DOCUMENT NO. : KP1/13D/4/1/TSP/14/020

Kenya Power

CURRENT AND POTENTIAL TRANSFORMER CONNECTED METERS - SPECIFICATION

A Document of the Kenya Power & Lighting Co. PLC
May 2023

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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

In order 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.

0.2 AMENDMENT RECORD

Rev No.	Date (YYYY-MM-DD)	Description of Change	Prepared by (Name & Signature)	Approved by (Name & Signature)
Issue 2 Rev 1	2017-12-13	Cancels and replaces KP1/10A.2B/3/3/01 dated … and all other previous issues	John Ng'ang'a Patricia Ngaaga	Dr. Eng. Peter Kimemia
Issue 2 Rev 2	2023-05-09	Cancels and replaces KP1-6C-4-1-TSP-14-020 … and all other previous issues	Eng. B. Dianga	Dr. Eng. Peter Kimemia
Issue 2 Rev 2	2023-05-09	Amended the Scope-Clause 1 to include area of application for the meter		
Issue 2 Rev 2	2023-05-09	Amended clause 4.2.6 to include retaining mechanism for the terminal cover screws.		
Issue 2 Rev 2	2023-05-09	Amended Clause 4.3.5 to specify that DLMS certificate requirement from any accredited ISO/IEC 17025 laboratory		
Issue 2 Rev 2	2023-05-09	Amended clause 4.3.6 to better define requirements for Modbus communication requirements		
Issue 2 Rev 2	2023-05-09	Modified original clause 4.3.10 to remove USSD CSD communication requirements for the meter.		
Issue 2 Rev 2	2023-05-09	Modified clause 4.16.8 for HHU battery rating requirements for standard manufacturing rating of 2000mAH		

0.4 FOREWORD

The Commercial Service and Sales have prepared this Specification in collaboration with Standards Department, Meter Central Laboratory, Infrastructure Development, CT and Network Management, all of The Kenya Power & Lighting Company PLC (KPLC). It lays down requirements for current and voltage connected static meters, for use in Advanced Metering Infrastructure (AMI) system for large industrial and commercial loads including metering for power generating stations.

In preparation of this specification, reference was made to IEC 62053-22:2003. A new format of writing specifications as guided by KEBS was also adopted.

Customer service division has previously kept their own specifications. The company is however in the process of standardizing all specifications through the Standards Department. This therefore serves to promote standardization.

This specification stipulates the minimum requirements for the meters 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, good workmanship and good engineering practice in the manufacture of the meters for KPLC.

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

Name	Division
Peter Wanyonyi	Commercial Service and Sales
Benson Dianga	Standards
Nancy Wairimu	Standards
Cleophas Ogutu	Infrastructure Projects
John Kenyanya	Meter Central Laboratory
John Kinyua	Procurement

1. SCOPE

1.1. This specification is for current and potential transformer connected static meters for measurement of alternating current active energy in 50Hz networks.

1.2. The specification stipulates the minimum requirements for current and potential transformer connected static meters for use in KPLC's system.

1.3. Meters are for use in KPLC's Advanced Metering Infrastructure (AMI) system.

1.4. The specification also describes the inspections and tests to be carried out on the meters as well as Schedule of Guaranteed Technical Particulars (GTP) to be filled and signed by the manufacturer and submitted with bids for tender evaluation.

1.5. It shall be the responsibility of manufacturer to ensure adequacy of the design, good workmanship, good engineering practice and adherence to the specifications and applicable standards and regulations in the manufacture of the meters.

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 will apply; for undated editions the latest edition of the referenced document shall apply.

IEC 60529:1989.	Degrees of protection provided by enclosures (IP Code).
IEC 62052-11:2003	Electricity Metering equipment (a.c.) – General Requirements, Tests and Test Conditions - PART 11: Metering equipment.
IEC 62053-22:2003	Electricity metering equipment (a.c.) – Particular Requirements - Part 21: Static meters for active energy (Classes 0.2s and 0.5s).
IEC 62054-21:2004	Electricity metering (a.c) – Tariff and Load Control- part 21: Particular requirements for time switches.
IEC TR 62055-21:2005	Electricity metering – Payment systems – Part 21: Framework for Standardization.
IEC 62055-31:2005	Electricity metering – Payment systems – Part 31: Particular requirements – Static payment meters for active energy (classes 1 and 2).

IEC 62055-41	Electricity metering-Payment systems-Part 41: Standard transfer specification (STS) - Application layer protocol for one - way token carrier systems.
IEC 62056-21:2002	Electricity Metering – Data exchange for meter reading, tariff, and load control – Part 21: Direct local data exchange.
IEC 62056-46:2006	Electricity metering – Data exchange for meter reading, tariff and load control – Part 46: Data link layer using HDLC protocol.
IEC 62056-53:2006	Electricity metering – Data exchange for meter reading, tariff and load control – Part 53: COSEM Application layer.
IEC 62056-61:2006	Electricity metering – Data exchange for meter reading, tariff and load control – Part 61: OBIS object identification system.
IEC 62056-62:2006	Electricity metering – Data exchange for meter reading, tariff and load control – Part 62: Interface classes.

3. DEFINITIONS AND ABBREVIATIONS

For the purpose of this specification the definitions given in the reference standards shall apply and the following abbreviations:

CIU:	Customer Interface Unit
COSEM:	Companion Specification for Energy Metering
DLMS:	Device Language Message Specification
EDIS:	Energy Data Identification System
EMC:	Electromagnetic Compatibility
GPRS:	General Packets Radio Service
GSM:	Global System for Mobile communications
I_b:	Basic current of an electric meter
I_{max}:	Maximum current of an electricity meter
I_n:	Nominal current of a transformer coupled electricity meter
IEC:	International Electrotechnical Commission
ISO:	International Organization for Standardization
LED:	Light Emitting Diode

LCD:	Liquid Crystal Display
KPLC:	The Kenya Power & Lighting Co. PLC
PLC:	Power Line Communication
RF:	Radio Frequency
TCP/IP:	Transmission Control Protocol/Internet Protocol
kWh:	Kilowatt hour
kVARh:	Kilovolt ampere reactive hour
AMI:	Advanced Metering Infrastructure
USSD:	Unstructured Supplementary Service Data
CSD:	Circuit Switched Data
GMAC:	Galois Message Authentication Code
MDMS:	Meter Data Management System

4.16.1 Meter Data Management System (MDMS).

4. REQUIREMENTS

4.1. SERVICE CONDITIONS

The meters shall be suitable for use outdoors in tropical areas and harsh climatic conditions including areas exposed to:

a) At altitudes of up to 2200m above sea level and humidity of up to 95%,

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

c) Pollution: Design pollution level to be taken as "Heavy" (Pollution level III) for inland and "Very Heavy" (Pollution level IV) for coastal applications in accordance with IEC 60815.

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

4.2. METER COVER, BASE AND TERMINALS

4.2.1. The meters shall be constructed as 3 phase 4-wire meters.

4.2.2. The meters shall be of the relevant British Standard (BS) 5685-foot print for standardized mounting for asymmetrical (BS) wiring.

4.2.3. The meters shall be of front projection mounting.

4.2.4. The meters shall have terminals with bottom entry for cables and the arrangement shall be L1V1L1: L2V2L2: L3V3L3: NN.

4.2.5. The meter front cover shall have a window (clear glass or polycarbonate) for reading the display and for observation and the terminal cover shall be transparent with sealable Nickel-plated steel

4.2.6. The nickel-plated steel screw shall be long enough for firm holding of the cover, and shall have a stopper/retaining mechanism to prevent the screw falling off when unscrewed.

4.2.7. The terminal cover shall be of transparent material. The external communication modem/module shall be equipped under the terminal cover.

4.2.8. The meters shall be ultrasonically sealed for life and there should be no screws on the body except for the termination of cables.

4.2.9. The meters shall be equipped with lockable / sealable push buttons where such buttons are used to change some meter parameters.

4.2.10. The meters' terminal cover shall be of the long type with cable entry knock-offs.

4.2.11. The meters potential links shall be inside the meter body and shall only be accessed by opening the meter body cover.

4.2.12. Terminal holes shall be of sufficient size to accommodate cables of at least 6mm diameter and depth of 15mm

4.2.13. The meters terminal holes and screws shall be made of nickel-plated brass for high strength and high conductivity.

4.2.14. The meters shall have a sealing provision for terminal cover that is sealable with utility wire seals. The meter shall have terminal cover open detection. Once the terminal cover is opened, the load shall be disconnected.

4.2.15. The meters shall conform to the degree of protection IP54 as given in IEC 60529.

4.2.16. The dimensions of the meter must not exceed the following values:

Width : 180 mm, Length : 300 mm, Height : 90 mm

4.3. COMMUNICATIONS

4.3.1 The meters shall have integrated GPS module for use in locating of the meter.

4.3.2 The meters shall have two separate pulse outputs (LED) indicators for testing and indication of kWh and KVARh meter measurement.

4.3.3 The meters shall be compliant with the DLMS/COSEM

4.3.4 The Meter shall be able to communicate with a remote central system using a plug in modem/module, through the GSM/GPRS, dual band for operation in the 3G networks.

4.3.5 The modem shall support meter communication protocols as per DLMS/COSEM standards. DLMS certificate from an ISO/IEC 17025 accredited laboratory shall be provided.

4.3.6 The meters shall be equipped with a single channel RS485 communication interface. The meters support remote reading via AMI system existing in Kenya Power. The remote Communication protocol shall be compliant with DLMS/COSEM, IEC62056.

4.3.7 The meters shall support two-way communication.

4.3.8 The meters shall be equipped with RF port to support communication with the hand held unit on site for a distance not less than 50 meters. The hand held units to be used in data reading shall meet all the requirements in clause 4.16

4.3.9 The meter shall be designed with a plug and play communication module that can be replaced at site without powering off the meter.

4.3.10 The manufacturer shall facilitate interfacing of the meters communication with the existing AMI System.

4.3.11 The meters shall be equipped with an infrared optical port with baud rate of 1200 - 9600 for meter programming and data downloading, according to IEC62056 -21.

4.3.12 The data communication is with encryption and authentication, mechanism is method 5 (GMAC).

4.3.13 The meter shall report to the AMI system when it is power on or off.

4.3.14 The meters shall have the relevant software for programming and reading out data.

4.3.15 The meters shall be programmable to allow the user to change parameters on the installation configuration and in particular the voltage and current transformation ratios. The transformation factor shall be greater or equal to 4000(≥4000).

4.3.16 Access to meter parameters and programming information shall only be through user-level password(s).

4.3.17 The meters software shall support 3 access levels:

a) No security - The lowest level of security would allow users to read specified data fields without password

b) Low level security - The level of security would allow users with the appropriate password to read specified data fields in the meter.

c) High level security - The highest level of security would allow users with the appropriate password to reconfigure the meter with a new program.

4.3.18 The meter program shall be capable of tracking user access to the meter.

4.3.19 Two laptop computers of specified features (or better) and two optical probes, for programming the meter data shall be provided at no extra cost. The laptop specifications are listed in Appendix G

4.3.20 Ten(10) Hand Held Units (see clause 4.16 for the hand-held units' requirements) shall be supplied for every 600 meters. For meter supplies less than or greater than 600 a simple ratio shall be applied to establish the number of HHUs to be supplied.

4.4. METER DISPLAY

4.4.1 The meters shall have a backlight seven-segment Liquid Crystal Display (LCD) for displaying parameters and measured values.

4.4.2 The meters shall have a backlight-LCD with at least ten (10) numerical characters comprising of selectable integers and No decimal points for energy measurement. Individual digit size shall be minimum 4 mm wide x 8 mm high.

4.4.3 The meters LCD shall have 6-digit ID codes that are OBIS compliant. In addition, the meters shall be DLMS/COSEM protocol compliant (IEC 62056).

4.4.4 The display must be associated with push buttons for parameter scrolling. LCD is to be clearly readable within a viewing angle ±15° in either the horizontal or vertical direction. Nominal diminutions of the display shall be 75 mm x 23 mm.

4.4.5 Meters shall support information reading via optical communication port at site even when mains power supply fails.

4.4.6 The meters shall be capable of continuous display of the presence or absence of individual phase voltages.

4.4.7 The meters LCD shall be capable of displaying various tampering conditions of the meter.

4.4.8 The display parameters shall be configurable by software action.

4.4.9 The LCD display shall operate in at least two modes, namely, basic and extended data list display using push buttons on meter front.

4.4.10 Meters shall have provision for reading the meter at site even when mains power supply fails.

4.5. REAL TIME CLOCK AND MEMORY

4.5.1 The meters shall have a real-time clock controlled by a quartz crystal oscillator. It shall be possible to reset the clock without loss of billing data.

4.5.2 The accuracy of the clock shall be maximum 0.5s and shall meet the requirements of IEC 62054-21.

4.5.3 The meters shall have remote and local synchronization capability.

4.5.4 The Clock shall have a configurable calendar type either as MMDDYY, DDMMYY or YYMMDD.

4.5.5 The meters shall have a backup power supply to run the calendar clock for a minimum of 1 year without mains supply.

4.5.6 If the backup is by means of Lithium battery it shall have a shelf life of ten (10) years.

4.5.7 The meters shall have a non-volatile memory capable of data storage and with long-term data retention for the certified life of the meter or 15 years, whichever is greater without an electrical supply being supplied to the meter.

4.6. FUNCTIONALITY AND LOAD CONTROL

4.6.1 The meters shall be equipped with auxiliary terminals for inputs and outputs.

4.6.2 For inputs, it shall be equipped with:

a) At least two (2) control signal inputs, the voltage signal can be 232Vac.

b) At least 4 Impulse signal inputs, the Impulse signal shall be an open/close signal.

4.6.3 For outputs, it shall be equipped with:

a) At least 4 control signal outputs, the control signal shall be an open/close signal, with maximum 400Vac/dc, 100mA.

b) At least 4 Impulse signal outputs, the Impulse signal shall be an open/close signal, with Maximum 250VDC, 27mA.

4.6.4 The meters shall detect significant reverse energy (SRE) when the line and load wires are swapped.

4.6.5 The meters shall continue to operate correctly and record in forward register during SRE detection.

4.7. TIME-OF-USE TARIFF MEASUREMENTS

4.7.1 The meter shall support main tariff table and passive tariff table, with the following parameters:

a) Up to 4 seasons, 4 weekend table,

b) 8 daily tables,

c) Up to 8 divisions per day,

d) Up to 4 tariffs.

4.7.2 The meters shall have four-day types namely weekday, Saturday, Sunday and Special/Holiday with switching times set independently.

4.7.3 The meters shall have at least forty (40) special days to take care of national holidays, world days and Easter holidays.

4.7.4 The meters shall be capable of measuring and displaying time-of-day demand (kW and kVA) consumption up to four tariff registers.

4.7.5 The meter shall have at least eight (8) registers for energy.

4.7.6 The meters shall have at least six (6) registers for maximum demand.

4.7.7 Each tariff register shall be set to operate over defined time periods during a 24-hour day.

4.8. ENERGY MEASUREMENTS

4.8.1 The meters shall be capable of measuring and displaying active, reactive and apparent energy consumption in both import and export modes.

4.8.2 The meters shall measure demand in two flow directions, namely; import and export.

4.8.3 The meters principal unit for measurement of energy shall be the kilowatt-hour (kWh). The meter shall be capable of measuring demand in KVAr, kVA and kW.

4.8.4 The meters shall measure reactive energy and demands in four quadrants up to 4 tariffs.

4.8.5 The energy registers shall be capable of displaying these measured parameters in either kilo-, Mega- or Giga-.

4.8.6 The meters shall be capable of measuring energy in security mode and also record reversed units in forward register.

4.8.7 The meters shall have a facility to indicate reverse connection and reversed units.

4.8.8 The meters shall have a capability of closing end of billing period on any selected date and time of the month selectable by software.

4.8.9 The meter's billing registers shall not be re-settable to zero readings.

4.8.10 The meters shall have at least eighteen (18) billing historical data stored in memory and retrievable by software action. The current billing/historical data shall be available on meter display for reading and billing purposes.

4.9. DEMAND MEASUREMENTS

4.9.1 The meters shall be capable of measuring and displaying active, reactive and apparent demand consumption in both import and export modes.

4.9.2 The meters shall display demand values and their time and date stamps.

4.9.3 The meters shall measure demand correctly even when the phase rotation/sequence is incorrect.

4.9.4 The meters shall have a capability of closing end of billing period on any selected date of the month selectable by software.

4.9.5 The meters shall have at least eighteen (18) billing historical data stored in memory and retrievable by software action. The current and billing/historical data shall be available on meter display for reading and billing purposes.

4.9.6 The meters shall be able to measure, display and store average power factor (PF) in independent import and export registers. The average PF is defined as the ratio of kWh to kVAr over a billing period/ over one month.

4.9.7 The demands registers shall be capable of displaying these measured parameters in either kilo-, Mega- or Giga-.

4.10. INSTRUMENTATION DATA MEASUREMENTS

4.10.1 The meters shall be capable of displaying instrumentation data namely instantaneous phase voltages and currents, phase angles, and power factor.

4.10.2 The meters shall be capable of measuring and displaying instantaneous power (active, reactive and apparent).

4.10.3 The meters shall be capable of measuring and displaying average power factor for the current and the previous billing months.

4.10.4 The meters shall be capable of continuous display of the presence or absence of individual phase voltages.

4.11. LOAD PROFILING

4.11.1 The meters shall be capable of storing load profiles for at least 180 days on 25 channels with 20 minutes integration.

4.11.2 The channels available for load profiling shall be as follows: +kWh, -kWh, +KVArh, -kVArh, +kVAh, -kVAh, +P, -P, +Q, -Q, +S, -S, QI, QII, QIII, QIV, V1, V2, V3, I1, I2, I3 & PF.

4.11.3 The load profile integration period shall be programmable from one (1) minute up to a maximum of sixty (60) minutes.

4.12. POWER QUALITY ANALYSIS

4.12.1 The meter shall collect and record basic power quality information – overcurrent, total no. of alarms, power outages, voltage and current, average power factor and line frequency, etc.

4.12.2 The meter shall measure total harmonic distortion (THD). Meters shall support wave capture function, capture data and can be read via software.

4.12.3 Meter shall support up to 32 times odd harmonic voltage and current measurement.

4.12.4 The meter shall be able to provide voltage sag and swell detection.

4.13. SECURITY FEATURES

4.13.1 The meters shall be capable of event recording and the event can be read remotely via system, which shall include but not be limited to:

a) Power ups and power downs with date and time stamp

b) Individual Phase failure, with date and time stamps

c) Over and under voltages based on a pre-set threshold with date and time stamp

d) Battery voltage status

e) Memory status

f) Meter Errors

g) Date and time of last programming/parameterization

h) Date and time of the last billing period

i) Firmware upgrades

j) Terminal and Meter cover removal even during a power failure

k) Main meter cover removal, even during a power failure

l) Communications removal

m) Magnetic detection, at least 0.5 mT

n) Existence of current, despite absence of one or two phases

o) Current imbalance, over 30% in one phase or two phases (compared with other phase) should be detected

p) Tariff change

q) Time and Date change.

4.13.2 The LCD shall display events that have occurred. The events displayed shall include but not be limited to the following:

a) Meter errors

b) Individual Phase failure

c) Battery voltage status

d) Alarms

e) Warning messages

f) Terminal cover

g) Communications removal

h) Magnetic detection, at least 0.5 mT

4.14. ELECTRICAL REQUIREMENTS

4.14.1 The meters shall be operated from main power with reference values of: 3×57.7/100V to 230 V/400V, 3 x 1 (10) A at 50 Hz.

4.14.2 Primary currents and voltages for the meters shall be programmable through the software thus allowing primary metering of Demand and Energy.

4.14.3 The meters shall be connectable as three phase four wire systems drawing of which shall be printed on the terminal cover.

4.14.4 The meter shall have reference standard currents of: In= 1 A; I max = 10 A for the operating conditions stated in clause 4.14.1.

4.14.5 The meters Power consumption shall meet IEC 62053-22 7.1-7.4

4.14.6 Influence of short-time over-currents shall meet IEC 62053-22 7.1-7.4

4.14.7 Influence of self-heating shall meet IEC 62053-22 7.1-7.4

4.14.8 AC voltage test shall meet IEC 62053-22 7.1-7.4

Requirements 4.14.4 to 4.14.8 shall form part of the type test approval to be issued by an international/ national (of the country of manufacture) meter certifying body.

4.15. ACCURACY REQUIREMENTS

4.15.1 The meter's accuracy shall be class 0.2s for active energy and class 2.0 for reactive energy measurements as per accuracy requirements such that it meets IEC 62053-22 8.1-8.6.

4.15.2 Limits of errors due to variation of the current shall meet requirement IEC 62053-22 8.1-8.6.

4.15.3 Limits of error due to influence quantities shall meet IEC 62053-22 8.1-8.6 requirements.

4.15.4 Test of starting and no-load condition shall meet IEC 62053-22 8.1-8.6 requirements.

4.15.5 Meter constant shall meet IEC 62053-22 8.1-8.6 requirements.

4.15.6 Accuracy test conditions shall meet IEC 62053-22 8.1-8.6 requirements.

4.16. HAND HELD UNIT (HHU) REQUIREMENTS

4.16.1 The handheld unit shall be used to read meter data and parameters at site which include

a) Meter consumption reading

b) Instantaneous data reading

c) Billing information reading

d) Event information reading. Phase loss, over-current, over-voltage, open box and other relevant data

e) Basic parameter reading, e.g. meter number, software version no, assets number etc

4.16.2 The handheld unit shall be used to read longitude and latitude information of the installation site and report to data center with the GIS information and the meter information after the installation.

4.16.3 The Hand Held Unit shall at least have one USB 2.0 port and a compatible data cable to download data from, and upload data to-through a client terminal computer- the Meter Data Management System (MDMS).

4.16.4 The handheld unit with wireless communication shall be able to acquire data from the meter at least 50m from the intended meter/s enclosure/s.

4.16.5 The handheld unit shall have a high precision GPS location module.

4.16.6 The handheld unit shall have Microsoft Windows as the operating system.

4.16.7 The handheld unit shall have LCD display: TFT-LCD， 320x240 pixel with touch screen

4.16.8 The handheld unit shall have a power supply with minimum 2000mAh battery with up to 48 hours of standby time.

4.16.9 The handheld unit shall have IP65 requirements.

4.16.10 The handheld unit shall have working temperature of 0°C to 60°C.

4.16.11 The handheld unit shall be able to withstand the drop impact of vertical height 1.5 meters.

4.16.12 The handheld unit shall be able to configure the following on the meter:

a) Set the time and date

b) Set the communication parameter

c) GPS code reading and match the GPS code with meter Number.

d) Import /Export meter information in batch

4.16.13 The handheld unit shall be complete with a charger for charging at 230Vac

4.16.14 The internal memory shall be at least 4GB

4.16.15 Supports up to 32GB micro SD card

4.16.16 The CPU shall be of at least 800MHz

5. TESTS REQUIREMENTS

The meters shall be inspected and tested in accordance with the requirements of IEC 62053-22, IEC 62052-11, IEC 62056 and other relevant standards and provisions of this specification.

6. MARKING, LABELLING AND PACKING

6.1. In addition to IEC 62052-11:2003 nameplate requirements, each meter shall be marked legibly and indelibly with the following information:

a) Name or trade mark of the manufacturer;

b) Country of origin;

c) Type/model;

d) Meter number up to twelve digits;

e) Barcode comprising of meter serial no;

f) The inscription "Property of K.P. &. L. Co PLC

g) Standard(s) to which the meter complies;

h) Year of manufacture.

i) Every meter shall be indelibly marked with connections diagrams

All markings to be written in English and with c), d) and e) at least 4 mm figure height.

6.2. The meters shall be packaged in such a manner as to minimize damage and entry of moisture during transportation and handling.

6.3. The meters shall be packed in suitable groups and / or batches with consecutive serial numbers provided by KPLC. The range of meter serial numbers including the barcode information for each meter shall be indicated on the outside of the packaging material.

6.4. The number of meters packaged in a group and/or batch for handling/lifting/carrying by an operator manually shall be such that their weight does not exceed 15 kg.

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APPENDICES

A. TESTS AND INSPECTION (Normative)

A.1 It shall be the responsibility of the manufacturer to perform or to have performed all the tests specified. Tenderers shall confirm the manufacturer's capabilities in this regard when submitting tenders. Any limitations shall be clearly specified.

A.2 Copies of Type Test Certificates and Type Test Reports issued by a third party testing laboratory that is accredited to ISO/IEC 17025 shall be submitted with the tender for the purpose of technical evaluation. A copy of the accreditation certificate to ISO/IEC 17025 for the testing laboratory shall also be submitted. Any translations of certificates and test reports into English language shall be signed and stamped by the Testing Laboratory that carried out the tests.

A.3 The meters shall be subject to acceptance tests at the manufacturer's works before dispatch. Acceptance tests shall be witnessed by two Engineers appointed by The Kenya Power and Lighting Company Limited (KPLC) and shall include the following:

A.3.1 Tests and test conditions given in IEC 62052-11:2003

A.3.2 Acceptance tests as per the requirements of IEC 62053-22:2003

A.4 **Testing Facility**

A.4.1 The bidder shall provide current e-mail address, fax and telephone numbers and contact person at the Testing Laboratory where Type Tests and Special Tests were carried out.

A.4.2 All test and measuring equipment to be used during acceptance testing shall have been calibrated and copies of valid calibration certificates shall be provided to KPLC Engineers. A detailed list of workshop tools, test/measuring equipment and list of tests that can be carried out by the manufacturer shall be submitted with the tender for evaluation.

A.5 Test reports for each meter shall be submitted to KPLC for approval before shipment.

A.6 During delivery of the meters, KPLC will inspect them and may perform or have performed any of the relevant tests in order to verify compliance with the specification. The supplier shall replace/rectify without charge to KPLC, meters which upon examination, test or use fail to meet any or all of the requirements in the specification.

B. QUALITY MANAGEMENT SYSTEM (Normative)

B.1 The bidder shall submit a quality assurance plan (QAP) that will be used to ensure that the meter design, material, workmanship, tests, service capability, maintenance and documentation, will fulfil the requirements stated in the contract documents, standards, specifications and regulations. The QAP shall be based on and include relevant parts to fulfil the requirements of ISO 9001:2015.

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

B.3 The bidder shall indicate the delivery time of each type of meter, manufacturer's monthly & annual production capacity and experience in the production of the type of meter being offered. A detailed list and contact addresses (including e-mail) of the manufacturer's previous customers outside the country of manufacture for exact or similar rating of meters sold in the last five years shall be submitted with the tender for evaluation.

C. DOCUMENTATION AND DEMONSTRATION (Normative)

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

a) Fully filled clause by clause Guaranteed Technical Particulars (GTP) signed by the manufacturer,

b) Copies of the manufacturer's catalogues, brochures, meter drawings and wiring diagrams and technical data showing description leaflet, programming details and manuals,

c) Sales records for the last five years and at least four customer reference letters,

d) Details of manufacturing capacity and the manufacturer's experience. The Number of electronic meters sold over a period of five years shall not be less than 150,000 meters.

e) Copies of required type test certificates and type test reports by a third party testing laboratory accredited to ISO/IEC 17025,

f) Copy of accreditation certificate to ISO/IEC 17025 for the third party testing laboratory,

g) Manufacturer's warranty and guarantee; subject to 36 months from date of delivery to KPLC stores,

h) Manufacturer's letter of authorization, copy of the manufacturer's ISO 9001:2015 certificate, ISO/IEC 17025:2005 certificate.

C.2 The successful bidder (supplier) shall submit the following documents/details to KPLC for approval before manufacture:

a) Fully filled clause by clause Guaranteed Technical Particulars (GTP) signed by the manufacturer,

b) Design drawings and wiring diagrams of the meters,

c) Original software, software manuals and operation manuals shall be submitted,

d) List of registers to be displayed and sequence of display as per appendix E,

e) Quality assurance plan (QAP) that will be used to ensure that the design, material, workmanship, tests, service capability, maintenance and documentation will fulfill the requirements stated in the contract documents, standards, specifications and regulations. The QAP shall be based on and include relevant parts to fulfill the requirements of ISO 9001:2015.

f) Detailed test program to be used during factory testing,

g) Marking details and method to be used in marking the meters,

h) 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 meters for The Kenya Power & Lighting Company,

i) Packaging details (including packaging materials and marking and identification of batches).

C.3 The bidder shall submit with the tender, a sample meter, meter software, operating manual(s), and an optical interface for interrogating the meter.

C.4 The sample meter submitted shall have basic and extended data display sequences as specified in appendix E of this document. The submitted meter samples shall be subjected to accuracy tests at KPLC's Meter Central Laboratory to verify the requirements of IEC 62053-22:2003 clause7.1-7.4 and 8.1 and to verify responsiveness to other clauses of this specification. Sample meters shall not be returned to the bidders.

C.5 The successful bidder and manufacturer shall demonstrate at their cost to at least twenty KPLC staff (in Nairobi) after delivery of meters to KPLC stores, for at least 3 days, the following;

a) Meter features,

b) Meter metrology,

c) Meter installation,

d) Meter software,

e) Meter programming and data downloading,

f) Other relevant information

C.6 **Samples**

Bidders are advised that the Laws of Kenya require that the Kenya Bureau of Standards must approve any new meter being introduced in the country. To this end Bidders shall furnish the Bureau with 4 (four) samples of each meter type to be supplied. The successful Bidder shall submit this approval before the signing of the supply contract. Bidders may communicate directly with the Kenya Bureau of Standards on this matter through the office of the Managing Director-Kenya Bureau of Standards.

D. SCHEDULE OF TECHNICAL DATA

Standard and type tests	
General requirements, tests and test conditions	IEC 62052-11:2003
Particular requirements for static meters for active energy	IEC 62053-22:2003
Power consumption and voltage requirements	IEC 62053-22:2003
Shock test	IEC 62052-11:2003
Plastic-determination of	IEC 62052-11:2003
Degree of protection	IP54
Measurement Base	Active / Reactive energy, 3 element, 4 quadrant
Network type	3phase 3 or 3 phase 4-wire
Connection type	VT and CT connected
Accuracy	kWh Class 0.2s (IEC 62053-22:2003); kvarh class 2 (IEC 62053-23:2003)
Humidity:	Reaching 95%
Altitude	Up to 2,600m
Temperature range (operating)	-1 to+60 0 C
Voltage measurement (Un)	3x 63.5/110 V 50Hz, 3 phase 4 wire
Voltage range	0.8 Un to 1.15 Un
Voltage circuit burden	2 W and 10 VA
Burst test	4 kV
Impulse voltage	6 kV, 1.2/50 s
Current measurement	In =1 A; Imax $\geq$ 6 A
Short circuit current	20 Imax for 0.5 s
Starting current	0.001In

Current circuit burden	≤1 VA
LCD	7 Measurement and 5 ID (EDIS) digits
Load profile	180 day-4-channel capacity at 20 minute intervals
Dielectric strength	4 kV, 50 Hz, 1 min.

E. LIST OF REGISTERS TO BE DISPLAYED & SEQUENCE OF DISPLAY

No.	Category/Sequence of Display	Data Item	OBIS Code
1	LCD Automatic Display List	Current Month Import Active +kWh Sum Energy	1-1:1.8.0
2	LCD Automatic Display List	Last month 1 Import Active +kWh Sum Energy	1-1:1.8.0*1
3	LCD Automatic Display List	Current Month Export Active -kWh Sum Energy	1-1:2.8.0
4	LCD Automatic Display List	Last month 1 Export Active -kWh Sum Energy	1-1:2.8.0*1
5	LCD Button Display List	ERR 0	0-0:F.F.0
6	LCD Button Display List	User No. High 6 digits	1-0:0.0.1
7	LCD Button Display List	User No. Low 6 digits	1-0:0.0.1
8	LCD Button Display List	Meter No. High 6 digits	1-0:0.0.0
9	LCD Button Display List	Meter No. Low 6 digits	1-0:0.0.0
10	LCD Button Display List	Time	1-0:0.9.1
11	LCD Button Display List	Date	1-0:0.9.2
12	LCD Button Display List	Current Month Import Active +kWh Sum Energy	1-1:1.8.0
13	LCD Button Display List	Last month 1 Import Active +kWh Sum Energy	1-1:1.8.0*1
14	LCD Button Display List	Current Month Export Active -kWh Sum Energy	1-1:2.8.0
15	LCD Button Display List	Last month 1 Export Active -kWh Sum Energy	1-1:2.8.0*1
16	LCD Button Display List	Current Month Import Apparent +kVA Sum Max Demand	1-1:9.6.0
17	LCD Button Display List	Current Month Import Apparent +kVA Sum Max Demand Date	1-1:9.6.0
18	LCD Button Display List	Current Month Import Apparent +kVA Sum Max Demand Time	1-1:9.6.0
19	LCD Button Display List	Last month 1 Import Apparent +kVA Sum Max Demand	1-1:9.6.0*1

No.	Category/Sequence of Display	Data Item	OBIS Code
20	LCD Button Display List	Last month 1 Import Apparent +kVA Sum Max Demand Date	1-1:9.6.0*1
21	LCD Button Display List	Last month 1 Import Apparent +kVA Sum Max Demand Time	1-1:9.6.0*1
22	LCD Button Display List	Current Month Import Apparent +kVA Sum Concurrent Active Power	1-1:1.5.0
23	LCD Button Display List	Current Month Import Apparent +kVA Sum Active Power Occur Date	1-1:1.5.0
24	LCD Button Display List	Current Month Import Apparent +kVA Sum Active Power Occur Time	1-1:1.5.0
25	LCD Button Display List	Last month 1 Import Apparent +kVA Sum Concurrent Active Power	1-1:1.5.0*1
26	LCD Button Display List	Last month 1 Import Apparent +kVA Sum Active Power Occur Date	1-1:1.5.0*1
27	LCD Button Display List	Last month 1 Import Apparent +kVA Sum Active Power Occur Time	1-1:1.5.0*1
28	LCD Button Display List	Current Month Import Active +kWh Tariff 1 Energy	1-1:1.8.1
29	LCD Button Display List	Last month 1 Import Active +kWh Tariff 1 Energy	1-1:1.8.1*1
30	LCD Button Display List	Current Month Import Active +kWh Tariff 2 Energy	1-1:1.8.2
31	LCD Button Display List	Last month 1 Import Active +kWh Tariff 2 Energy	1-1:1.8.2*1
32	LCD Button Display List	Current Month Import Apparent +kVA Tariff 1Max Demand	1-1:9.6.1
33	LCD Button Display List	Current Month Import Apparent +kVA Tariff 1Max Demand Date	1-1:9.6.1
34	LCD Button Display List	Current Month Import Apparent +kVA Tariff 1Max Demand Time	1-1:9.6.1
35	LCD Button Display List	Last month 1 Import Apparent +kVA Tariff 1Max Demand	1-1:9.6.1*1
36	LCD Button Display List	Last month 1 Import Apparent +kVA Tariff 1Max Demand Date	1-1:9.6.1*1
37	LCD Button Display List	Last month 1 Import Apparent +kVA Tariff 1Max Demand Time	1-1:9.6.1*1
38	LCD Button Display List	Current Month Import Apparent +kVA Tariff 1Concurrent Active Power	1-1:1.5.1
39	LCD Button Display List	Current Month Import Apparent +kVA Tariff 1Active Power Occur	1-1:1.5.1
40	LCD Button Display List	Current Month Import Apparent +kVA Tariff 1Active Power Occur	1-1:1.5.1

No.	Category/Sequence of Display	Data Item	OBIS Code
41	LCD Button Display List	Last month 1 Import Apparent +kVA Tariff 1Concurrent Active Power	1-1:1.5.1*1
42	LCD Button Display List	Last month 1 Import Apparent +kVA Tariff 1Active Power Occur	1-1:1.5.1*1
43	LCD Button Display List	Last month 1 Import Apparent +kVA Tariff 1Active Power Occur	1-1:1.5.1*1
44	LCD Button Display List	Current Month Import Reactive +kVArh Sum Energy	1-1:3.8.0
45	LCD Button Display List	Last month 1 Import Reactive +kVArh Sum Energy	1-1:3.8.0*1
46	LCD Button Display List	Current Month Import Apparent +kVAh Sum Energy	1-1:9.8.0
47	LCD Button Display List	Last month 1 Import Apparent +kVAh Sum Energy	1-1:9.8.0*1
48	LCD Button Display List	Sum Instant Power factor	1-1:13.7.0
49	LCD Button Display List	CT Ratio	1-0:0.4.2
50	LCD Button Display List	VT Ratio	1-0:0.4.3
51	LCD Button Display List	Phase A Instant Voltage	1-1:32.7.0
52	LCD Button Display List	Phase B Instant Voltage	1-1:52.7.0
53	LCD Button Display List	Phase C Instant Voltage	1-1:72.7.0
54	LCD Button Display List	Phase A Instant Current	1-1:31.7.0
55	LCD Button Display List	Phase B Instant Current	1-1:51.7.0
56	LCD Button Display List	Phase C Instant Current	1-1:71.7.0
57	LCD Button Display List	Frequency	1-1:14.7.0
58	LCD Button Display List	Sum Import Instant Active power kW	1-1:1.7.0
59	LCD Button Display List	Sum Import Instant Reactive power kVAr	1-1:3.7.0
60	LCD Button Display List	Sum Import Instant Apparent power kVA	1-1:9.7.0
61	LCD Button Display List	Current Month Import Sum Monthly average power factor	1-1:13.15.0
62	LCD Button Display List	Last month Import 1 Sum Monthly average power factor	1-1:13.15.0*1
63	LCD Button Display List	Current Month Export Sum Monthly average power factor	1-1:14.15.0
64	LCD Button Display List	Last month Export 1 Sum Monthly average power factor	1-1:14.15.0*1

F. GUARANTEED TECHNICAL PARTICULARS (Normative)

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

Clause number	KPLC requirement	Bidder's offer
Manufacturer's Name and address		Specify
Country of Manufacture		Specify
Bidder's Name and address		Specify
1.	**Scope**	Specify
1.1-1.2		
2.	Applicable Standards	State
3.	Terms & Definitions	Specify
4.	**Requirements**	
4.1	Operating Conditions	Specify
4.2	**Meter cover, base and Terminals**	
4.2.1	3 phase 4 wire configuration	Specify
4.2.2	BS 5685 footprint	Specify
4.2.3	The meters shall be of front projection mounting	Specify
4.2.4	Bottom entry terminals with arrangement $L_1V_1L_1$: $L_2V_2L_2$: $L_3V_3L_3$:NN	Specify
4.2.5	The meter's front cover may be of translucent material but shall have a window (clear glass or polycarbonate) for reading the display and for observation	Specify
4.2.6	The nickel-plated steel screw length for firm holding of the cover, and shall have a stopper/retaining mechanism to prevent the screw falling off when unscrewed.	
4.2.7	The terminal cover shall be of transparent material	Specify
	The modem shall be equipped under the terminal cover	Specify
4.2.8	The meters shall be ultrasonically sealed for life	Specify
4.2.9	The meters shall be equipped with lockable / sealable push buttons where such buttons are used to change some meter parameters.	Specify
4.2.10	Terminal cover long type with cable entry knock-offs	Specify

Clause number	KPLC requirement	Bidder's offer
4.2.11	The meter potential links shall be inside the meter body and shall only be accessed by opening the meter body cover	Specify
4.2.12	Terminal holes shall at be of sufficient size to accommodate the cables of at least 6mm diameter	Specify
4.2.13	The meters terminal holes and screws shall be made of brass or nickel-plated brass for high strength and high conductivity	Specify
4.2.14	Sealing provisions for terminal cover, back –up battery and reset button	Specify
	Meter to have terminal cover open detection	Specify
	Load to be disconnected once the terminal cover is opened	Specify
4.2.15	Conforms to IP54 degree of protection	Specify
4.2.16	Dimensions WxLxH of 180mmx300mmx90mm	Specify
4.3	**Communications**	Specify
4.3.1	The meters shall have integrated GPS module for use in meter location.	Specify
4.3.2	KWh and KVArh LED indicators for testing and indication	Specify
4.3.3	Compliant with DLMS/COSEM or equivalent protocol	Specify
4.3.4	The Meter shall be able to communicate with a remote central system using a plug in modem/module, through the GSM/GPRS, dual band for operation in the 3G networks.	Specify
4.3.5	The meter shall support DLMS/COSEM communication protocols	Provide DLMS/COSEM and KEMA certificates
4.3.6	The meters shall be equipped with a single channel RS485 communication interface The meters support remote reading via AMI system existing in Kenya Power. The remote Communication protocol shall be compliant with DLMS/COSEM, IEC62056.	Specify
4.3.7	Shall support two way communication	Specify
4.3.8	The meters shall be equipped with RF port to support communication with HAND HELD UNIT on site for a distance not less than 50 meters. The Hand held Units to be used in data reading shall meet all the requirements in clause 4.16	Specify
4.3.9	The modem shall be replaced at site without powering off the meter	Specify

Clause number	KPLC requirement	Bidder's offer
4.3.10	Manufacturer to facilitate interfacing of the meters communication with existing AMI system	Specify
4.3.11	Infrared optical port with baud rate 1200-9600 for programming and data downloading provided.	Specify
4.3.12	Communication with encryption and authentication	Specify
4.3.13	Reports to AMI system when Powered on or off	Specify
4.3.14	Relevant software and hardware for programming and data reading	Specify
4.3.15	The meters shall be programmable to allow the user to change parameters on the installation configuration and in particular the voltage and current transformation ratios. The transformation factor shall be greater or equal to 4000(≥4000).	Specify
4.3.16	Access and programming through user level passwords	Specify
4.3.17	Supports 3 access levels	Specify
4.3.18	Software capable of tracking user access	Specify
4.3.19	Two Laptops and two optical probes at no extra cost	Specify
	Laptop requirements shall be fully provided as per appendix G	Specify
4.3.20	10 HHU (see clause 4.17 for the Hand held units specifications) be supplied for every 600 meters	specify
4.4	**Meter display**	
4.4.1	The meter shall have a backlight seven segment LCD	Specify
4.4.2	The LCD shall have at least 10 numerical characters without decimal points. Digits shall be at least 4mm wide by 8mm high	Specify
4.4.3	LCD with 6-digit ID codes that are Obis compliant	Specify
4.4.4	Display associated with push buttons for scrolling.	Specify
	LCD to be clearly readable at ±15° horizontally or vertically.	Specify
	Nominal diminutions shall be 75mm x 23mm	Specify
4.4.5	Supports reading even when power supply fails	Specify
4.4.6	Display continuously presence or absence of individual phase voltages	Specify
4.4.7	Shall display various tampering conditions of the meter	Specify
4.4.8	Display parameters configurable by software action	Specify
4.4.9	LCD display operates in at least two modes, basic and extended data list display using push buttons on meter front	Specify
4.4.10	Supports reading even when mains power fails.	Specify
4.5	**Real time clock and memory**	

Clause number	KPLC requirement	Bidder's offer
4.5.1	With real time clock controlled by a quartz crystal oscillator that shall be reset without loss of billing data	Specify
4.5.2	Clock accurate to 0.5s max	Specify
4.5.3	Meters with remote and local synchronization capability	Specify
4.5.4	Clock with configurable calendar type	Specify
4.5.5	Meters with a backup power supply to run the calendar clock for a minimum of 1 year without mains supply	Specify
4.5.6	For lithium battery, it shall have a shelf life of 10 years	Specify
4.5.7	Non-volatile memory data retention period equivalent to meter certified period or 15years, whichever is greater, without electrical supply.	Specify
4.6	**Functionality and load control**	
4.6.1	Equipped with auxiliary terminals for inputs and outputs	Specify
4.6.2	2 control signal inputs	Specify and state signal type
	4 impulse signal inputs	
4.6.3	4 control signal outputs	Specify and state signal type
	4 impulse signal outputs	
4.6.4	Meters shall detect significant reverse energy when line and load wire are swapped	Specify
4.6.5	Meters shall operate correctly and record in forward register during SRE detection	Specify
4.7	**Time-of-use tariff measurements**	Specify
4.7.1	The meter shall support main tariff table and passive tariff table, with a) Up to 4 seasons, 4-weekend table, b) 8 daily tables, c) Up to 8 divisions per day, d) Up to 4 tariffs.	Specify
4.7.2	Meters shall have four day types namely weekday, Saturday, Sunday and Special/Holiday with switching times set independently.	Specify
4.7.3	Meters shall have at least forty (40) special days	Specify
4.7.4	Capable of measuring and displaying time-of-day demand (kW and kVA) consumption up to four tariff registers.	Specify
4.7.5	The meter shall have at least eight (8) registers for energy	Specify
4.7.6	Meters shall have at least six (6) registers for maximum demand.	Specify
4.7.7	Each tariff register shall be set to operate over defined time periods during a 24-hour day	Specify

Clause number	KPLC requirement	Bidder's offer
4.8	**Energy Measurements**	
4.8.1	Can measure and display active, reactive and apparent energy in both import and export modes	Specify
4.8.2	Shall measure demand in import and export flows	Specify
4.8.3	Main measurement unit shall be kilowatt-hour. It shall also measure in kVAr, kVA and kW	Specify
4.8.4	Meters shall measure reactive energy and demands in four quadrants up to 4 tariffs	Specify
4.8.5	Energy registers shall be able to display measured parameters in either kilo, mega or giga	Specify
4.8.6	The meters shall be capable of measuring energy in security mode and also record reversed units in forward register.	Specify
4.8.7	Meters shall have a facility to indicate reverse connection and reversed units	Specify
4.8.8	Meters shall have a capability of closing end of billing period on any selected date and time of the month selectable by software	Specify
4.8.9	The meter's billing registers shall NOT be re-settable to zero readings	Specify
4.8.10	The meters shall have at least eighteen (18) billing historical data stored in memory and retrievable by software action. The current billing/historical data shall be available on meter display for reading and billing purposes.	Specify
4.9	**Demand Measurements**	
4.9.1	Can measure and display active, reactive and apparent demand in both import and export modes	Specify
4.9.2	Meters shall display demand values and their time and date stamps	Specify
4.9.3	Meters shall measure demand correctly when phase rotation/sequence is incorrect	Specify
4.9.4	Meters shall have a capability of closing end of billing period on any selected date and time of the month selectable by software	Specify
4.9.5	Meters shall have at least eighteen (18) billing historical data stored in memory and retrievable by software action. The current and billing/historical data shall be available on meter display for reading and billing purposes	Specify

Clause number	KPLC requirement	Bidder's offer
4.9.6	Meters shall be able to measure, display and store average PF in independent import and export registers. The average PF is defined as the ratio of kWh to kVAh over a billing period/ over one month.	Specify
4.9.7	Demand registers shall be able to display measured parameters in either kilo, mega or giga	Specify
4.10	**Instrumentation data measurements**	
4.10.1	Shall display instantaneous phase voltages, phase currents, phase angles and power factors	Specify
4.10.2	Shall measure and display instantaneous power (active, reactive and apparent)	Specify
4.10.3	Shall measure and display average power factor for the current and previous billing months	Specify
4.10.4	Shall continuously display presence or absence of individual phase voltages	Specify
4.11	**Load profiling**	
4.11.1	Meters shall be capable of storing load profiles for at least 180 days on 25 channels with 20 minutes integration	Specify
4.11.2	The channels available for load profiling shall be as follows: +kWh, -kWh, +KVArh, -kVArh, +kVAh, -kVAh, +P, -P, +Q, -Q, +S, -S, QI, QII, QIII, QIV, V1, V2, V3, I1, I2, I3 & PF.	Specify
4.11.3	The load profile integration period shall be programmable from one (1) minute up to a maximum of sixty (60) minutes.	Specify
4.12	**Power Quality Analysis**	
4.12.1	Meters shall collect and record basic power quality information – overcurrent, total no. of alarms, power outages, voltage and current, average power factor and line frequency, etc.	Specify
4.12.2	Shall measure THD. Meters shall support wave capture function, data capture and can be read via software	Specify
4.12.3	Meters shall support up to 32 times odd harmonic voltage and current measurements	Specify
4.12.4	Meters shall be able to provide voltage sag and swell detection	Specify
4.13	**Security Features**	
4.13.1	The meters shall be capable of event recording and the event can be read remotely via system, which shall include but not be limited to:	Specify

Clause number	KPLC requirement	Bidder's offer
	a) Power ups and power downs with date and time stamp; b) Individual Phase failure, with date and time stamps; c) Over and under voltages based on a pre-set threshold with date and time stamp; d) Battery voltage status; e) Memory status; f) Meter Errors, g) Date and time of last programming/parameterization; h) Date and time of the last billing period; i) Firmware upgrades j) Terminal and Meter cover removal even during a power failure k) Main meter cover removal, even during a power failure l) Communications removal m) Magnetic detection, at least 0.5 mT n) Existence of current, despite absence of one or two phases o) Current imbalance, over 30% in one phase or two phases (compare with other phase) should be detected p) Tariff change q) Time and Date change.	
4.13.2	The LCD shall display events that have occurred. The events displayed shall include but not be limited to the following: a) Meter errors; b) Individual Phase failure; c) Battery voltage status; d) Alarms e) Warning messages etc. f) Terminal cover g) Communications removal h) Magnetic detection, at least 0.5 mT	Specify
4.14	**Electrical Requirements**	

Clause number	KPLC requirement	Bidder's offer
4.14.1	Mains reference: - 3×57.7/100V to 230 V/400V, 3 x 1 (10) A , 50 Hz.	Specify
4.14.2	Primary currents and voltages programmable through software	Specify
4.14.3	Three phase four wire connection. Drawing printed on terminal cover	Provide drawing
4.14.4	In= 1 A; I max = 10 A	Provide test reports
4.14.5	The meters Power consumption shall meet IEC 62053-22 7.1-7.4	Provide test reports
4.14.6	Influence of short-time over-currents shall meet IEC 62053-22 7.1-7.4	Provide test reports
4.14.7	Influence of self-heating shall meet IEC 62053-22 7.1-7.4	Provide test reports
4.14.8	AC voltage test shall meet IEC 62053-22 7.1-7.4	Provide test reports
4.15	**Accuracy requirements**	
4.15.1	Accuracy class 0.2s for active energy and class 2.0 for reactive energy as per IEC 62053-22 8.1-8.6	Provide test reports
4.15.2	Limits of errors due to variation of the current shall meet requirement IEC 62053-22 8.1-8.6.	Provide test reports
4.15.3	Limits of error due to influence quantities shall meet IEC 62053-22 8.1-8.6 requirements	Provide test reports
4.15.4	Test of starting and no-load condition shall meet IEC 62053-22 8.1-8.6 requirements	Provide test reports
4.15.5	Meter constant shall meet IEC 62053-22 8.1-8.6 requirements	Provide test reports
4.15.6	Accuracy test conditions shall meet IEC 62053-22 8.1-8.6 requirements	Provide test reports
4.16	**Hand Held Unit Requirements**	
4.16.1	The handheld unit shall be used to read meter data and parameters at site which include a) Meter consumption reading b) Instantaneous data reading c) Billing information reading d) Event information reading. Phase loss, over-current, over-voltage, open box and other relevant data e) Basic parameter reading, e.g. meter number, software version no, assets number etc	Specify
4.16.2	The handheld unit shall be used to read longitude and latitude information of the installation site and report to the data center with the GIS information and the meter information after the installation.	Specify
4.16.3	The Hand Held Unit shall have at least one USB 2.0 port and a	

Clause number	KPLC requirement	Bidder's offer
	compatible data cable to download data from, and upload data to-through a client terminal computer-the Meter Data Management System(MDMS)	
4.16.4	The handheld unit with wireless communication shall be able to acquire data from the meter at least 50m from the intended meter/s enclosure/s.	Specify
4.16.5	The handheld unit shall have a high precision GPS location module	Specify
4.16.6	The handheld unit shall have Microsoft Windows as the operating system	Specify
4.16.7	The handheld unit shall have LCD display: TFT-LCD, 320x240 pixel with touch screen	Specify
4.16.8	The handheld unit shall have a power supply with minimum 2000mAh battery with up to 48 hours of standby time	Specify
4.16.9	The handheld unit shall have IP65 requirements	Specify
4.16.10	The handheld unit shall have working temperature of 0°C to 60°C	Specify
4.16.11	The handheld unit shall be able to withstand the drop impact of vertical height 1.5 meters	Specify
4.16.12	The handheld unit shall be able to configure the following on the meter: a) Set the time and date b) Set the communication parameter c) GPS code reading and match the GPS code with meter Number. d) Import /Export meter information in batch	Specify
4.16.13	The handheld unit shall be complete with a charger for charging at 230Vac	Specify
4.16.14	The internal memory shall be at least 4GB	Specify
4.16.15	Supports up to 32GB micro SD card	Specify
4.16.16	The CPU speeds shall be at least 800MHz	Specify
5	**Test Requirements**	State
6	**Marking and Packing**	
6.1	Marking	Provide with drawing
6.2	Packed to minimize damage and moisture ingress	State
6.3	Meters' serial numbers, barcode information and batch numbers indicated	State
6.4	Weight per group/batch shall not exceed 15kgs	State
A	**Tests and Inspection**	

Clause number	KPLC requirement	Bidder's offer
A.1	Responsibility of carrying out tests	State
A.2	Copies of Type Test Reports submitted with tender	State
A.3	Acceptance tests to be witnessed by KPLC at factory before shipment	State
A.4.1	Contact information of the testing facility	
A.4.2	Testing tools list and calibration certificates. List of tests the manufacturer can carry out.	State
A.5	Test reports to be submitted by supplier to KPLC for approval before shipment	State
A.5-A6	Inspection at the stores and replacement of rejected meters	State compliance
B	**Quality Management System**	
B.1	Quality Assurance Plan	Provide
B.2	Copy of ISO 9001:2015 Certificate or KEBS Diamond mark of quality	Provide
B.3	Manufacturer's experience	Provide
	Manufacturing Capacity (units per month)	Provide
	List of previous customers	Provide
	Customer reference letters	Provide
C	**Documentation and demonstration**	
C.1	Documents submitted with tender	Provide
C.2	Documents to be submitted by supplier to KPLC for approval before manufacture	Provide
C.3	Sample meter, software, manuals and optical interface submitted with tender	Provide
C.4	Meter with basic and extended data	Provide
C.5	Demonstration to KPLC staff at supplier's cost	State compliance
D	Schedule of technical data	State compliance
E	List of registers to be displayed & sequence of display	Provide list
G	Laptop computer specifications	Provide
H	Hand held Unit	Provide
	Statement of compliance to specification	Provide

NOTE:

1) *Bidders shall give full details of the items on offer as per the specification and applicable standards. The details provided shall conform to the test reports and their certificates, as well as labelled drawings complete with dimensions, catalogues and/or brochures for the purpose of tender evaluation.*

2) *Bidders should note that the above Guaranteed Technical Particulars Schedules must be fully completed and submitted with the bid. Wherever there is conflict between the GTPs and the clauses in the specification, the clauses in the specification take precedence. Failure to complete the schedules shall lead to rejection of the bid.*

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

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Manufacturer's Name, Signature, Stamp and Date

G. LAPTOP COMPUTER SPECIFICATIONS

Description	Mandatory Minimum Requirements
Processor	Intel Core i7-5500 (2.60GHz 1600MHz 3MB, 8 Cores)
RAM	16GB DDR4-2133MHz SODIMM
Operating System	Windows 10 pro 64 bit
Optical Drive	Super Multi DVD-RW or DVD Recordable Burner
Hard Disk	1TB 7200 rpm Hard Drive
Display Panel	15.6" FHD LED Glossy (1920x1080) with integrated Webcam 720p camera
Graphics	Integrated Intel HD Graphics 520
Internal Audio	Integrated HD audio internal speaker (standard) or Stereo with Dolby Audio TM, 1xMic Headphones Combo
Communications	GPRS/ HSDPA Modem, Integrated Intel Gigabit Network Connection (10/100/1000 NIC)
Wireless	Intel 802.12 AC WLAN and Bluetooth(R)
Interfaces	VGA, MDP, 4-in-1 Card Reader, Smart Card Reader. RJ-45, Headphone and Microphone Jack, Mechanical Docking, 2 x USB 3.0, W/WAN SIM, Express Card Slot, 1 HDMI port, Bluetooth, Wi-Fi enabled
Pointing Devices	Touchpad with scroll zone, Two Pick Buttons or Pick Stick, Two Pick Buttons
Keyboard	Keyboard with Number Pad – English (Standard)
Mouse	External USB Mouse
Warranty	1 Year
Power	4-cell 41WHr Lithium-ion Battery; External AC adapter
Power Supply	230V AC, 50 Hz, British Type Plugs
Carrying Case	Genuine Leather Carrying Case
Manufacturer's Authorization	Manufacturers Authorization Certificate/ Letter and for the models quoted, the principal (Manufacturer) MUST have an established regional office in Kenya.