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Kenya Power

12kV OUTDOOR PROTECTION AND METERING BREAKER UNITS – SPECIFICATION

A Document of the Kenya Power & Lighting Co. Plc

November 2023

0.1 Table of Contents:

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0.2 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.

0.3 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	2023-11-02	New issue	Eng. S. Nguli	Dr. Eng. Kimemia
Issue No. 1 Rev. No. 1	2023-11-02	Modified Table 2 on Clause 4.5.1.13 for min clearances-phase to phase to ground.	Eng. B. Dianga	Dr. Eng. Kimemia
Issue No. 1 Rev. No. 1	2023-11-02	Amended Clause 4.5.1.13 to adjust the provisions for phase to phase and Phase to ground clearances		
Issue No. 1 Rev. No. 1	2023-11-02	Amended rated voltage on clause 4.5.2.1 from 240VAC to (rated nominal voltage (Un) 230VAC		
Issue No. 1 Rev. No. 1	2023-11-02	Amended clause 4.5.2.1 to include capacitor assisted magnetic actuated vacuum switching interruptions for braker		
Issue No. 1 Rev. No. 1	2023-11-02	Amended clause 4.5.4.4 to adjust the VT VA ratings from 150 to 300		
Issue No. 1 Rev. No. 1	2023-11-02	Amended clause 4.5.5.5 from metering class of 0.5 to a preferred 0.2.		
Issue No. 1 Rev. No. 1	2023-11-02	Amended CT ratings on clause 4.5.5.6 (table 4) from 400-200-100/5 to 400-200-100/1 for lower secondary currents		
Issue No. 1 Rev. No. 1	2023-11-02	Added a new Clause: 4.5.11.4 that specifies a requirement for sealable compartment for meter and terminal block.		
Issue No. 1 Rev. No. 1	2023-11-02	Modified Clause 4.2.13 to change IP requirements from 65 to 54		
Issue No. 1 Rev. No. 1	2023-11-02	Added in Appendix K, the Manufacturer's Warranty		

		requirements for manufacturers and bidders.		
Issue No. 1 Rev. No. 1	2023-11-02	Modified Clause 4.1 for pollution degree to class iv- very heavy		
Issue No. 1 Rev. No. 1	2023-11-02	Modified Clause 4.5.4 to include the casing design for the VT		
Issue No. 1 Rev. No. 1	2023-11-02	Modified Clause 4.5.6.5 to include the elements of the protection relay		

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0.4 FOREWORD

KPLC connects large power consumers on medium and high voltage service lines. Large power customers run and manage their own low-voltage network, which they reticulate to various load points.

In the past, medium and high voltage metering and protection have been done by an indoor panel sited in a customer provided space within the customer's premises.

As value of premises spaces increase, however, it's becoming difficult to get space to set up an indoor metering installation. Allocated spaces are increasingly becoming smaller and not adequate for the required metering installation. Moreover, it is usually not easy to maintain the recommended safe insulation clearances in hidden, small, difficult-to-access spaces. Cases of interferences with intent to tamper with the metering instruments have also been on the rise and this has been attributed to ease of access to the metering installation. Outdoor pole-mounted metering and protection equipment designs cater for the emerging space challenges and security and revenue protection needs in the medium voltage metering installation.

This specification stipulates the minimum requirements for the **12 kV Outdoor Protection and Metering Vacuum Circuit Breaker Units** that are acceptable for use in KPLC network. 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 this Kenya Power specification are responsible for its correct interpretation and application.

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

Name	Division
Benson Dianga	Standards
Peter Wanyonyi	Commercial Sales
Emmanuel Buluma	Central Construction
Vincent Achongo	Protection
Abdalla Chanzu	E/Plant Projects
Joseph Njoroge	Commercial Sales
Julius Ndirangu	Standards

1. SCOPE

1.1. This specification is intended to cover the design, manufacture, assembly, testing, supply and delivery of 12kV outdoor Protection and Metering Vacuum Circuit Breaker units. The scope includes installation and commissioning of the equipment for efficient and trouble-free service. The components in the unit include the 12kV Vacuum Circuit Breaker, current transformers, potential transformers, protection relays and metering instruments and associated accessories

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 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	High Voltage Metal Enclosed Switchgear & Control gears.
IEC 61869	Instrument Transformers
IEC 60255:	Electrical Relays
IEC 60529:	Degrees of protection provided by enclosures (IP Code)
ANSI C37:	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

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:-

a) Altitudes of up to 2200m above sea level

b) Humidity of up to 95%

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

d) Isokeraunic levels of up to 180 thunderstorm days per year.

e) Pollution (IEC 60815) Very Heavy: Class IV

4.2. GENERAL REQUIREMENTS.

4.2.1. The 12kV VCB Metering Unit shall be used in medium voltage system having characteristics listed in this specification.

4.2.2. The Unit shall be out-door type, designed for three phase operations and suitable for H-pole mounting. Single pole mounting where anchoring assemblies have clearly been shown through well done drawings 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.

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, from different manufacturers shall be 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 54

4.2.14. 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.

4.2.15. The design of protection and control schemes for the switchgear shall be subject to approval by KPLC

4.2.16. 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.

4.2.17. All wiring inside the switchgear shall be done with PVC insulated wire not less than 2.5 mm^2 s/c copper flexible cable except where its stated differently in other parts of this specification

4.2.18. A suitable wiring duct system having covers shall be installed and shall provide easy access for inspection and replacement of the wires.

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

4.3. PLANT COMPONENT DESIGN REQUIREMENTS

4.3.1. 12kV Vacuum Circuit Breaker

4.3.1.1. 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.

4.3.1.2. 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.

4.3.1.3. The circuit breaker and its operating mechanism shall be fully interlocked to prevent mal-operation.

4.3.1.4. All the breakers shall be supplied with necessary clamps and connectors suitable for appropriate current ratings.

4.3.1.5. Suitable arrangement of earthing the switchgears shall be provided. All the connecting bus bars and current carrying parts shall be made of electrolytic copper

4.3.1.6. 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.

4.3.1.7. 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.

4.3.1.8. Hinges of door shall be concealed type and of stainless-steel material to avoid rusting and obstructive opening of the door.

4.3.1.9. All the connecting bus bar and current carrying parts shall be made of copper.

4.3.1.10. All the gasket shall be of chemically treated neoprene.

4.3.1.11. Switchgear (Vacuum Circuit breakers etc.) and control gear (CTs, PTs, relays etc.) shall be mounted in the same units.

4.3.1.12. 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.

4.3.1.13. 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	17.5
6	Symmetrical Short – Circuit Rating		kA	31.5
7	Short-circuit current withstand, not less than 3 second		kA	31.5
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 μs kV_{peak})		kV	95
14	Test voltage at power frequency 1 min dry and wet. To earth and between phases		kV	38
15	Min Clearance	Phase to earth, min	mm	250
		Phase to phase, min	mm	300
17	Minimum nominal creepage distance as defined in IEC 60815, Table II		mm/kV	31

4.3.1.14. 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.

4.3.1.15. The Cubicle shall have an arrangement for emergency shunt tripping from remote place in addition to arrangement for local emergency tripping (Mechanical).

4.3.1.16. 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

4.3.1.17. All the six terminals shall be brought out through high quality bushings.

4.3.1.18. 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.

4.3.1.19. The cubicle shall have a provision for mounting of surge arresters and shall be supplied complete with surge arrestors.

4.3.1.20. The lifting arrangement shall not cause any effective loss of creepage distance/ phase to earth clearances as specified in the standard.

4.3.1.21. 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.

4.3.1.22. 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.

4.3.1.23. 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

4.3.1.24. All electrical and mechanical interlocks which are necessary for safe and satisfactory operation of the circuit breaker shall be provided

4.3.1.25. The 12kV VCB shall be equipped with power operated mechanism to operate all three phases simultaneously using 220/230V AC. The interrupters shall be either motor operated spring closing/opening mechanism or capacitor supported magnetic actuator technology.

4.3.1.26. It shall electrically and mechanically trip under various conditions. Cubicle shall also be provided with hand operated opening and closing mechanism. Operation counter and mechanically ON-OFF indicator shall be provided suitable for 10,000 operations.

4.3.1.27. The main circuit terminals shall be of high conductivity electrolyte grade copper. The terminal 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.

4.3.1.28. Connection terminals shall be sleeved with heat shrinkable sleeves of suitable voltage ratings. Special care shall be taken in the design of the terminal to provide for thermal expansion and to minimize the chances of bus fault.

4.3.1.29. 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.

4.3.1.30. 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.

4.3.1.31. 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.

4.3.1.32. 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.

4.3.1.33. 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.

4.3.2. **Voltage Transformer**

4.3.2.1. The VT shall be cast resin, able to operate normally and continuously with 115% of rated input voltage at normal service conditions.

4.3.2.2. 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.

4.3.2.3. Three numbers(3No.) single phase voltage transformer of the same rated output shall be required for each circuit breaker cubicle.

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

4.3.2.5. 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(min)		VA	300
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

4.3.3. **Current Transformer**

4.3.3.1. 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.

4.3.3.2. The rating of secondary winding shall be 1 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.

4.3.3.3. The rating of current transformers of all classes regarding ratio error, knee point voltage, resistance of secondary winding etc. shall have to be coordinated with the requirement of protective relays and protection scheme without any extra cost.

4.3.3.4. All the wires shall be lugged before termination on to the terminal blocks and on the devices to ensure durability of the connections.

4.3.3.5. The class 0.2 current transformer cores shall be connected directly to the Energy Meter compartment using a 4mm^2, 4/C steel armored multi-core control cable.

4.3.3.6. Technical Parameters of the 12kV current transformers shall be as per table 4 below

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	31.5 / 3
Rated continuous Thermal current	A	1.2 In

Transformation Ratio of CTs:400-200-100/1A			
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	kV	38
	Secondary		3

4.3.4. **Protection Relay**

4.3.4.1. 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.

4.3.4.2. 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.

4.3.4.3. 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. The relays shall be fully compatible to remote communication system and shall have facility for password protection.

4.3.4.4. 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.

4.3.4.5. The numerical relays shall have following features: -

i. Protection elements- 3 Phase O/C, E/F, and SEF

ii. Self-Diagnosis

iii. Minimum last five abnormal events recording (over current & earth fault) including fault level and phase along with date and time.

iv. On-line display of current.

v. Communicable with open Protocol having USB port.

vi. 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)

4.3.4.6. 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.

4.3.4.7. Besides the communication port, the relays shall have a human – machine interface facility (HMI) with LCD screen where one can easily access relay information.

4.3.4.8. Relay contacts shall be suitable for making and breaking the maximum currents, which they are required to control in normal service.

4.3.4.9. Operating time for auxiliary tripping relays shall not significantly affect the overall fault clearance time and short pick up time of less than 30ms.

4.3.4.10. Relay contacts shall make firmly without bounce and the relay mechanism shall not be affected by vibration or external magnetic fields.

4.3.4.11. Relays shall be provided with clearly inscribed labels describing their functions and IEC device function numbers.

4.3.4.12. 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

4.3.4.13. 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.

4.3.4.14. 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.

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

4.3.4.16. The relay for the Outdoor Metering Breaker shall be supplied with Laptop computers with relevant protection data and configuration drivers/files to modify, change and set parameters described in clause 4.3.4.5

4.3.4.17. A set of 10No. units or less, shall be supplied with one(1No.) laptop computer. The laptop specification shall include, but not be limited to, the following or higher specification as in Table 5.

Table 5: Laptop Technical Specifications

Description	Mandatory & Minimum Requirements
Operating system	Windows 11Pro (64 Bit)
Processor family	11th Generation Intel® Core™ i7 processor
Display	15-inch
Memory	8 GB DDR4 SDRAM (onboard)
Hard drive	512 GB PCIe NVMe M.2 SSD
Keyboard	Full-size Island-Style keyboard, split resistance
	One-piece precision TouchPad
Ports/Slots	2 x USB-A 3.2 Gen 1
	1 x USB-C 3.2 Gen 2
	1 headphone/microphone combo
	Mandatory: HDMI 2.1 Port
	3-in-1 microSD card reader
	Mandatory: Ethernet Port (RJ45)
Power supply type	65 W AC Power Adapter
Connectivity	Wi-Fi 5 or 6
	Bluetooth® 5.2 Combo
Primary battery	4-cell, 53 Wh Li-ion Polymer
Graphics	Integrated: UHD Graphics
Audio	2 x 2W Speakers with Dolby Atmos
	Dual Array Mics
Camera	720p HD with webcam privacy shutter
Manufacturer's Warranty	1 (One) Year

4.3.5. HT Trivector Meter

4.3.5.1. A 3 phase 4 wire A.C. Static Meter of accuracy class 0.2 for measurement of energy shall be provided for each 12KV outdoor VCB unit. The meters shall be Current and Potential

Transformers Connected types as per the latest KPLC specification referenced KP1-13D-4-1-TSP-14-020.

4.3.5.2. The class 0.2 of energy metering cores for CT and VT shall be connected directly to the energy meter compartment using a 4mm^2, 4-core steel armored multi-core control cable.

4.3.5.3. The meter shall be mounted on a sealable compartment. A suitable terminal block for cables connecting CT, VT and VCB shall also be provided with provision for sealing.

4.4. OPERATIONS AND ACCESSORIES REQUIREMENTS

4.4.1. Auxiliary Power Supply

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

4.4.1.2. The Ratio and Power rating of the power VT shall be 11000/230 VAC, 500VA limit output and a Minimum burden of 300 VA or other higher rating adequate to meet the auxiliary supply requirement for the equipment

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

4.4.1.4. 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.

4.4.1.5. 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.

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

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

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

4.4.2. Terminal Block (TBs)

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

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

4.4.2.3. 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.

4.4.2.4. 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.

4.4.2.5. 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.

4.4.2.6. 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.

4.4.2.7. 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.

4.4.3. Switchgear Earthing

4.4.3.1. 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.

4.4.3.2. 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.

4.4.3.3. 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 31.5 kA for 3 seconds.

4.4.4. Indications and Instruments

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

4.4.4.2. 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

4.4.4.3. 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 230 V AC supply and shall have low

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

4.4.4.4. 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.

4.4.5. **Installation of 12kV Outdoor Metering Unit**

4.4.5.1 One 12kV outdoor metering cubicle shall be installed at Institute of Energy Studies and Research (IESR) in Nairobi to demonstrate correct installation of the 12kV outdoor metering cubicle by the manufacturer.

4.4.5.2 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.

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

4.4.6. **Manufacturers Recommended Spares**

4.4.6.1 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.

4.4.6.2 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.

4.4.6.3 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.

5 TESTS AND INSPECTION (NORMATIVE)

5.1 Test Requirements

5.1.1 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

5.1.2 **Type Tests:** Certificates of type test reports for each constituent unit 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) Electrical Endurance Test
(viii) Critical Current Test
(ix) Short time withstand and Peak withstand current tests
(x) Control electronic elements surge withstand capability tests

5.1.3 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.

5.1.4 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.

5.1.5 **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.

5.2 **Factory Acceptance Test**

5.2.1 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.

5.2.2 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).

5.2.3 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

5.2.4 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.

5.2.5 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

5.3 Inspection and Delivery

5.3.1 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.

5.3.2 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.

6 WARRANTY

6.1 The supplier/manufacturer warrants the purchaser that all goods supplied under this contract shall have no defect arising from design, materials or workmanship.

6.2 A warranty of 12 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.

6.3 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.

7 MARKINGS AND LABELLING

7.1 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

7.2 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.

8 TRAINING

8.1 Training at The Manufacturers Premises

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

8.1.2 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.

8.1.3 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.

8.1.4 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.

8.1.5 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.

8.2 Local Training

8.2.1 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).

8.2.2 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.

APPENDICES

APPENDIX A: QUALIFICATION OF THE MANUFACTURER (NORMATIVE)

A.1. The manufacturer who shall be considered for tender award shall among other requirements outlined in the bidding fulfil the following requirements:

A.2. **Quality Assurance**: The manufacturer shall possess a valid ISO 9001: 2015 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.

A.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

A.4. **Letters of Customer Satisfaction:**
Letters of satisfaction from four (4) overseas customers for supply of metering unit or similar equipment offered in this tender. The letters of satisfaction shall bear the rubber stamp of the purchasing utilities and the name and signature of the author of the letter.

A.5. **Previous Performance:**
12kV outdoor metering units with previous poor performance in Kenya Power shall not be considered.

APPENDIX B: DOCUMENTATION (NORMATIVE)

B.1. The bidder shall submit its tender complete with technical documents required (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) Manufacturer ISO 9001:2015 Certificate and other technical documents required in the tender.

(ix) Manufacturers Warranty and Authorization

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

(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. That fulfil the requirements of ISO 9001:2015

(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 B.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.

B.3 Submit recommendations for use, detailed user's installation guide, etc. during delivery

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APPENDIX C: 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 Response
	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	
1.0	Scope:		
2.0	Reference standards	state	
3.0	Definitions		
4.0	**REQUIREMENTS**		
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	
4.2.9	Weatherproof design and minimal risk of fire; prevent ingress of vermin and dust and accidental contact	Provide design details	

Clause	Description	KPLC Requirement	Supplier's Response
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	
4.2.14	Control, indications, alarms and protection devices	Provide	
4.2.15	Design of protection and control schemes subject to approval by KPLC	Comply	
4.2.16	Terminal block	Provide	
4.2.17	Wiring material for the switchgear	2.5mm² PVC cables	
4.3.5	Safety and interlocking schemes	provide	
4.3	**PLANT COMPONENT DESIGN REQUIREMENT**	Specify	
4.3.1	**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	
4.3.1.1	Type of interrupter employed	Vacuum	
	Material enclosing circuit breaker	CRCA sheet steel of 3 mm thickness	
4.3.1.2	Supporting frame and accessories	Provide	

Clause	Description		KPLC Requirement	Supplier's Response
4.3.1.3	CB interlocks		Specify and provide wiring schematics	
4.3.1.4	Clamps and connectors rated 630A		To be provided	
4.3.1.5	Earthing studs on the cubicle		To provide and all	
	Earthing material to be copper		Provide	
4.5.1.6	Installation of CB		Outdoor	
4.3.1.7	CB mechanism class		M-2	
4.3.1.8	Corrosion resistance material and hinging of the doors		Specify materials to be used	
4.3.1.9	Connecting busbar & current carrying parts to be made of copper		Confirm	
4.3.1.10	Material of manufacture of gasket - neoprene		Confirm	
4.3.1.11	Integral units of CB, CT, VTs		Specify over	
4.3.1.12	Bus bar insulation material, and busbar ratings		specify	
4.3.1.13	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		31.5kA	
(viii)	Rated short circuit current and withstand [attach type test report]		31.5kA, 3 sec	
(ix)	Circuit breaker operating sequence [attach type test report]		0-0.3SEC-CO-3 MIN-CO	
(x)	Clearance	Phase to earth, min	300	

Clause	Description	KPLC Requirement	Supplier's Response
	Phase to phase, min	250	
(xi)	Creepage distance, mm/kV	31	
(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	
4.3.1.14	Instruments mounted on the switchgear cubicle.	specify	
	Shall be suitable for AC shunt tripping arrangement	specify	
4.3.1.15	Emergency trip facility	specify	
4.3.1.16	Healthy trip circuit check facility	Specify	
4.3.1.17	Type of bushing provided	specify	
4.3.1.18	Material for contacts	specify	
4.3.1.19	Provision for surge arrestors	provide	
4.3.1.20	Proximity of lifting arrangement to live parts	specify	
4.3.1.21	Material of contacts and thickness of silver plating, standard	specify	
4.3.1.22	Silver plated contacts	specify	
4.3.1.23	Endurance requirements	specify	
4.3.1.24	Mechanical and electrical interlocks provided	specify	
4.3.1.25	Power operated mechanism for simultaneous operation	State	

Clause	Description		KPLC Requirement	Supplier's Response
4.3.1.26	To be provided	Hand operated spring charging closing mechanism	Specify	
		Operation counter	Specify	
		Mechanically ON-OFF indicator suitable for 10,000 operations	Specify	
4.3.1.27	Material of terminals and joints, jointing		Specify	
4.3.1.28	Material of Sleeves		Specify	
4.3.1.29	Type, material of bushing and standard of manufacture		state	
4.3.1.30	Characteristic of the bushing material		specify	
4.3.1.31	Test on bushing material		specify	
4.3.1.32	Mounting requirements for protection		specify	
4.3.1.33	Number, material of lock nuts. And Sealing of any joints		state	
4.3.2	**Voltage Transformers (VT)**			
	Manufacturers name		State	
	Manufactures letter of authorization		Provide	
	Type or designation number of VT		State	
	Applicable standard		state	
4.3.2.1	Type of current transformer and material of core		specify	
4.3.2.2	Protection required		State	
4.3.2.3	PTs per breaker		State	
4.3.2.4	Winding type		Specify	
4.3.2.5	Technical Parameters			
i	Rated voltage of offered VT		12	
ii	1-minute power frequency withstand voltage [attach routine test report]	**Primary**	28KV	
		secondary	3kV	
iii	Impulse voltage withstands [attach copy of type test report]		95KV	

Clause	Description	KPLC Requirement	Supplier's Response
iv	Ratio: 12KV/120V	specify	
	Core 1: 300VA, cl 0.2	specify	
v	Rated Voltage factor	Rated Voltage factor	
vi	Primary fuses	Provide	
vii	Type of insulation	Specify	
4.3.3	**Current Transformers (CT)**		
	Manufacturer's name	Indicate	
	Manufacturer's letter of Authorization	Provide	
	Type or designation number of CT	state	
	Applicable standard	state	
4.3.3.1	Type of current transformer and material of core	specify	
4.3.3.2	Rating of secondary winding	specify	
4.3.3.3	Ratio error, Knee point voltage, Secondary winding resistance	state	
4.3.3.4	Cable terminations in the terminal block	State	
4.3.3.5	Class 0.2 CT cores connection to the Energy Tariff Meter	specify	
4.3.3.6	Technical parameters of CTs		
(i)	Rated voltage & frequency of offered CT	12kV,50Hz	
(ii)	Rated continuous thermal current	1.2In	
(iii)	Rated transformation	400-200-100/1A	
(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]	31.5kA, 3 sec	
(vii)	**Core details**		
	Core 1 - 15VA, 5P15	State	
	Core2 - 15VA, cl 0.2	state	

Clause	Description	KPLC Requirement	Supplier's Response
(viii)	Accuracy Limiting factor	15	
(ix)	Maximum Instrument Security Factor	5	
4.3.4	**Protection Relays**		
	Manufacturer's Name	State	
	Manufacturer's letter of Authorization	Provide	
	Applicable standard	state	
	Protection and Control Relay		
4.3.4.1	Relay shall be of Numeric Design, SCADA compatibility of relay	**State**	
	Size of Relay LCD screen	State	
4.3.4.2	Power supply of relay and breaker operation	specify	
4.3.4.3	Relay warranty	5 years	
	broken conductor protection	specify	
	Minimum storage of previous fault values	specify	
	Communication Provisions	specify	
4.3.4.4	Characteristics of terminal block	specify	
4.3.4.5	Features of the numerical relay	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	Provide	
(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	
(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 4mm2 cable.	specify	
(xii)	Fault Records storage capacity	state	
(xiii)	Events storage capacity	state	
(xiv)	Disturbance Record storage capacity	state	

Clause	Description	KPLC Requirement	Supplier's Response
(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	
4.3.4.6	For flush mounting on units surface, numerical design.	State	
4.3.4.7	Display and HMI provisions	State	
4.3.4.8	Relay contacts suitable for making and breaking the maximum currents	State	
4.3.4.9	Operating time for auxiliary tripping relays not significantly affects overall fault clearance time and short pick up time	specify	
4.3.4.10	Contacts to make firmly without bounce	specify	
	Mechanism not affected by vibration or external magnetic fields	specify	
4.3.4.11	Clearly inscribed labels describing their functions and IEC device function numbers	specify	
4.3.4.12	Coils operating on DC shall not be continuously connected from the positive pole of the battery supply	specify	
4.3.4.13	Thermal rating - fault clearance times shall not exceed the thermal withstand capability of the relay. (Max. fault current = 16 kA).	specify	
4.3.4.14	All the relays to be provided with test blocks as specified	specify	
4.3.4.15	EMC 89/126/EEC compliant.	state	
4.3.4.16	Provision of Laptop for configurations	State	
4.3.4.17	Laptop Specifications	specify	
4.3.5	**HT Trivector Meter**		
4.3.5.1	Manufacturers name & standard of manufacture	specify	
	Type or designation name of the units	specify	
	units suitable for flush mounting	specify	

Clause	Description	KPLC Requirement	Supplier's Response
4.3.5.2	Parameters measured	specify	
	Class of accuracy of measurement	specify	
	Configuration of the units (3 phase + 4 wire) and size of cables	specify	
4.3.5.3	Sealable Compartment for Meter, and terminal block for CT, VT and VT	specify	
4.4	**OPERATIONS AND SERVICE REQUIREMENTS**		
4.4.1	**Auxiliary Power Supply**		
4.4.1.1	Provision of VT for auxiliary supply complete with mounting fixtures	specify	
4.4.1.2	VT voltage rating and burden	specify	
4.4.1.3	AC Power burden of the recloser control	specify	
4.4.1.4	VT mounting frame	specify	
	Mode of protection of VT secondary output		
4.4.1.5	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)	
4.4.1.6	Battery capacity	specify	
4.4.1.7	Guarantee for the batteries	specify	
4.4.1.8	Manuals and drawings	provide	
4.4.2	**Terminal Blocks**		
4.4.2.1	Terminal blocks ratings	Control cables to be rated 600V	
4.4.2.2	Cables to be code as per circuit under control	State compliance	
4.4.2.3	Approval of drawings by KPLC	State	
4.4.2.4	Shorting links	provide	

Clause	Description	KPLC Requirement	Supplier's Response
4.4.2.5	Isolation links (sliding Links)	specify	
4.4.2.6	Identification and distinguishing marks on the terminal block	specify	
4.4.2.7	Identification of terminal blocks	specify	
4.4.3	**Switchgear Earthing**		
4.4.3.1	Provision for Earthing studs and lugs	provided	
4.4.3.2	Type & size of earthing conductor and rated voltage	specify	
4.4.3.3	Adequacy of earthing conductor for external connection	specify	
4.4.4	**Indicating Lamp Holders**		
4.4.4.1	Mounting, manufacturer's name & standard of manufacture	State	
4.4.4.2	Indicating lamps on the control board for:	State	
	ON, OFF	State	
	PT supply	State	
	Trip circuit	State	
	Auto trip	State	
4.4.4.3	Manufacture, rated voltage and power consumption	230V, <2.5W	
(ii)	Duty	Continuous	
(iii)	Duration of service	>10 years	
4.4.4.4	Indication lamp	State	
4.4.5	**Installation od 12kV Outdoor Metering Unit**		
4.4.5.1	Provide a unit for installation demonstration at IESR	State	
4.4.5.2	Installation to be supervised by a representative of the manufacturer	State	
4.4.5.3	Demonstration installation to be carried out as part of the training	State	
4.4.6	**Manufacturers Recommended Spares**		
4.4.6.1	Manufacturer to list spares required	State	
4.4.6.2	Cost listed separately	State	
4.4.6.3	Manufacturer/supplier commitment	State	

Clause	Description	KPLC Requirement	Supplier's Response
5.0	**TEST AND INSPECTION**		
5.1	**Test Requirements**	State	
5.1.1	Test standards	List	
5.1.2	Type test certificates submitted with tender for evaluation	List	
5.1.3	Accreditation testing laboratory	State	
5.1.4	Copies of previous type test and routine test reports by the relevant independent /international testing laboratory submitted State/List	List	
5.1.5	Routine test to be witnessed at the factory by KPLC engineers	List	
5.2	**Factory Acceptance Tests**		
5.2.1	Inspection of major components and accessories at the manufacturer's factory & post-delivery	State compliance	
5.2.2	FAT to be conducted in the factory	State compliance	
5.2.3	Sample size and sampling procedure	specify	
5.2.4	Tests to be conducted during FAT	List	
5.3	**Inspection at Delivery Point**		
5.3.1	Inspection of good at KPLC stores	State compliance	
5.3.2	The supplier shall replace/rectify without charge to KPLC, any defective equipment	State compliance	
6.0	**WARRANTY**		
6.1	Warranty that goods are new and without defects	provide	
6.2	Warranty period for 12kV outdoor metering cubicle	provide	
6.3	Warranty for electronic modules and cards	provide	
7.0	**MARKING & LABELLING**		
7.1	List Items for Name plate	State	
7.2	Name plate mounting	state	
8.0	**TRAINING**		
8.1	**Training at The Manufacturer's Premises**		

Clause	Description	KPLC Requirement	Supplier's Response
8.1.1	Training at Factory during FAT	State compliance	
8.1.2-8.1.4	Provide a program for training and topics to be trained, feedback on evaluation	Provide	
8.2	**Local Training & Installation of equipment at IESR**		
8.2.1-8.2.2	Local training and installation of the switchgear at IESR	Provide detail of program	
	APPENDICES		
	APPENDIX A: QUALITY MANAGEMENT SYSTEM		
A.1	QAP and ISO 9001:2015	State	
A.2	Copies of quality management certifications attached	State	
A.3	Delivery time, Production capacity & experience of the manufacturer	State	
A.4	Customer reference letters	List	
A.5	Previous Performance	List	
	APPENDIX B: TECHNICAL DOCUMENTATION		
B.1	The bidder will provide the following documents for the bid	state	
	(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	state	

Clause	Description	KPLC Requirement	Supplier's Response
	years and at least four customer reference letters.		
	(v) Manufacturing capacity & experience	state	
	(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) Copy of accreditation certificate to ISO/IEC 17025 for the third-party testing laboratory;	provide	
	(viii) Manufacturer ISO 9001:2015 Certificate and other technical documents required in the tender	State	
	(ix) Manufacturers Warranty and Authorization	state	
B2	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	
	(v) Marking details	State	
	(vi) Packaging details (including packaging materials and marking and identification of batches)	State	
	(vii) Manufacturer's undertaking	State	

Clause	Description	KPLC Requirement	Supplier's Response
B3	Submit recommendations for use, detailed user's installation guide, etc. during delivery	State	

** Words like 'agreed', 'confirmed' complied, '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