



TITLE:

**SPECIFICATION FOR  
ALUMINIUM CONDUCTORS  
STEEL REINFORCED  
Part 2: 75 mm<sup>2</sup> & 150 mm<sup>2</sup>  
(BARE & PVC COVERED)**

Doc. No.	KP1/6C/13/TSP/06/022-2
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**0.1 Circulation List**

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1	Manager, Standards
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**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	2011-03-24	Reviewed requirements on grease and packing	Eng. Simon Kimitei	Geoffrey Gathige
Issue 2 Rev. 0	2015-08-19	Replace issue 1 Rev 1 and includes new standards of manufacture	M. Apudo N. Wairimu 	Dr. Eng. Peter Kimemia 

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**FOREWORD**



This specification has been prepared by the Standards Department of The Kenya Power and Lighting Company Limited (KPLC) and it lays down requirements for ACSR-Bare and PVC covered conductors as per BS 6485 for use in distribution medium voltage lines. It is intended for use by KPLC in purchasing the ACSR conductors.

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

**1. SCOPE**

- 1.1. This specification is for Aluminium Conductors Steel Reinforced for medium voltage overhead power distribution lines.
- 1.2. This specification covers the following conductor sizes:
  - a) 75 Sq. mm Aluminium Conductor, Steel Reinforced, Bare
  - b) 75 Sq. mm Aluminium Conductor, Steel Reinforced, PVC Covered.
  - c) 150 Sq. mm Aluminium Conductor, Steel Reinforced, Bare
  - d) 150 Sq. mm Aluminium Conductor, Steel Reinforced, PVC Covered.
- 1.3. The specification also covers inspection and test of the ACSR conductors as well as schedule of Guaranteed Technical Particulars to be filled, signed by the manufacturer and submitted for tender evaluation.
- 1.4. The specification stipulates the minimum requirements for ACSR conductors acceptable for use in the company 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 ACSR conductors for The Kenya Power & Lighting Company Ltd.

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

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## 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 and shall be complied with by the manufacturer/ supplier.

- IEC 61089: Round wire concentric lay overhead electrical stranded conductors.
- IEC 61394: Overhead lines – Characteristics of greases for aluminium, aluminium alloy and steel bare conductors.
- BS 215: Aluminium Conductors and Aluminium Conductors Steel - Reinforced for Overhead Power Transmission. Part 2: Aluminium conductors, steel – reinforced.
- BS 2627: Specification for wrought aluminium for electrical purposes. Wire
- BS EN 50189: Conductors for overhead lines. Zinc coated steel wires
- BS 6485: PVC Covered Conductors for Overhead Power Lines.
- BS 7655-3.1: Specification for insulating and sheathing materials for cables. PVC insulating compounds. Harmonized types

## 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 ACSR conductors shall be suitable for continuous outdoor operation in tropical areas at:

- a) Altitudes of up to 2200m above sea level,
- b) Humidity of up to 90%,
- c) Average ambient temperature of +30°C with a minimum of -1°C and a maximum of +40°C
- d) Heavy saline conditions along the coast and
- e) Isokeraunic levels of up to 180 thunderstorm days per year.

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#### 4.2. MATERIALS

The material shall be of best quality and workmanship.

##### 4.2.1. Aluminium

- 4.2.1.1. The aluminium wire used in the manufacture of ACSR conductors shall conform to BS 2627. Aluminium wires shall be material G1E in the H9 condition with aluminium composition of 99.5% as specified in BS 2627 and characteristics as per Table 1.
- 4.2.1.2. Joints in the wire before final drawing shall be permitted in accordance with the clause 3.3.1 of BS 215 Part 2. Joints in the aluminium wire shall not be permitted in the final drawing.
- 4.2.1.3. Aluminium wires shall be uniform in quality, circular in cross section, clean, smooth and free from harmful defects, splinter irregularities and brittle places.

**Table 1: Characteristics of aluminium wires used for construction of standard aluminium conductors, steel reinforced as per BS 2627 & BS 215-2**

Particulars	Units	75mm <sup>2</sup>	150mm <sup>2</sup>
Standard diameter	mm	4.09	2.59
Cross sectional area	mm <sup>2</sup>	13.14	5.269
Mass per km	kg	35.51	14.24
Standard resistance at 20 <sup>0</sup> C	Ω	2.194	5.365
Resistivity at 20 <sup>0</sup> C, max	μΩcm	2.8264	2.8264
Minimum breaking load	N	2080	906
Density	g/cm <sup>3</sup>	2.703	2.703
Coefficient of linear expansion	/ <sup>0</sup> C	23 x 10 <sup>-6</sup>	23 x 10 <sup>-6</sup>
Constant mass temperature coefficient	/ <sup>0</sup> C	0.00403	0.00403

##### 4.2.2. Reinforcement Steel wire

- 4.2.2.1. The galvanized steel wire used for the reinforcement of the ACSR conductor shall conform to BS EN 50189 and the tensile strength grade of the steel wire shall conform to Table 6 – mechanical properties of ST4A wires of BS EN 50189.
- 4.2.2.2. The characteristic of zinc coated steel wires shall be as per table 2 below. The minimum zinc content shall be 99.85%.

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**Table 2: Characteristics of aluminium zinc coated steel wires used for construction of standard aluminium conductors, steel reinforced as per BS EN 50189**

Particulars	Units	
Resistivity at 20°C, max	nΩ-m	192
Modulus of elasticity	N/mm <sup>2</sup>	207000
Density at 20°C	kg/dm <sup>3</sup>	7.78
Coefficient of linear expansion	/K	11.5 x 10 <sup>-6</sup>

- 4.2.2.3. The tensile strength and stress at 1% elongation values, calculated on the nominal dimensions of the finished wire, shall conform to Table 6 of BS EN 50189.
- 4.2.2.4. The elongation at break shall conform to Table 6 of BS EN 50189, measured after fracture on an original gauge length of 250mm.
- 4.2.2.5. The steel wire shall not fracture when wrapped at a rate not exceeding 15 turns per minute around a cylindrical mandrel of diameter given in the appropriate column of Table 6 of BS EN 50189 to form a close helix of eight turns.
- 4.2.2.6. The numbers of twists on a length of 100 times the wire diameter that causes fracture shall be conform to Table 6 of BS EN 50189. Steel wires shall be uniform in quality, circular in cross section, clean, smooth and free from harmful defects, splinter irregularities and brittle places.
- 4.2.2.7. The weight and uniformity of coating and zinc adhesion shall be 250gm/sqm after stranding in accordance with Table 2 of BS EN 50189.
- 4.2.2.8. The tolerance on nominal diameter of the galvanized steel wire shall conform to Table 6 of BS EN 50189.

**4.2.3. Grease**

- 4.2.3.1. Neutral grease shall be applied between and over the layers of steel wires only. This shall be as shown in Figure C.2 of IEC 61089 and Fig. 1 below.
- 4.2.3.2. The grease used for corrosion protection in the manufacture of ACSR conductor shall have the following requirements satisfying IEC 61394.
- a) Shall not flow or deteriorate at temperatures up to 75°C,

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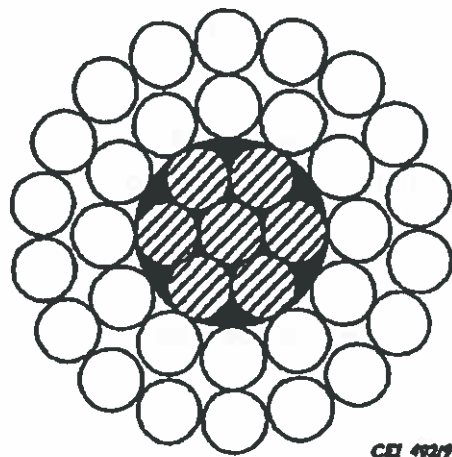


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- b) Shall not be inimical to aluminium or galvanized steel and it shall also have good adhesive and cohesive properties and
- c) Shall retain these qualities after weathering.
- d) Shall not extrude a surplus to the outside of the conductor after erection.
- e) Shall not present any risks to health and shall comply with all the usual health and safety standards.

**NOTE:** *The type of grease used in the manufacture of ACSR conductor and technical specifications including its expected life before expiry shall be furnished with the offer for purposes of tender evaluation.*



**Fig. 1: Application of grease as per Fig C. of IEC 61089**

**4.3. CONSTRUCTION**

**4.3.1. Bare Conductor**

- 4.3.1.1. The conductor shall be manufactured as per BS 215 Part 2 with stranding conforming to IEC 61089 standards.
- 4.3.1.2. The conductor shall be concentrically stranded, with successive layers in opposite lay, but such that the outermost layer shall be in the right hand spiral (Z).
- 4.3.1.3. The wires in each layer shall be evenly and closely stranded. The complete conductor and its layers shall be firm and solid. The lay ratio shall not exceed 13 for all layers.

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- 4.3.1.4. Steel wires shall be formed during stranding so that they remain inert when the conductor is cut.
- 4.3.1.5. All steel wires shall lie naturally in their position in the stranded core, and where the core is cut, the wire ends shall remain in position or be readily replaced by hand and then remain approximately in position. This requirement also applies to the outer layer of aluminium wires of a conductor.
- 4.3.1.6. Before stranding, aluminium and steel wires shall have approximately uniform temperatures.
- 4.3.1.7. There shall be no joints of any kind made in the steel core wire during stranding. Joints in individual aluminium wires are permitted, in addition to those made in the wire before final drawing, but no two such joints shall be less than 15 m apart in the complete stranded conductor. Such joints shall be made by resistance or cold-pressure butt-welding.
- 4.3.1.8. It shall be demonstrated during factory inspection/tests that good workmanship has been exercised in the manufacture of the complete conductor and that caging problems shall not arise during stringing.
- 4.3.1.9. The completed conductor shall be free from dirt, grit, excessive amounts of drawing oil and other foreign deposits. No grease shall be accepted on the outer layer.

**4.3.2. PVC Covered Conductor**

- 4.3.2.1. PVC covered conductors shall be manufactured in accordance with BS 6485 with covering designation Type 16 of minimum thickness of 1.6mm.
- 4.3.2.2. The material, construction and physical properties of the conductor shall, after covering, conform to BS 215 Part 2 and clause 4.3.1 of this specification.
- 4.3.2.3. The PVC covering shall conform to the Type TI 1 compound requirements of BS 7655-3.1. The colour of the covering shall be BLACK; all other properties shall be as per BS 6485.
- 4.3.2.4. When tested in accordance with BS 6485, the thickness of the PVC covering at any point shall be not less than 1.6mm.

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**Table 3: Test values for PVC covered conductor**

Particulars	Units	Value
Spark test voltages,	a.c , (r.m.s)	kV 12
	d.c	kV 18
Insulation resistance at 20°C	MΩ/km	1
High voltage test for 5 minutes, (r.m.s)	kV	25kV

**4.4. WORKMANSHIP**

- 4.4.1. The conductors shall be cleaned and free of imperfections, such as pipes, laps, cracks, kinks, bends, twists, seems excessive grease and other injurious defects.
- 4.4.2. Higher quality of work shall be maintained in drawing the wire and fabrication of the conductors.
- 4.4.3. Due precaution shall be taken to prevent the aluminium wires making contact with copper conductors, copper parts or copper residues during the process of redrawing, stranding as well as storage.
- 4.4.4. All machines and equipment used for this purpose of redrawing shall be properly cleaned, free from any copper residues.

**4.5. CONDUCTOR SIZES AND CHARACTERISTICS**

- 4.5.1. The sizes and characteristics for the aluminium and steel wires used in the construction of the conductors and the conductors sizes shall be as per Table 4:

**Table 4: Sizes and characteristics for the aluminium and steel wires**

Conductor characteristics	Units	Bare (Racoon)	PVC Covered	Bare (Wolf)	PVC Covered
Nominal Area of Aluminium	mm <sup>2</sup>	75	75	150	150
Stranding No/mm	Aluminium	No/mm 6/4.09	6/4.09	30/2.59	30/2.59
	Steel	No/mm 1/ 4.09	1/ 4.09	7/2.59	7/2.59
Approximate overall diameter of bare conductors	mm	12.3	12.3	18.13	18.13
Approximate overall diameter of covered conductors	mm	-	16.3	-	22.2

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Cross sectional area of conductors	Aluminium	mm <sup>2</sup>	78.83	78.83	158.1	158.1
	Total	mm <sup>2</sup>	91.97	91.97	194.9	194.9
Calculated maximum d.c resistance per kilometre at 20°C		Ω	0.3633	0.3633	0.1828	0.1828
Calculated minimum breaking load		kN	27.4	27.4	69.2	69.2
Approximate mass of conductor per kilometre—excluding mass of grease		kg	318	460	726	920

**NOTE:** The current carrying capacities of each conductor shall be stated by the manufacturer in Annex A attached. The applicable installation conditions shall also be specified.

4.5.2. Variation in diameter shall not exceed ±1% for aluminium wires and ±2% of steel wires.

**4.6. QUALITY MANAGEMENT SYSTEM**

4.6.1. The supplier shall submit a quality assurance plan (QAP) that will be used to ensure that the conductor 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.

4.6.2. The Manufacturer's Declaration of Conformity to reference standards and copies of quality management certifications including copy of valid and relevant ISO 9001: 2008 certificate shall be submitted with the tender for evaluation.

4.6.3. The bidder shall indicate the delivery time of the conductors, manufacturer's monthly and annual production capacity and experience in the production of the type and size of conductor being offered. A detailed list & contact addresses (including e-mail) of the manufacturer's previous customers outside the country of manufacture for the conductors sold in the last five years together with reference letters from four of the customers shall be submitted with the tender for evaluation.

**5. TESTS AND INSPECTION**

5.1. Type tests, sampling tests and routine tests shall be done in accordance with the requirements of IEC 61089, IEC 61394, BS 215, BS 2627, BS EN 50189 and this specification. It shall be the responsibility of the supplier to perform or to have performed all the tests specified.

5.2. Copies of Type Test Certificates & Type Test Reports issued by a third party testing laboratory that is accredited to ISO/IEC 17025 shall be submitted with the tender for the

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purpose of technical evaluation. A copy of the accreditation certificate to ISO/IEC 17025 for the testing laboratory shall also be submitted (all in English language).

5.3. Copies of type test reports to be submitted with the tender (by bidder) for evaluation shall be as stated:

**a) Aluminium Conductor, Steel-Reinforced, Bare - BS 215-2 & BS EN 50189:**

Aluminium Wires	Steel Wires	Complete Conductor
1. Tensile test	1. Determination of stress at 1% elongation	1. Lay ratio of each layer
2. Wrapping test	2. Tensile test	2. Tensile strength
3. Resistivity test	3. Wrapping test	3. Measurement of weight
	4. Galvanizing test	4. Resistance test
		4. Tests on grease

**b) PVC Covered Conductor - BS 6485**

- (i) Spark Test
- (ii) High Voltage Test
- (iii) Conductor Resistance
- (iv) Insulation Resistance Test
- (v) Thickness of PVC Covering
- (vi) Conductor Examination and Test

**NOTE:** Any translations of certificates and test reports into English language shall be signed and stamped by the third party ISO/IEC 17025 accredited Testing Laboratory that carried out the tests.

5.4. The conductors shall be subject to acceptance tests at the manufactures' works before dispatch. Acceptance tests (routine & sample tests) will be witnessed by two Engineers appointed by The Kenya Power and Lighting Company Limited (KPLC). Routine and sample test reports for the conductors to be supplied shall be submitted to KPLC for approval before shipment of the goods.

5.5. Tests to be witnessed by KPLC Engineers at the factory before shipment shall be the same as those in clause 5.3, in accordance with IEC 61089, IEC 61394, BS 215, BS 2627, BS EN 50189 and this specification.

5.6. On receipt of the conductors 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 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 PACKING**

**6.1. MARKING**

The gross, net and tare weight, length, designation, and any other necessary identification, shall be suitably marked inside the drum. This same information, together with the purchase order number, the manufacturer's serial number (if any) and all shipping marks and other information shall appear on the outside of each drum.

**6.2. PACKING**

- 6.2.1. The complete conductor shall be packed on wooden drums such as to prevent damage during transportation and handling. The wooden drums shall be made from treated timber resistant to termite attack. The drums shall be firm, with wooden lagging and any collapsed drums shall be rejected during delivery.
- 6.2.2. The actual length of conductor on a drum shall not be less than the length indicated on the drum.
- 6.2.3. 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.
- 6.2.4. The following information shall be marked (in a permanent manner) on one flange of the reel in English Language:
- 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) Month and year of manufacture
  - g) Batch number if available
  - h) KPLC Order Number
  - i) The instructions for handling and use (in English Language)
  - j) The words "**PROPERTY OF KENYA POWER & LIGHTING COMPANY LTD.**"

**NOTE:**

*Random lengths of conductors unavoidably obtained during production shall not exceed 5 % of the total order, providing that no piece is less than 50 % of the agreed length of conductor per drum.*

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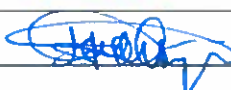

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## 7. DOCUMENTATION

- 7.1. The bidder shall submit its tender complete with technical documents required by Annex A (Guaranteed Technical Particulars) for tender evaluation. The documents to be submitted (all in English language) for tender evaluation shall include the following:
- Guaranteed Technical Particulars fully filled and signed by the manufacturer;
  - Copies of the Manufacturer's catalogues, brochures, drawings and technical data;
  - Sales records for previous five years and reference letters from at least four of the customers;
  - Details of manufacturing capacity and the manufacturer's experience;
  - Copies of required type test certificates and type test reports by a third party testing laboratory accredited to ISO/IEC 17025;
  - Copy of accreditation certificate to ISO/IEC 17025 for the third party testing laboratory;
  - Manufacturer's warranty and guarantee;
  - Manufacturer's letter of authorization, copy of the manufacturer's ISO 9001:2008 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:
- Guaranteed Technical Particulars fully filled and signed by the manufacturer;
  - Design drawings & construction details of the conductors including 3-D views;
  - 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;
  - Test Program to be used after manufacture;
  - Marking details and method to be used in marking each conductors;
  - Manufacturer's undertaking to ensure adequacy of the design, adherence to applicable regulations, standards and specification, ensure good workmanship and good engineering practice in the manufacture of the conductors for The Kenya Power and Lighting Company Limited;
  - Packaging details (including packaging materials and marking and identification of component packages).

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

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**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 & calculations, sales records for past five years, 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 third party testing laboratory for tender evaluation, all in English Language)

**BIDDERS NAME & ADDRESS** .....  
**TENDER NO** .....

Description		Bidders offer
Name of Manufacturer & Country of manufacture		State
Type/Model Reference Number		State
1.	Scope	
	Type and Size	
	75 Sq. mm Aluminium Conductor, Steel Reinforced, Bare	State
	75 Sq. mm Aluminium Conductor, Steel Reinforced, PVC Covered.	State
	150 Sq. mm Aluminium Conductor, Steel Reinforced, Bare	State
	150 Sq. mm Aluminium Conductor, Steel Reinforced, PVC Covered.	State
2.	Design standards complied with	State
3.	Terms and definitions	State
4.	Requirements	State
4.1	Service Conditions	State
4.2	Materials	
	Aluminium	
	Designation G1E in the H9 condition of BS 2627	
	Conductor size	75      150
	Standard diameter , mm	4.09      2.59      State values
	Cross sectional area, mm <sup>2</sup>	13.14      5.269      State values
	Mass per km , kg	35.51      14.24      State values
	Standard resistance at 20 <sup>0</sup> C, Ω	2.194      5.365      State values
	Resistivity at 20 <sup>0</sup> C, max, μΩcm	2.8264      State values
	Minimum breaking load, N	2080      906      State values
	Density, g/cm <sup>3</sup>	2.703      State values
	Coefficient of linear expansion, / <sup>0</sup> C	23 x 10 <sup>-6</sup> State values
	Constant mass temperature coefficient, / <sup>0</sup> C	0.00403      State values
	Steel	
	Designation as per BS EN 50189	ST4A      State
	Gauge length, mm	250      State values
	Resistivity at 20 <sup>0</sup> C, max, nΩ-m	192
	Modulus of elasticity, N/mm <sup>2</sup>	207000
	Density at 20 <sup>0</sup> C, kg/dm <sup>3</sup>	7.78

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TITLE:

**SPECIFICATION FOR  
ALUMINIUM CONDUCTORS  
STEEL REINFORCED  
Part 2: 75 mm<sup>2</sup> & 150 mm<sup>2</sup>  
(BARE & PVC COVERED)**

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Construction of conductor	Bare conductor	Coefficient of linear expansion, /K		11.5 x 10 <sup>-6</sup>	State values
		1% elongation as per Table 6 of BS EN 50189			
		Standard of manufacture			Specify
		Concentrically stranded			Specify
		Lay direction	Successive layers		Specify
			Outer layer		Specify
		Lay ratio, max			Specify
		Forming steel wires while stringing			Specify
		Steel wire stranding method			Specify
		Temperature of wires before stranding, °C			Specify
Whether to have joints in steel wire or not during stranding			Specify		
Caging problem during stringing			Specify		
Dirt free, grit free conductor with no foreign deposits			Specify		
PVC conductor covering	Designation as per BS 6485		Type T1 1	State	
	Colour		Black	State	
	Thickness, mm		1.6	State values	
	Spark test voltages, a.c r.m.s, kV		12	State values	
	Spark test voltages, d.c, kV		18	State values	
	Insulation resistance, min, MΩ/km		0.5	State values	
	HV test for 5 minutes, min, kV		25kV	State values	
Grease	Conform to IEC 61394		Y/N	State	
	Application shall be as per Fig. C.2 of IEC 61089		Y/N- specify	State	
	Properties of grease	Shall not flow or deteriorate at temperatures up to 75°C		Specify	
		Shall not be inimical to aluminum or galvanized steel		Specify	
		Shall have good adhesive properties		Specify	
		Shall retain its qualities after weathering		Specify	
		Shall not extrude a surplus to the outside conductor		Specify	
Shall not present any risk to users		Specify			
Expectant life		Specify			

4.4	<b>Conductor sizes and characteristics</b>				
A	<b>Bare (Racoon)</b>				
	Nominal Area of Aluminium		mm <sup>2</sup>	75	State values
	Stranding No/mm	Aluminium	No/mm	6/4.09	State values
		Steel	No/mm	1/ 4.09	State values
	Approximate overall diameter of bare conductors		mm	12.3	State values
	Cross sectional area of conductors	Aluminium	mm <sup>2</sup>	78.83	State values
Total		mm <sup>2</sup>	91.97	State values	

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	Calculated maximum d.c resistance per kilometre at 20°C	Ω	0.3633	State values	
	Calculated minimum breaking load	kN	27.4	State values	
	Approximate mass of conductor per kilometre—excluding mass of grease	kg	318	State values	
<b>B</b>	<b>PVC Covered</b>				
	Nominal Area of Aluminium	mm <sup>2</sup>	75	State values	
	Stranding No/mm	Aluminium	No/mm	6/4.09	State values
		Steel	No/mm	1/ 4.09	State values
	Approximate overall diameter of bare conductors	mm	12.3	State values	
	Approximate overall diameter of covered conductors	mm	16.3	State values	
	Cross sectional area of conductors	Aluminium	mm <sup>2</sup>	78.83	State values
		Total	mm <sup>2</sup>	91.97	State values
	Calculated maximum d.c resistance per kilometre at 20°C	Ω	0.3633	State values	
	Calculated minimum breaking load	kN	27.4	State values	
	Approximate mass of conductor per kilometre—excluding mass of grease	kg	460	State values	
<b>C</b>	<b>Bare (Wolf)</b>				
	Nominal Area of Aluminium	mm <sup>2</sup>	150	State values	
	Stranding No/mm	Aluminium	No/mm	30/2.59	State values
		Steel	No/mm	7/2.59	State values
	Approximate overall diameter of bare conductors	mm	18.13	State values	
	Cross sectional area of conductors	Aluminium	mm <sup>2</sup>	158.1	State values
		Total	mm <sup>2</sup>	194.9	State values
	Calculated maximum d.c resistance per kilometre at 20°C	Ω	0.1828	State values	
	Calculated minimum breaking load	kN	69.2	State values	
	Approximate mass of conductor per kilometre—excluding mass of grease	kG	726	State values	
<b>D</b>	<b>PVC Covered</b>				
	Nominal Area of Aluminium	mm <sup>2</sup>	150	State values	
	Stranding No/mm	Aluminium	No/mm	30/2.59	State values
		Steel	No/mm	7/2.59	State values
	Approximate overall diameter of bare conductors	mm	18.13	State values	
	Approximate overall diameter of covered conductors	mm	22.2	State values	
	Cross sectional area of conductors	Aluminium	mm <sup>2</sup>	158.1	State values
		Total	mm <sup>2</sup>	194.9	State values
	Calculated maximum d.c resistance per kilometre at 20°C	Ω	0.1828	State values	

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	Calculated minimum breaking load	kN	69.2	State values
	Approximate mass of conductor per kilometre– excluding mass of grease	Kg	920	State values
4.5	Workmanship – 4.5.1 – 4.5.4			Prove compliance
4.5	Quality Management System			provide
	Quality Assurance Plan			provide
	Copy of ISO 9001:2008 Certificate			provide
	Manufacturer's experience			provide
	Manufacturing Capacity (units per month)			provide
	List of previous customers			provide
	Customer reference letters			provide
5.1	Test standards and responsibility of carrying out tests			provide
5.2	Type test certificates and reports together with accreditation certificates			provide
5.3	List of Type Test Reports submitted with tender			provide
5.4	Acceptance tests to be witnessed by KPLC at factory before shipment			provide
5.5	Test reports to be submitted by supplier to KPLC for approval before shipment			provide
5.6	Replacement of rejected conductors			provide
6.1	Marking			provide
6.2	Packing			provide
7.1	Documents submitted with tender			provide
7.2	Documents to be submitted by supplier to KPLC for approval before manufacture			provide
8.0	Manufacturer's Guarantee and Warranty			provide
9.0	List catalogues, brochures, technical data and drawings submitted to support the offer			provide
10.0	List customer sales records and reference letters submitted to support the offer			provide
11.0	List Test Certificates submitted with tender			provide
12.0	List test reports of the surge arresters to be submitted to KPLC for approval before shipment			provide
13.0	Statement of compliance to specification (indicate deviations if any & supporting documents)			provide

**NOTE:**

- 1) Bidders shall give full details of the offered values of the items on order as per Annex A. The details provided shall conform to the test reports and their certificates as required by clause 5.2., well labeled drawings complete with dimensions, catalogues or brochures for the purpose of tender evaluation.
- 2) Bidder who shall have not complied by this requirement in bullet 1 shall automatically be disqualified for bidding this item.

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

**NOTE:** *The schedule in Annex A does not in any way substitute for detailed information required elsewhere in the specification.*

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