



TITLE:  
**SPECIFICATION FOR A  
PORTABLE PRIMARY  
CURRENT INJECTION SET  
[NUMERICAL]**

Doc. No.	KP1/3CB/TSP/09/047
Issue No.	1
Revision No.	0
Date of Issue	2014-02-11
Page 1 of 23	

## TABLE OF CONTENTS

### 0.1 Circulation List

### 0.2 Amendment Record

## FOREWORD

1. SCOPE
2. REFERENCES
3. TERMS AND DEFINITIONS
4. REQUIREMENTS
5. TESTS AND INSPECTION
6. MARKING, LABELLING AND PACKING
7. DOCUMENTATION AND TRAINING

**ANNEX A:** **Guaranteed Technical Particulars** (to be filled and signed by the Manufacturer and submitted together with copies of manufacturer's catalogues, brochures, drawings, technical data, sales records and copies of certificates/test reports for tender evaluation)

Issued by: Head of Section, Tech Stds & Specs

Authorized by: Head of Department, R & D

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Date: 2014-02-11

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Doc. No.	KP1/3CB/TSP/09/047
Issue No.	1
Revision No.	0
Date of Issue	2014-02-11
Page 2 of 23	

### 0.1 Circulation List

COPY NO.	COPY HOLDER
1	Research & Development Manager
2	Supply Chain Manager (Procurement)
Electronic copy (pdf) on Kenya Power Server (currently :Network-\\stima-fprnt-001\techstd&specs	

### 0.2 Amendment Record

Rev No.	Date (YYYY-MM-DD)	Description of Change	Prepared by (Name & Signature)	Approved by (Name & Signature)
0	2014-02-11	New Issue	Michael Apudo 	Eng. Simon Kimitei 

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Issue No.	1
Revision No.	0
Date of Issue	2014-02-11
Page 3 of 23	

## FOREWORD

These specifications have been prepared by Research and Development (R &D) Department in collaboration with Technical Services Department (System Protection Section) both of Kenya Power and Lightning Company (abbreviated as KPLC) and it lays down the requirements for a Portable Primary Current Injection Set (Numerical). The specification is intended for use by KPLC in purchasing the equipment.

The supplier shall also submit information which confirms satisfactory service experience with products which fall within the scope of this specification.

## 1. SCOPE

- 1.1. This specification is for a Primary Current Injection Test which shall be essential when commissioning new protection systems and after major repairs and component replacements. It shall also be capable of testing the whole protection system. It shall be able to detect current transformers connected with incorrect polarity or relays that have been set in the wrong sequence in differential systems.
- 1.2. The specification also covers inspection and test of the equipment as well as the schedule of Guaranteed Technical Particulars to be filled and signed by the manufacturer and submitted for tender evaluation.
- 1.3. The specification stipulates the minimum requirements for the Portable Primary Current Injection Set (Numerical) acceptable for use in the company (KPLC) and it shall be the responsibility of the supplier to ensure adequacy of the design, good workmanship, good engineering and adherence to applicable standards in the manufacture of the test equipment.

## 2. REFERENCES

The following standards contain provisions which, through reference in this text, constitute provisions of this specification. Unless otherwise stated, the latest edition of the referenced documents (including any amendments) applies:

IEC 61010-1: Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements

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	<b>Issue No.</b>	1
	<b>Revision No.</b>	0
	<b>Date of Issue</b>	2014-02-11
	Page 4 of 23	

- IEC 60950 Information technology equipment –Safety – Part 1: General requirements
- IEC 60664-1& 3: Insulation Coordination for Equipment within Low-Voltage Systems - Part 1: Principles, Requirements and Tests; Part 3: Use of coatings to achieve insulation coordination of printed board assemblies.
- IEC 60112: Method for the determination of the proof and the comparative tracking indices of solid insulating materials
- IEC 61326: Electrical Equipment for Measurement, Control and Laboratory Use - EMC Requirements
- IEC 60068: Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal) Part 2-27: Tests – Test Ea and guidance: Shock
- IEC 60529: Degrees of protection provided by enclosures (IP Code)
- IEC 60320: Appliance couplers for household and similar general purposes – Part 1: General requirements

### 3. TERMS AND DEFINITIONS

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

- MU: Merging Unit
- CTI: Comparative Tracking Index
- PLC: Performance Level Category

### 4. REQUIREMENTS

#### 4.1. Service Conditions

The conductors shall be suitable for continuous outdoor operation in tropical areas at altitudes of up to 2200m above sea level, humidity of up to 90%, average ambient temperature of +30°C with a minimum of -1°C and a maximum of +40°C; heavy saline conditions along the coast and isokeraunic levels of up to 180 thunderstorm days per year.

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KP1/3CB/TSP/09/047

Issue No.

1

Revision No.

0

Date of Issue

2014-02-11

Page 5 of 23

## 4.2. Design and Construction

- 4.2.1. The portable primary current injection set [numerical] shall conform to IEC 610610-1, IEC 60950 and IEC 60664-1 & 3 standards and the requirements of this specification.
- 4.2.2. The portable primary injection test system shall be smaller and lighter, combining a revolutionary high current generation technology, digital signal processing (DSP) based, with an automatic smart control, in a really transportable set, and able to inject up to 800A.
- 4.2.3. It shall be easy to transport so that the set can be much closer to the device under test (DUT), reducing the length of cables, and a significant decrease in power losses by eliminating intermediate connections.
- 4.2.4. The modern high-tech design shall have the highest level of injection capability in terms of power and duty cycle, with an ease of use.
- 4.2.5. It shall possess a touch-sensitive console which allows the user to fully monitor and control the test process, including the storage of results and test configuration tools.
- 4.2.6. It shall provide an automatic regulation of the magnitude to be injected, being stable regardless of the load change.
- 4.2.7. The current output range shall be adjusted at all times according to application, taking advantage of the modularity and versatility of the concentration of measurement and control functions in the Master Unit (MU), with a unique capacity to adjust the voltage and current required through the number of spire turns used.
- 4.2.8. This shall include a powerful measurement section, extending the number of testing applications and user-friendly interface from which the operator remotely controls and monitors the entire test process.
- 4.2.9. The system shall also include factory configured tests, to automatically perform a large amount of the most common testing, just by selecting the appropriate template and start the test. The user shall be able to easily make or modify test templates.

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Issue No.	1
Revision No.	0
Date of Issue	2014-02-11
Page 6 of 23	

### 4.3. Operation

- 4.3.1. The injection test shall be laptop controlled. Its operating system shall run on at least Microsoft Windows 7, and be capable of being integrated with other analytical and data management software in MS office suite.
- 4.3.2. The accuracy of the test results shall not be dependent on the quality of the input signal. The injection set shall be capable of generating its own test signals. A minimum of six (6) A.C current outputs and four (4) A.C voltage outputs are required.
- 4.3.3. The injection set shall have automatic in built suppression system for electrostatic & electromagnetic interferences in a substation. The equipment shall have automatic test procedures which are easy and simple to follow and use.
- 4.3.4. The test set should have an illuminated (red colour) power supply on/off switch; the test set should have a provision for combined generator A.C output test signals and a test cable with enough cores to carry all the A.C quantities from test set to device being tested. This cable should be able to carry maximum test set rated current and voltages and should be at least 3 meters long.

### 4.4. Test results

- 4.4.1. Test preparations and analysis of results and parameters shall be prepared off-line and tests executed automatically.
- 4.4.2. The equipment shall generate the test reports automatically, and a possibility of exporting them to MS Word or Excel for detailed analysis should be available.
- 4.4.3. The tester shall be equipped with a standard data communication interface for connection to remote data processing such as computer, or control equipment.
- 4.4.4. The interfaces shall use USB 3.0, device class DCh or FEh with a signaling speed of 5 Gbit/s and a usable data rate of up to 4 Gbit/s (500 MB/s) and RS232 serial communication line, with the length of the connection not exceeding 5 meters. The tester shall be capable of being remotely controlled by such equipment.
- 4.4.5. The injection test shall be capable of data uploading and downloading to laptop through RS232 and USB port and/or Ethernet.

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Doc. No.	KP1/3CB/TSP/09/047
Issue No.	1
Revision No.	0
Date of Issue	2014-02-11
Page 7 of 23	

## 4.5. Testing Capabilities

### 4.5.1. Relay Testing

- 4.5.1.1. The equipment shall be able to simulate primary faults to check if protective relays operate correctly; trip times measured and registered by the system, with 1 ms resolution.
- 4.5.1.2. It shall possess features such as automatic current regulation, the pre-set current injection, the injection time control, and the test results storage; to provide the user with the most advanced primary testing tool for protection relays.

### 4.5.2. Circuit Breaker Testing

- 4.5.2.1. It shall have facilities for the verification of the entire protection scheme to verify CB tripping, and CB operating time analysis in combination with total trip time including the IEDs and CB trip time.
- 4.5.2.2. Measurements with the equipment shall deliver reliable and repeatable results due to high signal and measurement accuracy.

### 4.5.3. Current Transformer Testing

- 4.5.3.1. The test set shall have advanced features – such as powerful measurement input, to allow performing a complete check of a CT. Through a 3 seconds test the following results shall be obtained: turns ratio, phase (polarity) between primary and secondary of the CT, and burden (impedance, power and power factor of the load).
- 4.5.3.2. It shall also be used for testing low power and Rogowski CTs, checking phase and burden in VTs, and checking ratio, polarity, short circuit impedance and reactance losses in Power Transformers. Test templates shall also be provided for Magnetization curve and “knee point” of a measuring CT.

### 4.5.4. Recloser and Sectionalizers

Through the high current fault simulation, the test set shall perform automatic test, detecting and getting opening and reclosing times, number of operations, partial and total times, of the recloser under test.

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Doc. No.

KP1/3CB/TSP/09/047

Issue No.

1

Revision No.

0

Date of Issue

2014-02-11

Page 8 of 23

#### 4.5.5. Switchgear Testing

4.5.5.1. Low voltage switchgear and control gear assemblies require also high current testing to comply with the relevant product standards, both by assembly manufacturers and users.

4.5.5.2. The test set shall be suitable for testing the rated short-time current that the assembly must withstand, and MCB/MCCBs tripping time performance, both thermal and short circuit trips.

#### 4.6. Ratings – Generator Outputs

The current and voltage ratings are as per Table 1 and 2 respectively with the design mechanical and electrical technical data listed in Table 3.

**Table 1: Current Outputs**

No.	Range	Amplitude	$t_{max}$	$V_{max}$	$Power_{max}$	f
1	800 A AC	0 --- 800 A	25 s	6.0 V	4800 VA	15 Hz – 400 Hz
		0 --- 400 A	8 min.	6.4 V	2560 VA	15 Hz – 400 Hz
		0 --- 200 A	> 2 h	6.5 V	1300 VA	15 Hz – 400 Hz
2	6 A AC	0 --- 6 A	> 2 h	55 V	330 VA	15 Hz – 400 Hz
3	3 A AC	0 --- 3 A	> 2 h	110 V	330 VA	15 Hz – 400 Hz
4	400 A DC	0 --- 400 A	2 min.	6.5 V	2600 VA	DC
		0 --- 300 A	3 min.	6.5 V	1950 VA	DC
		0 --- 200 A	> 2 h	6.5 V	1300 VA	DC
5	6 A DC	0 --- 6 A	> 2 h	60 V	360 VA	DC

**3000 A AC shall be achieved with an interface to a Current Booster**

**Table 2: Voltage Outputs**

No.	Range	Amplitude <sup>5</sup>	$t_{max}$	$I_{max}$	$Power_{max}$	f
1	2 kV AC	0 -- 2 kV	1 min	1.25 A	2500 VA	15 Hz – 400 Hz
		0 -- 2 kV	> 2 h	0.5 A	1000 VA	15 Hz – 400 Hz
2	1 kV AC	0 -- 1 kV	1 min	2.5 A	2500 VA	15 Hz – 400 Hz
		0 -- 1 kV	> 2 h	1.0 A	1000 VA	15 Hz – 400 Hz
3	500 V AC	0 – 500 V	1 min	5.0 A	2500 VA	15 Hz – 400 Hz
		0 – 500 V	> 2 h	2.0 A	1000 VA	15 Hz – 400 Hz
4	130 V AC	0 – 130 V	> 2 h	3.0 A	390 VA	15 Hz – 400 Hz

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KP1/3CB/TSP/09/047

Issue No.

1

Revision No.

0

Date of Issue

2014-02-11

Page 9 of 23

**Table 3: Power Supply and Mechanical Data**

No	Particulars	Test Performance	
1	Power Supply	Single-phase, nominal	220 V AC ... 250 V AC, 16 A
		Frequency, nominal	50 Hz
		Power consumption	<3500 VA (<7000 VA for short time < 10 sec)
		Connection socket	C22 conforming to IEC 60320
2	Environmental conditions	Operating temperature	-1 ... +40 °C (+30.2 ... +104 °F)
		Storage temperature	-5 ... +60 °C (23 ... +140 °F)
		Humidity range - Rel. humidity	5 ... 95 %, non-condensing
		Shock (operating)	15 g / 11 ms half sine as per IEC 60068-2-27
		Vibration (operating)	frequency range from 10 Hz to 150 Hz, continuous acceleration 2 g (20 m/s <sup>2</sup> ), 10 cycles per axis as per IEC 60068-2-6
3	EMC Immunity	Performance criteria of the equipment	IEC 61326-1 Class A,
4	Safety	Rated Impulse Voltage for equipment -1.2/50µs	6000 V as per IEC 60664-1, table 1
		Overvoltage category	Class IV as per IEC 61010-1
		Pollution category	Class 2 as per IEC 61010-1
		Insulation material group	Group II - 400≤CTI<600 (PLC=1) as per IEC 60112
		Minimum clearances for equipment to withstand steady state voltages, temporary over-voltages and to avoid partial discharge	5.5 mm as per IEC 60664-1
		Creepage distance for equipment subject to long term stresses, min	1.8 mm as per IEC 60664-1
		Minimum acceptable creepage distances on printed circuit boards	1.0 mm as per IEC 60664-1
		Maximum recurring peak voltage related to creepage distance on printed wiring boards	913 V as per IEC 60664-1
		Width of grooves by pollution degree on printed circuit boards	1.0 mm as per IEC 60664-1
		Partial discharge requirements	As per IEC 60664-1 Annex C
Solid insulation design	Shall withstand short term and long term stresses as per IEC 60664-1 clause 3.3		

\* If the internal emission source(s) is operating at a frequency below 9 kHz then measurements need only to be performed up to 230 MHz

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KP1/3CB/TSP/09/047

Issue No.

1

Revision No.

0

Date of Issue

2014-02-11

Page 10 of 23

**4.7. Accessories (To be supplied with the equipment)**

**4.7.1. Current Booster (optional, unless specified in the tender)**

Tests applications requiring up to 3000 A shall require the use of a Current Booster. The output current of the Portable Primary Injection Test Set shall be increased to up to 3000 A by an electronically controlled current booster. The booster shall be connected close to the busbar using short high current leads and to the tester via a long control cable. The current booster design technical data is as per Table 4;

**Table 4: Technical data for a current booster**

Current outputs						
Range	Amplitude	T <sub>max</sub> <sup>1</sup>	V <sub>max</sub> <sup>2</sup>	Power <sub>max</sub> <sup>2</sup>	f	
1000 A	0 -- 1000 A	25 s	4.90 V	4900 VA	15 – 400 Hz	
AC <sup>3</sup>	0 – 500 A	30 min	5.00 V	2500 VA	15 – 400 Hz	
	0 – 2000 A	25 s	2.45 V	4900 VA	15 – 400 Hz	
Internal measurement of outputs						
Output	Guaranteed accuracy			Typical accuracy		
	Amplitude		Phase	Amplitude		Phase
	Reading	Full scale	Full scale	Reading	Full scale	Full scale
3000 A AC	0.25 %	0.25 %	0.50 <sup>0</sup>	0.13 %	0.13 %	0.25 <sup>0</sup>
1000 A AC	0.25 %	0.25 %	0.50 <sup>0</sup>	0.13 %	0.13 %	0.25 <sup>0</sup>

- 1 With mains voltage 230 V at 23 °C ± 5 °C (73 F± 10 F) ambient temperature.
- 2 Signals below 50 Hz or above 60 Hz with reduced values possible.
- 3 Outputs in series.
- 4 Outputs in parallel.

**4.7.2. Laptop (optional unless specified in the tender)**

The laptop shall be designed and manufactured as per the requirements of IEC 60950 with minimum requirements as per Table 5.

**Table 5: Technical data for a Laptop**

Item	Minimum Specification
Brand	Specify
Model	Specify
Year of manufacture	Specify
Processor	Intel® Core™ i5-920 Processor

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Doc. No.

KP1/3CB/TSP/09/047

Issue No.

1

Revision No.

0

Date of Issue

2014-02-11

Page 11 of 23

Clock speed	2.2 GHz or higher
Chipset	Compatible – (specify)
Motherboard	Compatible – (specify)
Memory (maximum)	2GB DDR3, 1333MHz (Upgradable upto 6 GB)
Cache memory	3MB L2 or higher
Graphics	256MB Dedicated DDR3 Memory
Hard disk controller	Serial ATA
Hard disk	250 GB or higher 5400RPM SATA Hard Drive
Shock resistant	Anti-shock mounting design to protect screen and hard disk drive from damage and data loss
Keyboard	Spill resistant keyboard
Mouse	2 or 3 button with scroll wheel optical PC Mouse with pad – USB 3.0
Touch pad	Intelligent Touch with configurable vertical and horizontal scroll functions
Power supply	Input – 220V – 250V Auto-sensing, 50 Hz
Battery life	4 hours or higher
Optical drive	Dual Layer DVD +/-RW
Card slots	Secured Digital Card Reader
Display	14” or smaller WXGA with 1280 x 800 or higher resolution
Integrated Web Camera	2 Mega Pixels or higher
Network/Wireless Interfaces	Integrated 10/100/1000Mbps Ethernet LAN, Integrated 802.11 a/b/g/n WLAN, Bluetooth
Security	Booting/HDD User password Protection and Fingerprint Recognition
I/O Inputs	Minimum 3 x USB 3.0 Hi-Speed, 1 x RJ45, 1 VGA
Operating system	MS Windows 7 Professional OEM Version with original Media kit, & manuals (firewall enabled and all security updates and patches and fixes up-to-date) or equivalent higher version.
Productivity software	<p>Latest versions of, Open Office AND Genuine Microsoft Office 2007 Standard or better, OEM, Full or Suitable licensing scheme</p> <p>* Please quote the price for one unit of computer with and without Microsoft Office 2007</p> <p>Adobe Acrobat reader - the latest version</p>
Anti-virus	<p>Anti-Virus software should be installed with licenses (Specify) * Please quote the price for one unit of computer with and without Anti-Virus software</p>
Carrying bag	Include with the same brand of the notebook.
Manufacturer Authorization and warranty	Attach Authorization letter and 2 years comprehensive on-site manufacturer authorized warranty (parts).

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<b>Issue No.</b>	1
<b>Revision No.</b>	0
<b>Date of Issue</b>	2014-02-11
Page 12 of 23	

**4.7.3. Timer specifications**

4.7.3.1. The timer requirements shall be as follows:

- Metering :Relay timing or current duration
- Digital timer with large LED display
- Timer range : 9.999; 99.99; 999.9; 9999s, auto ranging
- Input contacts dry or wet
- Voltage range; 24V to 240V dc or ac

4.7.3.2. The output of either voltage or current shall automatically be selected by software or manually by the user. Current and voltage outputs shall be overload and short circuit proof and protected against over temperature.

4.7.3.3. The timer shall be inbuilt to record protection relay operation. There shall be circuit protection by circuit breakers and fuses and a thermal cut-out preventing overheating.

4.7.3.4. There shall also be a controlled switching to ensure that in event of power failure or thermal cut-out operating, the output cannot be re-energized until the controls are reset thereby offering protection to the equipment and the operator.

**4.8. Software**

4.8.1. The portable primary injection set shall be fully automated and software driven. The software shall be able to capture, analyse and manage data. The software shall eliminate human error with an automated setup and testing. The user shall simply selects the test mode and test voltage to conduct one or more tests, and the test set performs the measurements and reports the results in an easy-to-read format.

4.8.2. The software shall be Windows™ based. The software shall have a Data Management system that establishes a library of every apparatus test result that the users collect. The Data Manager System shall allow users to retrieve copy and organize existing data records, as well as create new records. The Data Management system shall provide easy-to-use functionality comparable to Windows Explorer.

4.8.3. The software shall have a Standardized Test Forms system for different equipment (transformers, current transformers, surge arresters, etc.). The Standardized Test Forms shall make testing and storing data easy to manage.

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KP1/3CB/TSP/09/047

Issue No.

1

Revision No.

0

Date of Issue

2014-02-11

Page 13 of 23

The test forms shall resemble one another; however, each one is customized for the appropriate test procedures for that type of apparatus.

- 4.8.4. Test results shall be automatically stored after each test, eliminating the need to reenter nameplate information when testing the same apparatus in the future. Should two or more data files exist for a particular apparatus, the software shall have the functionality to merge them into one record.
- 4.8.5. To improve the efficiency of testing and evaluation of results each equipment nameplate and test history is located in one record. The software shall have On Screen Help that will reduce inconsistency in test results and provide direction for performing tests correctly and consistently. The standardized test procedures shall provide consistency for identical tests that can be performed with the same methodology each time.
- 4.8.6. The software shall have automated temperature compensation by applying a temperature correction factor for accurate comparison of periodic test results. The electrical characteristics of most insulating materials vary depending on temperature.
- 4.8.7. In order to accurately compare results of periodic tests on the same apparatus, it is necessary to minimize the variation that is due to different temperatures. This can be accomplished by applying a temperature correction factor to the Power Factor calculation. A number of factors determine the appropriate correction factor: ambient temperature, apparatus temperature, apparatus type, manufacturer, and voltage class.
- 4.8.8. The software shall have an expert system that is able analyzes each line of data, taking into consideration the type of equipment, nameplate information, previous test results (if available), and reference tables. Further it shall also give a rating with an explanation as to how the rating was acquired. When unacceptable readings are obtained, the software shall provide the test technician with a list of recommended investigative procedures that can be followed.
- 4.8.9. All records are presented in a format that is easy to read, save and print. The software shall have the ability to diagnosis and identify problems with the instrument.

**NOTE:**

***To ensure that the tenderer complies with the software requirement a copy of the software shall be supplied with the tender document or shall be demonstrated at the time of adjudication.***

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KP1/3CB/TSP/09/047

Issue No.

1

Revision No.

0

Date of Issue

2014-02-11

Page 14 of 23

#### 4.9. Quality Management System

- 4.9.1. The supplier shall submit a quality assurance plan (QAP) that will be used to ensure that the Portable Primary Current Injection Set 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 9001:2008.
- 4.9.2. The Manufacturer's Declaration of Conformity to applicable standards and copies of quality management certifications including copy of valid and relevant ISO 9001: 2008 certificate shall be submitted with the tender for evaluation.
- 4.9.3. The bidder shall indicate the delivery time of the items, manufacturer's monthly & annual production capacity and experience in the production of the type and size of items being offered. A detailed list & contact addresses (including e-mail) of the manufacturer's previous customers for similar type of the Portable Primary Current Injection Set 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.

#### 5.0. TESTS AND INSPECTION

- 5.1. The Portable Primary Current Injection Set shall be inspected and tested in accordance with the requirements of IEC 61010-1, IEC 60950, IEC 60664- 1 & 3, IEC 61326, IEC 60112 and IEC 60529 standards. It shall be the responsibility of the supplier to perform or to have performed the tests specified and whatever other tests he normally performs at works.
- 5.2. Copies of previous Type Tests Reports issued by a third party testing laboratory that is accredited to ISO/IEC 17025 shall be submitted with the tender for the purpose of technical evaluation. The accreditation certificate to ISO/IEC 17025 for the same third party testing laboratory used shall also be submitted with the tender document (all in English Language)
- 5.3. Copies of type test reports to be submitted with the tender (by bidder) for evaluation shall be as stated below:

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TITLE:  
**SPECIFICATION FOR A  
PORTABLE PRIMARY  
CURRENT INJECTION SET  
[NUMERICAL]**

Doc. No.	KP1/3CB/TSP/09/047
Issue No.	1
Revision No.	0
Date of Issue	2014-02-11
Page 15 of 23	

**5.3.1. Type Tests for Equipment Performance**

- Electromagnetic compatibility (EMC)
- Switching tests on the equipment.
- Impulse overvoltage tests on the equipment -Clearances
- Dielectric voltage withstand tests on the equipment - Controlled overvoltage
- Functional tests on the equipment.

**5.3.2. Type Tests for Printed Circuit Board Coating Performance**

- Environmental, humidity and thermal conditioning tests
- Dielectric voltage withstand tests
- Comparative tracking index (CTI)
- Resistance to soldering heat test
- Flammability test
- Coating adhesion test
- Insulation resistance between conductors

**5.4.** Routine and sample test reports for the portable primary current injection set [numerical] to be supplied shall be submitted to KPLC for approval before shipment/delivery of the goods. KPLC Engineers will witness tests at the factory before shipment.

**5.5.** On receipt of the goods KPLC will perform any of the tests specified in order to verify compliance with this specification. The supplier shall replace without charge to KPLC the portable primary current injection set [numerical], which upon examination, test or use; fail to meet any of the requirements in the specification.

**5.6.** Tests to be witnessed at the factory before shipment shall be in accordance with IEC 61010-1, IEC 60664- 1 & 3, IEC 61326, IEC 60112 and IEC 60529 standards and this specification and shall include the following:

**5.6.1. Routine Tests Equipment Performance**

- Insulation Resistance of the equipment
- Leakage Current of the equipment
- Ground Continuity of the equipment
- Ground Bond of the equipment
- Polarization Test of the equipment

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Date: 2014-02-11

Date: 2014-02-11



TITLE:

**SPECIFICATION FOR A  
PORTABLE PRIMARY  
CURRENT INJECTION SET  
[NUMERICAL]**

Doc. No.

KP1/3CB/TSP/09/047

Issue No.

1

Revision No.

0

Date of Issue

2014-02-11

Page 16 of 23

- Recurring Peak Voltage Determination
- Dielectric Voltage Withstand Tests - Measuring clearances
- Functional tests of the equipment
- Dimensional and overall checks.

## 6.0. MARKING AND PACKING

### 6.1. PACKING

6.1.1. The Portable Primary Current Injection Set shall be packed in a standard rugged heavy duty robust case with cushion grip handles and rubberized gripping surface for outdoor use (protection category IP X5) in such a manner to avoid damage during transportation. The test set shall be carried in a sturdy transport case with hard-foam interior, water tight, air-tight, dust proof, chemical resistant and corrosion proof.

6.1.2. The housing shall be complete with a gasket to seals the lid when closed so as to protect the instrument against water and dirt while the instrument is carried through rainstorms or other hazardous conditions. The lid shall be secured by two latches and a handle for portability. A compartment shall also be provided for storage of test cables and line cord.

6.1.3. The accessories shall be packed in suitable matching bag with a shoulder carrying strap and a hand grip.

### 6.2. MARKING

The Portable Primary Current Injection Set and its accessories shall be marked in a permanent manner with the following information (in English Language):

- a) Standard to which the Portable Primary Current Injection Set complies
- b) Name of manufacturer
- c) Type of Portable Primary Current Injection Set (description of type, number and overall size of sections)
- d) Year and month of manufacture and serial number
- e) Maximum permissible measurement limits
- f) The words "**Property of Kenya Power & Lighting Co**" shall be engraved permanently on each Portable Primary Current Injection Set while the other parameters shall be marked on a permanent label.
- g) The overvoltage protection category and duty rating e.g. category IV-field
- h) The Portable Primary Current Injection Set shall be provided with a separate permanent label displaying advice to the user.

Issued by: Head of Section, Tech Stds & Specs

Authorized by: Head of Department, R & D

Signed:

Signed:

Date: 2014-02-11

Date: 2014-02-11





TITLE:

**SPECIFICATION FOR A  
PORTABLE PRIMARY  
CURRENT INJECTION SET  
[NUMERICAL]**

Doc. No.

KP1/3CB/TSP/09/047

Issue No.

1

Revision No.

0

Date of Issue

2014-02-11

Page 17 of 23

- i) In addition, the Portable Primary Current Injection Set shall be marked with the necessary labels that conform to IEC 61010-1 clauses 5.1.2 to 5 and its accessories (Laptop) as per IEC 60950 clauses 1.7.

## 7.0. DOCUMENTATION, WARRANTY AND TRAINING

### 7.1. Warranty and Training

- 7.1.1. The Portable Primary Current Injection Set [Numerical] shall be backed by a minimum 12-months factory warranty.
- 7.1.2. A two day Training on the equipment shall be carried out by the Supplier's Engineers on a KPLC site. The supplier shall meet the costs of this training.
- 7.1.3. The supplier/manufacturer shall provide technical support and software upgrades, where applicable, free of charge to KPLC for a period of not less than 24 months.
- 7.1.4. The Bidder shall submit a clause by clause statement of compliance with the specifications together with copies of the manufacturer's catalogues, brochures, technical data and proven test reports clearly marked to support each clause, all in English for evaluation. The manufacturer's type reference/designation of the item offered shall be indicated.

### 7.2. Documentation

- 7.2.1. The bidder shall submit its tender complete with technical documents required by Annex A (Guaranteed Technical Particulars) for tender evaluation. The technical documents to be submitted (all in English language) for tender evaluation shall include the following:
- Guaranteed Technical Particulars signed by the manufacturer;
  - Copies of the Manufacturer's catalogues, brochures, drawings and technical data;
  - Sales records for the last five years and at least four customer reference letters;
  - Details of manufacturing capacity and the manufacturer's experience;
  - Copies of required type test reports by a third party testing laboratory accredited to ISO/IEC 17025;
  - Copy of accreditation certificate to ISO/IEC 17025 for the third party testing laboratory;

Issued by: Head of Section, Tech Stds & Specs

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Date: 2014-02-11

Date: 2014-02-11



TITLE:  
**SPECIFICATION FOR A  
PORTABLE PRIMARY  
CURRENT INJECTION SET  
[NUMERICAL]**

Doc. No.	KP1/3CB/TSP/09/047
Issue No.	1
Revision No.	0
Date of Issue	2014-02-11
Page 18 of 23	

g) Manufacturers letter of authorization, ISO 9001:2008 certificate and other technical documents required in the tender.

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

- a) Guaranteed Technical Particulars signed by the manufacturer;
- b) Design Drawings with details of Portable Primary Current Injection Set to be manufactured for KPLC.
- c) 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 9001:2008
- d) Detailed test program to be used during factory testing;
- e) All documentation necessary for safety of the equipment as specified in IEC 61010-1 clause 5.4 shall be provided with the equipment.
- f) Manufacturer's undertaking to ensure adequacy of the design, good engineering practice, adherence to the specification and applicable standards and regulations as well as ensuring good workmanship in the manufacture of the Portable Primary Current Injection Set for The Kenya Power & Lighting Company;
- g) Packaging details (including packaging materials).

7.3 The supplier shall submit recommendations for use, care, storage and routine inspection/testing procedures, all in the English Language, during delivery of the portable primary current injection set [numerical] to KPLC stores

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Issued by: Head of Section, Tech Stds & Specs

Authorized by: Head of Department, R & D

Signed:

Signed:

Date: 2014-02-11

Date: 2014-02-11



**TITLE:**  
**SPECIFICATION FOR A  
PORTABLE PRIMARY  
CURRENT INJECTION SET  
[NUMERICAL]**

Doc. No.	KP1/3CB/TSP/09/047
Issue No.	1
Revision No.	0
Date of Issue	2014-02-11
Page 19 of 23	

**ANNEX A:** *Guaranteed Technical Particulars (to be filled and signed by the supplier and submitted together with copies of the Manufacturer's catalogues, brochures, drawings, technical data, sales records and copies of test certificates for tender evaluation)*

**Tender No .....** **Bidder's Name & Address .....**

	Description	Bidder's Offer
1	Name of the manufacturer and country of origin	Specify
	Type Reference Number or Model Number	Specify
2	<b>Applicable Standards</b>	Specify
3	<b>Terms and Definitions</b>	Specify
4	Requirements	
4.1	Service conditions	Specify
4.2	<b>Design and Construction</b>	
	4.2.1 – 4.2.9	
4.3	<b>Operation</b>	
	4.3.1 – 4.3.5	
4.4	<b>Test Results</b>	
	4.4.1 – 4.4.5	
4.5	<b>Testing Capabilities</b>	
	4.5.1 <b>Relay Testing</b>	
	4.5.1.1 – 4.5.1.2	
	4.5.2 <b>Circuit Breaker Testing</b>	
	4.5.2.1 – 4.5.2.2	
	4.5.3 <b>Current Transformer Testing</b>	
	4.5.3.1 – 4.5.3.2	
	4.5.4 <b>Recloser and Sectionalizer Testing</b>	
	4.5.5 <b>Switchgear Testing</b>	
	4.5.5.1 – 4.5.1.2	
4.5.	<b>Ratings – Generator Outputs – as per Table 1 and 2</b>	
	<b>Test / Output Current</b> Range; Resolution; Accuracy	800A ac continuous and 0 to 1000A ac 1mAVac ± 1mA of reading
	<b>Test / Out Voltage:</b> Range; Resolution; Accuracy	2Kv 1-2kV 0.010Vac ± 1% of reading.
	<b>Test / Output VA:</b> Capability	6 x 430VA/3x860VA/ 1x1000VA

Issued by: Head of Section, Tech Stds & Specs

Authorized by: Head of Department, R & D

Signed:

Signed:

Date: 2014-02-11

Date: 2014-02-11



**TITLE:**  
**SPECIFICATION FOR A  
PORTABLE PRIMARY  
CURRENT INJECTION SET  
[NUMERICAL]**

<b>Doc. No.</b>	KP1/3CB/TSP/09/047
<b>Issue No.</b>	1
<b>Revision No.</b>	0
<b>Date of Issue</b>	2014-02-11
Page 20 of 23	

<b>Auxiliary DC Supply Output</b> Resolution; Accuracy; Connection type:	0 to 260VDC.  1 V ±0.5 %of reading. 4mm <sup>2</sup> Banana socket	Specify
<b>Analog Input Ratings</b> <b>Current/Voltage:</b> Range; Connection type:	±20mA ±10V 4mm <sup>2</sup> Banana socket	Specify
<b>Binary Input Ratings</b> <b>Current/Voltage:</b> Range; Connection type:	At least 10 Binary Inputs 0 to 300VDC auto ranging. 8A 4mm <sup>2</sup> Banana socket	Specify

**Table 3: Power Supply and Mechanical Data as per Table 3**

Single-phase, nominal	220 V AC ... 250 V AC, 16 A	Specify
Frequency, nominal	50 Hz	Specify
Power consumption	<3500 VA (<7000 VA for short time < 10 sec)	Specify
Connection socket	C22 conforming to IEC 60320	Specify
Operating temperature	-10 ... +55 °C (+14 ... +131 °F)	Specify
Storage temperature	-20 ... +70 °C (-4 ... +158 °F)	Specify
Humidity range - Rel. humidity	5 ... 95 %, non-condensing	Specify
Shock (operating)	15 g / 11 ms half sine as per IEC 60068-2-27	Specify
Vibration (operating)	frequency range from 10 Hz to 150 Hz, continuous acceleration 2 g (20 m/s <sup>2</sup> ), 10 cycles per axis as per IEC 60068-2-6	Specify
Performance criteria of the equipment	IEC 61326-1 Class A,	Specify
Rated Impulse Voltage for equipment -1.2/50µs	6000 V as per IEC 60664-1, table 1	Specify
Overvoltage category	Class IV as per IEC 61010-1	Specify
Pollution category	Class 2 as per IEC 61010-1	Specify
Insulation material group	Group II - 400≤CTI<600 (PLC=1) as per IEC 60112	Specify
Minimum clearances for equipment to withstand steady state voltages, temporary over-voltages and to avoid partial discharge	5.5 mm as per IEC 60664-1	Specify
Creepage distance for equipment subject to long term stresses, min	1.8 mm as per IEC 60664-1	Specify

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Date: 2014-02-11

Date: 2014-02-11



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**SPECIFICATION FOR A  
PORTABLE PRIMARY  
CURRENT INJECTION SET  
[NUMERICAL]**

Doc. No.	KP1/3CB/TSP/09/047
Issue No.	1
Revision No.	0
Date of Issue	2014-02-11
Page 21 of 23	

	Minimum acceptable creepage distances on printed circuit boards	1.0 mm as per IEC 60664-1	Specify	
	Maximum recurring peak voltage related to creepage distance on printed wiring boards	913 V as per IEC 60664-1	Specify	
	Width of grooves by pollution degree on printed circuit boards	1.0 mm as per IEC 60664-1	Specify	
	Partial discharge requirements	As per IEC 60664-1 Annex C	Specify	
	Solid insulation design	Shall withstand short term and long term stresses as per IEC 60664-1 clause 3.3	Specify	
<b>4.7</b>	<b>Accessories</b>			
	<b>4.7.1 Current Booster (optional)</b>			
	Current outputs	Range	Amplitude	
		1000 A AC	0 -1000 A	Specify
			0 – 500 A	Specify
	0 – 3000 A		Specify	
	Internal measurement of outputs			
	Output	3000 A	Specify	
		1000 A	Specify	
	<b>4.7.2 Laptop</b>			
	Brand	Specify	Specify	
	Model	Specify	Specify	
	Year of manufacture	Specify	Specify	
	Processor	Intel® Core™ i7-920 Processor	Specify	
	Clock speed	2.2 GHz or higher	Specify	
	Chipset	Compatible – (specify)	Specify	
	Motherboard	Compatible – (specify)	Specify	
	Memory (maximum)	2GB DDR3, 1333MHz (Upgradable upto 4 GB)	Specify	
	Cache memory	3MB L2 or higher	Specify	
	Graphics	256MB Dedicated DDR3 Memory	Specify	
	Hard disk controller	Serial ATA	Specify	
	Hard disk	250 GB or higher 5400RPM SATA Hard Drive	Specify	
	Shock resistant	Anti-shock mounting design to protect screen and hard disk drive from damage and data loss	Specify	
	Keyboard	Spill resistant keyboard	Specify	
	Mouse	2 or 3 button with scroll wheel optical PC Mouse with pad – USB 3.0	Specify	
	Touch pad	Intelligent Touch with configurable vertical and horizontal scroll functions	Specify	
	Power supply	Input – 220V – 250V Auto-sensing, 50 Hz	Specify	
	Battery life	4 hours or higher	Specify	

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Signed:

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Date: 2014-02-11

Date: 2014-02-11



TITLE:

**SPECIFICATION FOR A  
PORTABLE PRIMARY  
CURRENT INJECTION SET  
[NUMERICAL]**

Doc. No.

KP1/3CB/TSP/09/047

Issue No.

1

Revision No.

0

Date of Issue

2014-02-11

Page 22 of 23

Optical drive	Dual Layer DVD +/-RW	Specify
Card slots	Secured Digital Card Reader	Specify
Display	14" or smaller WXGA with 1280 x 800 or higher resolution	Specify
Integrated Web Camera	2 Mega Pixels or higher	Specify
Network/Wireless Interfaces	Integrated 10/100/1000Mbps Ethernet LAN, Integrated 802.11 a/b/g/n WLAN, Bluetooth	Specify
Security	Booting/HDD User password Protection and Fingerprint Recognition	Specify
I/O Inputs	Minimum 3 x USB 3.0 Hi-Speed, 1 x RJ45, 1 VGA	Specify
Operating system	MS Windows 7 Professional OEM Version with original Media kit, & manuals (firewall enabled and all security updates and patches and fixes up-to-date). Sinhala/Tamil Unicode support is required.	Specify
Productivity software	Latest versions of, Open Office AND Genuine Microsoft Office 2007 Standard or better, OEM, Full or Suitable licensing scheme  * Please quote the price for one unit of computer with and without Microsoft Office 2007	Specify
	Adobe Acrobat reader - the latest version	Specify
Anti-virus	Anti-Virus software should be installed with licenses (Specify) * Please quote the price for one unit of computer with and without Anti-Virus software	Specify
Carrying bag	Include with the same brand of the notebook.	Specify
Manufacturer Authorization and warranty	Attach Authorization letter and 3 years comprehensive on-site manufacturer authorized warranty (labour & parts)	Specify
<b>Other Accessories</b>		
Generator combination cable	To carry all ac test quantities (at least 8 banana ended leads)	Specify
Flexible Test Leads (2.5mm <sup>2</sup> , 3m long)	At least 12 banana ended leads	Specify
Insulated Crocodile clips (4mm <sup>2</sup> )	At least 8 pieces	Specify
Flexible jumpers (2.5mm <sup>2</sup> , 50mm long)	At least 4 banana ended leads	Specify

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**TITLE:**  
**SPECIFICATION FOR A  
PORTABLE PRIMARY  
CURRENT INJECTION SET  
[NUMERICAL]**

Doc. No.	KP1/3CB/TSP/09/047
Issue No.	1
Revision No.	0
Date of Issue	2014-02-11
Page 23 of 23	

	PC to Test Set Communication cable	Parallel port or Ethernet or USB, or Optical Ethernet, Optical , IEC61850	Specify
	(g)Carrying Bag for accessories	Should be able to carry all the accessories, should be water proof2X 6 m high current cable	Specify
	(h)Others if any specify		Specify
	<b>4.7.3 Timer specification</b>		
	4.7.3 – 4.7.4		Specify
<b>4.8</b>	<b>Software</b>		
	4.8.1 – 4.8.9		Specify
	<b>Calibration certificate</b>	Certificate from accredited Laboratory.	Specify
<b>4.3</b>	<b>Quality Management Systems</b>		Specify
	4.9.1 – 4.9.3		
<b>5.0</b>	<b>Tests and Inspection</b>		
	5.1 – 5.6		Specify
<b>6.0</b>	<b>Marking and packing</b>		
	<b>6.1 Packing</b>		Specify
	6.1.1 – 6.1.3		
	<b>6.2 Marking</b>		
<b>7.0</b>	<b>Documentation, Warranty and Training</b>		
	<b>7.1 Warranty and Training</b>		Specify
	7.1.1 – 7.1.4		
	<b>7.2 Documentation</b>		
	7.2– 7.3		
8.0	Manufacturer's Guarantee and Warranty		Specify
9.0	List catalogues, brochures, technical data and drawings submitted to support the offer.		Specify
10.0	List customer sales records submitted to support the offer.		Specify
11.0	List Test Certificates submitted with tender		Specify
12.0	List test & calibration reports to be submitted to KPLC for approval before shipment		Specify
13.0	Statement of compliance to specification (indicate deviations if any & supporting documents)		Specify

.....  
**Manufacturer's Name, Signature, Stamp and Date**

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