



The Kenya Power & Lighting  
Co. Ltd.

TITLE:

**SPECIFICATION FOR PVC  
INSULATED SINGLE PHASE  
CONCENTRIC ALUMINIUM  
CABLES (LOW VOLTAGE)**

Doc. No.

KPLC1/3CB/TSP/05/004

Issue No.

1

Revision  
No.

1

Date of  
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2010-02-24

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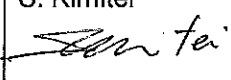
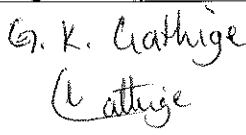
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### 0.1 Circulation List

| COPY NO. | COPY HOLDER                     |
|----------|---------------------------------|
| 1        | Research & Development Manager  |
| 2        | Procurement Manager             |
| 3        | Stores & Stock Control Manager  |
| 4        | Chief Manager, Distribution     |
| 5        | Deputy Manager, Technical Audit |

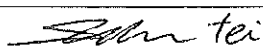
### 0.2 Amendment Record

| Rev No. | Date<br>(YYYY-MM-DD) | Description of Change   | Prepared by<br>(Name &<br>Signature)   | Approved by<br>(Name &<br>Signature)   |
|---------|----------------------|---|--|--|
| 1       | 2010-02-24           | Cancel and replaces 1 <sup>st</sup><br>Issue Rev 0 dated July<br>2005 | S. Kimitel<br> | G. K. Gathige<br> |
|         |                      |   |  |  |
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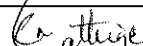
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## FOREWORD

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 PVC Insulated Single Phase Concentric Aluminium Cables (LV). It is intended for use by KPLC in purchasing the cables.

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 PVC insulated single phase concentric cables with circular stranded aluminium conductors for operation up to and including 1000 Volts between phases and 600 Volts to earth. The cable shall have a central phase stranded aluminium conductor insulated with red PVC and concentric layer comprising bare aluminium wires (combined neutral-earth conductor) and outer sheath in black PVC.

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

The specification stipulates the minimum requirements for PVC Insulated Single Phase Concentric Aluminium Cables (LV) 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 cables for KPLC.

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

## 2. REFERENCES

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

KS 04-1022:-Kenya Standard Specification for 600/1000V PVC-insulated single-phase concentric cables with copper or aluminium conductors for electricity supply

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### 3. TERMS AND DEFINITIONS

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

### 4. REQUIREMENTS

#### 4.1 SERVICE AND SYSTEM CONDITIONS

- a) The cable shall be a service cable for continuous operation outdoors and tropical conditions (temperature range of  $-1^{\circ}\text{C}$  to  $+40^{\circ}\text{C}$ , humidity of upto 90% and saline conditions along the coast).
- b) The cable shall be suitable for laying in cable ducts and in air.
- c) Permissible continuous loading operating temperature shall be  $70^{\circ}\text{C}$ .

#### 4.2. MATERIALS AND CONSTRUCTION

4.2.1. The cable shall be designed and manufactured to Kenya Standard KS 04-1022.

##### 4.2.2. Phase Conductor

4.2.2.1 The phase conductor shall be circular stranded annealed aluminium conductors (class 2) as specified in KS 04-1022. The phase conductor shall have a left-hand direction of lay.

4.2.2.2 The insulation of the phase conductor shall be red PVC compound specified in KS 04-1022. It shall be applied by an extrusion process and shall be spark tested in accordance with KS 04-1022.

4.2.2.3 The thickness of insulation, determined in accordance with KS 04-1022, shall be not less than the value given in Table 1 of this specification and the smallest of the measured values shall not fall below the value given in the said table by more than  $(10\% + 0.1\text{mm})$ .

##### 4.2.3. Concentric Layer

4.2.3.1 The neutral conductor shall be concentric and shall be manufactured from plain annealed aluminium wires in accordance with KS 04-1022. The number of wires and the resistance of the neutral conductor shall comply with Table 1 of this specification.

4.2.3.2 The concentric layer shall be applied with a right hand direction of lay.

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#### 4.2.4. Oversheath

4.2.4.1 The oversheath shall be an extruded layer of black PVC compound as specified in KS 04-1022. The oversheath shall be spark tested in accordance with KS 04-1022.

4.2.4.2 The minimum thickness of the oversheath shall not fall below the value given in Table 1 of this specification by an amount more than (15% + 0.1mm).

### 4.3. STANDARD SIZES AND CHARACTERISTICS

4.3.1 The characteristics of the cables shall comply with the following table.

**Table 1: Characteristics (as per KS 04-1022)**

| Phase Conductor                    |  |                                   | Concentric neutral conductor: number. & approx. diameter of wires<br><u>No./mm</u> | Minimum lay lengths<br><u>mm</u> | Thickness of oversheath<br><u>mm</u> | Approximate overall diameter<br><u>mm</u> | Maximum conductor dc resistance per 1000m of cable at 20°C |                     |
|------------------------------------|--|-----------------------------------|--|----------------------------------|--------------------------------------|---|--|---------------------|
| <u>Nominal area mm<sup>2</sup></u> | <u>No. &amp; approx dia. of wires mm</u> | <u>Thickness of insulation mm</u> |  |                                  |                                      |   | <u>Phase ohms</u>  | <u>Neutral ohms</u> |
| 16                                 | 7/1.70                                   | 1.55                              | 26/1.13  | 155                              | 1.4                                  | 13.34                                     | 1.91   | 1.808               |
| 25                                 | 7/2.14                                   | 1.60                              | 29/1.13  | 165                              | 1.5                                  | 14.88                                     | 1.20   | 1.0586              |
| 35                                 | 19/1.5<br>3                              | 1.65                              | 27/1.35  | 178                              | 1.6                                  | 16.75                                     | 0.868  | 0.7966              |

#### 4.4. EMBOSsing ON CABLE

The cable shall be embossed with the following information throughout the length of the oversheath.

- 600/1000 VOLTS PVC CABLE PROPERTY OF KPLC
- Year of Manufacture
- Size of Cable
- Name of Manufacturer

(Example: '16 SQ MM 600/1000 VOLTS PVC CABLE PROPERTY OF KPLC 2004' xxx)  
'xxx' being the manufacturer's name.

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Letters and figures shall be raised and consist of upright block characters which shall be legible. Minimum size of characters shall be 3mm. The gap between the end of one inscription and the beginning of the next shall be not greater than 25mm and the gap between each complete set of markings shall be not greater than 500mm.

An indelible marking shall also be given at every one meter interval to assist field personal in cutting required length.

**5. TESTS AND INSPECTION**

- 5.1 The cable shall be inspected and tested in accordance with the requirements of this specification and KS 04-1022. It shall be the responsibility of the manufacturer to perform or to have performed the tests specified.
- 5.2 Copies of previous test certificates and test reports by the relevant International or National Testing/Standards Authority of the country of manufacture (or ISO/IEC 17025 accredited independent laboratory) shall be submitted with the offer for evaluation. A copy of accreditation certificate for the laboratory shall also be submitted (all in English Language).
- 5.3 Routine and sample test reports for the cables to be supplied shall be submitted to KPLC for approval before shipment/delivery of the goods. KPLC Engineers (2) will witness these tests at the factory before shipment.
- 5.4 During delivery of the cables, KPLC will inspect them and may perform or have performed any of the relevant tests in order to verify compliance with the specification. The manufacturer shall replace/rectify without charge to KPLC, cables which upon examination, test or use fail to meet any or all of the requirements in the specification.

**6. MARKING, LABELLING AND PACKING**

- 6.1 The finished cable shall be wound on wooden drum such as to prevent damage during transportation and handling. The drums shall be made from treated timber resistant to termite attack.
- 6.2 The actual length of cable shall not be less than the length indicated on the drum.
- 6.3 Both ends of every drum length of cable shall have been sealed to prevent the ingress of water during transportation, storage, handling and installation. Both ends shall be secured to the drum to prevent mechanical damage.

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6.4 The following information shall be marked legibly and in a permanent manner on the flange of the drum:

- a) The manufacturer's name;
- b) The type and rating of cable;
- c) The conductor cross-sectional area in mm<sup>2</sup>;
- d) The length of the cable, in metres;
- e) The year of manufacture;
- f) The gross mass and net mass, in kilogram;
- g) The instructions for handling and use (in English Language);
- h) The words "PROPERTY OF KENYA POWER & LIGHTING CO."

**Note:** The cable shall have been marked in accordance with clause 4.4

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

Tender No.....

| Description  | Bidder's offer    |
|--|-------------------|
| Manufacturer   |                   |
| Country of manufacture                                 |                   |
| Service conditions & application                       |                   |
| Applicable Standard(s)                                 |                   |
| Type and design  |                   |
| Phase Conductor (material & construction)              |                   |
| Neutral Conductor (material & construction)            |                   |
| Phase Conductor Insulation (material & colour)         |                   |
| Oversheath   | Material & colour |
|  | Marking           |
| <b>RATINGS/CHARACTERISTICS</b>                         |                   |
| Conductor nominal cross-sectional area                 |                   |
| Voltage designation U <sub>o</sub> /U(U <sub>m</sub> ) |                   |
| Conductor shape  |                   |
| Thickness of insulation                                |                   |

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|  |                   |
|--|-------------------|
| Thickness of oversheath  |                   |
| Maximum phase conductor resistance at 20°C   |                   |
| Maximum neutral conductor resistance at 20°C   |                   |
| Current carrying capacity  | In air<br>In duct |
| Power frequency withstand voltage  |                   |
| List of Type Test Reports submitted (indicate Test Report Numbers)   |                   |
| List of Tests to be witnessed by KPLC Engineers at the factory before shipment                                     |                   |
| Marking on cable & drum (parameters to be indicated and method of marking)   |                   |
| Packing  |                   |
| Installation and technical manuals to be provided during delivery  |                   |
| List of catalogues, brochures, drawings, technical data and customer sales records submitted to support the offer. |                   |
| Statement of compliance and or deviations from Tender Specifications   |                   |
| Inspection/test by KPLC during delivery before acceptance to stores/site   |                   |

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

|  |  |
|--|--|
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