THE KENYA POWER AND LIGHTING CO. LTD

SPECIFICATIONS

For

POWER QUALITY ANALYZER

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SPECIFICATION FOR POWER QUALITY ANALYZER

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FOREWORD

This specification has been prepared by the Meter Central Laboratory and Central office Large Power Unit of KPLC. It lays down requirements for portable three-phase watt-hour working Analyzer.

INTRODUCTION

This specification was prepared to establish and promote uniform requirements for portable three-phase working Analyzer. The specification lays down the minimum requirements for equipment acceptable for evaluation. It is the responsibility of the Supplier to obtain copies of the standards referred herein.

1. SCOPE

This specification is for a Power Quality Analyzer (further Herein referred simply as "The Analyzer"). The Analyzer shall have the capability of quick examination of the true condition

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This specification has been prepared by the Meter Central Laboratory and Central office Installations management of KPLC. It lays down requirements for portable three-phase power quality Analyzer.

INTRODUCTION

This specification was prepared to establish and promote uniform requirements for portable three-phase working Analyzer. The specification lays down the minimum requirements for equipment acceptable for evaluation. It is the responsibility of the Supplier to obtain copies of the standards referred herein.

1. SCOPE

This specification is for A Power Quality Analyzer (further Herein referred simply as "The Analyzer"). The Analyzer shall have the capability of quick examination of the true condition of any electrical system. It shall provide complete and accurate True RMS measurements of all important electrical parameters for single and three phase applications.
Each Analyzer shall be supplied with a laptop computer, the minimum specifications of which are attached in Appendix B.

2. REFERENCES

The references below, their equivalents or superior standards should be the reference guidelines

governing the design and operation of the Analyzer.

IEEE 519-1992:	Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems.
IEC 61000-4-1:	Electromagnetic compatibility (EMC) – Part 4-1: Testing and measurement techniques – Overview of IEC 61000-4 series.
IEC 61000-4-7:	Electromagnetic compatibility (EMC) – Part 4-7: Testing and measurement techniques –General guide on harmonics and inter-harmonics measurements and instrumentation, for power supply systems and equipment connected thereto.
IEC 61000-4-30:	Electromagnetic compatibility (EMC) – Part 4-30: Testing and measurement techniques – Power quality measurement methods
IEC 61010-1:	Safety requirements for electrical equipment for measurement, control and laboratory use- Part 1: General

3. DEFINITIONS

The definitions in the reference standards apply.

4. REQUIREMENTS

4.1 OPERATING CONDITIONS

4.1.1 The Analyzer shall be suitable for operation in tropical climate where temperatures may vary from 0 to 40degrees Celsius;

4.1.2 The Analyzer shall be suitable in climates of relative humidity reaching 80% and operating altitudes ranging from sea level to 2200m above sea level.

4.1.3 The Analyzer shall be used for measurement of various electrical parameters in domestic, industrial and commercial meter installations.

4.2 DESIGN AND CONSTRUCTION

4.2.1 The Analyzer shall accurately measure voltage (V), current (A), power factor (%) true power (kW) and apparent power (kVA) along with voltage and current harmonics in electrical systems.

4.2.2 The Analyzer shall be light in weight not more than 2 Kg.

4.2.3 The Analyzer shall have probes for easy connection for both single phase and three phase applications.

4.2.4 The Analyzer's degree of protection shall be IP-54.

4.2.5 The Analyzer shall measure True RMS phase-phase as well as phase-to –neutral voltage, with Minimum and Maximum registers.

4.2.6 The Analyzer shall measure True RMS current in each phase, with Minimum and Maximum registers and phase displacement.

4.2.7 The Analyzer shall measure True RMS as well s displaced Power Factor of each phase with indication of Minimum and Maximum values of measurements.
4.2.8 The Analyzer shall indicate Angle Displacement between voltage and current, as well as the Three Phase Voltage Sequence.
4.2.9 The Analyzer shall measure Active, Reactive, & Apparent Power per each phase and also total values for three phases.
4.2.10 The Analyzer shall measure voltage and current Harmonics up to 50^{th} order for each phase, expressed as a percentage of the fundamental.
4.2.11 The Analyzer shall measure Total Harmonic Distortion (T.H.D.) of voltage and current.
4.2.12 The Analyzer shall display Waveforms of the measurements of Voltage, Current, Power Factor and Harmonics.
4.2.13 The Analyzer shall have not less than 4.3-inch color TFT Display
4.2.14 The Analyzer shall have a carrying case to fit the Unit and all its accessories.

4.3 RATINGS

4.3.1 The Analyzer shall have an accuracy of **±1.0%** or better on Power Measurement under balanced voltage and current conditions. Refer to table under 4.3.15.
4.3.2 The Analyzer shall be supplied by mains voltage of 230VAC, 50Hz supply.
4.3.3 The Analyzer shall have battery power option to power the set in operation for at least 5hrs without mains supply.
4.3.4 The Analyzer shall be capable of automatically adjusting its scale for accurate readings (auto ranging)
4.3.5 The influence of auxiliary voltage on the measuring results shall be less than 0.005% at 10% variation.
4.3.6 The power consumption shall not be more than 30 VA.
4.3.7 The Analyzer shall have a frequency tolerance of ± 1Hz at 50Hz.
4.3.8 The influence of external magnetic fields shall be less than 0.15%/ mT.
4.3.9 The Analyzer shall have four (4) clamp-on current transformers (C.T.'s) rated at 2,500A or higher for current measurements on the primary side of LV circuits.:
4.3.10 The Analyzer shall have four (4) clamp-on current transformers (C.T.'s) rated at 10A or higher for current measurements on the secondary side of High Voltage circuits.:

4.3.11 The current measurement range shall have measurement errors of less than ±1% of reading, ±1% of full scale.
4.3.12 The Analyzer shall have four (4) cables with voltage clips for single phase or three phase voltage measurements rated at 600VAC.
4.3.13 The Analyzer voltage range shall be from 0 to 1000Vrms. (CAT III /1000V)
4.3.14 The voltage measurement error shall be less than ±1% of reading, ±1% of full scale.

4.3.15 The power (P, Q, S) and energy measurement errors per phase and as sum of all phases in 3/4 wire networks shall be as follows:

Power	**Direct**	**Clip-on CT's**
Active and apparent P'S	≤ ± 1.0%	≤ ± 1.0%
Reactive Q	≤ ± 1.5%	≤ ± 2.0%

4.3.16 The phase angle (ϕ) measurement range shall be 0° to 360° and with a measurement error of ≤ ± 1.0°.
4.3.17 The Power factor measurement error shall be less than ± 0.5% of the measured value.

4.3.18 The Analyzer shall have a USB port or 9 pin RS232 serial interface for data transfer to a laptop computer. If a 9 pin RS232 serial interface is used, then 9 pin RS232 USB converter shall be included.

4.3.19 The Analyzer shall have software for data collection, analysis, representation and verification.

4.3.20 Each analyzer shall be supplied with a laptop computer loaded with the Analyzer's software and ready for use shall also be quoted for. The specification of which are attached as Appendix B.

4.3.21 The Analyzer software shall be compatible with Microsoft Windows 10 operating system and all lower versions up to Microsoft Windows 95.

4.3.22 The analyzer will have modem communication facility for remote control/download of information using GPRS/EDGE technology from a unit on site.

4.3.23 Clear step by step set up procedure of the remote communication with the analyzer shall be provided.

4.3.24 The analyzer should have facility to compute flickers in accordance with IEC-61000-4-15.

4.3.25 The analyzer shall have sampling rate on transients of not less than 49 kSamples per second.

4.3.26 Number of channels for the analyzer shall be 4 x U, 4 X I, single or multi.

4.3. 27 The analyzer shall have time synchronization thru GPS receiver

4.3. 28 The analyzer shall have temperature measurement feature with range -10° to 85°C

4.3. 29 The analyzer shall be designed for long term recording with memory capacity not less than 32GB

4.4 INSTRUCTIONS AND MARKINGS

4.4.0 The Analyzer shall be marked legibly and indelibly with the following information:

4.4.1(a) Name or trade mark of the manufacturer.

4.4.1(b) Country of origin-

4.4.1(c) Type/model and serial number-

4.4.1(d) Nominal input voltage and frequency -

4.4.1(e) Fuse ratings

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

4.4.2 Relevant technical details, schematic drawing, operational and service manuals shall be submitted to support the tender and shall be clearly marked to indicate the type/model and serial number of the working Analyzer being offered.

4.4.3 The Tenderer shall submit a clause-clause statement of compliance with these specifications in the format seen in Appendix B. in case of deviations the affected requirements shall be indicated. Insertions such as "noted", "agreed" etc shall be considered non-responsive where specific response is called for.

5. TESTS

5.1 A copy of certificate of calibration on the Analyzer's performance across its operating range and traceable to an International or National calibration laboratory shall be provided with the submitted tender documents. The certificate shall be for a type of the Analyzer being offered.

5.2 The delivered Analyzers shall be accompanied by their calibration certificates.

5.3 The manufacturer's declaration of conformity to reference Standards shall be submitted

6. INFORMATION AND WARRANTY (In case of Tender Award)

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

6.2 The supplier shall commit himself to make available essential spares and other consumables for a period of not less than 5years or for the expected life period of the Analyzers whichever is greater.

6.3 Factory Acceptance tests and Training on the Analyzers shall be provided at the manufacturer's premises for two engineers, for a period of three days excepting the day of arrival and departure; the supplier shall bear the cost of training.

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

NB: - *This schedule does not in any way substitute for detailed information required elsewhere in the specification.*

Manufacturer's Declaration: I…….. On behalf of …. ……. …

Declare that the above specifications and details are correct for the offered Analyzer.

Name …… Title ……

Signature ……

Date …….. Stamp/ Seal……..

APPENDIX A: STATEMENT OF COMPLIANCE

The supplier (Bidder) shall complete the table below to capture the Supplier's response to

Clause Number	Bidder's offer	Manufacturer's / Supplier's response.
4.1	**Operating Conditions**	
4.1.1	Temp range in degrees 0 – 40 degrees Celsius;	
4.1.2	Humidity 80% in altitudes of 0 – 2200m above sea level	
4.1.3	Measure of electrical parameters in domestic, industrial and commercial meter installations	
4.2	**Design and Construction**	
4.2.1	Shall measure voltage (V), current (A), power factor (%) true power (kW) and apparent power (kVA) along with voltage and current harmonics in electrical systems.	
4.2.2	Light weight not more than 2 Kg	
4.2.3	Probes for both single phase and three phase applications.	
4.2.4	The Analyzer degree of protection shall be IP-54	
4.2.5	Shall measure True RMS phase-to-phase as well as phase-to-neutral voltage, with Minimum and Maximum registers	
4.2.6	Shall measure True RMS current in each phase, with Minimum and Maximum registers and phase displacement.	
4.2.7	Shall measure True as well as displaced Power Factor of each phase with Minimum and Maximum value indication.	
4.2.8	Shall indicate Angle Displacement between voltage and current, as well as the Three Phase Voltage Sequence.	
4.2.9	The Analyzer shall measure Active, Reactive, & Apparent Power per each phase and also total values for three phases.	
4.2.10	The analyzer shall measure voltage and current Harmonics up to 50th order for each phase expressed as percentage of of the fundamental.	
4.2.11	Shall measure Total Harmonics Distortion (THD) of voltage and current.	
4.2.12	Shall display waveforms of the measurements of Voltage, Current, Power Factor and Harmonics	
4.2.13	Shall have a 4.3 inch color TFT Display on the unit.	
4.2.14	Shall have a carrying case to fit the unit and all its accessories.	
4.3	**RATINGS**	
4.3.1	Shall have an accuracy of ±1.0% or better on Power measurement under balanced voltage and current condition.	
4.3.2	Shall be supplied by mains voltage of 240V AC, 50Hz supply.	
4.3.3	In addition to the mains supply, the Analyzer should have **re-chargeable battery pack** to enable full operation without mains for at least 5Hours.	

Clause Number	Bidder's offer	Manufacturer's / Supplier's response.
4.3.4	Shall be capable of automatically adjusting its scale for accurate readings.	
4.3.5	The influence of auxiliary voltage on the measuring results shall be less than 0.005% at 10% variation.	
4.3.6	The power consumption shall not be more than 30 VA.	
4.3.7	The Analyzer shall have a frequency tolerance of ±1 Hz at 50Hz.	
4.3.8	Influence of external magnetic fields shall be less than 0.15% / Mt.	
4.3.9	Shall have 4 current clamp transformers (C.T..'s) rated at 2,500A or higher for current measurements on the primary side of the LV circuits.	
4.3.10	Shall have 4 current clamp transformers (C.T..'s) rated at 10A or higher for current measurements on the secondary side of the HV circuits.	
4.3.11	The current measurement range shall have measurement errors of less than ± 1% of the reading, and ± 1% of full scale.	
4.3.12	The Analyzer shall have four(4) cables with voltage clips for single phase or three phase voltage measurements rated at 600VAC.	
4.3.13	The Analyzer voltage range shall be from 0 to 1000Vrms (CAT III /1000V)	
4.3.14	The voltage measurement errors shall be less than ± 1% of the reading, and ± 1% of full scale.	
4.3.15	The power (P, Q, S) and energy measurement errors per phase and as sum of all phases in ¾ wire networks shall be as in table 4.3.15.	
4.3.16	The phase angle (ϕ) measurement range shall be 0° to 360° and with a measurement error of ≤± 0.10.	
4.3.17	The power factor measurement error shall be less than ± 0.5% of the measured value.	
4.3.18	The Analyzer shall have a USB port or 9 pin RS232 serial interface for data transfer to a laptop computer. If RS232 serial interface is used, then an RS232/USB converter should be provided.	
4.3.19	Shall have software for data collection, analysis, representation and verification.	
4-3.20	Each analyzer shall be supplied with a laptop computer loaded with the Analyzer's software and ready for use shall also be quoted for. The specification of which are attached as Appendix B.	
4.3.21	Software shall be compatible with Microsoft Windows 10 and all other lower versions up to Microsoft Windows 95.	

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4.3.22	Analyzer shall have Modem communication facility for remote control/download of information using GPRS/EDGE technology from a unit on site.	
4.3.23	Clear step by step set up procedure for remote communication	
4.3.23	Analyzer should have facility to compute flickers in accordance with IEC-61000-4-15	
4.3.24	Have sampling rate on transients of not less than 49 kSamples per second..	
4.3.25	Number of channels 3 x U, 3 x I, single or multi	
4.3.26	Number of channels 4 x U, 4 X I, single or multi.	
4.3.27	Should have time synchronization thru GPS receiver	
4.3.28	Should have temperature measurement feature with range -10° to 85°C	
4.3.29	Should be designed for long term recording with memory capacity not less than 32GB	
4.4	**Instructions and Markings**	
4.4.1 a)	Name or trade mark of the manufacturer.	
4.4.1 b)	Country of origin	
4.4.1 c)	Type/model and serial number	
4.4.1 d)	Nominal input voltage and frequency	
4.4.1 e)	Fuse ratings	
	All markings written in English with at least 4mm figure height	
4.4.2	Provisions of Relevant technical details, schematic drawings, operational and service manuals shall be submitted to support the tender and shall be clearly marked to indicate the Type/Model and serial number of Analyzer being offered.	
4.4.3	A clause by clause statement of compliance with these specifications.	
5	**Tests**	
5.1	A copy of certificate of Calibration traceable to an to an International or National calibration laboratory for type of Analyzer being offered should be attached to the tender.	
5.2	The delivered Analyzer shall be accompanied by the Calibration Certificate.	
5.3	The manufacturer's declaration of conformity to reference standard shall be attached.	
6	**INFORMATION AND WARRANTY (In case of Tender Award)**	

Clause Number	Bidder's offer	Manufacturer's / Supplier's response.
6.1	The Analyzers shall have a warranty against any defects, which may develop due to faulty material, calibration, transportation or workmanship for a period of eighteen months from the date of delivery. All defective Analyzers shall be replaced at the supplier's cost.	
6.2	The supplier to make available essential spares and other consumables for a period of not less than 5years or for the expected life period of the Analyzers whichever is greater.	
6.3	Factory Acceptance tests and Training on the Analyzers shall be provided at the manufacturer's premises for two engineers at suppliers cost	
6.4	Packaged in such a manner as to minimize damage and entry of moisture during transportation and handling.	

NB: - This schedule does not in any way substitute for detailed information required elsewhere in the specification.

Manufacturer's Declaration: I…….. On behalf of ……..

Declare that the above specifications and details are correct for the offered Analyzer.

Name … ….. …… Title ……..

Signature ……

Date ……..…… Stamp/ Seal……..……

APPENDIX B: MINIMUM TECHNICAL REQUIREMENTS FOR LAPTOP COMPUTER

Description	Mandatory Minimum Requirements	Tenderer's Offer
Processor	Intel Core i5-6200U (2.3GHz 2.3GHz, 2 Cores)	
RAM	8GB 1600 MHz DDR3L	
Operating System	Windows 8.1 pro or 10 pro (32 bit)	
Optical Drive	SuperMulti DVD burner	
Hard Disk	1TB 7200 rpm Hard Drive	
Display Panel	15.6" FHD LED Glossy with integrated camera (1920x1080)	
Graphics	Intel HD Graphics 5500	
Communications	56K Modem, Integrated Intel Gigabit Network Connection (10/100/1000 NIC),	
Wireless	Intel 802.11ac WLAN and Bluetooth(R)	
Security	Security Lock Slot **plus steel cable with a combination lock**	
Ports	Two USB 3.0 (one Always On), VGA, MiniDP, Ethernet (RJ-45), Dock connector	
Pointing Devices	Touchpad with scroll zone, two pick buttons or Point stick, two pick buttons	
Keyboard	6-row, spill-resistant, multimedia Fn keys, optional LED backlight TrackPoint® pointing device and buttonless Mylar surface touchpad, multi-touch	
Mouse	External wireless optical Mouse	
Camera	HD720p resolution, low light sensitive, fixed focus.	
Smart card reader	Media reader4-in-1 reader (MMC, SD, SDHC, SDXC)	
Warranty	3-year/1-yr battery limited onsite service, IWS (International Warranty Service17)	
Battery	External battery: Li-Ion 6-cell (48Wh or 72Wh)	
Power Supply	240V AC, 50 Hz, British plugs	
Carrying Case	Genuine Leather Carrying Case	