



The Kenya Power & Lighting  
Co. Ltd.

TITLE:

**SPECIFICATION FOR POLE  
MOUNTED 11 & 33kV VACUUM  
AUTOMATIC LOAD TRANSFER  
SWITCH**

Doc. No.

KPLC1/3CB/TSP/11/007

Issue No.

1

Revision  
No.

2

Date of  
Issue

2010-04-12

Page 1 of 10

## TABLE OF CONTENTS

### 0.1 Circulation List

### 0.2 Amendment Record

### FOREWORD

1. SCOPE
2. REFERENCES
3. SERVICE CONDITIONS
4. REQUIREMENTS
5. TESTS AND INSPECTION
6. MARKING AND LABELLING

### ANNEX A: Technical Particulars

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Page 2 of 10

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COPY NO.	COPY HOLDER
1	Research & Development Manager
2	Procurement Manager
3	Stores & Stock Control Manager
4	Design & Construction Manager
5	Operations & Maintenance Manager
6	Deputy Manager, Technical Audit

### 0.2 Amendment Record

Rev No.	Date (YYYY-MM-DD)	Description of Change	Prepared by (Name & Signature)	Approved by (Name & Signature)
1	2010-04-12	Clause 4.3.1 making and breaking currents and minimum mechanical operations	<i>S. K. Ngũgĩ</i> <i>[Signature]</i>	<i>G. K. Cathige</i> <i>[Signature]</i>

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Revision  
No. 2

Date of  
Issue 2010-04-12

Page 3 of 10

## FOREWORD

This specification has been prepared by the Research and Development Department of The Kenya Power and Lighting Company Limited (KPLC) and it lays down requirements for 11 & 33kV vacuum pole mounted automatic load transfer switches. It is intended for use by KPLC in purchasing the automatic load transfer switches. Both the operating and insulation medium shall not involve the use of SF6 or oil.

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

## 1. SCOPE

This specification is for 11kV and 33kV pole mounted vacuum automatic load transfer switches together with controls and auxiliary equipment for use on distribution lines to provide seamless load transfers from one source to alternative standby source without voltage or frequency transients wherever there is an interruption on the current source.

The equipment shall be complete with all components to realize the intended application.

The specification stipulates the minimum requirements for equipment acceptable for use in the company and it shall be the responsibility of the manufacturer to ensure adequacy of the design, good workmanship and good engineering practice in the manufacture of the equipment for KPLC.

The specification also covers inspection and test of the equipment as well as schedule of Guaranteed Technical Particulars to be filled, signed by the manufacturer and submitted for tender evaluation.

The specification does not purport to include all the necessary provisions of a contract.

## 2. REFERENCES

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Issue No. 1

Revision  
No. 2

Date of  
Issue 2010-04-12

Page 4 of 10

The following standards contain provisions which, through reference in the text constitute provisions of this specification. Unless otherwise stated, the latest editions (including amendments) apply.

IEC 60068: Environmental testing and humidity levels

IEC 60255: Electrical Relays

IEC 60298: AC metal enclosed switchgear and control gear for rated voltage up to and including 52kV

IEC 60529: Degree of protection offered by enclosures (IP code)

IEC 60265: High voltage switches for rated voltages of 52kV and above

IEC 62271-200: A.C metal enclosed switchgear and control gear for rated voltages above 1kV and up to 52KV.

IEC 60270: High voltage test techniques – partial discharge measurements.

IEC 60255: Electrical relays

IEC 60694: Common specification for high voltage switchgear and control gear standards

IEC 60947-6-1: Automatic load transfer switch

IEC 61000: Electromagnetic compatibility (EMC) testing and measurement

BS EN 60298: AC metal enclosed switchgear and control gear for rated voltage up to 52kV.

IEC 62271-100: High voltage switchgear and control gear

ANSI C37.60: Control element surge withstand.

ISO 1461: Hot dip galvanized coatings on fabricated iron and steel articles.

### 3. TERMS AND DEFINITIONS

For the purpose of this specification the definitions given in the reference standards shall apply.

### 4. REQUIREMENTS

#### 4.1 SERVICE CONDITIONS

The automatic load transfer switches shall be suitable for continuous operation outdoors in tropical areas at altitudes of up to 2000m 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 tropical sunshine conditions. The level of galvanizing for all ferrous parts and materials used shall be suitable for these conditions.

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Doc. No.	KPLC1/3CB/TSP/11/007
Issue No.	1
Revision No.	2
Date of Issue	2010-04-12
Page 5 of 10	

## 4.2. MATERIALS AND CONSTRUCTION

### 4.2.1 SWITCH

- 4.2.1.1 The switch shall be suitable for pole mounting, designed for three-phase operation by means of a Local and remote control for load transfer from two sources.
- 4.2.1.2 The switching shall be in vacuum and the insulation medium shall be air, the switch shall also be equipped with an operation counter visible from the ground.
- 4.2.1.3 The switch shall have a mechanical status indicator for both the Open and the closed position
- 4.2.1.4 The switch shall be equipped with inbuilt current transformers of appropriate ratio, which will be connected to the control for so that faults on the load side can be detected and load transfer blocked.
- 4.2.1.5 All current carrying parts shall be made of electrolytic high conductivity material with the contacts silver-plated.
- 4.2.1.6 Manually operated levers to enable manual trip and close of source-side interrupter switches during power outages to be provided.
- 4.2.1.7 The switch to be provided with suitable terminals and connecting clamps for conductors of up to 18.2mm diameter (both aluminium and copper).

### 4.2.1.8 VOLTAGE TRANSFORMERS

(i) A set of three phase Voltage Transformers shall be supplied, for monitoring the status of the two sources. The marshalling boxes for the Voltage transformers and connection cables to the marshalling box and to the Control box shall be provided.

(ii) The Voltage transformers shall be for external mounting next to the switching units. All necessary brackets and accessories for mounting the voltage transformers shall be provided.

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Revision  
No. 2

Date of  
Issue 2010-04-12

Page 6 of 10

(iii) The secondary voltage of the Voltage transformers shall be between 100V and 240V AC. This voltage shall be used for powering the control box and also for electrical operation of the switches

#### 4.2.2 CONTROL UNIT

4.2.2.1 The control unit shall be suitable for pole mounting, preferably below the switch, in a weather proof, vermin proof and dust proof housing. The degrees of protection shall be class IP54 as per the requirement of IEC 60529.

4.2.2.2 The control unit shall be complete with auxiliary equipment suitable for automatic load transfer from one source to an alternate standby source whenever there is loss of power on the preferred source.

4.2.2.3 The control unit shall be a fully programmable microprocessor/numerical based unit with the following features on its front face:

(a) LCD Screen to facilitate manual programming of the control unit and viewing of data such as events, fault records and measurands

(b) Key Pad: This shall be used for programming and viewing the control settings, measurands and control logic for the unit

©The control Box shall have a suitable means of showing the status of the two sources, i.e., whether they are live or not

(d) If the control has locked out i.e., failed to transfer load because it has detected a fault on the load side, then this should be indicated on the control by a suitable means.

(e) The time delay for load transfer from preferred source to alternate source and vice versa and from one source to another where none of the sources is preferred shall be programmable from 0 seconds to at least 60 seconds

4.2.2.4. Control unit safety

The control unit shall have a door on the front which is lockable with a padlock to prevent unauthorized access to the control unit.

4.2.2.5 The control units to be supplied complete with integral termination kits, control and interconnecting cables and pole mounting bracket.

4.2.2.6 The control Unit shall be equipped for Supervisory control via SCADA

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Issue No.	1
Revision No.	2
Date of Issue	2010-04-12
Page 7 of 10	

Automatic Change-over from one source to the other shall occur when:-

- One or all the phases for the source in service is detected to be dead or de-energized and all the phases of the standby source are healthy.
- Under voltage or overvoltage is detected on one or more phases of the source in service and all the phases of the standby source are healthy.

NB: The settings of the overvoltage and under voltage sensing relays shall be programmable at least within  $\pm 20\%$  of nominal voltage rating

#### 4.3 CHARACTERISTICS

4.3.1 The electrical characteristics of the automatic load transfer switches shall be as follows:-

CHARACTERISTICS	11kV switch	33kV switch
Rated system highest voltage and frequency	12kV, 50Hz	36kV, 50Hz
Rated continuous current	400A	400A
Minimum Power Frequency Withstand Voltage, rms	38 kV	90 kV
Minimum Lightning Impulse Withstand Voltage phase to phase and phase to earth, peak	95 kV	200 kV
Minimum breaking /making capacity, peak	16/31.5kA	16/40kA
Rated short time withstand current 3sec	16kA	16kA
Minimum creepage distance of insulator	300mm	900mm
Vacuum explosion chamber contact permission attrition thickness	2mm	6mm
Minimum clearance between phase to phase and phase to earth	300mm	450mm
Minimum number of Mechanical & Full Load Operations	10,000	10,000

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<b>Issue No.</b>	1
<b>Revision No.</b>	2
<b>Date of Issue</b>	2010-04-12
Page 8 of 10	

- 4.3.2 The insulation for the voltage Transformers shall be 38kV and 95kV for 12kV VTs and 90kV and 200kV for 33kV VTs
- 4.3.3 Detailed manuals and drawings of the installation and control unit circuits and components shall accompany the tender (all in English Language)
- 4.3.4 Spares: Spares required to run the equipment for 15 years after installation shall be listed and Offered as an option

## 5. TESTS AND INSPECTION

- 5.1 Type tests, sampling tests and routine tests shall be done in accordance with the requirements of IEC 60255, IEC 60529, IEC 60265, IEC 60270, IEC60947, IEC 61000 IEC 60068, ANSI C37.60, IEC 60298, ISO 1461 and the requirements of this specification. It shall be the responsibility of the manufacturer to perform or to have performed all the tests specified.
- 5.2 Certified true copies of previous type test reports by the relevant Independent/International or National Testing/Standards Authority of the country of manufacture (or ISO/IEC 17025/ILAC accredited laboratory) shall be submitted with the tender for evaluation (all in English Language). A copy of accreditation certificate for the laboratory shall also be submitted.
- 5.3 The Load Transfer Switches shall be subject to acceptance tests at the manufacturer's works before dispatch. Acceptance tests shall be witnessed by two Engineers appointed by The Kenya Power and Lighting Company Limited (KPLC). Routine and Sample Test Reports for the Load Transfer Switches to be supplied shall be submitted to KPLC for approval before delivery of the goods.
- 5.4 On receipt of the equipment, KPLC will inspect them for acceptance at stores and may perform or have tests performed in order to verify compliance of the equipment with this specification.

The supplier shall replace without charge to KPLC, any equipment which upon examination, test or use fail to meet any or all of the requirements in this specification

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Revision  
No. 2

Date of  
Issue 2010-04-12

Page 9 of 10

**6. MARKING AND LABELLING**

6.1 The following information shall be marked indelibly and legibly and in a permanent manner on each item.

- i) Manufacturer's Name or Trademark;
- ii) Manufacturer's Type Designation;
- iii) Specified Electrical Characteristics;

6.2 All marking shall be permanent either by embossing, etching or engraving.

6.3 A set of Three (3) installation and technical manuals for the automatic load transfer switch shall be submitted during delivery.

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Issue

2010-04-12

Page 10 of 10

**ANNEX A:**

**Guaranteed Technical Particulars and Statement of Compliance** (to be filled and signed by the Manufacturer for all clauses and submitted together with catalogues, brochures, drawings, and technical data and test reports for tender evaluation)

Description	Bidder's offer
1. Manufacturer's Name & Country of manufacture	
2. Type Reference/Model Number of Equipment offered	
3. List of components to be supplied (for one installation)	
4. Service Conditions	
5. Applicable Standards	
6. Maximum System Voltage (kV)	
7. One-minute power frequency withstand voltage,	
8. Lighting impulse withstand voltage (kVp)	
9. Rated continuous current	
10. Rated short time withstand current 3 sec	
11. Minimum breaking /making capacity, peak (amps)	
12. Minimum creepage distance of insulator	
13. Minimum clearance between phase to phase and phase to earth	
14. List of copies of Type Test Reports submitted (indicate Test Report Numbers, Testing Authority and contact addresses)	
15. List Acceptance Tests to be witnessed by KPLC Engineers at the factory	
16. List of catalogues, brochures, technical data, drawings and customer sales records submitted to support the offer.	
17. Statement of compliance to specifications & guarantee	

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

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