THE WEIGHTS AND MEASURES (ELECTRICITY METERS) RULES, 2015.

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The Weights and Measures (Electricity Meters) Rules, 2015.

(Under sections 22 and 43 of the Weights and Measures Act, Cap. 103)

IN EXERCISE of the powers conferred on the Minister responsible for trade by sections 22 and 43 of the Weights and Measures Act, Cap 103, these Rules are made this 22nd day of May, 2015.

PART I—PRELIMINARY

1. Title.

These Rules may be cited as the Weights and Measures (Electricity Meters) Rules, 2015.

2. Interpretation.

In these Rules, unless the context otherwise requires—

"absolute error" means indicated energy value minus the true energy value;

"accuracy class" means a class of measuring instruments or measuring systems that meet stated metrological requirements that are intended to keep measurement errors or instrumental uncertainties within specified limits under specified operating conditions;

"Act" means the Weights and Measures Act, Cap. 103;

"active power" means the rate at which energy is transported measured as the time mean of instantaneous power, which is calculated at each instant as the product of voltage and current;

"Authority" means the Electricity Regulatory Authority established under the Electricity Act, 1999, Cap. 145;

"auxiliary device" means a device within the meter that is not part of the basic metrology function;

"base maximum permissible error" means the extreme values of the relative error of indication of a meter permitted by these Rules, when the current and power factor are varied within the intervals given by the rated operating conditions, and when the meter is otherwise operated at reference conditions,

"Bureau" means Uganda National Bureau of Standards established under the Uganda National Bureau of Standards Act, Cap. 327 ;

"case" means the case of a meter that completely encloses it;

"checking facility" means a facility that is incorporated in the meter and which enables faults that would otherwise be significant faults to be detected and acted upon in such a way that incorrect registration is prohibited or recorded separately;

"consumer" means any person supplied or entitled to be supplied with electrical energy for personal, industrial, commercial use but does not include a person supplied with electrical energy for delivery to another person;

"current" means the root mean square value of the electrical current flowing through the meter;

"current circuit" includes the internal connections of the meter and part of the measuring element through which flows the current of the circuit to which the meter is connected;

"current range" means the range of current, over which the meter is designed to function within specified error limits;

"defect" includes a departure of a meter quality characteristic from its intended level of state that occurs with a severity sufficient to cause the meter not to satisfy normal usage requirements;

"direct connected meter" means a meter intended for use by direct connection to a circuit or circuits being measured without the use of external devices such as instrument transformers;

"Director" means the Executive Director of Uganda National Bureau of Standards;

"distributor" means a person who owns, operates, manages or controls distribution facilities for the movement or delivery of electricity to consumers;

"disturbance" means an influence quantity having a value within limits specified in accordance with these Rules, but outside the specified rated operating conditions of the meter;

"electrical energy" means electrical energy when generated, transmitted, distributed or utilised for any purpose except the transmission of any communication signal;

"electricity meter" means a de vice that measures the amount of electric energy consumed by a residence business or an electrically powered device;

"electrical energy meter" has the same meaning as electricity meter;

"electromechanical meter" means a meter in which currents in fixed coils react with the currents induced in the conducting moving element, generally a disk or disks which cause their movement proportional to the energy to be measured;

"fault" means the difference between the error of indication and the intrinsic error of a measuring instrument;

"frequency" means the frequency of the voltage and current supplied to the meter;

"harmonic" means a part of a signal that has a frequency that is an integer number multiple of the fundamental frequency of the signal, where the fundamental frequency is generally the nominal frequency;

"harmonic number" means an integer number used to identify a harmonic and is the ratio of the frequency of a harmonic to the fundamental frequency of the signal;

"influence factor" means an influence quantity having a value within the rated operating conditions specified in these Rules; "influence quantity" means a quantity that is not the measure but affects the result of the measurement;

"initial intrinsic error" means the intrinsic error of a measuring instrument as determined prior to performance tests and durability evaluations;

"inspector" means an Inspector of Weights and Measures appointed under the Act;

"interval meter" means an electricity meter which displays and stores the result as measured in predetermined time intervals;

"intrinsic error" means the error of a measuring instrument, determined under reference conditions;

"low current" means the lowest value of current within the manufacturer's specified range of current values at and above which the maximum permissible error requirement is constant with regard to current variations;

"maximum current" means the highest value of current at which the meter is specified by the manufacturer to meet the accuracy requirements of these Rules;

"maximum permissible error" means the extreme value of measurement error with respect to a known reference quantity value prescribed by these Rules for given measurement;

"maximum permissible error shift" means the extreme values of the relative error of indication of a meter permitted by these Rules, when a single influence factor is taken from its value at reference conditions and varied within the rated operating conditions;

"measuring element" means the part of a meter that transforms a current and voltage into a signal proportional to the power or energy;

"meter constant" means the value expressing the relation between the energy registered by the meter and the corresponding value of the test output;

"minimum current" means the lowest value of current at which the meter is specified by the manufacturer to meet the accuracy requirements of these Rules;

"multi-tariff meter or multi-rate meter" means an electricity meter intended to measure and display electrical energy where energy will have more than one tariff rate including a tariff rates determined by time, load or some other quantity;

"nominal frequency" means the frequency of the voltage and current specified by the manufacturer for normal operation of the meter;

"nominal voltage" means the voltage specified by the manufacturer for normal operation of the meter;

"place on market" means making a meter available in Uganda for an end user;

"power factor" means the ratio of active power to the apparent power*;*

"primary rated register" means a register where the scale factor due to the used instrument transformer is considered such that the measured energy on the primary side of the instrument transformer is indicated;

"put into use" means the first use of a meter intended for the end user for the purpose, for which it was intended;

"rated operating conditions" means a set of specified measuring ranges for performance characteristics and specified operating ranges for influence quantities, within which the variations of operating errors of a meter are specified and determined;

"reference condition" means operating condition prescribed for evaluating the performance of a measuring instrument or measuring system or for comparison of results;

"register" means part of the meter that stores the measured values;

"register multiplier" means a constant with which the register reading shall be multiplied to obtain the value of the metered energy;

"relative error" means absolute error divided by the true energy value, usually expressed as a percentage;

"significant fault" means a fault greater than the value specified in these Rules;

"starting current" means the lowest value of current specified by the manufacturer at which the meter should register electrical energy at unity power factor and, for poly-phase meters, with balanced load;

"static meter" means a meter in which current and voltage act on solid state electronic elements to produce an output proportion to the energy to be measured;

"test output" means a device which can be used for testing of the meter, providing pulses or the means to provide pulses corresponding to the energy measured by the meter;

"transformer operated meter" means a meter intended for use with one or more external instrument transformers;

"transitional current" means the value of current at and above which the meter is specified by the manufacturer to lie within the smallest maximum permissible error corresponding to the class index of the meter;

"voltage" means root mean square value of the electrical voltage supplied to the meter;

"voltage circuit" includes the internal connections of the meter, part of the measuring element and, in the case of static meters, part of the power supply, supplied with the voltage of the circuit to which the meter is connected.

PART II—UNITS OF MEASUREMENT AND STANDARDS

3. Units of electrical energy.

(1) The units of measurement for the sale of electrical energy shall be—

(a) the watt hour;

(b) the volt-ampere hour; or

(c) the volt ampere reactive (var).

(2) Where the unit of measurement for the sale of electricity is the volt-ampere hour, vector addition shall be used to determine the total number of such units in a combination of polyphase circuits.

(3) The units of measurement for the sale of electricity shall include multiples and submultiples of such units.

4. Secondary standards.

(1) The Director shall procure and cause to be maintained suitable secondary standards to which all electrical energy testing meters shall be traceable.

(2) The Director shall cause the secondary standards, for the time being, to be re-verified by an electrical laboratory accredited for such purposes at least once in every fifteen years.

5. Working standards.

(1) The Director shall procure and keep records of working standards of electrical energy testing meters for the use of inspectors in the exercise of their duties under these Rules.

(2) The Director shall maintain working standards for electrical energy testing meters and shall cause every working standard to be calibrated at least once every twelve months and issue a certificate prescribed in Schedule 1.

PART III—METROLOGICAL REQUIREMENTS OF METERS

6. Rated operating conditions

(1) The rated operating conditions set out in Table 1 of Schedule 2 to these Rules shall apply to the meters in the accuracy classes specified in rule 7(1) of these Rules.

(2) A meter shall not exceed the maximum permissible error for the specified class under rated operating conditions.

7. Accuracy requirements.

(1) A meter shall be designed and manufactured so that when exposed to disturbances significant faults do not occur.

(2) Where the checking facility detects and acts upon a significant fault, the meter shall clearly indicate that such an event has occurred and the fault shall no longer be considered a significant fault after that.

(3) The manufacturer shall indicate the accuracy class of electrical energy meter according to internationally accepted standard.

8. Direction of energy flow.

(1) The polarity of energy flow shall be defined by the manufacturer's connection instructions for the meter and shall be capable of bi-directional energy flow.

(2) An electrical energy meter shall fall into one of the following categories—

(a) single - register, bi-directional;

(b) two - register, bi-directional;

(c) single - register, positive direction only; or

(d) single - register, uni-directional.

9. Maximum permissible errors.

(1) The relative error for an electrical energy meter shall be within the base maximum permissible error specified in Table 2 of Schedule 2.

(2) An electrical energy meter shall be able to carry the *imax* continuously without an error larger than the base maximum permissible error for a meter of its class.

(3) The error shift due to continuous current at *imax* shall not be larger than fifty percent of the base maximum permissible error for the relevant class.

10. Allowed effects of influence.

(1) The temperature coefficient of an electrical energy meter that is operated at reference conditions shall fulfill the requirements prescribed in Table 3 in Schedule 2.

(2) The variations of error when the load current and power factor are held constant at a point within the operating range with the meter operated at reference conditions, and when any single influence quantity is varied from its value at reference conditions to its extreme values defined in Table 4 of Schedule 2 shall be such that the additional percentage error is within the corresponding limit of error shift given in Table 4.

(3) An error shift larger than that prescribed in Table 4 in Schedule 2 shall constitute a significant fault.

(4) An electrical energy meter shall continue to function after the completion of each of these tests specified under this rule.

11. Allowed effects of disturbance.

(1) An electrical energy meter shall withstand disturbance encountered under conditions of normal use.

(2) Where an electrical energy meter is operated under the conditions set out in Table 5 of Schedule 2 and no current is applied, a change in the registers or pulses of the test output shall not be considered as a significant fault if the change in the registers or equivalent energy of the test output is less than: critical change value= m . Unom .Imax . 10-6 Kw. h

Where m is the number of measuring elements

12. Timing requirements for interval and multi-tariff meters. An interval electrical energy meter shall be able to measure and store interval data for a minimum of thirty five days of thirty minute interval data.

13. Meter marking.

(1) The following information shall be marked on every meter—

(a) the name of the manufacturer;

(b) the *U*nom;

(c) the *I*max;

(d) the *I*tr;

(e) the approval mark;

(f) the serial number;

(g) the number of phases;

(h) the number of wires;

(i) the register multiplier, if other than unity;

(j) the meter constant or constants;

(k) the year of manufacture;

(l) the class index;

(m) the directionality of energy flow, if the meter is bidirectional or unidirectional but no marking is required if the meter is capable only of positive direction energy flow;

(n) the meter type;

(o) the temperature range;

(p) the humidity and water protection information;

(q) the impulse voltage protection information;

(r) the *f*nom;

(s) the connection mode or modes for which the meter is specified;

(t) the connection terminals uniquely identified to distinguish between one terminal and another.

(2) The markings of the information specified in subrule (1) shall be indelible, distinct and legible from outside the meter.

(3) The markings of meters intended for outdoor locations shall withstand solar radiation and multiple values of *U*nom and *f*nom shall be marked, if so specified by the manufacturer.

(4) Where the serial number of the meter is affixed to dismountable parts, the serial number shall be marked in a position where it is not readily disassociated from parts determining the metrological characteristics of the meter.

14. Protection of metrological properties.

(1) The metrological properties of every meter shall be protected.

(2) The means to protect the metrological properties of a meter intended for outdoor locations shall withstand solar radiation.

15. Software identification.

(1) The software of an electrical energy meter shall be clearly identified with the software version or another token.

(2) The identification may consist of more than one part but at least one part shall be dedicated to the legal purpose.

(3) The identification shall be inextricably linked to the software itself and shall be presented on command or displayed during operation.

(4) For the purposes of identification under this rule, an imprint of the software identification on the meter shall be an acceptable solution if it satisfies the following conditions—

(a) the user interface does not have any control capability to activate the indication of the software identification on the display or the display does not technically allow the identification of the software to be shown;

(b) the meter does not have an interface to communicate with the software identification; and

(c) after production of the meter a change of the software is not possible or only possible if the hardware or a hardware component is also changed.

(5) It is the responsibility of the manufacturer of the hardware or hardware component to ensure that the software identification is correctly marked on the meter.

16. Software and parameter protection.

(1) The legally relevant software of a meter shall be secured against any unauthorised modification, loading or change.

(2) Only those functions specified under these Rules shall be allowed to be activated by the user interface and the activation shall be done in such a way that it does not facilitate fraudulent use.

(3) The parameters that fix the legally relevant characteristics of the meter shall be secured against unauthorised modification.

(4) The manner of verification of the parameter settings of the meter shall be displayed in a conspicuous place.

(5) The parameters may be classified as—

(a) unalterable, that is, the parameters have been secured and cannot be easily accessed unless through a special operational mode; or

(b) settable, that is, the parameters can be accessed easily by an authorised person such as the user or repairer.

(6) For the purposes of subrule (1), the zeroing of the register that stores the total energy metered shall be taken as a modification of a device specific parameter.

(7) In these Rules, all software modules that perform relevant functions or that contain relevant data domains form the legally relevant software part of an electrical energy meter.

(8) The software modules referred to in subrule (7), shall be made identifiable as prescribed under rule 15(1).

(9) Where the software modules that perform legally relevant functions are not identified, the whole software shall be considered as legally relevant.

(10) Where a legally relevant software part communicates with other software parts, a software interface shall be defined and all communications shall be performed exclusively through this interface.

(11) The legally relevant software part and the interface shall be clearly documented.

(12) There shall be unambiguous assignment of each command to all initiated functions or data changes in the legally relevant part of the software.

(13) Commands that communicate through the software interface shall be declared and documented.

(14) Only documented commands shall be allowed to be activated through the software interface.

(15) The manufacturer shall state the completeness of the documentation of commands.

17. Separation of electronic devices and subassemblies.

Metrologically critical parts of a meter shall not be influenced by other parts of the meter.

18. Data quality.

(1) The measurement value stored or transmitted in a meter shall be accompanied by all relevant information necessary for future legally relevant use.

(2) The data in a meter shall be protected by software means to guarantee the authenticity, integrity and, if necessary correctness of the information concerning the time of measurement.

(3) The software that displays or further processes the measurement values and accompanying data shall check the time of measurement, authenticity, and integrity of the data

after having read it from the insecure storage or after having received it from an insecure transmission channel.

(4) The data shall be discarded or shall be marked "unusable" if an irregularity is detected as a result of the checks carried out under subrule (3).

(5) Confidential keys used in the protection of data shall be kept secret and secured in the electricity meter and the keys shall only be input or read if a seal is broken.

(6) Software modules that prepare data for storing or sending, or that check the data after reading or receiving belong to the legally relevant software part.

19. Data storage.

(1) All measurement data in a meter shall be stored automatically as soon as the measurement is concluded.

(2) Where the final value is from a calculation, all data that is necessary for the calculation shall be automatically stored with the final value.

(3) The storage device shall be sufficiently durable to ensure that the data is not corrupted under normal storage conditions.

(4) There shall be sufficient memory storage for any particular application.

(5) Stored data in a meter shall only be deleted when the following conditions have been fulfilled—

(a) the transaction is settled; and

(b) the data is printed by a printing device subject to legal control.

(6) Where the memory is full and the requirements under subrule (5) have been met, the memorised data may only be deleted under the following conditions—

(a) the data shall be deleted in the same order it was recorded; and

(b) the deletion shall be automatic or if it manual, the specific access rights shall apply before deletion.

20. Data transmission and internal clocks.

(1) The measurement of data in a meter shall not be influenced by a transmission delay.

(2) A measurement process shall be stopped to avoid loss of measurement data when network services become unavailable.

(3) The internal clocks in a meter shall be enhanced by specific means such as software to reduce their uncertainty when the time of measurement is necessary for a specific field such as in an interval meter or a multi-tariff meter.

21. Checking facility event recorder.

(1) Where a meter is equipped with a checking facility, the event recorder of the facility shall have enough room for at least one hundred events and shall be of a first-in-first-out type.

(2) The event recorder shall not be changed or zeroed without breaking a seal or without authorised access such as a password or a key.

22. Display in a meter.

(1) The indicating device in a meter shall be easy to read.

(2) The minimum height of the characters of measurement results shall be four millimeters.

(3) Any decimal fraction shall be clearly indicated in the display.

(4) Any decimal fraction for a mechanical register shall be marked differently.

(5) An indicating device shall not be significantly affected by exposure to normal operating conditions over the maximum duration of the meter life time.

(6) Where a single indicating device is constructed to present multiple values, it shall be able to display the content of all the relevant memories.

(7) For automatic sequencing displays, each display of register for billing purposes shall be retained for a minimum of five seconds.

(8) For multi-tariff meters, the register which reflects the active tariff shall be indicated and shall be possible to read each tariff register locally and each register shall be clearly identified.

(9) The register shall be capable of storing and displaying an amount of energy that corresponds to the meter running at $P=U\text{nom}.\ I\text{max}.\ n$ for at least four thousand (4000) hours, where n is the number of phases.

(10) The retention time for an electronic register that has been disconnected shall be twelve months.

23. Test output.

(1) A meter shall be equipped with a test output for efficient testing.

(2) The manufacturer of a meter shall declare the necessary number of pulses to ensure a standard deviation of measurement less than 0.1 base m.p.e. at $I\text{max}$, Itr and $Imin.$, where the design of the test output is such that the pulse rate does not correspond to the measured power in every given relevant time interval.

(3) The relationship between the measured energy given by the test output and the measured energy given by the indicating device shall comply with the marking on the name-plate.

24. Durability.

(1) A meter shall be designed to maintain adequate stability of the metrological characteristics over a period of time specified by the manufacturer, if it is properly installed, maintained and used according to the manufacturer's instructions when in the environment for which it is intended.

(2) A meter shall be designed and manufactured such that significant durability errors do not occur and if they do occur, they are detected and acted upon through durability protection measures.

(3) A manufacturer shall provide at least one of the following forms of documentation for the durability of a meter—

(a) description of measures for durability enhancement or protection;

(b) documented experiences based on the operation of meters of similar construction; or

(c) durability test procedure.

PART IV—TYPE APPROVAL DOCUMENTATION AND IMPORTATION OF METERS

25. Meaning of "type".

(1) All meters manufactured by the same manufacturer may form a type if they have similar metrological properties resulting from the use of the same uniform construction of parts or modules that determine the metrological properties.

(2) A type may have several current ranges and several values of the nominal voltage and frequency, and include several connection modes and several ancillary devices.

(3) For purposes of this rule, "same uniform construction" means the same construction of the measuring elements, the same construction of metering software, the same construction of the register and indicating device, the same temperature compensation mechanism, the same construction of case, mechanical block and mechanical interface.

26. Application for "type" approval.

(1) An application for type approval shall be accompanied by the following—

(a) the identification of the type including—

(i) the name or trade mark;

(ii) the type designation;

(iii) the versions of hardware and software; and

(iv) the drawing of name plate;

(b) the metrological characteristics of the meter including—

(i) a description of the principle of measurement;

(ii) the metrological specifications;

(iii) any steps which should be performed prior to the testing the meter;

(c) the technical specification for the meter including—

(i) a block diagram with a functional description of the components and devices;
(ii) the drawings, diagrams and general software information, explaining the construction and operation including interlocks;

(iii) the description and position of seals or other means of protection;

(iv) the documentation related to durability characteristics;

(v) any document or other evidence that the design and construction of the meter complies with the requirements of these Rules;

(vi) the specified clock frequency.

(d) the user manual;

(e) the installation manual;

(f) a description of the checking facility;

(g) the software documentation including—

(i) a description of the legally relevant software and how the requirements are met;

(ii) a list of the software modules that belong to the legally relevant part including a declaration that all legally relevant functions are included in the description;

(iii) the description of the software interfaces of the legally relevant software part and of the commands and data flows via this interface including a statement of completeness;

(iv) the description of the generation of the software identification;

(v) the source code which shall be made available to the Director, depending on the validation method chosen;

(vi) the list of parameters to be protected and description of protection means;
(vii) a description of security means of the operating system including passwords;

(viii) a description of the software sealing methods;

(ix) an overview of the system hardware with diagrams to elaborate the system hardware;

(x) the identification of legally relevant hardware and that which performs legally relevant functions;

(xi) a description of the accuracy of the algorithms;

(xii) a description of the user interface, menus and dialogues;

(xiii) the software identification and instructions for obtaining it from an instrument in use;

(xiv) a list of commands of each hardware interface of the measuring instrument, electronic device or sub-assembly including a statement of the completeness;

(xv) a list of durability errors that are detected by the software and a description of the detecting algorithms;

(xvi) a description of data sets stored or transmitted,

(xvii) a description of fault detecting algorithms in the software and the list of faults that are detected; and

(xviii) the operating manual;

(h) the type test documentation, if the test is to be based on the existing type approval.

27. Importation of meters.

(1) A person who imports a meter of the type that has already received approval outside Uganda, shall apply to the Director, and provide the information specified in Schedule 3.

(2) A person who imports a meter under subrule (1) shall ensure that—

(a) the manufacturer of the meter has obtained quality assurance certification conforming to international standards;

(b) the manufacturer has at least five years of experience in the manufacture of the meters in question;

(c) the manufacturer has supplied such meters to a minimum of five electricity authorities or utilities, out of which, at least three are from outside the country of manufacture;

(d) the manufacturer furnishes catalogues describing the meter which shall include the type, model number, construction features, materials used, technical literature, dimensional drawings and the type-test certificates conforming to International standards;

(e) two meter samples are submitted to the Director together with the certificates;

(f) the type test certificate so furnished shall contain results on the following tests—

(i) test of mechanical requirements;

(ii) spring hammer test;

(iii) shock test;

(iv) vibration test;

(v) test of resistance to heat and fire; and

(vi) tests of protection against penetration of dust and water.

(3) Proof of the requirements in subrule (2) shall be given to the Director, at least three months before importation of the meters commences.

(4) In the case of requirements relating to the tests under subrule (2)(f) , the proof shall indicate the following—

(a) the name, address and country of the resting Authority;

(b) the date of testing;

(c) the name of equipment type tested;

(d) number of pages of the type test certificates;

(e) manufacturer's identity or catalogue reference number;

(f) the basic parameters;

(g) the standard to which the meter was type tested; and

(h) the comments and observation of the testing authority, if any.

PART V—FUNCTIONS OF THE BUREAU

28. Functions of the Bureau.

The functions of the Bureau under these Rules are to provide for—

(a) the specifications relating to design, composition, construction and performance to which any meter or class, type or design of meter shall conform before permission or approval as regards that meter or class, type or design of meter;

(b) the specifications relating to the installation and use of any meter or any class, type or design of meter;

(c) the manner in which meters of any class, type or design, or in any circumstances, are to be tested, verified, sealed, reverified or resealed and the manner and circumstances in which such meters are to be stamped, re-stamped, labelled, relabelled, tagged, re-tagged or otherwise marked;

(d) the specification in which meters of any class, type or design, or in any circumstances, are to be tested, verified, sealed, reverified or resealed and the manner and

circumstances in which those meters are to be stamped, re-stamped, labelled, relabelled, tagged, re-tagged or otherwise marked;

(e) the plans for the initial verification and re-verification of meters of any class, type or design;

(f) the fees and charges payable by any person for any certificate, inspection or service provided under these Rules.

PART VI—VERIFICATION OF METERS

29. Inspector to verify meters.

(1) A meter shall only be verified, sealed, re-verified or re-sealed by an inspector, whether the meter is verified individually or statistically after payment of the prescribed fees in Schedule 4.

(2) A seal of any verified meter shall only be broken by an inspector or a person authorized by an inspector in writing.

(3) A meter with broken seal shall not be put in use until it has been verified and re-sealed.

(4) A licensee is responsible for each verified meter that is in use.

(5) A licensee shall keep a meter in good repair, and is responsible for causing it to be verified from time to time in accordance with the requirements of these Rules.

(6) Every licensee shall submit a meter to an inspector for reverification at least once every five years.

(7) The licensee shall notify the Director two months before the due date of re-verification.

30. Meter verification procedures.

(1) An inspector shall ensure that the test system or working standard used has sufficient accuracy to verify the meter and that its calibration is valid.

(2) An inspector shall check that the meter under test is manufactured in conformity with the corresponding type approval documentation.

(3) The Director may authorize any inspector, in writing, to verify any type or class of meters in accordance with international standards in the absence of verification procedures in these Rules.

(4) A meter or type of meter verified in accordance with international standards under this rule shall be treated as if it were verified under these Rules.

31. Verification marks.

(1) A verification mark shall be applied to every meter verified under these Rules.

(2) A verification mark shall be applied either on the stamping plug or adhesive label of the meter and the following requirements shall apply—

(a) the mark shall be easily affixed without affecting the metrological properties of the meter;

(b) the mark shall be visible without moving or dismantling the meter when in use;

(c) the part on which the mark is located shall not be removable from the meter without damaging the mark; and

(d) the size of the space intended to contain the marks applied by the inspector shall not be less than 200 square millimeters.

32. Sealing.

(1) Every meter verified in accordance with these Rules shall be sealed.

(2) Sealing may be mechanical or solid state, that is to say, electronic seal or both mechanical and solid state, as the case may be.

(3) The Director may require that provision is made for the sealing devices and parameters that have a metrologically significant effect and that determine the measurement result.

33. Inspector to apply verification mark and seal.

Only an inspector shall apply a verification mark or seal required to be applied to any meter under these Rules.

34. Verification certificate.

An inspector shall issue a verification certificate in respect of every meter that is verified and sealed in accordance with these Rules.

35. Withdrawal of meters from service.

(1) The Director may, by notice in writing to the owner of any meter, require its withdrawal from service where the Director believes that the withdrawal is necessary.

(2) A copy of the withdrawal notice shall be published in the Uganda Gazette or in a newspaper of wide circulation.

PART VII—GENERAL

36. Delivery or sale of meters.

A person shall not deliver, offer for sale, sell, purport to sell, or put into use any meter unless that meter has been passed by an inspector as fit for use for trade and bears valid verification marks indicating that it has been passed as provided for under these Rules.

37. Offences related to meters.

(1) A person who—

(a) without authority makes, causes or procures to be made, or assists in making any certificate under these Rules or purporting it to be a certificate so required or any stamp, seal, label, tag or mark prescribed for the purposes of these Rules or purporting it to be a stamp, seal, label, tag or mark;

(b) knowingly sells, utters or disposes of, lets, uses, lends or exposes for sale any meter with any stamp, seal, label, tag or mark made or obtained by means other than means provided for under these Rules;

(c) in relation to the administration of these Rules, knowingly—

(i) makes any false representation;

(ii) makes or causes to be made any false entry in any register or record,

(iii) makes or causes to be made any false document or makes any alteration, false in a material particular, to the form of a copy of any document; or

(iv) produces or tenders any document containing false information,

(d) for a fraudulent purpose, repairs or alters, or causes to be repaired or altered, or tampers with or does any other act in relation to a meter, or any wire leading to a meter, so as to cause the meter to register with an error or replaces any meter with a meter likely to mislead,

commits an offence.

(2) A person who contravenes sub-rule (1) commits an offence and is liable on conviction to a fine not exceeding three currency points or imprisonment not exceeding three months or both.

SCHEDULE 1

Rule 5

CERTIFICATE OF VERIFICATION OF WORKING STANDARD

I certify that the Working Standard meter with under listed particulars has this day been duly calibrated in my presence by comparison with the Reference Standard in accordance with the Weights and Measures (Electrical Energy Meters) Rules 2014.

(a) Manufacturer's mark or name ……

(b) Accuracy class, type or design of the meter ……....

(c) Meter Serial Number……..

(d) Previous Seal No. …….

(e) New seal No. ……

(f) Expiry date. …….. (g) Next date of calibration. …….

(h) The errors, if any, of the meter at all points tested……

(i) Signature……. (j) Name ……

(In block letters)

(k) *(Executive Director of Uganda National Bureau of Standards)*

Dated this ……day of ……., 20.....

SCHEDULE 2

Metrological requirements Rule 6(1)

Table 1: RATED OPERATING CONDITIONS

<table>
<tr><td>Influence quantity</td><td>Values, Ranges</td></tr>
<tr><td>Frequency</td><td>f_{nom} ±2% where f_{nom} is to be specified by the manufacturer.
If the manufacturer specifies more than one nominal frequency, the rated operating conditions shall be the combination of all f_{nom} ±2% intervals</td></tr>
<tr><td>Voltage</td><td>U_{nom}±10% where U_{nom} is to be specified by the manufacturer.
Meters designed to operate across a range of voltages shall have applicable U_{nom},s specified by the manufacturer. If the manufacturer specifies more than one nominal voltage the rated operating conditions shall be the combination of all U_{nom}±10% intervals.</td></tr>
<tr><td>Current</td><td>I_{st} to I_{max}
I_{max} and I_{tr}, I_{min} and I_{st} are to be specified by the manufacturer in accordance with the following:

<table>
<tr><td>Direct Connected</td><td colspan="4">Accuracy Class</td></tr>
<tr><td></td><td>A</td><td>B</td><td>C</td><td>D</td></tr>
<tr><td>I_{max} /I_{tr}</td><td>≥ 50</td><td>≥ 50</td><td>≥ 50</td><td>≥ 50</td></tr>
<tr><td>I_{max} /I_{min}</td><td>≥ 100</td><td>≥ 125</td><td>≥ 250</td><td>≥ 250</td></tr>
<tr><td>I_{max} /I_{st}</td><td>≥ 100</td><td>≥ 1250</td><td>≥ 1250</td><td>≥ 1250</td></tr>
</table>
<table>
<tr><td>Transformer Operated</td><td colspan="4">Accuracy Class</td></tr>
<tr><td></td><td>A</td><td>B</td><td>C</td><td>D</td></tr>
<tr><td>I_{max} /I_{tr}</td><td>≥ 24</td><td>≥ 24</td><td>≥ 24</td><td>≥ 24</td></tr>
<tr><td>I_{max} /I_{min}</td><td>≥ 60</td><td>≥ 120(1)</td><td>≥ 120</td><td>≥ 120</td></tr>
<tr><td>I_{max} /I_{st}</td><td>≥ 480</td><td>≥ 600</td><td>≥ 1200</td><td>≥ 1200</td></tr>
</table>
Note (1) ≥ 60 for class B transformer operated electromechanical meters.</td></tr>
<tr><td>Power factor</td><td>From 0.5 inductive to 1 to 0.8 capacitive, except for classes C and D where the operating range is from 0.5 inductive to 1 to 0.5 capacitive.
For bi-directional meters the power factor range limits are valid in both directions.</td></tr>
<tr><td>Temperature</td><td>From lower temperature limit to upper temperature limit as specified by the manufacturer.
The manufacturer shall specify the lower temperature limit from the values:
-55 ^{0}C, -40 ^{0}C, -25 ^{0}C, -10 ^{0}C, +5^0

The manufacturer shall specify the upper temperature limit from the values:
+30^{0}C+40 ^{0}C, +55 ^{0}C, +70 ^{0}C</td></tr>
</table>

<table>
<tr><td>Humidity and water</td><td>With respect to humidity, the manufacturer shall specify the environment class for which the instrument is intended:

H1: enclosed locations where the instruments are not subjected to condensed water, precipitation, or ice formations;

H2: enclosed locations where the instruments may be subjected to condensed water, to water from sources other than rain and to ice formations;

H3: open locations with average climatic conditions.</td></tr>
<tr><td>Connection modes</td><td>The manufacturer shall specify whether the meter is intended for direct connection, connection through current transformers or through current and voltage transformers.

The manufacturer shall specify the connection modes, the number of measuring elements of the meter and the number of phases of the electric system for which the meter is intended.

Meters may be categorized as follows:
<table>
<tr><td></td><td>No. of phases</td><td>No. of wires</td><td>No. of elements</td></tr>
<tr><td></td><td>single</td><td>two</td><td>1</td></tr>
</table></td></tr>
</table>

	single	three	1
	single	three	2
	three	four	3
	three	three	2
	two	three	2

Tilt_____	Mounting position as specified by the manufacturer ±3 degrees. If no mounting position is given, any mounting position is allowed.
Harmonics	The voltage and current shall be allowed to deviate from the sinusoidal form, as given by the requirements in Table 4 –'Harmonics in voltage and current circuits'
Load current in only one current circuit for poly-phase meters and for single –phase 3- wire meters.	The load balance shall be allowed to vary from fully balanced conditions to Balance

Table 2: BASE MAXIMUM PERMISSIBLE ERROR AND NO LOAD REQUIREMENTS

Quantity		Base maximum permissible errors(%) for meter s of class			
		A	B	C	D
Current I where $I_{tr} \leq I \leq I_{max,}$ and power factor variation from 0.8 to1 to 0.5 inductive		±2.0	±1.0	±0.5	±0.2
Current I where $I_{min} \leq I < I_{tr,}$ at unity power factor		±2.5	±1.5	±1.0	±0.4
Current I where $I_{st} \leq I < I_{min,}$ at unity power factor	Direct connected meter	±2.5·Itr/(2·I)	±1.5·Itr/(2.5·I)	±1.0·Itr/(5·I)	±0.4·Itr/(5·I)
	Transformer operated meter	±2.5·Itr/(2.5·I)	±1.5·Itr/(2.5·I)	±1.0·Itr/(5·I)	±0.4·Itr/(5· I)
No load		No significant metered energy as given by the corresponding test			

Table 3: LIMITS OF TEMPERATURE COEFFICIENT OF ERROR

Influence quantity	Power factor	Limits for temperature coefficient (%K) for meters of class			
		A	B	C	D
Temperature coefficient(%K), over any interval within the temperature range which is not less than 15 K and not greater than 23 K, for current $I_{tr} \leq I \leq I_{max}$	1	±0.1	±0.05	±0.03	±0.01
	0.5 inductive	±0.15	±0.07	±0.05	±0.02

Table 4: LIMIT OF ERROR SHIFT DUE TO INFLUENCE QUANTITIES

Influence quantity	Value	Test Schedule	Value of Current	Power factor	Limits of error shift(%) for meters of class			
					A	B	C	D
Temperature dependence	Over entire specified temperature range	Seventh	$I_{tr} \leq I \leq I_{max}$	1	±3.3	±1.7	±0.7	±0.3
				0.5 inductive				
Load balance		Seventh		1	±1.5	±0.7	±0.2	±0.1

	Current in only one current circuit		$I_{tr} \le I \le I_{maxssss}$	0.5 inductive				
Voltage variation	$U_{nom \pm 10\%}$	Seventh	$I_{tr} \le I \le I_{max}$	1	±1.0	±0.7	±0.2	±0.1
				0.5 inductive	±1.5	±1.0	±0.4	±0.2

Frequency variation	$f_{nom \pm 2\%}$	Seventh	$I_{tr} \le I \le I_{max}$	1	±0.8	±0.5	±0.2	±0.1
				0.5 inductive	±1.5	±0.7	±0.2	±0.1
Harmonics in voltage and current circuits	*D* is 0-40% *I*, 0-5 %*U*	Seventh	$I_{tr} \le I \le I_{max}$	1	±1.0	±0.6	±0.3	±0.2
Tilt	≤ 3 degrees	Seventh	$I_{tr} \le I \le I_{max}$	1	±1.5	±0.5	±0.4	n.a
Damp heat	Humidity class	Seventh	$I_{tr} \le I \le I_{max}$	1	±0.2	±0.1	±0.05	±0.02
Severe voltage variation	0.8 $U_{nom} \le U < 0.9\ U_{nom}$ 1.1 $U_{nom} < U \le 1.15\ U_{nom}$ $U < 0.8\ U_{nom}$	Seventh	As defined in test	1	±1.5	±1	±0.6	±0.3
					+ 10 to -100			
One or two phases interrupted		Seventh	As defined in test	1	±4	±2	±1	±0.5
Sub-harmonics in the AC current circuit	Two periods on, two periods off	Seventh	As defined in test	1	±3	±1.5	±0.75	±0.5
Influence quantity	Value	Test Rule	Value of Current	Power factor	Lim its of error shift(%) for meter s of class			
					A	B	C	D
Harmonics in the AC current circuit	Phase-fired t 90 degrees	Seventh	As defined in test	1	±1	±0.8	±0.5	±0.4
Reversed phase sequence	Any two phases inter-changed	Seventh	As defined in test	1	±1.5	±1.5	±0.1	±0.05
Continuous (DC) magnetic induction of the external origin	200 mT at30mm from core surface	Seventh	As defined in test	1	±3	±1.5	±0.75	±0.5
Magnetic								

field(AC power frequency) of external origin	400A/m	Seventh	As defined in test	1	±2.5	±1.3	±0.5	±0.25
Radiated RF electromagnetic fields	*f*=80 to 6000 MHz ≤10 V/m; Amplitude modulated	Seventh	As defined in test	1	±3	±2	±1	±1
Conducted disturbances induced by radio frequency fields	*f*=0.15to 80 MHz ≤10 V/m; Amplitude modulated		As defined in test	1	±3	±2	±1	±1
DC in the AC Current circuit	Sinusoidal current, twice amplitude, half-wave rectified $I_{\leq}$ $I_{max}/\sqrt{\sqrt{}}2$		As defined in test	1	±6	±3	±1.5	±1
High- order harmonics	Superimposed: $0.02U_{nom,}$ $0.1I_{tr;}$ $15f_{nom}$ to $50f_{nom}$		As defined in test	1	±1	±1	±0.5	±0.5

Table 5: Disturbances

Disturbance quantity		Test Settings	Allowed effects	Limits of error shift(%) for meters of class			
				A	B	C	D
Magnetic field(AC,power frequency) of external origin		1000 A/m,3 s	No significant fault as given by the corresponding test	-	-	-	-
Electrostatic discharges		6 kV contact discharge,8 kV air discharge	No significant fault as given by the corresponding test	-	-	-	-
Fast transients		Voltage and current circuits 4 kV; auxiliary circuits 2kV	No significant fault as given by the corresponding test	6.0	4.0	2.0	1.0
Voltage dips		Test (a): 30%,0.5 cycles Test (b): 60%,1 cycle Test (c): 60%, 25/30 cycles	No significant fault as given by the corresponding test	-	-	-	-
Voltage interruptions		0%,250/300 cycles	No significant fault as given by the corresponding test	-	-	-	-

Radiated, RF, electromagnetic fields		f=80 to 6000 MHz,30 V/m, amplitude modulated, without current	No significant fault as given by the corresponding test	-	-	-	-
Surges on AC power lines		Voltage circuits: 2 kV line to line. 4 kV line to earth. Auxiliary circuits: 1 kV line to line, 2 kV line to earth.	No significant fault as given by the corresponding test.	-	-	-	-
Disturbance quantity		Test Settings	Allowed effects	Limits of error shift(%) for meters of class A B C D			
Damped oscillatory waves immunity		Voltage circuits: Common model 2.5 kV Differential model 1.0 kV	No significant fault as given by the corresponding test.	-	-	-	-
Short time overcurrent		Direct connected meters: 30.$I_{max,}$ Transformer operated meters: 20. I_{max}	No significant fault as given by the corresponding test. No damage shall occur.	Transf ormer o perated			
				1.0	0.5	0.05	0.005
				Direct connected			
				1.5	1.5	0.05	
Impulse voltage		Refer to Rule	No significant fault as given by the corresponding test. No damage shall occur.	-	-	-	-
Earth fault		Earth fault in one phase	No significant fault as given by the corresponding test. No damage shall occur.	1.0	0.7	0.3	0.1

Operation of auxiliary devices		Auxiliary devices operated with $I=I_{tr}$ and I_{max}	No significant fault as given by the corresponding test.	1/10 of base m.p.e.			½ of base m.p.e.			
Vibration		Vibration in the three mutually perpendicular axes	No significant fault as given by the corresponding test.	1/10 of base m.p.e			½ of base m.p.e.			
Shock		Refer to test Rule	No significant fault as given by the corresponding test.	1/10 of base m.p.e			½ of base m.p.e.			
Protection against solar radiation		Refer to test Rule	No alteration in appearance or impairment in functionality, metrological properties and sealing	-	-	-		-		
Disturbance quantity		Test Settings	Allowed effects	Limits of error shift(%) for meters of class						
				A	B		C	D		
Protection against ingress or dust		Refer to test Rule	No interference with correct operation or impairment of safety, including tacking along creepage distances.	-	-		-	-		
Extreme temperatures		Refer to test Rule	No significant fault as given by the corresponding test.	1/10 of base m.p.e.			½ of ba se m.p.e.			
Humidity and water		Refer to test Rule	No significant fault as given by the corresponding test.	-	-		-	-		

SCHEDULE 3

Rule 27

APPLICATION FOR PERMISSION OR APPROVAL TO IMPORT METERS

Subject to Rule 29, any person with an intention to import meters into Uganda shall apply to the Director, indicating the following particulars.

1. An application for permission or an approval referred to in Rule 29 of these Rules, shall be made in writing to the Director and shall contain the following information:

   (a) the name and principal place of business of the applicant;

   (b) information sufficient to describe clearly the design, composition, construction and performance of the meter or the class, type or design of meter, to which the application relates;

(c) data that indicate whether the meter or the class, type or design of meter to which the application relates meets all applicable requirements of these Rules, and specifications.

(d) where the manner of installation or use affects the performance of the meter or meters of the class, type or design to which the application relates, the manner in which the meter or each meter of the class, type or design is to be installed and used;

(e) a copy of any promotional material, instructions and other information distributed or intended for distribution to purchasers or prospective purchasers of the meter or the class, type or design of meter to which the application relates; and

(f) such additional information in respect of the meter or the class, type or design of meter that is necessary for the purposes of the application.

2. An applicant shall make available to the Director one or more meters of the class, type or design of meter to which the application referred to relates, and shall also make available such equipment, material and services as are required to inspect and test the meter or meters.

3. Where the Director grants an approval under these Rules, he or she shall specify in writing in the approval, any conditions to which the approval is subject.

SCHEDULE 4

Rule 29 Verification Fees

Location of Meter	*Total Verification Fees-Shillings*
In House (New Meters)	8,000
In Service (In Field)	25,000