Nigerian Electricity Management Services Agency (NEMSA)

"TECHNICAL REQUIREMENTS FOR ENERGY METERS IN NIGERIA"

A Presentation

by

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INTRODUCTION

- All energy meters to be deployed in Nigeria must meet the general requirements of the Nigerian Metering Code Version 02
- These requirements which are generally specified in Section 4 of the Code include:
  - Applicable Voltage, Current & Frequency Standards
  - Accuracy
  - Type of Connection points
  - Casing
  - Location of Check & Metering Systems
  - Communication

EXCERPTS OF NERC METERING CODE

SECTION 4.1. GENERAL

The technical specifications enunciated herein are a summary of minimum requirements for energy meters and metering accessories approved for use in Nigeria's electricity network. It is aimed at promoting quality of energy metering in Nigeria to ensure fair play in energy transactions among utilities and customers and safety of all meter users. The specifications cover the following:

i. Electromechanical Meters
ii. Electronic Meters
iii. Prepaid Meters
iv. Automatic Meter Reading Systems (AMR)
v. Smart Metering
vi. Current Limiters
vii. Metering Accessories
viii. Metering Panels

4.1.1. This Code recognizes all the existing meter technologies however *the framework for future deployment of meters shall be smart metering.*

EXCERPTS OF NERC METERING CODE

SECTION 4.1.2. The specifications for the energy meters to be deployed in Nigeria are prepared in accordance with the following International
Standards:
i. IEC 62052-11
ii. IEC 62053-11,21,22 and 23
iii. IEC 62055-41 and 52
iv. IEC 62056
v. IEC 60044-1,2 and 3

METER TYPES

- SINGLE PHASE (2Wire) 5(60) AMPS CREDIT STATIC METER
- 3PHASE 4WIRE 5(60) AMPS ELECTRONIC CREDIT METER
- 3PHASE 4WIRE 10(100) AMPS (WHOLE CURRENT) ELECTRONIC CREDIT METER
- 3PH 4W CT OPERATED STATIC ENERGY METER
- *KEYPAD SINGLE &THREE PHASE ELECTRICITY DISPENSER*
- SPLIT TYPE PREPAYMENT SINGLE & THREE PHASE DISPENSER
- AUTOMATIC METER READING SYSTEM (AMR)
- SINGLE PHASE (DUAL PREPAYMENT AND CREDIT TYPE)

BASIC REQUIREMENTS FOR DISTRIBUTION METERS

1. VOLTAGE RATING	240V/415V
2. OPERATING VOLTAGE	-40% to + 10% V_{ref}
3. CURRENT RATING	5(60)A
4. FREQUENCY	50Hz $\pm$ 2%
5. SYSTEM	Single or Three Phase
6. SECONDARY VOLTAGE VARIATIONS	(85 – 120)/(50 – 70) V
7. OPERATING TEMPERATURE	-10^0C to 55^0C
8. INTERNAL BATTERY OR AN EQUIVALENT GIVING TOTAL STAND-BY LIFE OF 10 YEARS (MINIMUM)	Lithium CR2025 – 1HF
9. AUXILIARY BATTERY FOR DOWNLOADING STORED DATA.	12 D.C. Supply
10. ACCURACY CLASS	0.5s for 33KV, 0.2s for 132 and 330KV
10. STORAGE TEMPERATURE	Up to 70^0C
11. LIFE SPAN	10 Years

BASIC REQUIREMENTS FOR DISTRIBUTION METERS

12. RELATIVE HUMIDITY. NON-CONDENSING	Up to 96% at 45^{O}C
13. BURDEN	2VA/phase in voltage circuit and1VA/phase in current circuit.

GENERAL CONSTRUCTION AND COMPONENT SPECIFICATIONS FOR STATIC ENERGY METERS

S/NO	PARAMETERS	TECHNICAL REQUIREMENTS
1.	Body of Meter	Bakelite or polycarbonate
2.	Terminal Block	Made of polycarbonate grade and shall form integral part of the meter base, brass or copper current terminals with star head brass screws as well as bimetallic contacts.
3.	Terminal cover	Transparent terminal cover with external provision of sealing through screws.
4.	Diagram of connections	Diagram of external connections to be shown inside the terminal cover.
5.	Marking on name plates	Meter shall have clearly visible, indelible and distinct name plate.
6.	Meter sealing	One seal shall be affixed one side of meter body.
7.	Guarantee/Warranty	5 years
8.	Resistance to heat and fire	The terminal block of meter case shall be protected against the spread of fire. They shall not be ignited by thermal overload of live parts in contact with them.

GENERAL CONSTRUCTION AND COMPONENT SPECIFICATIONS FOR STATIC ENERGY METERS

S/NO	PARAMETERS	TECHNICAL REQUIREMENTS
9.	Measurement or computing chips	The Measurement or computing chips used in the Meter shall be with the Surface mount type along with the ASCIIs.
10.	Memory Chips	The memory chips shall not be affected by the external parameters like sparking, high voltage spikes or electrostatic discharges.
11.	Display Modules	a) The display modules shall be well protected from the external Ultra-Violet (UV) radiations. b) The display visibility shall be sufficient to read the Meter mounted at a height of 0.5 metre as well as at the height of 2 metres.
12.	Communication Modules	Communication modules shall be compatible for the two RS 232/485 ports one for optical port for communication with Meter reading instruments & the other, for the hardware. RS 232/485 port to communicate with various modems for AMR such as mobile telephony, radio frequency, fixed line, satellite, or power line communication technology with IEC 62056-21 DLMS/COSEM protocol.

S/NO	PARAMETERS	TECHNICAL REQUIREMENTS
13.	Optical Port	Optical port shall be used to transfer the Meter data to Meter reading instrument. The mechanical construction of the port shall be such to facilitate the data transfer easily.
14.	Power Supply	The power supply shall be with the capabilities as per the relevant standards. The power supply unit of the Meter shall not be affected in case the maximum voltage of the system appears to the terminals due to faults or due to wrong connections.
15.	Electronic Components	The active and passive components shall be of the surface mount type to be handled and soldered by the state of the art assembly processes. The components shall be positioned in such a way that the leads of components shall not be under stress and not touching the internal wires.

S/NO	PARAMETERS	TECHNICAL REQUIREMENTS
16.	Mechanical Parts	The internal electrical components shall be of electrolytic copper and shall be protected from corrosion, rust, etc. · The other mechanical components shall be protected from rust, corrosion, etc.by suitable plating and painting methods.
17.	Battery	Lithium with minimum guaranteed life of 10 years and can last without recharging for 60 days.
18.	RTC & Micro Controller	The accuracy of Real Time Clock shall be as per relevant IEC standards
19.	P.C.B.	Glass Epoxy, fire resistance grade FR4, with minimum thickness of 1.6mm
20.		

GENERAL REQUIREMENTS

Section 4.4.4 GENERAL REQUIREMENTS

On the Meter name plate shall be affixed:

- Indelible meter serial number shall not be more than twelve (12) digits and legibly printed.
- Size of the digit of the meter serial number shall be a minimum of 5mm×3mm.
- Bar code shall be printed below the meter serial number.
- Manufacturer's Name and Trade mark.
- Place of manufacture.
- Year of manufacture.
- Reference voltage, current and frequency.
- Class index.
- Meter constant.
- Owner/Utility's identity.

GENERAL REQUIREMENTS

GENERAL TAMPER AND ANTI-FRAUD DETECTION/EVIDENCE FEATURES

The Meter shall log minimum of 225 tamper events, compartment-wise division of each event
and their persistence time shall be indicated.
The meter shall not be affected by any remote tamper control device and shall continue
recording energy under any one or combinations of the following conditions:

i. **Phase sequence reversal**: The Meters shall work accurately irrespective of the phase
sequence of the supply.

ii. **Detection of missing potential**: In case someone intentionally takes out a potential lead,
the date and time of such occurrence shall be recorded by the Meter. The restoration
of normal supply shall also be similarly recorded. The threshold for the voltages shall be
programmable as specified.

GENERAL REQUIREMENTS

- The manufacturer shall affix one seal on one side of the Meter.
- The internal potential links shall be in closed position or link-less. Meters will be preferred and there shall not be any external link.
- Terminal cover shall be fixed on meter before dispatch.
- The operation manual and the inscriptions on the name plate shall be provided in English Language.

GENERAL REQUIREMENTS

SEALS SPECIFICATIONS

Type - Compressible or non-compressible type

Material - Plastic with embossed serial number

Temperature Range - To withstand operating temperature of up to 70oc

Colour -To be of any colour

Wire Dimension - Not more than 2.5mm2 cross-sectional area.

Average Break Strength - Reasonably large break strength

SEALING POINTS

Every metering system shall be sealed at the following sealing points:-

(i) Meter cover

(ii) Meter terminal cover

(iii) Meter battery cover

(iv) Test terminal cover

(v) Voltage fuses & Links

(vi) CTs and VTs terminals

(vii) Associated circuits, and

(viii) Metering box or cubicles


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