2. **Type Tests:** Certificates of type test reports as per relevant IEC standards shall be submitted with the tender bid for purposes of tender evaluation. This shall include: -

- (i) Dielectric Tests
- (ii) Rated Symmetrical Interruption Test
- (iii) Making currents
- (iv) Partial Discharge Test
- (v) Temperature rise test
- (vi) Mechanical operations test
- (vii) Control electronic elements surge withstand capability tests

A.3. The test certificates shall be from an accredited reputable independent testing laboratory, acceptable to the purchaser. Proof of accreditation by a national/international authority shall be forwarded with the offer. Test reports shall be complete including all the pages as issued by the testing authority. Submission of only Parts of test reports shall not be acceptable.

A.4. Copies of previous type test reports by the relevant International or National Testing/Standards Authority of the country of manufacture (or ISO/IEC 17025 or ILAC accredited independent laboratory) shall be submitted with the tender for evaluation (all in English Language). A copy of accreditation certificate for the laboratory shall also be submitted.

A.5. **Routine Tests:** Certificates of routine test reports as per relevant IEC standards shall be submitted with the tender bid for purposes of tender evaluation. This shall include: -

- (i) Dielectric Test on the Main circuit
- (ii) Measurement of the resistance of the main circuit
- (iii) Partial Discharge Test
- (iv) Temperature rise test
- (v) Mechanical operations test
- (vi) One-minute power frequency withstand test for the 12kV outdoor metering cubicle.

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APPENDIX B: FACTORY ACCEPTANCE TESTS

- B.1 Kenya Power shall conduct compulsory inspection of all major components and accessories at the manufacturer's factory, and thereafter post-delivery to selected sites, installation, testing, and commissioning. This testing shall include, but not be limited to, verification of controls, logic, drives, releases, failover functions, monitoring and signalling functions, etc.
- B.2 Upon completion of manufacturing, the 12kV outdoor metering units shall be subject to acceptance tests at the manufacturer's works before dispatch. Acceptance tests shall be witnessed by two or more Engineers appointed by The Kenya Power and Lighting Company Limited (KPLC).
- B.3 The manufacturer/supplier shall give one months' notice to Kenya Power on intended dates to conduct the Factory Acceptance Tests (FATs). The Supplier shall further provide letters of invitation to the Kenya Power Engineers nominated to attend the FATs
- B.4 During FATs thirty (30%) percentage of all the 12kV outdoor metering units manufactured shall be subject to the Factory Acceptance Tests in the presence of Kenya Power & Lighting Company Engineers. The 12kV outdoor metering units shall be randomly selected via their serial numbers by the KPLC Engineers who shall attend the FATs. If failure of any component is witnessed during the FATs, then the number of 12kV outdoor metering units to be tested during the FATs shall be increased to forty (40%) percent of the total manufactured units.
- B.5 The following tests shall be conducted on all the sampled manufactured units and all the other units:
- i. Dielectric Test on the Main circuit
 - ii. Measurement of the resistance of the main circuit
 - iii. Partial Discharge Test
 - iv. Temperature rise test
 - v. Mechanical operations test
 - vi. One-minute power frequency withstand test for the 12kV outdoor metering cubicle

APPENDIX C: INSPECTION AT DELIVERY POINT

- C.1. On receipt of the equipment, KPLC shall inspect the 12kV Outdoor Metering VCB Cubicle for acceptance at stores and may perform or have tests performed to verify compliance of the equipment with this specification.
- C.2. The supplier shall replace/rectify without charge to KPLC, any equipment which upon examination, test or use, fail to meet any or all of the requirements in this specification.

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APPENDIX D: WARRANTY

- D.1. The supplier/manufacturer warrants the purchaser that all goods supplied under this contract shall have no defect arising from design, materials or workmanship.
- D.2. A warranty of 24 months from the date of delivery of the units to Kenya Power store shall be offered by the manufacturer for the 12kV Outdoor Metering VCB Cubicle.
- D.3. A warranty of 36 months from the date of delivery of the cubicle to Kenya Power store shall be provided for the electronic cards in the 12kV Outdoor Metering VCB Cubicle. Any electronic parts/modules found to have failed at commissioning or while the 12kV outdoor metering cubicle is in service or store during this warranty period shall be replaced free of charge by the manufacturer/supplier.

APPENDIX E: MARKINGS AND NAME PLATE

- E.1. Rating plate(s) shall be provided on the 12kV outdoor metering units using a non-ferrous material that shall be weather and corrosion resistance. Stainless steel is preferred, with the following details, engraved, indelibly stamped or etched.
- (i) Manufacturer's Name
 - (ii) Manufacturers type or Identification Number
 - (iii) Serial Number
 - (iv) Date of Manufacture
 - (v) Equipment rated Maximum Voltage
 - (vi) Standard of manufacture
 - (vii) Rated Continuous current
 - (viii) Rated Symmetrical Interrupting Current capacity and withstand time
 - (ix) Rated Power frequency withstand Voltage
 - (x) Rated Impulse Withstand Voltage
 - (xi) The words "**Property of The Kenya Power & Lighting Co. Ltd.**"
 - (xii) Nameplates for each of VCB, CT and PT as per their requirements, shall be placed at an appropriate location
- E.2. The name plate shall be mounted clear of live parts in a position that can be read while the 12kV outdoor metering units is in service, without compromising the safety of personnel.

APPENDIX F: MANUFACTURERS' RECOMMENDED SPARES

- F.1. The manufacturer shall provide a list of recommended spare parts to ensure that the 12kV outdoor metering units provide at least 10 years of continuous service.

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- F.2. The cost of the recommended spares shall be indicated separately on the bid price as an option. The cost of one units of recommended spare(s) shall be indicated, as well as the total price.
- F.3. The purchaser shall decide whether to accept all, part or none of the offered spares. The manufacturer/supplier shall provide this commitment in the bid.

APPENDIX G: QUALIFICATION OF THE MANUFACTURER (NORMATIVE)

- G.1. The manufacturer who shall be considered for tender award shall among other requirements outlined in the bidding fulfil the following requirements:
- G.2. **Quality Assurance:** The manufacturer shall possess a valid ISO 9001: 2008 or later quality assurance certification for the manufacture of the 12kV outdoor metering units for the factory where the 12kV outdoor metering units are to be manufactured. This shall cover the duration of manufacture and delivery of the 12kV outdoor metering units. The bidder shall furnish a copy of the ISO certificate certified as a true copy of the original together with the tender bid.
- G.3. **Manufacturing Experience:** The manufacturer of the 12kV outdoor metering units shall have minimum of 10 years' experience in the manufacture of the 12kV outdoor metering units. The manufacturer must have sold at least 500 12kV outdoor metering units to overseas customers in the last 5 years. Records of overseas sales with purchaser's name, year and quantity shall be furnished with the bid, as well as the email contact and day telephone number of the purchasers.
- The manufacturer shall be required to submit evidence with relevant references of design, supply, installation, testing, training, and commissioning of similar 12kV outdoor metering units
- G.4. **Letters of Customer Satisfaction:**
Letters of satisfaction from four (4) overseas customers for the particular 12kV outdoor metering units offered in this tender shall be furnished with the bid. The letters of satisfaction shall bear the rubber stamp of the purchasing utilities and the name and signature of the author of the letter.
- G.5. **Previous Performance:**
12kV outdoor metering units with previous poor performance in Kenya Power shall not be considered.

APPENDIX H: TRAINING (NORMATIVE) TRAINING AT THE MANUFACTURER'S PREMISES

- H.1 During the factory acceptance testing (FAT), the manufacturer shall conduct complete training for the complete 12kV outdoor metering units for KPLC Engineers/Technicians.

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- H.2 This shall include theory on how the equipment works followed by practical demonstrations. All the operational, protection and control features shall be exhaustively explained and demonstrated, including the operation of the interface software
- H.3 The manufacturer shall plan adequate time for the training separate from the FATs.
 The duration of the training shall however not be less than three (3) eight hour working days. The employer may send a separate team from the team witnessing the FATs to attend the training. The duration and the cost of the training shall be indicated in the bid. Accommodation and airfare shall be catered for by KPLC.
- H.4 The Training shall be considered to have been successful once the engineers/Technicians are able to:
- (i) Competently carry out all the operations on the 12kV outdoor metering units
 - (ii) Correctly install the equipment
 - (iii) Establish communication from a laptop to the equipment and carry out complete parameter settings and download and analyse data
 - (iv) Trouble shoot and analyse and rectify any minor breakdowns that may occur, including safe replacement of parts/modules and recommissioning of the 12kV outdoor metering units back to service.
- H.5 The manufacturer shall conduct evaluation tests and give a feedback report on the training to the employer for each of the Engineers/Technicians. The Engineers/Technicians shall receive relevant Competency/Authorisation certificates to carry out the said works.

APPENDIX I: LOCAL TRAINING (IN KENYA) (NORMATIVE)

- I.1. Following the delivery of the equipment, the manufacturer shall conduct complete training for the complete 12kV outdoor metering units for a total of (30) KPLC Engineers/Technicians, in Nairobi Kenya. The training shall be conducted in two sessions of 15 engineers/technicians each. Each session shall last at least one day (eight hours).
- I.2. The Training shall include theory on how the equipment works followed by practical demonstrations on operation and protection and control configuration and parameter settings. All the operational, protection, metering and control features of the equipment shall be exhaustively explained and demonstrated, including the operation of the interface software.

Note: All the cost of conducting the training including the venue, refreshments and meals shall be borne by the manufacturer/Supplier. Costs of local travels and accommodation for the participants shall be borne by KPLC.

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APPENDIX J: INSTALLATION OF A 12kV OUTDOOR METERING CUBICLE UNITS (NORMATIVE)

J.1. One 12kV outdoor metering cubicle shall be installed at Kenya Power International (KPI) in Nairobi to demonstrate correct installation of the 12kV outdoor metering cubicle by the manufacturer. The installation work shall be guided and supervised by the Manufacturer's representative who is an expert in field installation and operation of the 12kV outdoor metering units.

This event shall be arranged to follow immediately after the local training to optimize on the resources.

APPENDIX K: DOCUMENTATION (NORMATIVE)

K.1. The bidder shall submit its tender complete with technical documents required by Appendix M (Guaranteed Technical Particulars) for tender evaluation. The technical documents to be submitted (all in English language) for tender evaluation shall include the following:

- (i) Guaranteed Technical Particulars signed by the manufacturer;
- (ii) Copies of the Manufacturer's catalogues, brochures, and technical data sheets (including ratings) for 12kV outdoor metering units, the complete assembled units and layout drawings. Mechanical drawings on the design and construction of the 12kV outdoor metering units shall also be submitted;
- (iii) Detailed drawings and step by step procedure for safe installation and correct commissioning process of the 12kV outdoor metering units. This shall include the recommended maximum earthing resistance values for safe operation of the 12kV outdoor metering units and the 12kV outdoor metering units
- (iv) Sales records for the last five years and at least four customer reference letters;
- (v) Details of manufacturing capacity and the manufacturer's experience;
- (vi) Copies of required type test reports by a third-party testing laboratory accredited to ISO/IEC 17025;
- (vii) Copy of accreditation certificate to ISO/IEC 17025 for the third-party testing laboratory;
- (viii) Manufacturers letter of authorization, ISO 9001:2008 or later certificate and other technical documents required in the tender.

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

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- (i) Fully filled clause by clause Guaranteed Technical Particulars (GTP) signed by the manufacturer;
- (ii) Design drawings and technical details;
- (iii) Quality assurance plan (QAP) that shall be used to ensure that the design, material; workmanship, tests, service capability, maintenance and documentation shall 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 9001:2008 or later;
- (iv) Detailed test program to be used during factory testing;
- (v) Marking details;
- (vi) Packaging details (including packaging materials and marking and identification of batches). The 12kV outdoor metering units shall be packaged for outdoor storage in tropical conditions. The manufacturer shall state the maximum acceptable storage duration for the complete 12kV outdoor metering units taking cognisance of the service conditions defined in clause 4.1.
- (vii) 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 12kV outdoor metering units for The Kenya Power & Lighting Company.

K.3. The supplier shall submit recommendations for use, care, storage and routine inspection/testing procedures, all in the English Language, during delivery of the 12kV outdoor metering units to KPLC stores.

K.4 Routine and sample test reports to be submitted to Kenya Power for approval before shipment/delivery of the goods

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APPENDIX L: GUARANTEED TECHNICAL PARTICULARS (GTPS)

(To be filled, stamped and signed by the Supplier/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 test certificates and test reports for tender evaluation or approval, all in English Language)

Tender No.

Bidder's Name.....

Clause	Description	KPLC Requirement	Supplier's Details/ Response	Comment
	Manufacturer's name	state		
	Manufacturer's letter of Authorization.	Provide a copy		
	Description of item on offer			
	Type or designation number of Switchgear offered and applicable standard.	state		
2	Scope:			
3	Reference standards	state		
4.1	Service conditions	specify		
4.2	General Requirements			
4.2.1	Highest system Voltage	12kV		
4.2.2	Suitable for H-pole or single pole mounting	specify		
4.2.3	Withstanding dynamic and thermal stresses	State		
4.2.4	Equipment point of application	Outdoor and tropical conditions		
4.2.5-6	Good Engineering practice in manufacture of the equipment	state		
4.2.7	Parts from different machines to be interchangeable.	specify		
4.2.8	High class workmanship	Specify		

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4.2.9	Weatherproof design and minimal risk of fire; prevent ingress of vermin and dust and accidental contact	Provide design details		
4.2.10	Safety clearances of all live parts as per relevant standards	state		
4.2.11	Design to operate in tropical conditions with minimal maintenance	Provide design features		
4.2.12	Design range of the rated voltage and currents for the equipment	80-130% U, I		
4.2.13	Degree of protection for switchgear and control gear	Specify		
4.3	Electrical Controls, Auxiliaries & Power Supplies			
4.3.1	Control, indications, alarms and protection devices	Provide		
4.3.2	Design of protection and control schemes subject to approval by KPLC	Comply		
4.3.3	Terminal block	Provide		
4.3.4	Wiring material for the switchgear	2.5mm ² PVC cables		
4.3.5	Wiring duct system	provide		
4.4	Operation and control devices	Provide for interlocks (Mechanical and electrical)		
4.5.1	12KV CIRCUIT BREAKER (CB)			
	Manufacturer's name	Indicate		
	Manufacturer's letter of Authorization	Provide		
	Type or designation number of circuit breaker offered	State		
	Applicable standard for manufacture and testing	state		
4.5.1.1	Type of interrupter employed	Vacuum		
	Material enclosing circuit breaker	CRCA sheet steel of 3 mm thickness		
4.5.1.2	Supporting frame and accessories	Provide		

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4.5.1.3	CB interlocks	Specify and provide wiring schematics		
4.5.1.4	Clamps and connectors rated 630A	To be provided		
4.5.1.5	Earthing studs on the cubicle Earthing material to be copper	To provide and all		
4.5.1.6	Installation of CB	Outdoor		
4.5.1.7	CB mechanism class	M-2		
4.5.1.8	Corrosion resistance material and hinging of the doors	Specify materials to be used		
4.5.1.9	Connecting busbar & current carrying parts to be made of copper	Confirm		
4.5.1.10	Material of manufacture of gasket - neoprene	Confirm		
4.5.1.11	Integral units of CB, CT, VTs	Specify over		
4.5.1.12	Bus bar insulation material, and busbar ratings	specify		
4.5.1.13	Technical Parameters			
(i)	Rated circuit breaker voltage	12kV		
(ii)	Rated current - busbars, circuit	630A		
(iii)	1-minute power frequency withstand [attach test report]	38kV		
(iv)	Rated making capacity	40KA		
(v)	Impulse withstand voltage [attach type test report]	95kV		
(vi)	Test voltage at power frequency 1 min dry and wet. To earth and between phases	38kV		
(vii)	Symmetrical Short – Circuit Rating	25kA		
(viii)	Rated short circuit current and withstand [attach type test report]	25kA, 3 sec		
(ix)	Circuit breaker operating sequence [attach type test report]	0-0.3SEC-CO-3 MIN-CO		
(x)	Clearance	Phase to earth, min	400	
		Phase to phase, min	400	
(xi)	Creepage distance, mm/kV	31		

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(xii)	Auxiliary AC supply	230 VAC		
(xiii)	CB operating mechanism	Motor wound spring		
(xiv)	Hand operated spring charging closing mechanism	provide		
(xv)	Operations counter & Mechanical ON/OFF indicator	provide		
(xvi)	Bus bars to be sleeved with heat shrinkable sleeves rated at 12kV	specify		
	Visible spring charged /discharged mechanical indication on CB as per specifications.	Provide		
	Breaker control switch mounting	specify		
4.5.1.14	Instruments mounted on the switchgear cubicle. Shall be suitable for AC shunt tripping arrangement	specify		
4.5.1.15	Emergency trip facility	specify		
4.5.1.16	Healthy trip circuit check facility	Specify		
4.5.1.17	Type of bushing provided	specify		
4.5.1.18	Material for contacts	specify		
4.5.1.19	Provision for surge arrestors	provide		
4.5.1.20	Proximity of lifting arrangement to live parts	specify		
4.5.1.21	Material of contacts and thickness of silver plating, standard	specify		
4.5.1.22	Silver plated contacts	specify		
4.5.1.23	Endurance requirements	specify		
4.5.1.24	Mechanical and electrical interlocks provided	specify		
4.5.2	Operating mechanism			
4.5.2.1	Power operated mechanism for simultaneous operation	State		

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4.5.2.2	To be provided	Hand operated spring charging closing mechanism	Specify		
		Operation counter	Specify		
		Mechanically ON-OFF indicator suitable for 10,000 operations	Specify		
4.5.2.3	Material of busbars and joints, jointing		Specify		
4.5.2.4	Sleeves		Specify		
Bushings					
4.5.3.1-4.5.3.3	Type, material of bushing and standard of manufacture		state		
4.5.3.4	Method of mounting the bushing (avoid direct point loading)		specify		
	Degree of protection		specify		
4.5.3.5	Number, material of lock nuts. And Sealing of any joints		state		
4.5.4	VOLTAGE TRANSFORMERS(VT)				
	Manufacturers name		State		
	Manufactures letter of authorization		Provide		
	Type or designation number of VT		State		
	Applicable standard		state		
4.5.4.1	Protection		State		
4.5.4.2	PTs per breaker		State		
4.5.4.3	Fixing		Specify		
	Winding type		Specify		
4.5.4.4	Technical Parameters				
1	Rated voltage of offered VT		12		
2	1-minute power frequency withstand voltage [attach routine test report]	Primary	28KV		
		secondary	2kV		
3	Impulse voltage withstands [attach copy of type test report]		75KV		

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4	Ratio: 12KV/120V Core 1: 150VA, cl 0.2	specify specify		
5	Rated Voltage factor	Rated Voltage factor		
6	Primary fuses	Provide		
7	Type of insulation	Specify		
4.5.5	CURRENT TRANSFORMERS (CT)			
	Manufacturer's name	Indicate		
	Manufacturer's letter of Authorization	Provide		
	Type or designation number of CT	state		
	Applicable standard	state		
4.5.5.1	Type of current transformer and material of core	specify		
4.5.5.2	Rating of secondary winding	specify		
4.5.5.3	Ratio error, Knee point voltage, Secondary winding resistance	state		
4.5.5.4	Cable terminations in the terminal block	State		
4.5.5.5	Class 0.5s CT cores connection to the Energy Meter	specify		
4.5.5.6	Technical parameters of CTs			
(i)	Rated voltage & frequency of offered CT	12kV, 50Hz		
(ii)	Rated continuous thermal current	1.2In		
(iii)	Rated transformation	400-200-100/5A		
(iv)	1-minute power frequency withstand voltage [attach test report]	Primary	38kV	
		Secondary	3kV	
(v)	Impulse voltage withstands [attach copy of type test report]	95kVp		
(vi)	Short-circuit withstand current and duration [attach copy of type test report]	25kA, 3 sec		
(vii)	Core details Core 1 - 15VA, 5P15	State		

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	Core2 - 15VA, cl 0.2	state		
(viii)	Accuracy Limiting factor	15		
(ix)	Maximum Instrument Security Factor	5		
4.5.6	PROTECTION RELAYS AND AUXILIARY RELAYS			
	Manufacturer's Name	State		
	Manufacturer's letter of Authorization	Provide		
	Applicable standard	state		
	PROTECTION AND CONTROL RELAY			
4.5.6.1	Relay shall be of Numeric Design, SCADA compatibility of relay	State		
	Size of Relay LCD screen	State		
4.5.6.2	Power supply of relay and breaker operation	specify		
4.5.6.3	Relay warranty	5 years		
	broken conductor protection	specify		
	Minimum storage of previous fault values	specify		
4.5.6.4	Characteristics of terminal block	specify		
4.5.6.6	For flush mounting on units surface, numerical design.	State		
	Standard	state		
	Relay Features			
(i)	Relay is equipped with Circuit Breaker close and open key/push buttons	State		
(ii)	Three phase overcurrent	Provide		
(iii)	Earth fault function	provide		
(iv)	Sensitive earth fault function	Provide		
(v)	Over and under-voltage function			
(vi)	Measurement and display of instantaneous values of I, V, P, Q and p.f. on the LCD	state		
(vii)	Trip Indication Via Red LED	specify		
(viii)	Healthy Indication via Green LED	specify		

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(ix)	Relay has eight LEDs for Annunciation	specify		
(x)	Start and Trip output contacts are freely configurable	specify		
(xi)	Relay terminals are screw type and adequate to accommodate 4mm ² cable.	specify		
(xii)	Fault Records storage capacity	state		
(xiii)	Events storage capacity	state		
(xiv)	Disturbance Record storage capacity	state		
(xv)	MMI with keypad and LCD	Provide		
(xvi)	Serial RSS232 port	Provide		
(xvii)	Communication Port for connection to Local network	specify		
(xviii)	Relay is equipped with IEC 61850 communication	state		
(xix)	Rated DC supply and tolerance	State		
4.5.6.8	Relay contacts suitable for making and breaking the maximum currents	State		
4.5.6.9	Operating time for auxiliary tripping relays not significantly affect overall fault clearance time and short pick up time	specify		
4.5.6.10	Contacts to make firmly without bounce	specify		
	Mechanism not affected by vibration or external magnetic fields	specify		
4.5.6.11	Clearly inscribed labels describing their functions and IEC device function numbers	specify		
4.5.6.12	Coils operating on DC shall not be continuously connected from the positive pole of the battery supply	specify		

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4.5.6.13	Thermal rating - fault clearance times shall not exceed the thermal withstand capability of the relay. (Max. fault current = 16 kA).	specify		
4.5.6.14	All the relays to be provided with test blocks as specified	specify		
4.5.6.15.	EMC 89/126/EEC compliant.	state		
4.5.7	Auxiliary Power Supply			
4.5.7.1	Provision of VT for auxiliary supply complete with mounting fixtures	specify		
4.5.7.2	VT voltage rating and burden	specify		
4.5.7.3	AC Power burden of the recloser control	specify		
4.5.7.4	VT mounting frame Mode of protection of VT secondary output	specify		
4.5.7.5	Battery capacity and life for the metering units	State and provide warranty (original catalogues from manufacturer to support the offer must be submitted with bid)		
4.5.7.6	Battery capacity	specify		
4.5.7.7	Guarantee for the batteries	specify		
4.5.7.8	Manuals and drawings	provide		
4.5.8	TERMINAL BLOCKS			
4.5.8.1.	Terminal blocks ratings	Control cables to be rated 600V		
4.5.8.2	Cables to be code as per circuit under control	State compliance		
4.5.8.3	Approval of drawings by KPLC	State		
4.5.8.4	Shorting links	provide		
4.5.8.5	Isolation links (sliding Links)	specify		
4.5.8.6	Identification and distinguishing marks on the terminal block	specify		
4.5.8.7	Identification of terminal blocks	specify		
4.5.9	Switchgear Earthing			

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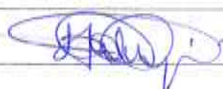

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4.5.9.1	Provision for Earthing studs and lugs	provided		
4.5.9.2	Type & size of earthing conductor and rated voltage	specify		
4.5.9.3	Adequacy of earthing conductor for external connection	specify		
4.5.10	INDICATING LAMPS AND HOLDERS			
4.5.10.1	Mounting, manufacturer's name & standard of manufacture	State		
4.5.10.2	Indicating lamps on the control board for: ON, OFF PT supply Trip circuit Auto trip	State		
4.5.10.3	Manufacture, rated voltage and power consumption	230V, <2.5W		
(ii)	Duty	Continuous		
(iii)	Duration of service	>10 years		
4.5.10.4	Indication lamp	State		
4.5.11	Power Measurement (Meter)			
4.5.11.1	Manufacturers name & standard of manufacture	State		
	Type or designation name of the units	State		
	units suitable for flush mounting			
4.5.11.2	Parameters measured	State		
	Class of accuracy of measurement	State		
	Configuration of the units (3 phase + 4 wire) and size of cables	State		
4.5.11.3	Terminal MCB before meter	Provide		
	Appendices			
A	TESTS AND INSPECTION (NORMATIVE)		State	
A.1	Test standards	List		
A.2	Type test certificates submitted with tender for evaluation	List		

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A.3	Accreditation testing laboratory	State		
A.4	Copies of previous type test and routine test reports by the relevant independent /international testing laboratory submitted State/List	List		
A.5	Routine test to be witnessed at the factory by KPLC engineers	List		
B	Factory Acceptance Tests			
B1	Inspection of major components and accessories at the manufacturer's factory & post-delivery	State compliance		
B2-B3	FAT to be conducted in the factory	State compliance		
B4	Sample size and sampling procedure	specify		
B5	Tests to be conducted during FAT	List		
C	Inspection at Delivery Point			
C1	Inspection of good at KPLC stores	State compliance		
C2	The supplier shall replace/rectify without charge to KPLC, any defective equipment	State compliance		
D	Warranty			
D1	Warranty that goods are new and without defects	provide		
D2	Warranty for 12kV outdoor metering cubicle	provide		
D3	Warranty for electronic modules and cards	provide		
E1	Marking and name plate	Specify material of name plate, Mode of marking and details to be marked		
E2	Name plate mounting	state		
F	Spare parts			
F1	Manufacturer to list spares required and when required	List		
F2	Cost listed separately	state		
F3	Manufacturer/supplier commitment	state		
G.1	QUALITY MANAGEMENT SYSTEM			
G.2	QAP and ISO 9001:2008 or later	State		
	Copies of quality management certifications attached	State		

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G.3	Delivery time, Production capacity & experience of the manufacturer	State		
G.4	Customer reference letters	List		
G.5	Previous Performance			
H	Training at The Manufacturer’s Premises			
H.1	Training at Factory during FAT	State compliance		
H2-H5	Provide a program for training and topics to be trained, feedback on evaluation	Provide		
I&J	Local Training & Installation of equipment at KPI			
I.1-J	Local training and installation of the switchgear at KPI	Provide detail of program		
K. Technical documents to be submitted with tender documents				
K1	(i) Fully-filled clause by clause Guaranteed Technical Particulars (GTPs) - Appendix L - stamped and signed by the manufacturer.	state		
	(ii) Copies of the Manufacturer’s catalogues, brochures, drawings and technical data for the equipment;	state		
	(iii) Detailed drawings and step by step procedure for safe installation and correct commissioning process of the 12kV outdoor metering units, including recommended maximum earthing resistance values for safe operation	State		
	(iv) Details of the manufacturer’s experience; Sales records for the last five years and at least four customer reference letters.	state		
	(v) Manufacturing capacity	state		

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	(vi) 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 (all in English Language).	state		
	(vii) A copy of accreditation certificate for the laboratory (all in English Language)	provide		
	(viii) Manufacturers letter of authorization	State		
	(ix) Marking & Packaging details (including packaging materials).	state		
K2	Documents to be submitted Kenya Power for approval before manufacture/supply	State		
	(i) Fully filled clause by clause Guaranteed Technical Particulars (GTPs) stamped and signed by the manufacturer (these are not the ones submitted with the tender);	State		
	(ii) Technical details and drawings	State		
	(iii) Quality assurance plan (QAP)	State		
	(iv) Detailed test program to be used during factory testing	State		

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	(v) Marking details	State		
	(vi) Packaging details (including packaging materials and marking and identification of batches)	State		
	(vii) Manufacturer's undertaking	State		
K3	Submit recommendations for use, detailed user's installation guide, etc. during delivery	State		
K4	Routine and sample test reports to be submitted to Kenya Power for approval before shipment/delivery of the goods	State		

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

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

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