



Kenya Power

TITLE:

**SPECIFICATION FOR CABLE
11KV S/C AL XLPE AWA PVC**

Doc. No.

KP1/3CB/TSP/05/027

Issue No.

1

Revision
No.

0

Date of
Issue

2014-04-24

Page 10 of 14

6. MARKING, LABELLING AND PACKING

- 6.1 The finished cable shall be wound in one continuous length on metallic drum such as to prevent damage during transportation and handling. The drums shall be lagged with wood all round to prevent damage to the cable.
- 6.2 Each drum shall have one continuous length of 500m and 300m for cable sizes 1x300mm² and 1x630mm² respectively. The actual length of cable shall not be less than the length indicated on the drum.
- 6.3 Both ends of the drum length of 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:
- The manufacturer's name;
 - The type and rating of cable;
 - The conductor cross-sectional area in mm²;
 - The length of the cable, in metres;
 - The year of manufacture;
 - The gross mass and net mass, in kilogram;
 - The instructions for handling and use (in English Language);
 - The words "**PROPERTY OF THE KENYA POWER & LIGHTING CO.**"

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

7. DOCUMENTATION

- 7.1 The bidder shall submit its tender complete with technical documents required by Annex A (Guaranteed Technical Particulars) for tender evaluation. The information 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 test reports by a third party testing laboratory accredited to ISO/IEC 17025;

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Issue No.	1
Revision No.	0
Date of Issue	2014-04-24
Page 11 of 14	

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

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

- a) Guaranteed Technical Particulars,
- 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. The QAP shall be based on and include relevant parts to fulfil the requirements of ISO 9001:2008
- 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, 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;
- g) Packaging details (including packaging materials and length on drum).

The drawings to be submitted by the supplier to KPLC for approval before manufacture shall be in standard format clearly indication drawing number, parts list with material details & quantities, standard of manufacture, ratings, approval details and identify of the manufacturer (as per manufacturer's authorization submitted during tendering)

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Issue No.	1
Revision No.	0
Date of Issue	2014-04-24
Page 12 of 14	

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 & calculations, sales records, four 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

CLAUSE	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	
1	Scope: a) Design, manufacture, test, ship and deliver S/C Aluminium XLPE insulated 11kV cables to KPLC store/site as per terms of contract b) 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 Co. Ltd	a) b)
2	Applicable standards	
3	Terms and definitions	
4.1.1	Cable Application	
4.1.2	System Conditions	
4.1.3	Anti-termite protection	
4.1.4	Fire Performance (indicate applicable IEC standards)	
4.1.5	Minimum Design Service Life	
4.2.1.1	Applicable Standards	
4.2.1.2	Continuous Operating Temperature Short Circuit Temperature (five seconds duration)	
4.2.2	Conductor	
4.2.3	Conductor Screen	
4.2.4.1	Insulation	
4.2.4.2	Insulation application	
4.2.4.3	Insulation Colour	

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Issue No.

1

Revision No.

0

Date of Issue

2014-04-24

Page 13 of 14

CLAUSE	Description	Bidder's offer
4.2.5	Insulation Screen and Metallic Screen	
	4.2.5.1	
	4.2.5.2	
	4.2.5.3	
	4.2.5.4	
4.2.6.1	Separation sheath	
4.2.6.2	Armour	
4.2.7.1	Oversheath	
4.2.7.2	Embossing on Oversheath	
4.3	Conductor nominal sectional area, mm ²	
	Voltage Designation	
	Conductor material & shape	
	Thickness of insulation, mm	
	Thickness of separation sheath, mm	
	Armour wire material & diameter, mm	
	Thickness of oversheath, mm	
	Approximate overall diameter, mm	
	Power frequency single phase test voltage, 5 min, kV	
	Maximum conductor resistance, Ω/km	
	Current carrying capacity	
	In air	
	In duct	
4.4.1	Quality Assurance Plan	
4.4.2	Manufacturer's Declaration of Conformity to Reference Standards	
	Copy of Manufacturer's ISO 9001:2008 Certificate	
4.4.3	Customer sales records and customer reference letters submitted to support the offer.	
5.1	Test Standard	
	Responsibility of carrying out tests	
5.2	Copies of Type Test Certificates & Type Test Reports to IEC 60502-2	
	a) Bending test, followed by a partial discharge test;	
	b) Tan δ measurement;	
	c) Heating cycle test, followed by a partial discharge test;	
	d) Impulse test, followed by a voltage test;	
	e) Voltage test for 4 h	
5.3	Tests to be witnessed by KPLC Engineers at factory before shipment	
	1.Routine tests to IEC 60502-2	

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Issue No.

1

Revision
No.

0

Date of
Issue

2014-04-24

Page 14 of 14

CLAUSE	Description	Bidder's offer
	a) Measurement of the electrical resistance of conductors;	
	b) Partial discharge test	
	c) Voltage test.	
	2. Sample tests to IEC 60502-2	
	a) Conductor examination;	
	b) Check of dimensions;	
	c) Voltage test;	
	d) Hot set test for XLPE insulation and elastomeric sheaths	
	e) Verification of the length on a randomly selected drum	
5.4	Sampling	
	Sample size	
	Acceptance criteria	
5.5	Inspection & test of cable during delivery before acceptance to KPLC stores/site	
6.1	Cable Drums & Wooden Lagging	
6.2	Number of lengths on Drum	
	Total Length of Cable on Drum	
6.3	Cable end plug sealing & securing on drum	
6.4	Marking on Cable Drum Flange	
7.1	Documents submitted with tender for evaluation	
7.2	Documents to be submitted by supplier to KPLC for approval before manufacture	
-	Manufacturing capacity of similar cable (Qty per month)	
	Manufacturer's experience	
-	Statement of compliance to Tender Specifications	
-	Deviations from Tender Specifications	

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

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Kenya Power

TITLE:

**SPECIFICATION FOR ALUMINUM
4-CORE PVC INSULATED,
STEELWIRE ARMoured CABLE**

Doc. No. KP1/3CB/TSP/05/001

Issue No. 4

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Page 1 of 16

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. SEALING, MARKING AND PACKING
7. DOCUMENTATION

ANNEX A: Guaranteed Technical Particulars (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 for previous five years, four customer reference letters, details of manufacturing capacity, the manufacturer's experience and copies of complete type test certificates and type test reports for tender evaluation, all in English Language)

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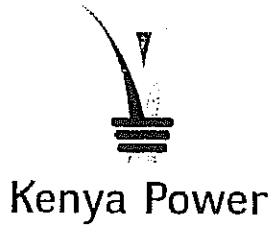
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TITLE:
**SPECIFICATION FOR ALUMINUM
 4-CORE PVC INSULATED,
 STEELWIRE ARMoured CABLE**

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Page 2 of 16	

0.1 Circulation List

COPY NO.	COPY HOLDER
1	Research & Development Manager
2	Procurement Manager
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)
Issue 4 Rev 0	2013-04-30	Cancel and replaces 3rd Issue Rev 2 dated 2003-07-02	S. Kimitai <i>S. Kimitai</i>	G. Owuor <i>G. Owuor</i>

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S. Kimitai

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G. Owuor

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TITLE:

**SPECIFICATION FOR ALUMINUM
4-CORE PVC INSULATED,
STEELWIRE ARMoured CABLE**

Doc. No. KP1/3CB/TSP/05/001

Issue No. 4

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Date of Issue 2013-04-30

Page 3 of 16

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 **Aluminium 4-core, PVC insulated, steel wire armoured cables**. It is intended for use by KPLC in purchasing the cables.

1. SCOPE

1.1 This specification is for four core, stranded and compacted circular aluminium conductors, PVC insulated, galvanized steel wire armoured, PVC outer sheathed power cables for operation at a.c. voltages of 600 Volts to sheath, 1000 Volts between conductors and highest system voltage of 1200 Volts for use in KPLC distribution network.

1.2 This specification covers the following cable sizes:

- 4 x 25 mm² AL/PVC/SWA/PVC
- 4 x 70 mm² AL/PVC/SWA/PVC
- 4 x 120 mm² AL/PVC/SWA/PVC
- 4 x 185 mm² AL/PVC/SWA/PVC
- 4 x 300 mm² AL/PVC/SWA/PVC

1.3 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 Aluminum 4-core PVC insulated, steel wire armoured cables acceptable for use in the company and it shall be the responsibility of the supplier to ensure adequacy of the design, good engineering practice, adherence to the specification, applicable standards and applicable regulations as well as ensuring good workmanship in the manufacture of the cables for The Kenya Power & Lighting Company.

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

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TITLE:

**SPECIFICATION FOR ALUMINUM
4-CORE PVC INSULATED,
STEELWIRE ARMoured CABLE**

Doc. No.	KP1/3CB/TSP/05/001
Issue No.	4
Revision No.	0
Date of Issue	2013-04-30
Page 4 of 16	

2. REFERENCES

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

- BS 6346: 600/1000V and 1900/3300V armoured electric cables having PVC insulation;
- 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);
- IEC 60228: Conductors for insulated cables;
- IEC 60811-1-1: Common test methods for insulating and sheathing materials of electric cables:-
Part 1: Methods for general application;
Section 1: Measurements of thickness and overall dimensions – Tests for determining the mechanical properties;
- KS 04-187: Specification for conductors of insulated cables.

3. TERMS AND DEFINITIONS

For the purpose of this specification the definitions given in BS 6346, IEC 60228, IEC 60502-1 and KS 04-187 apply, together with the following:

- Al: Aluminium
PVC: Polyvinyl Chloride
SWA: Steel Wire Armour

4. REQUIREMENTS

4.1 SERVICE AND SYSTEM CONDITIONS

4.1.1 Cable Application

- a) The cable shall be a distribution cable for use in outdoors installations and tropical conditions (temperature range of -1°C to +40°C, humidity of upto 90% and saline conditions along the coast).

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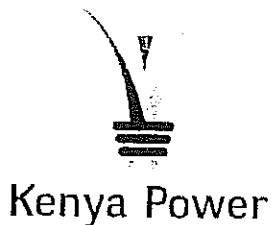
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TITLE:
**SPECIFICATION FOR ALUMINUM
4-CORE PVC INSULATED,
STEELWIRE ARMoured CABLE**

Doc. No.	KP1/3CB/TSP/0
Issue No.	4
Revision No.	0
Date of Issue	2013-04-30
Page 5 of 16	

- b) The cable shall be suitable for laying in cable ducts and in the ground in power stations and customer installations.
- c) The cable shall also be suitable for laying on slopes.
- d) Permissible continuous loading operating temperature shall be 70°C.

4.1.2 Operating Voltage

The rated operating voltage (U_0/U), required by this specification is 600/1000 V at 50Hz a.c.

4.2. CABLE CONSTRUCTION

4.2.1. Design

- 4.2.1.1 The cable shall be designed and manufactured in accordance with requirements of IEC 60228 and IEC 60502-1 and the requirements of this specification.
- 4.2.1.2 All materials used shall be compatible and suitable for the continuous operating temperature of the cable of 70°C and short circuit temperature of 160°C (5 seconds max duration) as per IEC 60502-1.

4.2.2. Conductors

The cable shall be made from stranded circular compact plain aluminium conductors, class 2 in accordance with IEC 60228 and KS 04-187, and as specified in the table 1 in clause 4.3 of this specification.

4.2.3. Insulation

4.2.3.1 Material

The insulation shall be extruded dielectric of type PVC/A in accordance with the requirements of IEC 60502-1.

The insulation shall be applied by extrusion to form a compact and homogeneous layer.

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**SPECIFICATION FOR ALUMINUM
4-CORE PVC INSULATED,
STEELWIRE ARMoured CABLE**

Doc. No.	KP1/3CB/TSP/05/201
Issue No.	4
Revision No.	0
Date of Issue	2013-04-30
Page 6 of 16	

4.2.3.2 Insulation Thickness

The average thickness of insulation when determined in accordance with IEC 60811-1-1, shall not be less than the nominal values given in table 1 of clause 4.3 as appropriate, and the smallest of the measured values shall not fall below the nominal value by more than (10%+0.1mm).

4.2.3.3 Identification of Cores

Cores shall be identified by colouring throughout the insulation material. Colours of the cores shall be in the following sequence:- Red, Yellow, Blue and Black.

Black colour shall be used only for Neutral.

4.2.4. Laying up

Cores shall be laid up with a right hand direction of lay. Non-hygroscopic fillers shall be applied integrally with the bedding of armoured cable to form a compact and circular cable.

A plastic binder tape shall be applied over the laid up cores of the cable.

There shall be no adhesion between the bedding of armoured cable or the sheath and insulation. Where the bedding or sheath is applied integrally with fillers, it shall be possible to strip it from the cable without damaging the insulation.

4.2.5. Bedding

4.2.5.1 Material

Bedding of four core cables shall comprise of extruded layers of polymeric material compatible with the underlying insulation and suitable for use at the operating temperatures of the cable.

The bedding shall not adhere to the underlying cores.

4.2.5.2 Bedding Thickness

The average thickness of the bedding, when determined in accordance with IEC 60811-1-1 shall not be less than the nominal value given in table 1 of clause 4.3 as

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