



TITLE:
**SPECIFICATION FOR A PORTABLE
THREE-PHASE RELAYS TEST UNIT
(Secondary Injection Set –
Numerical).**

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Issue No.	1
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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)*

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0.1 Circulation List

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FOREWORD

This specification has been prepared by Research and Development (R &D) Department in collaboration with System Protection Office both of Kenya Power and Lighting Company Limited (abbreviated as KPLC) and it lays down requirements for a Portable Three-Phase Relays Test Unit (Secondary Injection Set – Numerical).

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. The specifications is for a high accuracy, intelligent and fully automated (Digital/Numerical) relays testing equipment, to be used for field testing of Medium and High Voltage Protection Relays on Lines, Transformers and Feeders.
- 1.2. The specification also covers inspection and test of the Injection Set as well as schedule of Guaranteed Technical Particulars to be filled, signed by the manufacturer and submitted for tender evaluation.
- 1.3. The specification stipulates the minimum requirements for the Secondary Injection Set acceptable for use in the company and it shall be the responsibility of the Manufacturer to ensure adequacy of design, good workmanship and good engineering practice in the manufacture of the test equipment for KPLC.
- 1.4. The specification does not purport to include all the necessary provisions of a contract.

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 |
| 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 |

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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.

- EMTP: Electromagnetic Transients Program
- MU: Merging Unit
- CTI: Comparative Tracking Index
- PLC: Performance Level Category
- ADC: Analogue direct current
- DAC: Digital alternating current.

4. GENERAL REQUIREMENTS

4.1. Design and Construction

- 4.1.1. The Portable Three-Phase Relays Test Unit (Secondary Injection Set – Numerical) shall conform to IEC 610610-1, IEC 60950 and IEC 60664-1 & 3 standards and the requirements of this specification.
- 4.1.2. The injection set shall be a light weight portable unit (not more than 18 kgs) that can perform complete testing of Distance, Differential, Over-current & Earth fault, Voltage and Frequency Relays together with the calibration of instruments such as Ammeters, Voltmeters and transducers.

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- 4.1.3. It shall be fully automated, intelligent and of high accuracy with no additional external calibration kit/tool and shall be equipped with most recent software for easy operation, data analysis and test plan scheduling.
- 4.1.4. The test set shall also be microprocessor based protective relay test set. The microprocessor module shall be an integrated communications processor featuring:
- a) High-speeds of about 300 MHz,
 - b) Memory controller with minimum of 1MB of Synchronous SRAM (SSRAM) and 64MB of 133 MHz Synchronous DRAM (SDRAM).
 - c) Enhanced 32-bit RISC communications processor module
 - d) Communication Processor Module with 10/100 Mbps Ethernet link.
- 4.1.5. The set shall provide basic functional testing of electro-mechanical, solid state and microprocessor-based, generation, transmission and distribution relays.
- 4.1.6. It shall be capable of being upgraded in hardware instrumentation-features/options and software, which provides for customization to meet various field and laboratory applications..
- 4.1.7. The system shall be formed to provide full testing capability; voltage & current sources, timer/sensing, breaker simulation, logic outputs and logic inputs for both single and three phase relaying.
- 4.1.8. All amplifiers shall be direct coupled and at power ratings to test high burden ground, directional ground and differential E/M relays as well as full panels of relays.
- 4.1.9. In order to achieve maximum power to test relays, the test system shall be provided with multiple current and voltage ranges. Control of the parametric values shall come from individual controls.
- 4.1.10. The system shall be optionally capable of providing a holistic approach to protection system testing with realistic three phase Power System Simulation including:
- a) Steady-state sine wave calibration using signals representing faulted-phasors
 - b) Dynamic tests using time-synchronously controlled sine waves representing pre-fault, fault, and post fault values derived from computer models
 - c) Transient testing using both actual collected data from Protection Relay Event Recordings, Digital Fault Recorders (DFR) and computer models (e.g. E.M.T.P.).
 - d) End-to-End GPS satellite synchronized scheme testing

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- 4.1.11. The above system shall not exceed one instrument when full three phase high power currents are required.
- 4.1.12. The set shall provide variable voltage and current, precise phase angle control, wide frequency range, integral digital timer, and battery simulator. The set shall provide a three-phase wye connected voltage and three-phase wye connected current simultaneously, and two three phase wye current sources simultaneously.
- 4.1.13. It shall incorporate digital readouts of each applied source quantity. The display shall indicate magnitude, phase angle and frequency of all applied/source quantities simultaneously. The set shall incorporate PC controls for varying the source output parameters, when in manual mode. The set shall accommodate a PC based automated testing program.
- 4.1.14. If required in the appendix, the bidder will provide all necessary equipment to replay dynamic or COMTRADE transient fault records generated by EMTP simulation, or actual Digital Fault Recorder files or Protection Relays Event Records through relay test set.
- 4.1.15. If required in the appendix, the test set will include all equipment necessary to perform satellite synchronized dynamic or transient testing with a remote location. Supplier shall supply sufficient equipment to interface with the complete three-phase wye connected current and voltage test set.
- 4.1.16. The set shall be capable of testing all types of impedance relays, phase comparison relays, directional overcurrent relays, overcurrent relays, over and under-voltage relays, differential relays, high impedance bus differential relays, over and under frequency relays, and voltage or current negative sequence filter networks.
- 4.1.17. The set shall be modular in design, capable of providing a single three-phase voltage and current test system, as well as, three single-phase voltage and current test sets.

4.2. Operation

- 4.2.1. The portable injection test set shall be laptop controlled manufactured to meet IEC 60950 requirements. Its Operating System shall run on windows 7 professional or equivalent higher version and be capable of being integrated with other analytical and data management software in MS office suite.

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- 4.2.2. 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 six (6) A.C voltage outputs are required.
- 4.2.3. The injection set shall have a minimum of four (4) binary freely programmable outputs that can handle up to 300 V DC, 8A.
- 4.2.4. It shall have a minimum of two (2) analogue DC inputs that can handle up to ± 2 mA, ± 10 V DC and an auxiliary DC supply of up to 300 V DC.
- 4.2.5. It shall have automatic in built suppression system for Electrostatic & Electromagnetic interferences in a substation as per IEC 60326 class A requirements. The equipment shall also have automatic test procedures which are easy and simple to follow and use.
- 4.2.6. The test set shall have an illuminated (red colour) power supply on/off switch; the test set shall also 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 2 meters long.

4.3. Test results

- 4.3.1. Test preparations and analysis of results and parameters shall be prepared off-line and tests executed automatically.
- 4.3.2. 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.
- 4.3.3. The tester shall be equipped with a standard data communication interface for connection to remote data processing such as computer, or control equipment.
- 4.3.4. 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.
- 4.3.5. The injection test shall be capable of data uploading and downloading to laptop through RS232 or USB port and/or Ethernet.

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4.4. Testing Capabilities

The test set shall be capable of automatically carrying out the following pre-commissioning field tests;

- a) Advanced Distance Relay and Scheme testing, characteristic plotting, zone reaches and timing for various line angles and binary input/output signals monitoring, testing multiple fault loops in an automated sequence.
- b) Advanced Differential Relay and Scheme testing, Bias slope characteristic plotting and timing for up to 3 winding transformers.
- c) Advanced Over-current and Earth fault Relay and Scheme testing, characteristic plotting, pickup and timing for various line angles and binary input/output signals monitoring in an automated sequence.
- d) Advanced Transplay for trouble shooting faults records, Relay evaluation with transient files, End -to -End testing and generating test reports.

4.5. Operational Features

4.5.1. Monitoring Circuit:

The set shall incorporate monitoring circuitry capable of giving an audible and visual indication of contact opening and closure. The monitoring circuit properties shall be as follows:

- (i) Senses dry contact opening and closing.
- (ii) Senses application of AC or DC voltage.
- (iii) Response Time: 0.1 millisecond maximum.
- (iv) Dry Contact Mode Source: At least two inputs capable of 12V / 20mA
- (v) At least one input shall be monitor input status change of less than 180 uSec.
- (vi) Extensible to support up to 16 inputs

4.5.2. Contact Outputs:

The set shall provide eight user selectable dry contact outputs with the following properties:

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- (i) Input Voltage: 240 AC/DC
- (ii) Switching Current: 0.5 Amps make/break and/or up to 4 outputs capable of 8.0 Amps make/break.
- (iii) Response Time: 0.1 millisecond maximum pick up and drop out for 0.5 Amp outputs with 2.5mS operating time for 8.0A make/break outputs.
- (iv) The set shall either comprise eight (8) 0.5 A outputs or four (4) 0.5A outputs and four (4) 8.0A outputs
- (v) Isolation: 500 Volts Peak
- (vi) Extensible to support up to 16 outputs.

4.5.3. Digital Timers:

The digital timer properties shall be:

- (i) Senses dry contact closing and opening.
- (ii) Senses application of AC or DC voltage.
- (iii) Separate start and stop gates for timer control.
- (iv) Up to 24 hours of recording time
- (v) Timer shall have the capability of using inputs as state change triggers to provide total control of state transitions under dynamic and transient type testing.
- (vi) Auto-ranging Digital Timers with 0-999.9 ms/sec/cycles range. It should also display GPS time.
- (vii) Accuracy of timer should be: ± 0.001 % of reading, ± 50 μ sec, with resolution of 100 μ sec.

4.5.4. Transducer Metering Input Measurement

The set shall incorporate measuring inputs for transducer analog and digital outputs. The associated software shall be capable of automated and manual testing of Voltage, Current, Frequency, Watt, Var, Watt-hour, AC Phase, Power Factor, Var-hour, Volt-Ampere-hour transducers and energy meters

4.5.5. Analog Input Measurement

The set shall be capable of recording all the internal source generated signals and up to 8 additional sources in combinations of analog and digital signals
Additional analog input measurements can be made of voltage or current signals.

Maximum Input voltage: 250 AC RMS or DC
Bandwidth: DC to 10kHz

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Input Impedance: 150k Ohm
Channel Isolation: +/- 500Vp Channel to Channel
Accuracy: +/- 0.06%

4.5.6. Self-Diagnostics and Calibration

The general design, use and power-up of the set shall perform an exhaustive series of self-diagnostics and calibration checks as follows:

a) At power-up:

- (i) The DAC/ADC self-calibration, validation and accuracy check to several reference voltages. If error is detected, the front panel shall display calibration error and the voltage at which the error was found.
- (ii) Upon calibration error detection, the instrument will be inoperable. This prevents conducting a test with the instrument out of calibration.
- (iii) Updated calibration of offset in the DACs.
- (iv) Check calibration constants.

b) During use of the instrument, there shall be:

- (i) Continuous safety check routines
- (ii) Hardware and software distortion monitoring and supervision of power amplifiers:
 - Inverter peak current too high.
 - Source current exceeds 1.5 second transient rating.
 - Source clipping (distortion) error.
 - Supply voltage out of range
 - Inverter temperature too high.

4.6. Ratings

The specification requirement ratings for the voltage and current inputs are as per Table 1 and 2, whereas the power supply and mechanical requirements shall be based on Table 3.

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Table 1: Voltage Output

AC Voltage	
Continuous rating	150 VA at range maximums upto 300 Volts AC
Transient rating (1.5 sec)	195 VA at range maximums up to 260 Volts AC. In low range current mode only
DC Voltage	
Continuous rating	150 VA at range maximums up to 300 Volts DC
Convertible	Each 150 VA Voltage Source can convertible to high-power low range current sources (0.5 A @ 300 V, 1.0 A @ 150 V, 2.0A @ 75 V).
Amplitude Accuracy	±0.02% of output voltage
Phase Accuracy	0.25 degrees of phase angle setting.
Noise:	-80 db of range at 50 Hertz.
Stability	Output stable in all four quadrants-load power factor from 1 to -1 through zero lead or zero lag
Frequency Resolution / Range	0.001 Hz from 0.1 to 99.999 Hz with 1 Hz resolution up to 2 kHz.
Harmonic Capability	Harmonics of Internal or Line Frequency up to 25 th Harmonic.
Electrostatic Discharge Immunity	As per IEC 80 1A
Surge Withstand Capability	As per ANSI/IEEE C37.90.
Distortion	Low distortion sine waves; total harmonic distortion should not exceed 2% at 50Hz. Typical value should not exceed 0.2%.
CE / C Tick	The instrument shall carry either the CE or C Tick marks.

Table 2: Current Output

AC Current	
Continuous Rating	450 VA at range maximums up to 90 Amps AC
Transient rating (1.5 sec)	675 VA at range maximums up to 180 Amps AC.
DC Current	
Continuous Rating	450 VA at range maximums up to 60 Amps DC
Transient rating (1.5 sec)	675 VA at range maximums up to 120 Amps DC
Amplitude Accuracy	0.02% of output voltage
Phase Accuracy	0.25 degrees of desired phase angle
Noise	-80 db of range at 50.60 Hertz.
Stability	Output stable in all four quadrants-load power factor from 1 to -1 through zero lead or zero lag
Frequency Resolution / Range	0.001 Hz from 0.1 to 99.999 Hz with 1 Hz resolution up to 2 kHz
Harmonic Capability	Harmonics of Internal or Line Frequency up to 25 th Harmonic.
Electrostatic Discharge Immunity	As per IEC 60255-22-2.
Surge Withstand Capability	As per ANSI/IEEE C37.90
Distortion	Low distortion sine waves; total harmonic distortion should not exceed 2% at 50/60 Hz. Typical value should not exceed 0.2%.

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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
		Single-phase, permissible	215 V AC ... 264 V AC (L-N or L-L)
		Frequency, nominal	50 Hz
		Power consumption	<3500 VA (<7000 VA for short time < 10 sec)
		Connection	C22 conforming to IEC 60320
2	Environmental conditions	Operating temperature	-10 ... +55 °C (+14 ... +131 °F)
		Storage temperature	-20 ... +70 °C (-4 ... +158 °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 ²), 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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4.7. Accessories (To be supplied with the equipment)

4.7.1. 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 4. The supplier shall be required to declare in Annex A the offered values for the laptop.

Table 4: Technical data for a Laptop

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

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Productivity software	<p>Latest versions of, Open Office AND Genuine Microsoft Office 2010 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 2010</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 3 years comprehensive on-site manufacturer authorized warranty (labour & parts).

4.7.2. Cable Accessories

The cable accessories requirements shall be as per Table 5. The bidder shall be required to declare in Annex A the additional cable accessories accompanying the equipment.

Table 5: Cable accessories

No	Particulars	Accessories
1	Generator Combination cable	To carry all ac test quantities (at least 8 banana ended leads)
2	Flexible Test Leads (2.5mm ² , 3m long)	At least 12 banana ended leads
3	Insulated Crocodile clips (4mm ²)	At least 8 pieces
4	Flexible jumpers (2.5mm ² , 50mm long)	at least 4 banana ended leads
5	PC to Test Set Communication cable	Parallel port or Ethernet and USB, or Optical Ethernet, Optical , IEC61850
6	Network communication cable	Parallel port or Ethernet or USB, or Optical Ethernet, Optical , IEC61850
7	Carrying Bag for accessories	.Should be able to carry all the accessories, should be water proof
8	Others if any	Specify

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4.8. Quality Management System

- 4.8.1. The supplier shall submit a quality assurance plan (QAP) that will be used to ensure that the portable three phase secondary 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.
- 4.8.2. 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.
- 4.8.3. 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 three phase secondary 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 three phase relay injection set shall be inspected and tested in accordance with the requirements of IEC 61010-1, 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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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 of 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
- Flammability
- Coating adhesion
- Insulation resistance between conductors

5.4. Routine and sample test reports for the portable three-phase relays test unit (secondary 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 Three phase secondary Injection Set, 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

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- Polarization Test of the equipment
- Recurring Peak Voltage Determination
- Dielectric Voltage Withstand Tests - Measuring clearances
- Functional tests of the equipment.

6.0. MARKING AND PACKING

- 6.1. The portable three phase relay 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.
- 6.2. The equipment shall be portable, rugged and light weight. Its carrying case shall be shockproof, and impact resistant. Also shall be able to withstand a fall of one meter without damage to the equipment.
- 6.3. 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.
- 6.4. The Portable Three phase Relay secondary Set shall be marked in a permanent manner with the following information (in English Language):
- a) Standard to which the Portable three phase Relay secondary Injection Set complies
 - b) Name of manufacturer
 - c) Type of Portable 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 three-phase relays test unit (secondary injection set – numerical) 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 three-phase relays test unit (secondary injection set – numerical) shall be provided with a separate permanent label displaying advice to the user.

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- i) In addition, the portable three phase relay secondary injection set shall be marked with the necessary labels that conform to IEC 61010-1, clause 5.1.2 to 5.

7.0. DOCUMENTATION AND TRAINING

7.1. Warranty and Training

- 7.1.1. The portable 3 phase relays test unit [secondary injection set - numerical] shall be backed by a minimum 12-months factory warranty.
- 7.1.2. If the test set is new to KPLC, then a two day Training on the equipment shall be carried out by the Supplier's engineer on a KPLC site. The supplier shall meet the cost of this training.
- 7.1.3. After tender award, factory inspection and certification by two KPLC's engineers or third party shall be carried out before shipment of the Equipment.
- 7.1.4. Technical support and software, where applicable upgrades shall be provided free of charge to KPLC for a period of not less than 36 months.
- 7.1.5. 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.
- 7.1.6. In the case of tender award, technical details for the portable 3 phase relays test unit (secondary injection set – numerical) shall be submitted to the procuring entity for approval before manufacture commences.

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

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documents to be submitted (all in English language) for tender evaluation shall include the following:

- a) Guaranteed Technical Particulars signed by the manufacturer;
- b) Copies of the Manufacturer's catalogues, brochures, drawings 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 type test reports by a third party testing laboratory accredited to ISO/IEC 17025;
- f) Copy of accreditation certificate to ISO/IEC 17025 for the third party testing laboratory;
- 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 three phase secondary 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.

7.2.3. The supplier shall submit recommendations for use, care, storage and routine inspection/testing procedures, all in the English Language, during delivery of the portable three-phase relays test unit (secondary injection set – numerical) to KPLC stores

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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	Applicable Standards	Specify
3	Terms and Definitions	Specify
4	Requirements	
4.1	Service conditions	Specify
4.2	Design and Construction	
	4.2.1 – 4.2.9	
4.3	Operation	
	4.3.1 – 4.3.5	
4.4	Test Results	
	4.4.1 – 4.4.5	
4.5	Testing Capabilities	
	4.5.1 Relay Testing	
	4.5.1.1 – 4.5.1.2	
	4.5.2 Circuit Breaker Testing	
	4.5.2.1 – 4.5.2.2	
	4.5.3 Current Transformer Testing	
	4.5.3.1 – 4.5.3.2	
	4.5.4 Recloser and Sectionalizer Testing	
	4.5.5 Switchgear Testing	
	4.5.5.1 – 4.5.1.2	

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-	Specify

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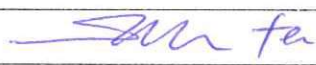
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		2-27	
Vibration (operating)		frequency range from 10 Hz to 150 Hz, continuous acceleration 2 g (20 m/s ²), 10 cycles per axis as per IEC 60068-2-6	Specify
Performance criteria of the equipment		IEC 61326-1 Class A,	Specify
Rated Impulse Voltage for 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
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
4.7	Accessories		
	4.7.1 Laptop		
	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

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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
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	Attach Authorization letter and 3 years comprehensive on-site manufacturer authorized	Specify

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	warranty	warranty (labour & parts)	
	4.7.2. Other Accessories		
	Generator combination cable	To carry all ac test quantities (at least 8 banana ended leads)	Specify
	Flexible Test Leads (2.5mm ² , 3m long)	At least 12 banana ended leads	Specify
	Insulated Crocodile clips (4mm ²)	At least 8 pieces	Specify
	Flexible jumpers (2.5mm ² , 50mm long)	At least 4 banana ended leads	Specify
	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 proof 2X 6 m high current cable	Specify
	(h) Others if any specify		Specify
4.8	Quality Management Systems		Specify
	4.8.1 – 4.8.3		
5.0	Tests and Inspection		
	5.1 – 5.6		
6.0	Marking and packing		
	6.1 Packing		Specify
	6.1.1 – 6.1.3		
	6.2 Marking		
7.0	Documentation, Warranty and Training		
	7.1 Warranty and Training		Specify
	7.1.1 – 7.1.4		
	7.2 Documentation		
	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

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