THE KENYA POWER AND LIGHTING CO. LTD

SPECIFICATION

for

SINGLE-PHASE STATIC METERS FOR ACTIVE ENERGY

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SINGLE PHASE STATIC METERS FOR ACTIVE ENERGY

CONTENTS

Foreword

This specification was prepared by Meter Central Laboratory of the Kenya Power & Lighting Company (KPLC). It lays down requirements for newly manufactured single phase static meters for active energy. The specification is intended for procurement of equipment and does not include provision of contract.

Introduction

This specification was prepared to establish and promote uniform requirements for meters. The specification lays down the minimum requirements for equipment acceptable for evaluation. It is the responsibility of the Manufacturer/ Supplier to familiarize himself with the standards referred herein.

This specification is in two parts, one is a narrative clause-by-clause and the other is a summarized table of the same clauses located in the specifications and marked as **Appendix B**.

Tenderers shall complete the schedule in **Appendix B** and this shall form the basis for the technical evaluation of their tender. **(See clause 4.5.5).**

Appendix A is a snapshot of the technical data and tenderers shall indicate conformance or state any deviation from these requirements.

1. Scope

This specification is for newly manufactured single-phase static meters for measurement of alternating current active energy in 50 Hz networks.

2. References

The following documents were referred to during the preparation of this specification:

[1] IEC 62052-11:2003, Electricity Metering equipment (a.c.) – General Requirements, Tests and Test Conditions- PART 11: Metering equipment

[2] IEC 62053-21:2003, Electricity metering equipment (a.c.) – Particular Requirements - Part 21: Static meters for active energy (class 1.0).

In case of conflict, the requirements of this specification take precedence.

3. Terms and definitions

The definitions given in IEC 62052-11:2003 apply.

4. Requirements

In addition to the requirements in IEC 62052-11:2003 and IEC 62053-21:2003, the meters shall fulfill the following requirements.

4.1 Operating Conditions requirements

4.1.1 The meters shall be suitable for operation in tropical climate where temperatures may vary from -1 to 55 degrees Celsius.

4.1.2 Relative humidity reaching 95 % and altitude of up to 2,200 m above sea level.

4.1.3 The meters shall be used for measurement of active energy for domestic loads under tropical climate conditions.

4.2 Design and Construction requirements

4.2.1 The requirements given in 5.1 to 5.11 of 2[1] shall apply.

4.2.2 The meters shall be constructed as 1 phase 2-wire meters.

4.2.3 The meters shall have terminals with bottom entry for cables and the arrangement shall be **L:N:N:L.**

4.2.4 The meter base and cover shall be of non-metallic, non-hygroscopic, flame retardant, polished material having high impact-resilience and low dirt absorption properties.

4.2.5 The front cover may be of translucent material but shall have a window (clear glass or polycarbonate) for reading the display and for observation.

4.2.6 The meters shall conform to the degree of protection **IP 51** as given in **IEC 529:1989** Degrees of protection provided by enclosures (IP Code) Amendment 1:1999.

4.2.7 The material of which the terminal block is made shall be capable of passing the tests given in **ISO 75.**

4.2.8 The meters shall be for front projection mounting.

4.2.9 The meters body shall be sealed for life by ultra sonic sealing method and it shall not be possible to gain access to the meter without permanent damage to the meter. The meters shall be accessible for connection only through the terminal cover.

4.2.10 The potential link of the meters shall be internal (inside the sealed part of the meter).

4.2.11 The meters shall have a sealing provision for terminal cover.

4.2.12 The meter terminal cover shall be of the short-length type, flush to the meter base.

4.2.13 Terminal holes shall be of sufficient size to accommodate the cables of at least **8 - mm** diameter.

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

4.2.15 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.

4.2.16 The certified life of the meter shall not be less than 15 years.

4.2.17 Meters shall have a facility to enable meter reading when mains power supply fails.

4.2.18 Meters shall have a facility to indicate reverse connection.

4.2.19 The meters shall continue to register energy forward during reverse connection condition.

4.2.20 The meters shall have a facility to indicate earth loading, a condition where the load is connected to local earth instead of the meter neutral, making neutral current to the meter to be absent.

4.2.21 The meter shall continue to register energy accurately under earth loading conditions even under phase/neutral and Load/supply reversed.

4.2.22 The meter registers shall **NOT BE** re-settable to zero readings.

4.2.23 The meters shall have an LCD display.

4.2.24 The meters LCD shall have at least 7 digits and no decimals.

4.2.25 The meters shall be capable of recording and displaying on the LCD, error status when the meter malfunctions.

4.2.26 The meters shall have an LED indicator for testing and indication of kWh meter operation.

4.2.27 The principal unit for the measured values shall be the kilowatt-hour (kWh).

4.3 Electrical requirements

4.3.1 The meters shall be operated from mains with reference values of: -

240 V, 50 Hz.

4.3.2 The meters shall be connectable for single phase two wire systems, drawing of which shall be indicated on the terminal cover or on the meter base **(stickers will not be acceptable)**

4.3.3 The meter shall have reference standard currents of: -

$I_b = 5$ A; $I_{max} \geq 80$ A.

4.3.4 Power consumption

The requirement of 2[2] applies.

4.3.5 Influence of short-time over-currents

The requirement of 2[2] applies.

4.3.6 Influence of self-heating

The requirement of 2[2] applies.

4.3.7 AC voltage test

The requirement of 2[2] applies.

4.3.8 EMC Tests

The requirement of 2[2] applies.

Requirements 4.3.4 to 4.3.8 shall form part of the type test approval to be issued by an international / national (of the country of manufacture) meter certifying body.

4.4 Accuracy requirements

Tests and test conditions given in 2[1] shall apply.

4.4.1 The meter's accuracy shall be class 1 for active energy.

4.4.2 Limits of errors due to variation of the current.

The requirement of 2[2] applies.

4.4.3 Limits of error due to influence quantities

The requirement of 2[2] applies.

4.4.4 Test of starting and no-load condition

The requirement of 2[2] applies.

4.4.5 Meter constant

The requirement of 2[2] applies.

4.4.6 Accuracy test conditions

The requirement of 2[2] applies.

Requirements of clause 4.4 shall form part of the type test approval to be issued by an international / national (of the country of manufacture) meter certifying body.

4.5 Instructions and Marking

4.5.1 In addition to 2[1] 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 ten digits;
e) The inscription "Property of K.P. &. L. Co Ltd."
f) Standard to which the meter complies.
g) Year of manufacture.
h) Bar code with meter number information.

All markings to be written in English and with at least 4 mm figure height.

4.5.2 Every meter shall be indelibly marked with diagrams of connections and phase sequence for which the meter is intended.

4.5.3 In addition, the following drawings and information shall be required with the tender:

(a) Meter drawing giving all the relevant dimensions;
(b) Wiring diagrams;
(c) Description leaflet including details of programming of the meters;
(d) User's and service manuals.

4.5.4 Copies of type approval certificate(s) with test and calibration results of the meter being offered (see clauses 4.3 & 4.4) obtained from an international or the national meter certification body shall be provided. **If type approval certificate(s) is (are) from accredited meter certification laboratories (and not national or international body), then it (they) shall be accompanied with copies of certificates of accreditation from the national or an international certification body.**

4.5.5 **The Tenderer shall complete clearly, all the clauses in both columns of the schedule in Appendix B**. This shall form the basis of evaluation of the submitted tender. Failure to complete this appendix shall render the tender non-responsive. The tenderers shall indicate the details of their offer where it is different from these

requirements. Where the requirement is the same, they shall indicate what is offered. **Insertions such as "noted", "agreed" etc. shall be considered as non-responsive where a specific response is called for.**

4.5.6 The manufacturer shall provide proof of conformance to ISO 9001(2008) standard.

4.5.7 The manufacturer shall provide a list of at **least three previous utilities** to which the meter being offered has been supplied including addresses and contact person(s) of the utilities

4.5.8 The tenderer shall give proof that the number of electronic meters (**single** and **three phase**) sold to **utilities outside the country of manufacture** over a period of the last **5 years** shall not be less than **75,000** meters. The addresses and contact person(s) of the utilities shall be provided with the tender to facilitate confirmation of this information by the procuring entity

5.0 INFORMATION AND WARRANTY *(In case of Tender Award)*

5.1 Drawings and technical details shall be submitted to Kenya Power for approval before manufacture of the meters commences. The Kenya Power undertakes to submit their comments or approval for the drawings within three weeks of receiving the draft copies.

5.2 Original software, software manuals and operation manuals shall be submitted in 3 copies. Description leaflets (brochures) shall be submitted in copies of 100 for each meter type.

5.3 The meter shall have a warranty against any defects, which may develop due to faulty material, calibration, transportation or workmanship for a period **of eighteen (18) months** from the date of delivery. **All defective meters shall be replaced at the supplier's cost**.

5.4 The manufacturer shall make a commitment in writing on the availability of essential spares and other consumables for the certified life of the meter.

5.5 Kenya Power engineers will inspect meter-manufacturing facilities intending to supply meters to the company for the first time at no extra cost, with the exception the cost of the engineers' transportation to the nearest major airport in Kenya. Such inspection shall not in any way prejudice the purchaser's rights and privileges.

5.6 The manufacturer shall meet the full costs of two engineers, for meter inspection and acceptance testing at the manufacturer's facility, with the exception of the cost of the engineers' transportation to the nearest major airport in Kenya. The factory inspection and factory acceptance tests shall run for duration of three (3) working days each.

5.7 After delivery of meters to Kenya Power, the manufacturer shall conduct training for at least 3 days for twenty people in Nairobi, Kenya. The training shall cover and not be limited to:

1) Meter features;
2) Meter metrology;
3) Meter installation;
4) Meter anti tamper features

5.8 The manufacturer shall meet the cost of the training described in clause (5.7).

5.9 Samples

(a) The tenderer shall submit one sample together with the tender documents. The submitted meter samples shall be subjected to accuracy tests at Kenya Power's Meter Central Laboratory to verify the requirements of IEC 62053-21:2003 clause 8.1 and to verify responsiveness to other clauses of this specification. Sample meters shall not be returned to the tenderers.

(b) 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. Bids submitted without the meter type approval from the Bureau will **NOT** be considered non-responsive. However the winning Bidder must 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 following address:

The Managing Director
Kenya Bureau of Standards,
P.O. Box 54974, 00200 Nairobi
Kenya.

Tel: (+254 020) 605490, 602350

Fax: (+254 020) 604031

Email: info@kebs.org

Web:http://www.kebs.org

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

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

5.12 The meters shall be packaged in multiples of ten unless where the number of meters in a group/batch does not make a multiple of ten.

5.13 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.

5.14 Each meter shall be packaged in a paper carton with an open window to allow reading of meter number manually and electronically by barcode scanning without need to remove the meter from the carton.

5.15 The supplier shall indicate the delivery time versus quantities of each type of meter and his production capacity.

5.16 Where test and / or calibration certificates/ reports are issued by a laboratory other than the **International / National Meter Certification Authority**, a copy of accreditation certificate shall be attached together with the tender documents.

5.17 The manufacturer shall provide current e-mail addresses, fax and telephone numbers of the national / international testing / calibration laboratories and meter certification bodies to facilitate confirmation of the submitted test reports & certificates.

Appendix A. 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 62053-21:2003
Power consumption and voltage requirements	IEC 62053-21:2003
Shock test	IEC 62052-11:2003
Plastic-determination of temperature deflection under load	IEC 62052-11:2003
EMC Tests	IEC 61000-4-3; EN 55014/55022
Degree of protection	IP51
Measurement Base	Active
Network type	2-wire
Connection type	Direct
Accuracy	kWh class 1.0 (IEC 62053-21:2003)
Humidity:	Reaching 90%
Altitude	Up to 2,200m above sea level
Temperature range (operating)	-1 to +55 ^{0} C
Voltage measurement (U_n)	240 V 50Hz
Voltage range	0.8 U_n to 1.15 U_n
Voltage circuit burden	≤ 2 W and 10 VA
Burst test	4 kV
Impulse voltage	6 kV, 1.2/50 μs
Current measurement	I_b=5 A; $I_{max} \geq 80$ A
Short circuit current	30 I_{max}
Starting current	0.004 I_b
Current circuit burden	≤ 4 VA
LCD display	At least 7 digits, Nil decimals
Dielectric strength	4 kV, 50 Hz., 1 min
Terminal entry diameter	8.0 mm
Indications	Reverse current, Earth loop and Power ON

Appendix B Specifications Matrix for Single-phase Static Meters for Active Energy

CLAUSE	KENYA POWER REQUIREMENT	MANUFACTURER'S COMPLIANCE/REMARKS	REFERENCE PAGE IN THE SUBMITTED DOCUMENTS
4.1	**Operating conditions requirements**		
4.1.1	-1 to 55 ^{0}C (operational)		
4.1.2	Humidity: Average annual reaching 90 % and altitude of up to 2,200m		
4.1.3	Measurement of energy in tropical conditions		
4.2	**Design and Construction requirements**		
4.2.1	IEC 62052-11:2003 requirements given in 5.1 to 5.11		
4.2.2	1 phase 2- wire configuration		
4.2.3	**L:N:N:L** terminal configuration		
4.2.4	Meter base and cover of non-metallic, non-hygroscopic, flame retardant, polished material		
4.2.5	Clear glass or polycarbonate window		
4.2.6	Degree of protection: IP 51		
4.2.7	Material of Terminal block to pass tests of ISO 75		
4.2.8	Front projection mounting		
4.2.9	Meter sealed for life ultrasonically		
4.2.10	Internal potential links		
4.2.11	Sealing provisions for terminal cover		
4.2.12	Short-length type terminal cover, flush to meter base		
4.2.13	Terminal holes to accommodate **8 mm** diameter cables		
4.2.14	Brass and Nickel plated terminal holes		
4.2.15	Non-volatile memory; data retention period equivalent to meter certified period or 15 years, whichever is longer		
4.2.16	Certified life of meters not less than 15 years		
4.2.17	Mains power fail reading facility		
4.2.18	Reverse energy indication		
4.2.19	Registration of energy under reverse connection condition		
4.2.20	Earth loading indication		
4.2.21	Registration of energy under earth loading condition		
4.2.22	Non-resettable meter registers		
4.2.23	LCD display		
4.2.24	LCD display with at least 7 digits Nil decimals		
4.2.25	Faults status recording through error codes display		
4.2.26	LED indicator for testing and operation		
4.2.27	KWh as principal unit of measurement		
4.3	**Electrical requirements**		
4.3.1	Mains reference, 240 V, 50 Hz		
4.3.2	2 wire system connection		
4.3.3	$I_b = 5$ A; $I_{max} \geq 80$ A		
4.3.4	As per IEC 62053-21:2003		

4.3.5	As per IEC 62053-21:2003		
4.3.6	As per IEC 62053-21:2003		
4.3.7	As per IEC 62053-21:2003		
4.3.8	As per IEC 62053-2:2003		
4.4	**Accuracy requirements**		
4.4.1	As per IEC 62053-21:2003		
4.4.2	As per IEC 62053-21:2003		
4.4.3	As per IEC 62053-21:2003		
4.4.4	As per IEC 62053-21:2003		
4.4.5	As per IEC 62053-21:2003		
4.4.6	As per IEC 62053-21:2003		
4.5	**Instructions and marking**		
4.5.1	Name plate marking requirements (indelibly marked and at least 4 mm height		
(1)	Manufacturer name		
(2)	Country of origin		
(3)	Model/Type of meter		
(4)	Meter serial number		
(5)	"Property of K.P. & L. Co. Ltd" inscription		
(6)	Standard to which meter complies		
(7)	Year of manufacture		
(8)	Bar code information		
4.5.2	Indelible markings of connection diagram with phase sequence		
4.5.3	Information on meter markings/wiring diagram / manuals/description leaflets.		
4.5.4	Type approval and calibration / test certificates		
4.5.5	Compliance matrix requirements		
4.5.6	Conformance to ISO 9001(2006)		
4.5.7	Meter type export details		
4.5.8	Meter type export for last 5 years at least 75,000 meters		

I .....on behalf of..... declare that the above specifications matrix conforms to a typical tender meter, type..... being offered for this tender.

Signature.....

Date..... Stamp/Seal .....