



The Kenya Power

TITLE:

**SPECIFICATION FOR  
ALL ALUMINIUM  
CONDUCTORS  
(Soft Drawn)**

Doc. No.

KP1/6C/13/TSP/06/021

Issue No.

1

Revision  
No.

0

Date of  
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2016-06-03

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**ANNEX A:** *Guaranteed Technical Particulars (to be filled and signed by the supplier for all clauses and submitted together with relevant copies of the Manufacturer's catalogues, brochures, drawings, technical data, sales records for previous five years, customer reference letters, details of manufacturing capacity, the manufacturer's experience and copies of complete type test reports for tender evaluation, all in English Language)*

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Development

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**0.1 Circulation List**

COPY NO.	COPY HOLDER
1	Manager, Standards
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 1 Rev 1				
		1. Deleted sentence indicating need for manufacturer to submit information in the forward as it is covered elsewhere.  2. Included Standard ISO/IEC 17025 the Reference clause  3. Replaced word 'manufacturer' with 'supplier' in the sentence at Clause 5.5 starting 'The supplier shall replace---		

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**1. 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 All Aluminum Conductors (soft drawn). It is intended for use by KPLC in purchasing the conductors intended for use on low voltage overhead power distribution lines.

1.1. The specification covers the following conductor sizes:

50 sq. mm All Aluminum Conductor (soft drawn), Polyvinyl Chloride (PVC) covered.

100 sq. mm All Aluminum Conductor (soft drawn), Polyvinyl Chloride (PVC) covered.

**2. REFERENCES**

The following documents were referred to during the preparation of this specification, in case of conflict; the provision of this specification shall take precedence.

BS 215: Specification for Aluminum Conductors and Aluminum Conductors Steel - Reinforced for Overhead Power Transmission. Part 1: Aluminum Stranded Conductors.

BS 6485: PVC Covered Conductors for Overhead Power Lines.

BS 6746: Specification for PVC insulation and sheath of electric cables.

BS 2627: Specification for Wrought Aluminum for Electrical Purposes Wire.

ISO/IEC 17025: General requirements for the competence of testing and calibration laboratories

**3. TERMS AND DEFINITIONS**

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

**4. REQUIREMENTS**

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**4.1. SERVICE CONDITIONS**

The conductor shall be suitable for continuous outdoor operation in tropical areas with the following conditions.

- a) Altitude: up to 2,200m above sea level;
- b) Temperature: average of +30°C with a minimum of -1°C and max +40 °C;
- c) Humidity: up to 95%;
- d) Pollution: Design pollution level to be taken as "Heavy" (Pollution level III) for inland and "Very Heavy" (Pollution level IV) for coastal applications in accordance with IEC 60815.
- e) Isokeraunic level: 180 thunderstorm days per year

**4.2. MATERIALS**

Aluminum wires used in the construction of the conductor shall be soft drawn as per BS 2627.

**4.3 CONSTRUCTION**

4.3.1 The conductor shall be manufactured as per BS 215 part 1.

4.3.2 The conductor shall be concentrically stranded, with successive layers in opposite lay, but such that the outer layer shall be in the right hand spiral (Z).

4.3.3 Variation in diameter shall not exceed  $\pm 1\%$  of aluminum wires.

The wires in each layer shall be evenly and closely stranded.

4.3.4 The conductor shall have an inner insulation of red PVC Type T12 to BS 6746 and over sheath of black PVC compound Type TM2 to BS 6746 and shall be applied by extrusion.

The insulation shall have a thickness of not less than 0.5mm with over sheath of not less than 0.8mm.

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#### 4.4. STANDARD SIZES

The Standard Sizes for the aluminum wires used in the construction of the conductors and the conductors sizes shall be as follows:-

Table 1: Conductor characteristics

CONDUCTOR	units	50	100
Nominal Area of Aluminum	mm <sup>2</sup>	50	100
Approximate overall diameter	mm	9.30	13.17
Overall diameter of covered conductors.	mm	11.7	16.00
Stranding	No/mm	7/3.10	7/4.39
Maximum d.c. resistance at 20°C	Ω/km	0.5419	0.2702
Tensile strength	(KN)	8.28	16
Thickness Insulation(PVC)	mm	0.5	0.5
Thickness of Oversheath(PVC)	mm	0.8	0.8
Approximate weight	Kg/Km	200	360

#### 5. TESTS AND INSPECTION

- 5.1. The conductors shall be inspected, sampled and tested in accordance with the requirement of BS 215-1 (Bare Conductors), BS 6485 (PVC Covered Conductors) and this specification. It shall be the responsibility of the manufacturer to perform or to have performed all the tests specified.
- 5.2. Copies of previous Type Test and Routine Test Reports issued by the National Testing/ Standards Authority of the country of manufacture (or ISO/IEC 17025 accredited laboratory) shall be submitted with the offer for evaluation (all in English Language). A copy of the accreditation certificate for the laboratory shall also be submitted. Any translations of certificates and test reports into English shall be certified by the Testing Authority.

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5.3. The following tests shall be done at the manufacturer's works in the presence of KPLC Engineers (2) and in accordance with BS 215-1, BS 6485 and this specification:

a) The aluminum wires shall be tested in accordance with BS 215-1 and the following.

Table 2: Test parameters

ALUMINIUM WIRES	COMPLETE CONDUCTOR
1. Tensile test	1. Lay ratio of each layer
2. Wrapping test	2. Tensile strength
3. Resistivity test	3. Measurement of weight
	4. Resistance test

b) The following tests shall be carried out on the PVC covered conductor in accordance with BS 6485:

1. Spark Test
2. Conductor Resistance
3. Thickness of PVC Covering
4. Conductor Examination and Test
5. PVC material

c) Construction/workmanship: The Manufacturer shall demonstrate during factory inspection/tests that the complete conductor is of good workmanship.

5.4. Test reports shall be completed for the above tests and submitted to KPLC for approval before shipment/delivery of the conductor.

5.5. On receipt of the conductors the purchaser (KPLC) may perform or have performed any of the tests specified in order to verify compliance with specification.

The Supplier shall replace without charge to KPLC conductors, which upon examination, test or use, fail to meet any of the requirements in the specification.

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**6. MARKING AND LABELLING**

- 6.1 The complete conductor shall be packed on wooden drums such as to prevent damage during transportation. The wooden drums shall be made from treated timber resistant to termite attack.
- 6.2 The actual length of conductor on a drum shall not be less than the length indicated on the drum.
- 6.3 Both ends of every drum length of conductor 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.
- 6.4 The following information shall be marked (in a permanent manner) on one flange of the reel:
- (a) Direction of rotation of the reel
  - (b) Type of conductor and size (cross-sectional areas in mm<sup>2</sup>)
  - (c) The length of the conductor, in metres
  - (d) Gross weight and net weight (kg)
  - (e) Manufacturer's name
  - (f) Year of manufacture
  - (g) KPLC Order Number
  - (h) Standard of manufacture
  - (i) The instructions for handling and use (in English Language)
  - (j) The words "Property of The Kenya Power & Lighting Co. Ltd."

**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 technical documents to be submitted (all in English language) for tender evaluation shall include the following:
- a) Guaranteed Technical Particulars;
  - 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;

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- e) Copies of required test reports by a third party testing laboratory accredited to ISO/IEC 17025. The test reports shall not be more than five years old.
- f) Copy of accreditation certificate for the testing laboratory.

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 with details of conductors 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) Marking details and method to be used in marking the conductor drums
- f) Manufacturer's undertaking to ensure adequacy of the design, good engineering practice, adherence to the specification and applicable standards and regulations as well as ensuring good workmanship in the manufacture of the conductors for The Kenya Power & Lighting Company
- g) Packaging details (including packaging materials and their dimensions).

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**ANNEX A: Guaranteed Technical Particulars** (to be filled and signed by the Manufacturer for each size offered and submitted together with catalogues, brochures, drawings, technical data and test reports for tender evaluation)

**TENDER NO.**.....

Clause	Description	Guaranteed Technical Particulars for Conductor offered
1	Name and address of the Manufacturer	
	Country of manufacture	
	Manufacturer's Letter of Authorization	
	Model/Type Reference No. of the offered transformer	
	Drawing Reference Number	
	Manufacturer's warranty and guarantee certificate for the offered conductor	
2	Type and Size	
3.	Reference Standard of manufacture	
4.1	Service Conditions	
4.2	Materials	Aluminum (condition/grade)
		PVC Insulation (type and thickness)
		PVC Sheath (type and thickness)
4.3.1	Construction & Standard	
4.3.2	Direction of lay	
4.3.3	Inner Insulation and standard of manufacture	
	Oversheath and standard of manufacture	
	Thickness of insulation	
4.4	<b>Size and ratings</b>	
	Nominal area of aluminum, mm <sup>2</sup>	
	Overall diameter of bare conductor, mm	
	Overall diameter of covered conductor, mm	
	Stranding, Aluminum	

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	No./mm	Tolerance on diameter	
	Maximum d.c. resistance at 20°C, ohm/km		
	Minimum breaking load, kN		
	Approximate mass of conductor, kg/km		
	Current carrying capacity, A (state applicable conditions)		
5.1	Test standard(s) for bare and covered conductors		
5.2	List test reports submitted (indicate test report numbers, date, Testing Institution and their contact addresses)		
5.4	Test reports to be submitted to KPLC before delivery		
5.5	Replacement of non compliant conductor		
6.1	Mode of Packing, & Length on drum		
6.3	Mode of Sealing of both end of conductor		
6.4	Permanent Marking on the drum		
7.1	Documents submitted with tender		
7.2	Documents to be submitted to KPLC for approval before manufacture		
Other details required with the tender	Manufacturer's Guarantee and Warranty		
	List catalogues, brochures, technical data, drawings and customer sales records submitted to support the offer		
	List Acceptance Tests to be witnessed by KPLC Engineers at the factory		
	Statement of compliance to specification		

**Note:** *This schedule does not in any way substitute for detailed information required elsewhere in the specification.*

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

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