DOCUMENT NO.: KP1/13D/4/1/TSP/13/005

Kenya Power

MAXIMUM DEMAND INDICATOR - SPECIFICATION

A Document of the Kenya Power & Lighting Co. Ltd

March 2023

TABLE OF CONTENTS

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)
0	2023-03-08	New issue	Eng. Faith Gicugu	Dr. Eng. Peter Kimemia

FOREWORD

This Specification has been prepared by the Standards department in collaboration with Distribution Networks department both of The Kenya Power and of Lighting Company Plc (KPLC) and it lays down requirements for maximum demand indicator. It has been prepared to establish and promote uniform requirements for maximum demand indicators for use at KPLC.

The maximum demand indicator is intended for use by the distribution network substation teams in monitoring the loading conditions of distribution transformers.

There are no other specifications in this series.

This specification stipulates the minimum requirements for maximum demand indicators acceptable for use in the company and it shall be the responsibility of the suppliers 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 Maximum Demand Indicator for KPLC.

Users of this KPLC specification are responsible for its correct interpretation and application.

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

Name	Division
Bernard Kingesi	Network Management
Mohamed Amiyo	Network Management
Eng. Faith Gicugu	IESR

1. SCOPE

1.1. This specification is for Maximum Demand Indicator for use by company's distribution network substation teams

1.2. The specification covers requirements, design, inspection and tests and schedule of Guaranteed Technical Particulars (GTP)of maximum demand indicator.

2. NORMATIVE REFERENCES

The following standards contain provision 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 61557: Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. - Equipment for testing, measuring or monitoring of protective measures - Part 1: General requirements;

IEC 62052-21:2016: Electricity metering equipment (a.c.) - General requirements, tests and test conditions - Part 21: Tariff and load control equipment

IEC 62053-22:2020: Electricity metering equipment - Particular requirements - Part 22: Static meters for AC active energy (classes 0,1S, 0,2S and 0,5S)

IEC 60359: Electrical and electronic measurement equipment - Expression of performance;

IEC 61010 Safety requirements for electrical equipment for measurement, control, and laboratory;

IEC 61000: Electromagnetic Compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test; – Part 6-2: Generic standards – Immunity for Industrial environment;

ISO 9001: Quality Management systems – Requirements;

ISO/IEC 17025: General Requirements for the competence of testing and calibration laboratories;

OIML D 11: General Requirements for Measuring Instruments - Environmental Conditions;

3. DEFINITIONS AND ABBREVIATIONS

For the purpose of this specification, the definitions and abbreviations given in the reference standards shall apply together with the following abbreviations.

3.1. ABBREVIATIONS

EMC – Electromagnetic Compatibility
EU – European Union
IP – Ingress Protection
ISO – International Organization for Standardization.
KPLC- Kenya Power and Lighting Company Plc
Kg –Kilogram
KV - Kilovolt
LV – Low Voltage
MDI –Maximum Demand Indicator
RMS – Root mean Square

4. REQUIREMENTS

4.1. SERVICE CONDITIONS

4.1.1 The Maximum Demand Indicator (MDI) shall be suitable for use outdoors in tropical areas and harsh climatic conditions including areas exposed to:

a) Altitudes of up to 2200m above sea level;

b) Humidity of up to 95%;

c) Average ambient temperature of +30ºC with a minimum of -1˚C and a maximum of +40˚C

d) Pollution: Class IV (Very Heavy)

4.2. DESIGN

4.2.1 The Maximum Demand Indicator (MDI) shall be designed, manufactured and tested in accordance with the relevant international standards.

4.2.2 It shall be designed for outdoor applications. The unit housing shall be made of UV resistant materials.

4.2.3 It shall be electronic, low power device capable of recording the following parameters:

i. Transformer phase voltages and currents – rms and MDI values
ii. kVA, kVAR and kW. – Instantaneous demand and peak demand
iii. Transformer tank ambient temperature
iv. Local ambient temperature

4.2.4 It shall have the following key features:

a) Inputs – phase currents via Rogowski sensors; ambient and tank temperatures, via external temperature probes.

b) Logging – 15-minute intervals at 16-bit resolution data capture – load profiling: daily maximum phase currents and temperatures.

c) Download – User can download all or only a section of the data.

d) Unique Asset ID – Each transformer can be assigned a unique ID. All data is recorded in the MDI Manager database under the unique asset identifier.

e) Power supply –internal, rechargeable battery(Via integrated solar cell) external DC(Mounted indoors)

4.2.5 The equipment shall have data processing capability coupled with proven wireless technologies to provide remote access of transformer load profiles.

4.2.6 It shall have drive-by data collection capability, achieved preferably via spread spectrum communication signals.

4.2.7 It shall have provision for data capture including load profiling (daily maximum phase currents and temperatures, with user-defined alarm threshold.

4.2.8 It shall support communication via GSM technology (4G and above) as well as Wi-Fi enabled modem.

4.2.9 It shall be easy to install and connect via rogowski current sensors

4.2.10 The metering circuit/system shall be compliant with IEC 62053-22 (Class- 1s).

4.2.11 It shall be battery operated preferably rechargeable, integrated solar powered battery. It shall also be AC powered, 230V, 50Hz supply

4.2.12 It shall be maintenance free

4.2.13 It shall employ a microcontroller (processor) with minimum 80 MHz speed, 256Kb RAM & 8MB storage, provision for memory card with storage of 100GB or more.

4.2.14 Shall have a real time clock.

4.2.15 It shall have seven (7) analog (Three (3) temperature & four (4) - 4~20mA inputs) & seven (7) Digital Inputs/Outputs.

4.3. ACCESSORIES

4.3.1 Four (4) sets of rogowski sensors for current measurement.

4.3.2 Four (4) sets of flexible cables complete with crocodile clips for voltage measurement. The flexible cables shall be a minimum of 4 meters.

4.3.3 Ambient temperature & Humidity sensors with the following characteristics :

a) Resolution-0.1 ^{o}C

b) Accuracy- 0.5 °C

c) Temperature Range -50 to 100 °C.

4.3.4 IP65 box having size 250mm x 300mm x 110mm (L x W x H) with shielded wiring/cables, flexible SS conduits cover, connectors/adaptors and box mounting flange (Suitable length cable/conduit length, Max - 5meters.

4.4. WARRANTY AND TECHNICAL SUPPORT

4.4.1. The maximum demand indicator shall be backed by a minimum of 12-months factory warranty.

4.4.2. Technical support and software upgrade, where applicable shall be provided free of charge to Kenya Power for a period of not less than 36 months.

5. TESTS REQUIREMENTS

5.1. The maximum demand indicator shall be inspected and tested in accordance with the relevant standards and requirements of this specification.

5.2. Copies of test reports for the maximum demand indicator offered shall be submitted for tender evaluation shall include all tests specified in the relevant IEC standard.

6. MARKING AND PACKING

6.1. MARKING

The following information shall be marked legibly and in a permanent manner on the Maximum demand indicator:

a) The manufacturer's name or trade mark;

b) The type reference number / model number;

c) Type of battery and polarity of connection in the battery compartment

d) Standard of manufacture;

e) The serial number;

f) Words "PROPERTY OF KENYA POWER"

g) The instructions for handling and use (in the English Language).

6.2. PACKING

6.2.1. The maximum demand indicator shall be packaged properly to protect them from damage during shipment, transportation and storage.

6.2.2. Each package shall contain a packing list in waterproof envelope and a copy in triplicate shall be forwarded to KPLC prior to dispatch. The package shall be clearly marked on the outside to indicate number of items, total weight and correct positioning during storage.

6.2.3. All accessories required for mounting/installation shall be provided for each maximum demand indicator.

APPENDICIES

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 previous Test Reports issued by own or a third party testing laboratory that is accredited to ISO/IEC 17025:2005 or 17025:2017 confirming accuracy and compliance of the Maximum demand indicator offered shall be submitted with the offer for evaluation (all in English Language). A copy of the accreditation certificate and the scope of accreditation of the testing laboratory shall also be submitted. Any translations of certificates or reports into English language shall be signed and stamped by the Testing Authority that carried out the tests.

A.3 Test certificates and calibration certificates for the maximum demand indicator to be supplied shall be submitted to KPLC for approval before shipment/delivery of the equipment.

A.4 On receipt of the maximum demand indicator, Kenya Power will inspect them and may perform any of the relevant tests in order to verify compliance with the specification. The supplier shall replace without charge to KPLC, any maximum demand indicator 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 supplier shall submit a **quality assurance plan (QAP)** that will be used to ensure that the Maximum demand indicator physical properties, tests 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.

B.2 The Manufacturer's **Declaration of Conformity** to applicable standards and copies of quality management certifications including copy of valid and relevant ISO 9001:2015 certificate shall be submitted with the tender for evaluation.

B.3 The bidder shall indicate the delivery time of the equipment, manufacturer's monthly & annual production capacity and experience in the production of the maximum demand indicator being offered. A detailed list & contact addresses (including e-mail) of the manufacturer's previous customers for similar type of the maximum demand indicators sold in the last five years as well as reference letters from at least four of the customers shall be submitted with the tender for evaluation.

C: DOCUMENTATION AND DEMONSTRATION (Normative)

C.1 The bidder shall submit their tender complete with technical documents for tender evaluation. The technical 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, drawings giving all relevant dimensions, wiring diagram / schematic diagram and technical data;

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;

e) Copies of required test and calibration reports from testing laboratory accredited to ISO/IEC 17025;

f) Copy of accreditation certificate to ISO/IEC 17025 for the testing laboratory;

g) Manufacturers letter of authorization, ISO 9001:2015 certificate, and other technical documents required in the tender.

h) Manufacturer's warranty and guarantee; subject to 12 months from date of delivery to KPLC stores

i) Operational manual.

j) Service manual.

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

a) Fully filled clause by clause guaranteed technical particulars (GTP) stamped and signed by the manufacturer;

b) Drawings of the maximum demand indicator to be manufactured for KPLC.

c) Product manuals, operation manuals and brochures,

d) 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.

e) Marking details and method to be used in marking the maximum demand indicator;

f) All documentation necessary for safety of the equipment.

g) Packaging details (including packaging materials).

C.3. The supplier shall submit recommendations for use, care, storage and routine inspection/testing procedures, all in the English Language, during delivery of the maximum demand indicator to KPLC stores.

C.4. The successful bidder shall demonstrate to KPLC Staff (in Nairobi) the set up and operation of the maximum demand indicator on selected distribution transformers.

----------SPACE LEFT BLANK----------

D: GUARANTEED TECHNICAL PARTICULARS (Normative)

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

Tender No. .....

Bidder's name and Address.....

Clause number	Requirement	Bidder's offer
Manufacturer's Name and address		State
Country of Manufacture		State
Name and model Number		State
1.	Scope	State
2.	Normative References	State
3.	Definitions and Abbreviations	State
4.	**Requirements**	
4.1	Service Conditions	State
4.1.1	Suitable for outdoor use in tropical areas and harsh climatic conditions	State compliance
a	Altitudes of up to 2200m above sea level	State
b	Humidity of up to 95%;	State
c	Average ambient temperature, minimum & maximum	State
d	Pollution: Class	State
4.2	**Design and construction**	
4.2.1	Standard of manufacture	State

Clause number	Requirement		Bidder's offer
4.2.2	Designed for outdoor applications		State
4.2.3	Electronic, low power device		State
	Parameters recorded:	Voltage	State
		RMS & MDI Current	State
		kVA, kVAR, kW	State
		Transformer tank ambient temperature	State
		Local ambient temperature	State
4.2.4	Key Features		
a	Inputs – phase currents via Rogowski sensors; ambient and tank temperatures, via external temperature probes		State
b	Logging – 15-minute intervals at 16-bit resolution Data capture – load profiling: daily maximum phase currents and temperatures.		
c	Download – User can download all or only a section of the data.		State
d	Unique asset ID – Each transformer can be assigned a unique ID. All data is recorded in the MDI Manager database under the unique asset identifier.		State
e	Power supply –internal, rechargeable battery(Via integrated solar cell) external DC(Mounted indoors)		State
4.2.5	It shall have data processing capability		State
	Proven wireless technology for remote access of load profiles		Specify
4.2.6	Drive-by data collection capability achieved via spread spectrum communication signals		Specify
4.2.7	Provision for data capture including load profiling		Specify
	Daily maximum currents phase and temperatures		Specify
	User defined alarm threshold		Specify

Clause number	Requirement	Bidder's offer
4.2.8	Communication via GSM technology (4G and above)	Specify
	Wi-Fi enabled modem.	Specify
4.2.9	Easy to install and connect via Rogowski current sensors	State
4.2.10	Metering circuit/system compliant with IEC 62053-22 (Class- 1s)	State
4.2.11	Battery operated and also powered via AC, 230V, 50Hz	State
	Rechargeable, integrated solar powered battery	State
4.2.12	Maintenance free	State
4.2.13	Employ microcontroller (processor) with minimum 80 MHz speed, 256Kb RAM & 8MB storage	State
	Provision for memory card with storage of 100GB or more	State
4.2.14	Shall have a Real time clock	State
4.2.15	seven (7) Analog inputs (For temperature and current	Specify
	Seven (7) Digital Inputs/Outputs	State
4.3	**Accessories**	
4.3.1	Four (4) sets of rogowski sensors for current measurement	State
4.3.2	Four (4) sets of flexible cables complete with crocodile clips for voltage measurement	State
	Length - minimum of 4 meters	State
4.3.3	Ambient temperature & Humidity sensors, Characteristics:	Provide
	Resolution-0.1 oC	State
	Accuracy- 0.5 ^{o}C	State
	Temperature Range -50 to 100 ^{o}C	State
4.3.4	IP65 box having size 250mm x 300mm x 110mm (L x W x H)	State
	With shielded wiring/cables	State
	With flexible SS conduits cover	State

Clause number	Requirement	Bidder's offer
	Connectors/adaptors and box mounting flange	State
	Suitable length cable/conduit length, Max - 5meters	State
4.4	**Warrant and Technical Support**	
4.4.1.	Minimum of 12-months factory warranty.	State
4.4.2.	Provide free Technical support and software upgrade to KENYA POWER for a period of not less than 36 months.	State
5	**Test Requirement**	
5.1	Test standards and requirements	State
5.2	Copies of test reports for the maximum demand indicator offered shall be submit for tender evaluation	Attach
	Copies of test reports shall include all tests specified in the relevant IEC standard	State
6	**Marking and Packing**	
6.1	Marking	Specify
6.2	Packing	Specify
A	**Test and inspection**	
A.1	Responsibility of carrying out tests	State
A.2	Copies of Type Test Reports submitted with tender	Provide
A.3	Test certificates and calibration certificates to be submitted by supplier to KPLC for approval before supply/delivery	Provide
A.4	Inspection at the stores and replacement of rejected items	State compliance
B	**Quality Management System**	
B.1	Quality Assurance Plan	Provide
B.2	Copy of ISO 9001:2015 Certificate	Provide

Clause number	Requirement	Bidder's offer
B.3	Delivery time of the equipment	Provide
	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 for evaluation	Provide
C.2	Documents to be submitted by supplier to KPLC for approval before manufacture	Provide
C.3	Documents to be submitted during delivery at the store	Provide
C.4	Demonstration	State
	Statement of compliance to specification (indicate deviations if any & supporting documents)	State compliance

.....

Manufacturer's Name, Signature, Stamp and Date