



Kenya Power

TITLE:

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

Doc. No.

KP1/3CB/TSP/05/004

Issue No.

2

Revision No.

2

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*(to be filled and signed by the Manufacturer and submitted together with relevant copies of the Manufacturer's catalogues, brochures, drawings, technical data, sales records, customer reference letters, details of manufacturing capacity, the manufacturer's experience, copies of complete type test reports and accreditation certificate to ISO/IEC 17025 for the testing laboratory for tender evaluation, all in English Language)*

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**0.1 Circulation List**

COPY NO.	COPY HOLDER
1	Head of Department, Standards
2	Supply Chain Manager, Procurement
Electronic copy (pdf) on KPLC server currently: <a href="http://172.16.1.40/dms/browse.php?fFolderId=23">http://172.16.1.40/dms/browse.php?fFolderId=23</a>	

**0.2 Amendment Record**

Rev No.	Date (YYYY-MM-DD)	Description of Change	Prepared by (Name & Signature)	Approved by (Name & Signature)
Issue 2 Rev 1	2014-09-23	Included size 10mm <sup>2</sup> Single Core Concentric Aluminium for single phase customers in SWER system	S. Kimiti	
Issue 2 Rev 2	2015-02-18	Included IEC 60502-1, IEC/ISO 17025, ISO 9001		

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## FOREWORD

This specification has been prepared by the Standards Department in collaboration with The Design Optimization Committee both of The Kenya Power & Lighting Company Ltd (abbreviated as 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 bid shall be submitted complete with information that confirms satisfactory service experience of the manufacturer 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 (KPLC) and it shall be the responsibility of the supplier to ensure adequacy of the design, good workmanship, good engineering practice and adherence to standards, specifications and applicable regulations in the manufacture of the cables for The Kenya Power & Lighting Company Ltd.

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.

ISO 9001: Quality Management System-Requirements

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- ISO/IEC 17025: General requirements for the competence of testing and calibration laboratories
- IEC 60502-1: Power Cables with extruded insulation and their accessories for rated voltages from 1kV (Um=1.2kV) up to 30kV (Um=36kV)- Part 1: Cables for rated voltages from 1kV (Um=1.2kV) up to 3kV (Um=3.6kV).
- KS 04-1022: Kenya Standard Specification for 600/1000V PVC-insulated single-phase concentric cables with copper or aluminium conductors for electricity supply

### 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

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

#### 4.2. MATERIALS AND CONSTRUCTION

4.2.1. The cable shall be designed and manufactured to Kenya Standard KS 04-1022, IEC 60502-1 and the requirements of this specification.

##### 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.

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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% + 0.1mm).

## 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.

## 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 Table 1.

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

Phase Conductor			Concentric neutral conductor: number. & approx. diameter of wires <u>No./mm</u>	Minimum lay lengths <u>mm</u>	Thickness of overshoot <u>hmm</u>	Approximate overall diameter <u>mm</u>	Maximum conductor dc resistance per 1000m of cable at 20°C	
Nominal area <u>mm<sup>2</sup></u>	No. & approx dia. of wires <u>mm</u>	Thickness of insulation <u>mm</u>					Phase <u>ohms</u>	Neutral <u>ohms</u>
10	7/1.35	1.55	23/1.13	146.5	1.4	12.21	3.08	1.335
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	19/1.53	1.65	27/1.35	178	1.6	16.75	0.868	0.7966

## 4.4. EMBOSSING ON CABLE

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

- a) 600/1000 VOLTS PVC CABLE PROPERTY OF KPLC
- b) Year of Manufacture
- c) Size of Cable
- d) Name of Manufacturer

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

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 length 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, IEC 60502-1 and KS 04-1022. It shall be the responsibility of the supplier to perform or to have performed the tests specified.
- 5.2 Copies of previous test certificates and test reports by a third party testing laboratory accredited to ISO/IEC 17025 shall be submitted with the offer for evaluation. A copy of the accreditation certificate for the testing laboratory shall also be submitted with the tender (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 supplier shall replace/rectify without charge to KPLC, cables which upon examination, test or use fail to meet any of the requirements in the specification.

## 6. MARKING AND PACKING

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- 6.1 The finished cable shall be wound in one continuous length on wooden drum such as to prevent damage during transportation and handling. The drums shall be made from treated timber resistant to termite attack and shall be lagged all round to prevent damage to the cable. There shall be no gaps in the wooden lagging around the drum.
- 6.2 Each drum shall contain only one continuous length of cable of 2500m nominal length. The actual length of cable shall not be less than the length indicated on the drum.
- 6.3 Both ends of the cable shall have been sealed to prevent the ingress of water during transportation, storage, handling and installation. The sealing shall enclose the oversheath completely and shall be by close fitting plastic caps. Both ends of the cable shall be secured to the drum to prevent mechanical damage.
- 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 voltage 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) Arrow indicating direction of rotation, the words 'not to be laid flat' (in English Language);
  - h) The words "**PROPERTY OF THE KENYA POWER & LIGHTING CO.**"
- Note: The cable shall have been embossed in accordance with clause 4.4*

## 7. DOCUMENTATION

- 7.1 The bidder shall submit its tender complete with technical documents required by the tender document and Annex A (Guaranteed Technical Particulars) for tender evaluation. The documents to be submitted (all in English language) for tender evaluation shall include the following:
- a) Guaranteed Technical Particulars fully filled and signed by the manufacturer;
  - b) Copies of the Manufacturer's catalogues, brochures, drawings and technical data;
  - c) Sales records and customer reference letters;
  - d) Details of manufacturing capacity and the manufacturer's experience;
  - e) Copies of required type test certificates and type test reports by a third party testing laboratory accredited to ISO/IEC 17025;

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- f) Copy of accreditation certificate to ISO/IEC 17025 for the testing laboratory;
- g) Manufacturer's warranty and guarantee;
- h) Manufacturer's letter of authorization, copy of the manufacturer's ISO 9001:2008/KEBS Diamond Mark certificate and other technical documents required in the tender.

7.2 The successful bidder (supplier) shall submit the following documents/details (from the manufacturer as per tender) to The Kenya Power & Lighting Company for approval before manufacture:

- a) Guaranteed Technical Particulars fully filled and signed by the manufacturer,
- b) Design drawings and construction details of the cable,
- c) Quality assurance plan (QAP) that will be used to ensure that the cable design, material, workmanship, tests, service capability, maintenance and documentation will fulfil the requirements stated in the contract documents, standards, specifications and regulations.
- d) Test Program to be used after manufacture,
- e) Marking details and method to be used in marking the cables,
- f) Manufacturer's undertaking to ensure adequacy of the design, adherence to applicable standards/specification, good workmanship and good engineering practice in the manufacture of the cables for The Kenya Power and Lighting Company Limited,
- g) Packaging details (including packaging materials, lagging and length on drum).

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**ANNEX A: SCHEDULE OF GUARANTEED TECHNICAL PARTICULARS FOR OFFERED CABLES**

*(to be filled and signed by the Manufacturer and submitted together with relevant copies of the Manufacturer's catalogues, brochures, drawings, technical data, sales records, customer reference letters, details of manufacturing capacity, the manufacturer's experience, copies of complete type test reports and accreditation certificate to ISO/IEC 17025 for the testing laboratory for tender evaluation, all in English Language)*

**TENDER NO. ....BIDDER'S NAME & ADDRESS .....**

Description		Bidder's offer
Name and address of the Manufacturer		
Country of manufacture		
Manufacturer's Letter of Authorization		
Model/Type Reference No. of the offered cable		
Manufacturer's warranty and guarantee for the offered cable		
Service conditions & application		
Applicable Standard(s)		
Type and design		
Phase Conductor (material & construction)	Material of phase conductor	
	No. of wires in phase conductor and diameter of each wire	
Neutral Conductor (material & construction)	Material of neutral conductor	
	No. of wires in neutral conductor and diameter of each wire	
Phase Conductor Insulation	Material	
	Colour	
Oversheath (outer sheath)	Material	
	Colour	
	Marking, embossing	
<b>RATINGS/CHARACTERISTICS</b>		
Conductor nominal cross-sectional area		
Voltage designation Uo/U(Um)		
Conductor shape		
Thickness of insulation		
Thickness of oversheath		

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Description	Bidder's offer
Maximum phase conductor resistance at 20°C	
Maximum neutral conductor resistance at 20°C	
Current carrying capacity	In air at 40°C
	In duct at 40°C
Power frequency withstand voltage	
List of Type Test Reports submitted with tender (indicate Test Report Numbers)	
List of Tests to be witnessed by KPLC Engineers at the factory before shipment	
Embossing on the cable oversheath (parameters to be indicated and method of marking)	
Marking on cable drum (parameters to be indicated and method of marking)	
Packaging (wooden drum & lagging)	
Length of cable on drum	
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 to Tender Specifications	
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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