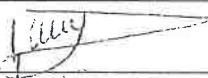
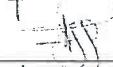

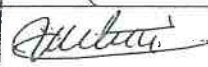


## THE KENYA POWER AND LIGHTING CO. LTD

## SPECIFICATIONS

For

PORTABLE CLASS 0.05 THREE-PHASE WORKING STANDARD FOR  
TESTING ELECTRICITY METERS

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## REVISION RECORD

REVISION	DESCRIPTION OF REVISION	DATE
0	3 <sup>rd</sup> Issue	September 2009
0	4 <sup>th</sup> Issue	December 2014

# SPECIFICATIONS FOR PORTABLE CLASS 0.05 THREE-PHASE WORKING STANDARD FOR TESTING ELECTRICITY METERS

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## FOREWORD

This specification has been prepared by the Customer Service Division in consultation with the Research and Development Department. It is intended for procurement of equipment from manufacturers and does not include provision of contract.

## INTRODUCTION

This specification was prepared to establish and promote uniform requirements for Class 0.05 portable three-phase watt-hour working standard. The specification lays down the minimum requirements for equipment acceptable for evaluation. It is the responsibility of the Supplier to be conversant with the standards referred herein.

## 1. SCOPE

This specification is for a portable class 0.05 three-phase watt-hour working standard (further Herein referred simply as "The Standard"). *The Standard shall have the capability of testing both single phase and three-phase electromechanical and electronic energy meters at site. The Standard shall measure active, reactive and apparent power and energy measurements for single-phase and three-phase, 2-or-3-or-4 wire circuits. The Standard shall be capable of checking meter installation parameters and associated circuits.* The Standard shall be used for both direct and via split core transformers (Current clamps) connection in current measurements.

The standard shall be supplied with a laptop computer, the minimum specifications of which are attached in Appendix C.

## 2. REFERENCES

The following documents were referred to during the preparation of this specification: IEC 61000, IEC 61010, IEC 62052/53, and associated parts.

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

## 3. DEFINITIONS

The definitions given in the above reference standards apply.

## 4. REQUIREMENTS

### 4.1 Operating Conditions

4.1.1 The Standard shall be suitable for operation in tropical climate where temperatures may vary from -1 to 50 degrees Celsius; relative humidity reaching 80% and operating altitudes ranging from sea level to 2200 m above sea level.

4.1.2 The Standard shall be used for measurement of power and energy in domestic, industrial and commercial meter installations.

### 4.2 Design and Construction

4.2.1 The Standard shall comply fully with IEC 61000-4-30 - Definition of Power Quality Measurement Methods. Where the specifications differ with those of this standard, this specification shall apply in respect only of the specific differences.

- 4.2.2 The Standard's accuracy shall be Class 0.05.
- 4.2.3 The Standard shall be made of hard plastic and /or light aluminium profile or equivalent material to allow a weight of not more than 3 kg.
- 4.2.4 The Standard's degree of protection shall be minimum IP-30.
- 4.2.5 The Standard shall measure active, reactive and apparent power and energy measurement for single-phase and three-phase, 2- wire, 3- wire or-4 wire circuits with an integrated error calculator.
- 4.2.6 The standard shall be capable of 4 quadrant power measurement.
- 4.2.7 The standard shall be for both direct and via clamp-on CT connection in current measurement.
- 4.2.8 The standard shall be able to determine the operating burden on instrument transformers for CT and PT.
- 4.2.9 The standard shall be able to perform turns ratio test by simultaneously measurement of both primary and secondary currents in CT connected measuring systems.
- 4.2.10 The standard shall be capable of measuring currents up to a maximum of 2000 A per phase through external clip-on CTs. These Clip-on CTs shall be quoted separately from the main equipment and its other accessories.
- 4.2.11 The Standard shall have a wide measuring range with auto ranging.
- 4.2.12 The Standard shall display vector diagram for analysis of mains conditions and meter connections and relevant instantaneous values.
- 4.2.13 The Standard shall measure and display waveforms.
- 4.2.14 The Standard shall be able to detect circuit connection faults.
- 4.2.15 The Standard shall perform accuracy test, calculate and display the error.
- 4.2.16 The Standard shall be capable of measuring and displaying True RMS values of current and voltage, phase angles, power factor, frequency and phase rotation.
- 4.2.17 The display shall be of at least 6 x 4" with high resolution of at least 320x240 pixels or a LCD one.
- 4.2.18 The standard shall display voltage sequence indication ( $U_1$ ,  $U_2$ , and  $U_3$ ).

- 4.2.19 The Standard shall have test data storage of at least 200 measurements, which is capable of being sent, through serial interface to an external PC after measurement by Windows based data management software.
- 4.2.20 The data management software shall be provided without license/ license costs
- 4.2.21 The standard shall measure harmonics in voltage and current up to 40<sup>th</sup> THD.
- 4.2.22 The Standard shall have pulsed output for energy (galvanic isolation).
- 4.2.23 The Standard shall have features like Hold-function to read the instantaneous values during meter testing and integrated START/STOP-push button for a quick visual meter check, without scanning head.
- 4.2.24 The standard shall have a provision for insertion of a scanning head for testing both electromechanical and static (electronic) meters.
- 4.2.25 The standard shall have a set of Test leads (quick connecting cable set), CT's (120 A), Accessories, Transportation case, Photoelectric Scanning head with its support contained, and an additional Scanning head with magnet and sucker for expedient testing of LEDs.
- 4.2.26 The standard shall have selective power measurement.
- 4.2.27 The standard shall be able to test power and energy registers.
- 4.2.28 The standard shall be delivered with a MS-Windows analyzer and simulation software for vectorial diagrams.
- 4.2.29 The standard shall be fitted with a belt to make it possible for the operator to be able to hang it on shoulder or neck while operating at site
- 4.2.30 The Photoelectric Scanning head shall be suitable for use with both LED pulsed electronic meters and Ferraris meters, selectable via a selector switch.
- 4.2.31 The Photoelectric Scanning head support shall have a spring mechanism with different adjusting possibilities to make it possible to attach as desired the scanning head to the meter.
- 4.2.32 The standard shall also have an additional Scanning head with magnet and sucker for expedient testing of LEDs.
- 4.2.33 A rugged transportation case shall be provided to store and/or transport the standard and its accessories.

4.2.34 The standard shall be fully compliant to IEC 61010-1 standard on safety. Proof of compliance to this requirement shall be provided.

#### 4.3 Ratings

- 4.3.1 The Standard voltage supply shall be switchable between the auxiliary supply (external voltage with nominal voltage 240 V, 50 Hz) and the test voltage at 90.....265 VAC/ 47.....63 Hz.
- 4.3.2 Voltage measurement: 100 mV .... 300 V
- 4.3.3 Current measurement: 1 mA .....12 A direct measurement and 5 mA .....120 A for measurement with clip-on CT
- 4.3.4 Fundamental frequency: 15.....70 Hz.
- 4.3.5 Accuracy class: 0.05
- 4.3.6 Voltage measurement error < 0.05%
- 4.3.7 Current measurement error < 0.05%
- 4.3.8 Power / energy measurement error < 0.1% ( direct measurement) and < 0.2% ( with clamps/CT's)
- 4.3.9 Phase angle measurement error < 0.01° ( direct measurement) and < 0.1° (with clamps/CTs).
- 4.3.10 Frequency measurement error  $\pm 0.01$  Hz.
- 4.3.11 Harmonic measurement error < 0.2%
- 4.3.12 The influence of auxiliary voltage on the measuring results shall be less than 0.005% at 10 % variation.
- 4.3.13 The power consumption shall not be more than 28 VA.
- 4.3.14 The Sampling rate shall be 16 bits 504 samples per period and above

#### 4.4 Instructions and Markings

- 4.4.1 The Standard shall be marked legibly and indelibly with the following information:
  - a) Name or trade mark of the manufacturer
  - b) Country of origin
  - c) Type/model and serial number
  - d) Nominal input voltage and frequency
  - e) Power consumption in Watts or VA's



i) Fuse ratings

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

- 4.4.2 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 the portable class 0.05 three-phase watt-hour working standard being offered.
- 4.4.3 The manufacturer shall provide a list of at least three previous utilities to which the standard being offered has been supplied (Brochures shall be attached to support this requirement). The number of standards sold over a period of 5 years shall not be less than 100 standards.
- 4.4.4 The Tenderer shall fill the attached matrix to be used as a guideline in accessing the manufacturers' compliance to the requirements of this specification. The Tenderers shall indicate the details of their offer where it is different from these requirements. Insertions such as "noted", "agreed" etc. shall be considered as non-responsive where a specific response is called for.

## 5 TESTS

- 5.1 A certificate of calibration on the standard's performance across its operating range from an International or National calibration laboratory or from an accredited laboratory shall be provided with the submitted tender documents. The certificate shall be for a type of the standard being offered.
- 5.2 The delivered standards shall be accompanied by their calibration certificates.
- 5.3 If the certificates of calibration (clause 5.1 and 5.2) are issued by a laboratory other than an International or National calibration laboratory, proof of accreditation and a copy of ISO/IEC 17025 certificate shall be submitted with the tender.
- 5.4 The manufacturer's declaration of conformity to reference standards, proof of ISO 9001(2008) standards shall be submitted.

6 INFORMATION AND WARRANTY (In case of Tender Award)

- 6.1 The Standards 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. Defects shall be rectified at the supplier's cost, including duties, taxes and shipment.
- 6.2 The supplier shall commit to make available essential spares and other consumables for a period of not less than 10 years or for the certified life of the standards or whichever is greater.
- 6.3 The manufacturer shall meet the full costs of two engineers, for portable standard inspection and acceptance testing at the manufacturer's facility, excepting the cost of engineers' transportation from Kenya to the nearest major airport
- 6.4 The manufacturer shall meet the full costs of local training on the operational and maintenance (troubleshooting, repair and calibration etc) of the portable standard in Nairobi for 14 participants for at least 3 (three) days.
- 6.5 The standards shall be packaged in such a manner as to minimize damage and entry of moisture during transportation and handling.
- 6.6 Each standard shall be delivered with a laptop, with minimum specifications as attached in appendix C.
- 6.7 3 copies of service manual with details of the requirements/method for routine maintenance and calibration of the portable standard to be provided.

APPENDIX A: SUMMARY SCHEDULE OF TECHNICAL DATA

Auxiliary Supply	90.....265 VAC , 47.....63 Hz
Power Supply through test voltage	90.....265 VAC, 47.....63 Hz
Power Consumption	≤ 28VA
Voltage Measurement	100 mV.....300 V
Influence of auxiliary voltage on the measuring	≤ ± 0.005 % at 10 % variation
Test Current, direct connection	1 mA.....12 A
Test Current, clamp-on	5 mA.....120 A
Fundamental Frequency	15.....70 Hz
Measuring modes	4 Wire active/-reactive/apparent 3 Wire active /- reactive 2 Wire active /- reactive
Accuracy class	0.05
Voltage measurement error (90....300 V)	≤ 0.05 %



Current measurement error, direct (1 mA....12 A)	≤ 0.05 %
Current measurement error, via CT(5 mA.....120 A)	≤ 0.1 %
Current measurement error, via CT ( up to 2000 A)	≤ 0.2 %
Power/energy measurement error	≤ 0.1 % (direct measurement)
Power/energy measurement error	≤ 0.2 % (with CT's)
Angle measurement (direct measurement)	≤ ± 0.01°
Angle measurement (with clamps/CTs)	≤ ± 0.1°
Frequency measurement	± 0.01 Hz
Temperature range (Operation)	-1.....+ 50 °C
Relative Humidity	Up to 80 % Not condensing
Sampling Rate	Minimum 16 bit 504 samples per period
Safety protection	IEC 61010-1
Degree of protection	Minimum IP-30
Certification	CE, IEC 61000-4-30.

APPENDIX B. TABLE AND STATEMENT OF COMPLIANCE

(To be filled by the Supplier FOR ALL CLAUSES and submitted for tender evaluation)

Clause Number	Bidder's offer	Manufacturer's Compliance/Remarks	Reference Page in the submitted documents
4.1	<b>OPERATING CONDITIONS</b>		
4.1.1	Suitable for operation in tropical conditions -1 to 45 degrees Celsius, 80% humidity non condensing		
4.1.2	Power & Energy measurements in Domestic, Industrial and Commercial meter installations		
4.2	<b>DESIGN &amp; CONSTRUCTION</b>		
4.2.1	Compliance fully with IEC 61000-4-30		
4.2.2	Class 0.05 accuracy		
4.2.3	Standard made of hard plastic &/or light aluminum profile or equivalent material to allow a weight of not more than 3 kg.		
4.2.4	Degree of protection Minimum IP-30		
4.2.5	Measurement of active, Reactive and Apparent power and Energy in s/phase and three phase, 2- wire 3-or-4 wire circuits.		
4.2.6	4 quadrant power measurement		
4.2.7	Direct and via clamp-on CT connection in current measurement.		
4.2.8	The standard shall be able to determine the operating burden on instrument transformers for CT and PT.		
4.2.9	The standard shall be able to perform turns ratio test by simultaneously measurement of both primary and secondary currents in CT connected measuring systems.		
4.2.10	Capability of measuring currents up to a maximum of 2000 A per phase through external clip-on CTs to be quoted separately from the main equipment and its other accessories.		
4.2.11	The Standard shall have a wide measuring range with auto ranging.		

Clause Number	Bidder's offer	Manufacturer's Compliance/Remarks	Reference Page in the submitted documents
4.2.12	Display of vector diagram for analysis of mains conditions and meter connections and relevant instantaneous values.		
4.2.13	Measurement and display of waveforms		
4.2.14	Ability to detect circuit connection faults		
4.2.15	Ability to perform accuracy test, calculate and display the error.		
4.2.16	Capability of measuring and displaying True RMS values of current and voltage, phase angles, power factor, frequency and phase rotation.		
4.2.17	The display of at least 6 x 4" with high resolution of at least 320x240 pixels or a LCD one.		
4.2.18	Display of voltage sequence indication (U <sub>1</sub> , U <sub>2</sub> and U <sub>3</sub> )		
4.2.19	Storage of test data for at least 200 measurements which is capable of being sent, through serial interface to an external PC after measurement by Windows based data management software		
4.2.20	Data management software license/ license costs		
4.2.21	Measurement of harmonics in voltage and current up to 40 <sup>th</sup> THD		
4.2.22	Pulsed output for energy (galvanic isolated)		
4.2.23	Features like Hold-function to read the instantaneous values during meter testing and integrated START/STOP-push button for a quick visual meter check, without scanning head.		
4.2.24	Provision for insertion of a scanning head for testing both electromechanical and static (electronic) meters.		
4.2.25	A set of Test leads (quick connecting cable set), CT's (120 A), Accessories, Transportation case, Photoelectric Scanning head with its support contained and an additional Scanning head with magnet and sucker for expedient testing of LEDs.		
4.2.26	Selective power measurement.		
4.2.27	Test power and energy registers		
4.2.28	Delivered with a MS-Windows analyzer and simulation software for vectorial diagrams.		
4.2.29	Provision of a belt for ease of transportation by operator while operating at site		
4.2.30	The Photoelectric Scanning head suitable for use with both electronic meters and Ferraris meters		
4.2.31	The Photoelectric Scanning head suitable for attachment to a meter as desired.		
4.2.32	Additional Scanning head with magnet and sucker for expedient testing of LEDs.		
4.2.33	A rugged transportation case for storing and/or transporting the standard and its accessories		
4.2.34	Full compliance to IEC 61010-1 standard on safety		
4.3	<b>RATINGS</b>		
4.3.1	The voltage supply switchable between the auxiliary supply (external voltage with nominal voltage 240 V, 50 Hz) and the test voltage at 90.....265 VAC/ 47.....63 Hz		
4.3.2	Voltage measurement: 100 mV .... 300 V		
4.3.3	Current measurement: 1 mA .....12 A direct measurement 5 mA .....120 A for measurement with clip-on CT		
4.3.4	Fundamental frequency: 15.....70 Hz		
4.3.5	Accuracy class: 0.05		
4.3.6	Voltage measurement error < 0.05%		
4.3.7	Current measurement error < 0.05%		

Clause Number	Bidder's offer	Manufacturer's Compliance/Remarks	Reference Page in the submitted documents
4.3.8	Power / energy measurement error < 0.1% ( direct measurement) and < 0.2% ( with clamps/CT's)		
4.3.9	Phase angle measurement error $\leq 0.01^\circ$ (direct measurement) and <0.1° (with clamps/CTs).		
4.3.10	Frequency measurement error $\pm 0.01$ Hz		
4.3.11	Harmonic measurement error < 0.2%		
4.3.12	The influence of auxiliary voltage on the measuring results less than 0.005% at 10 % variation.		
4.3.13	Power consumption shall not be more than 28 VA		
4.3.14	Sampling rate 16 bit and above		
4.4	<b>INSTRUCTIONS &amp; MARKINGS</b>		
4.4.1	The Standard shall be marked legibly and indelibly		
4.4.2	Submission of relevant technical details, schematic drawings, operational and service manuals.		
4.4.3	List of at least three previous utilities to which the standard being offered has been supplied. The number of standards sold over a period of 5 years shall not be less than 100 standards.		
4.4.4	The Tenderer to fill the attached matrix to be used as a guideline in accessing the manufacturers' compliance to the requirements of this specification. Insertions such as "noted", "agreed" etc. shall be considered as non-responsive where a specific response is called for.		
5.	<b>TESTS</b>		
5.1	Submission of a certificate of calibration on the standard's performance across its operating range from an International or National calibration laboratory or from an accredited laboratory.		
5.2	Proof of accreditation and a copy of ISO/IEC 17025 certificate of Accredited lab if certificate in 5.5.1 is from an accredited lab.		
5.3	Submission of ISO 9001(2008) standards certificate		
6.	<b>INFORMMATION AND WARRANTY</b>		
6.1	The Standards to have a warranty against any defects for a period of Eighteen months from the date of delivery		
6.2	Availability of essential spares and other consumables for a period of not less than 10 years		
6.3	The manufacturer to meet the full costs of two engineers, for meter inspection and acceptance testing at the manufacturer's facility		
6.4	The manufacturer to meet the full costs of local training on the operational and maintenance of the portable standard in Nairobi for at least 3 (three) days		
6.5	The standards packaged in such a manner as to minimize damage and entry of moisture during transportation and handling		
6.6	Each standard shall be delivered with a laptop ,with minimum specifications as attached in appendix C		
6.7	6.7 3 copies of service manual with details of requirements/method for routine maintenance and calibration.		







APPENDIX C: SPECIFICATIONS FOR THE LAPTOP COMPUTER

Clause Number	Bidder's offer	Manufacturer's Compliance/Remarks	Reference Page in the submitted documents
<b>B.2</b>	<b>Operating Conditions</b>		
B.2.1	Shall be suitable for operation in tropical climate where temperatures may vary from 0 to 40 degrees Celsius;		
B.2.2	Shall be suitable in climates of relative humidity reaching 80 % (non-condensing).		
<b>B.3</b>	<b>Technical Parameters:</b>		
B.3.1	The laptop shall have an Intel Core 2 Duo processor or Higher		
B.3.2	The laptop speed shall be at least 2.66 GHz		
B.3.3	The laptop shall have a 4 MB L2 cache or Higher		
B.3.5	The laptop shall have a Hard Disk Drive of at least 500 GB or higher		
B.3.6	The laptop shall have an Optical Drive - DVD+/-RW Combo Drive		
B.3.7	The laptop shall have an Integrated Touchpad with scroll zone, two pick buttons or Pointstick, two pick buttons		
B.3.8	The laptop shall not exceed 4kg with battery		
B.3.9	The laptop shall be supplied together with a battery charger		
B.3.10	The laptop Power Adapter shall be full range auto switching 100/240 Volts, 50Hz		
<b>B.4</b>	<b>Color Display</b>		
B.4.1	Display 12.1 inch -14.1 inch WXGA anti-glare or higher		
B.4.2	1280x800 Resolution		
B.4.3	4 GB (1066 MHz DDR2 SDRAM		
B.4.4	The Laptop shall have 2 built in high definition Audio Stereo speakers, stereo headphone/line out, stereo microphone/integrated mono microphone.		
<b>B.5</b>	<b>Integrated Communications</b>		
B.5.1	The laptop shall have 56K modem		
B.5.2	Integrated Intel Gigabit Network Connection (10/100/1000 NIC)		
B.5.5	At least 3 No. USB Ports		
B.5.9	1 No. External CRT Port that can be secured by screws.		
B.5.10	The laptop shall have WIFI (Wireless Lan) Enabled		
B.5.11	The laptop interfaces shall be Type I/II PC Card slot, VGA, 1394a, RJ-11/modem, RJ-45/Ethernet, USB 2.0		
<b>B.6</b>	<b>Instructions and Markings</b>		
B.6.1	Name or trade mark of the manufacturer		
B.6.2	Country of origin		
B.6.3	Type/model and serial number		
B.6.4	Nominal input voltage and frequency		
<b>B.7</b>	<b>Software, Accessories &amp; Warranty</b>		
B.7.1	The laptop Operating System shall be preinstalled		

Clause Number	Bidder's offer	Manufacturer's Compliance/Remarks	Reference Page in the submitted documents
	Genuine Windows 7® Business 32		
B.7.2	The laptop shall have DVD/CD's and Manuals of the Installed Software		
B.7.3	The laptop shall have supplied with a leather Carrying case and strap		
B.7.4	The laptop shall have One Year warranty.		
B.7.5	The laptop's keyboard should be standard, with all characters in ENGLISH		

**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 matrix conforms to a typical tender item type..... as clearly marked in the attached technical brochures & drawings, and being offered for this tender.

Signature.....

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

