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Kenya Power

ENAMELLED ROUND COPPER WINDING WIRE — SPECIFICATION

A Document of the Kenya Power & Lighting Company Plc.

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0.1 Circulation List

COPY NO.	COPY HOLDER
1	Manager, Standards
Electronic copy (pdf) on Kenya Power server (http://172.16.1.40/dms/browse.php?fFolderId=23)	

REVISION OF KPLC STANDARDS

To keep abreast of progress in the industry, KPLC standards shall be regularly reviewed. Suggestions for improvements to approved standards, addressed to the Manager, Standards department, are welcome.

0.2 Amendment Record

Rev No.	Date (YYYY-MM-DD)	Description of Change	Prepared by (Name & Signature)	Approved by (Name & Signature)
Issue 2 Rev 0	2020-12-30	Revised:	B. Rotich S .Nguli	Dr. Eng. Peter Kimemia

FOREWORD

This Specification has been prepared by the Standards Department in collaboration with Electrical Plant Workshop Department both of The Kenya Power and Lighting Company Plc (KPLC) and it lays down requirements for copper winding wire.

Copper winding wire is intended for use by the Electrical Plant Workshop Department for rewinding transformers.

This Specification was prepared to establish and promote uniform requirements for copper winding wire to be used at Kenya Power and Lighting Company Plc.

There are no other specifications in this series.

This specification stipulates the minimum requirements for copper winding wire acceptable for use in the company and it shall be the responsibility of the suppliers and manufacturer to ensure that the offered design is of the highest quality and guarantees excellent service to KPLC, good workmanship and good engineering practice in the manufacture of the copper winding wire for KPLC.

Users of this KPLC specification are responsible for its correct interpretation and application.

The following are members of the team that developed this specification:

No	Name	Department
1.	George Welimo	Electrical Plant Workshop
2.	Rotich Benard	Standards
3.	Stephen Nguli	Standards

1. SCOPE

1.1. This specification is for Enamelled Round Copper Winding Wire without a bonding layer for use by company's Electrical Plant Workshop Department.

1.2. The size required to be specified for each tender.

2. REFERENCES (NORMATIVE)

The following standards contain provision which, through reference in this text, constitute provisions of this specification. For dated editions the cited edition will apply; for undated editions the latest edition of the referenced document shall apply.

IEC 60317-0-1-2013: Specifications for particular types of winding wires
Part 0-1: General requirements – Enamelled round copper wire

IEC 60851: Winding wires – Test methods

ISO 9001:2015: Quality Management systems – Requirements

ISO17025:2017: General Requirements for the competence of testing and calibration laboratories

BS 148:2009 Specification for insulating oil for transformers and switchgear

IEC 60296:2020 Specifications and test methods for unused and recycled mineral insulating oils

3. DEFINITIONS AND ABREVIATION

For the purpose of this specification the definitions and abbreviations given in the reference standards shall apply together with the following abbreviations.

3.1. ABBREVIATIONS

KPLC- Kenya Power and Lighting Company Limited

ISO – International Organization for Standardization.

Kg –Kilogram

KV – Kilovolt

4. REQUIREMENTS

4.1. SERVICE CONDITIONS

4.1.1 The round enameled copper windings shall be used in design and construction of electrical equipment for continuous use in both outdoor and indoor operation in areas with the following atmospheric conditions: -

Altitude: From sea level up to 2200m above mean sea level.

Humidity: High at the Coast, up to 90% and lower inland, up to 50%.

Temperatures: Average ambient temperature of +35˚C with a minimum of -1°C and a maximum of +40˚C.

Pollution: Heavy saline with severe corrosive effects in coastal lands and generally clean air inland.

4.2. DESIGN AND CONSTRUCTION

4.2.1. General Requirements

4.2.1.1. The copper winding wires shall be designed and manufactured to comply with IEC 60317-0-1-2013.

4.2.1.2. All the Copper conductors shall be reasonable smooth, uniform and shall be free from all defects such as die marks, scratches, abrasions and kinks etc.

4.2.1.3. The wires shall be enameled round copper wires suitable for windings in electrical equipment. The wires shall be Grade 2 as per IEC 60317-0-1-2013 and without a bonding layer.

4.2.1.4. The copper winding wires shall be suitable for use inside the transformer oil complying with BS148 and IEC 60296 and at temperature up to 105 °C.

4.2.1.5. The resistivity of copper at 100˚C shall be taken as 0.0224 μΩ.M.

4.2.1.6. The density of copper at temperature of 100˚C shall be taken as 8 894 kg/m^3.

4.2.1.7. The specific heat of copper at 100˚C shall be taken as 398.4 J/Kg.°C.

4.2.1.8. The wire shall be enameled round copper wires suitable for windings in electrical equipment.

4.2.1.9. The wire shall be grade 2 as per IEC 60317-0-1-2013 and without a bonding layer.

4.2.1.10. The insulation shall be of class A with temperature class of 105°C

4.2.1.11. The conductor shall be completely and uniformly covered with durable flexible and synthetic enamel. The enamel should have a smooth surface free from embedded particulars of dust and other deleterious materials.

4.2.2. Specific Functional Requirements

The wires shall be within the limits set in IEC 60317-0-1-2013 for dimensions, mechanical and electrical properties.

4.2.2.1. Dimensions

The wires shall be in sizes SWG 8-32 (0.2743-4.0640mm) in diameter.

Note: *The copper winding wire dimensions to be procured shall be specified in the tender*

4.2.2.2. Mechanical Properties

The mechanical properties of copper winding wires shall be as detailed in IEC 60317-0-1-2013 and shall include elongation, springiness, flexibility and adherence, resistance to abrasion, Resistance to solvents, Solderability, Loss of Mass and heat bonding.

4.2.2.3. Electrical Resistance

The electrical properties of copper winding wires as detailed in IEC 60317-0-1-2013 shall include electrical resistance, breakdown voltage, continuity of insulation, dielectric dissipation factor and pin hole.

4.2.2.4. Chemical Properties

The chemical properties of copper winding wires as detailed in IEC 60317-0-1 shall include resistance to solvents, solderability and resistance to transformer oil

4.2.2.5. Thermal Properties

The thermal properties of copper winding wires as detailed in IEC 60317-0-1 shall include heat shock, cut through, temperature index and loss of mass

5. MARKING AND PACKING

5.1. Packing

5.1.1 The wire rolls shall be evenly and compactly wound on spools. Be continuous and no spool shall contain more than one length of wire

5.1.2. Particular care shall be taken during the manufacture, handling, packing and transportation of the conductor, to see that the surface is not dented, cut or damaged in any way

5.1.3 There shall be no joint of any kind in the conductor. A certificate shall be recorded by the supplier/manufacture on each spool that. "***Certified that there is no joints of any kind in the conductor.***"

5.2. Markings

Each spool shall carry a label containing the following information (marked legibly and indelibly):

(i) Manufacturer's name and/or trade mark;

(ii) Type of wire and insulation, for instance trade name and/or IEC specification number;

(iii) Net mass of wire;

(iv) Nominal dimension(s) of wire and grade of insulation;

(v) Date of manufacture

(vi) Standard to which the wire complies

(vii) The words "**PROPERTY OF KENYA POWER AND LIGHTING COMPANY.**"

APPENDICES

APPENDIX A: TESTS AND INSPECTION

A.1. Copper winding wire shall be inspected and tested in accordance with the requirements of IEC 60317-0-1-2013 and this specification.

A.2. It shall be the responsibility of the manufacturer to perform or to have performed all the tests specified. Tenderers shall confirm the manufacturer's capabilities in this regard when submitting tenders. Any limitations shall be clearly specified.

A.3. Copies of previous Test Reports issued by own or a third party testing laboratory that is accredited to ISO/IEC 17025:2005 or 17025:2017 confirming compliance of the copper winding wires offered shall be submitted with the offer for evaluation (all in English Language).

A.4. A copy of the **accreditation certificate** and the **scope of accreditation** of the testing laboratory shall also be submitted. Any translations of certificates or test reports into English language shall be signed and stamped by the Testing Authority that carried out tests. Copies of test reports for the copper wire offered to be submitted for tender evaluation shall include the following tests:

(i) Dimension determination (Overall Diameter Measurement.; Bare conductor diameter Measurement and Increase in dimension due to coatings)

(ii) Electrical Resistance

(iii) Breakdown Voltage (at room and elevated Temperature)

(iv) Continuity of Insulation

(v) Elongation

(vi) Springiness

(vii) Flexibility and adherence

(viii) Resistance to abrasion

(ix) Heat bonding

(x) Resistance to solvents

(xi) Resistance to transformer oil

(xii) Heat shock

(xiii) Cut through

(xiv) Elongation test.

(xv) Flexibility and Adherence tests.

(xvi) Mandrel Winding test

(xvii) Resistance to Solvents

(xviii) Temperature Index

(xix) Voltage Endurance Test

Note *Test Reports for enameled round copper wire within the range of sizes SWG 8-32(0.2743-4.0640mm in diameter) shall be accepted as representative for any of the enameled round copper wire in the tender.*

A.5. Prior to the manufacture of copper winding wires on order the purchaser (Kenya Power) reserves the right to inspect the manufacturing facility and the quality management system.

A.6. Upon completion of manufacturing process, the winding wires shall be subject to inspection by two Kenya power Engineers at place of manufacture and tests carried out on samples picked at random in their presence.

A.7. Test reports shall be completed and made available for approval before shipment/ delivery of the winding wires. KPLC will cater for the accommodation and air travel expenses of their representatives.

A.8. On receipt of the copper wire Kenya Power 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 Kenya Power, any spool of copper winding wire which upon examination, test or use fail to meet any or all of the requirements in the specification.

APPENDIX B. TECHNICAL DOCUMENTATION (NORMATIVE)

B.1. The bidder shall submit its tender complete with technical documents for tender evaluation. The technical documents to be submitted (all in English language) for tender evaluation shall include the following:

a) Fully filled clause by clause guaranteed technical particulars (GTP) signed by the manufacturer;

b) Copies of the Manufacturer's catalogues, brochures, drawings giving all relevant dimensions, Wiring diagram / Schematic Diagram 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;

e) Copies of required type test reports by a third party testing laboratory accredited to ISO/IEC 17025;

f) Copy of accreditation certificate to ISO/IEC 17025 for the third party testing laboratory and

g) Manufacturer and sub-contracted test lab test equipment and their calibration certificates

B.2. The successful bidder (supplier) shall submit the following documents/details to The Kenya Power & Lighting Company for approval before manufacture:

a) Fully filled clause by clause Guaranteed Technical Particulars (GTPs) stamped and signed by the manufacturer **(these are not the ones submitted with the tender)**;

b) Detailed hard copy Design Drawings with details of composite poles to be manufactured for KPLC,

c) Detailed test program to be used during factory testing,

d) Marking details and method to be used in marking the copper winding wire rolls.

e) 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 composite poles for The Kenya Power & Lighting Company

APPENDIX C. QUALITY MANAGEMENT SYSTEM

C.1. The supplier shall submit a quality assurance plan (QAP) that will be used to ensure that the raw material, manufacturing process, tests and documentation, will fulfill the requirements stated in the contract documents, standards, specifications and regulations.

C.2. The QAP shall be based on and include relevant parts to fulfill the requirements of ISO 9001:2015.

C.3. The Manufacturer's Declaration of Conformity to reference standards and copies of quality management certifications including copy of valid and relevant ISO 9001: 2015 certificate shall be submitted with the tender for evaluation.

C.4. The bidder shall indicate the delivery time of the copper winding wire and the manufacturer's monthly and annual production capacity and experience in the production of the winding copper wire for Kenya Power.

APPENDIX D: WARRANTY

D.1. The supplier/manufacturer warrants the purchaser that all goods supplied under this contract shall have no defect arising from design, materials or workmanship.

D.2. A warranty of 60 months from the date of delivery of the winding copper wires to KPLC store shall be offered by the manufacturer for the winding copper wires.

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E: GUARANTEED TECHNICAL PARTICULARS (Normative)

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 suppliers' capacity and experience; and copies of complete type test certificates and test reports for tender evaluation, all in English Language)

Tender No. .....

Bidder's name and Address.....

Clause number	DESCRIPTION		Bidder's offer
Manufacturer's Name and address		Specify	
Country of Manufacture		Specify	
1.	Scope	State	
2.0	Standard of manufacture	state	
4.	**Requirements**		
4.1.1	Service Conditions	Specify	
4.2	**Design and construction**		
4.2.1.1	Standard of design and manufacturer	Specify	
4.2.1.2	Complete wires to be smooth and free from defects	state	
4.2.1.3	Material of the copper winding wire and grade	state	
	Application for the copper winding wires	state	

Clause number	DESCRIPTION		Bidder's offer
4.2.1.4	Point of use and applicable temperature	specify	
4.2.1.5	Material Resistivity at100 °C	Specify	
4.2.1.6	Material Density at 100 °C	Specify	
4.2.1.7	Material Specific Heat at 100 °C	Specify	
4.2.1.8	Suitability for use	Specify	
4.2.1.9	Grade of wire	Specify	
	With or without Bonding Layer	Specify	
4.2.1.10	The insulation and temperature class	state	
4.2.1.11	Type of wire covering	specify	
4.2.2	**Specific Functional Requirements**		
4.2.2.1	Dimensions of copper winding wire on offer	State	
4.2.2.2	**Mechanical properties of the copper windings wires offered**		
	Elongation (%)	state	
	Springiness	state	
	Resistance to abrasion	state	
4.2.2.3	**Electrical Properties of the copper windings wires offered**		
	Electrical Resistance (Ω)	specify	
	Breakdown Voltage (kV)	Specify	

Clause number	DESCRIPTION		Bidder's offer
	Continuity of Insulation(MΩ)	specify	
	Dielectric dissipation factor(pC)	Specify	
4.2.2.4	Chemical properties as per IEC 60317-0-1	List submitted Tests	
4.2.2.5	Thermal properties as per IEC 60317-0-1	List submitted Tests	
5	**Marking and Packaging**		
5.1.1 & 5.1.2	Method of packaging	Specify	
5.1.3	Joints on conductor	specify	
	Certification that there no joints	state	
5.2	**Marking**		
	Marking permanent and legibly **ALL** information in specification.	state	
	APPENDICES		
A.1	Test standard	State	
A.2	Responsibility of type and routine testing.	Sate	
A.3	Copies of previous Test Reports	Attach	
A.4	Name and address of third party Testing laboratory	state	
	Attach of valid accreditation Certificate	state	
	Scope of Accreditation	Attach	

Clause number	DESCRIPTION		Bidder's offer
A.5	Allow Inspection of the manufacturing Facility and Quality Management system	State compliance	
A.6	Allow for Factory Acceptance tests of the copper winding wire	State compliance	
A.7	Test certificates and calibration certificates to be submitted by supplier to KPLC for approval before supply/delivery	Provide	
A.8	Inspection at the stores and replacement of rejected items	State compliance	
B	**TECHNICAL DOCUMENTATION**		
B.1	Documents submitted with tender for evaluation	List	
B.2	Documents to be submitted for approval before manufacture	List	
C	**Quality Management System**		
C.1	Quality Assurance program	Attach copy	
C.2	Valid copy of ISO 9001:2015	Attach	
C.3	Declaration of Conformity to standard	Attach/state	
C.4	Delivery time of the copper rewinding wire	State	
	Manufacturer's experience	state	

Clause number	DESCRIPTION		Bidder's offer
	Manufacturing Capacity (Tonnes per month)	Provide	
	List of previous customers	Provide	
	Customer reference letters	Provide	
D	**WARRANTY**		
D1&D2	warranty period of the delivered copper winding wires	Provide	
Others	Statement of compliance to specification (indicate deviations if any & supporting documents)	State compliance	

NOTE:

1) Bidders shall give full details of the item(s) on offer as per the specification and applicable standards. The details provided shall conform to the test reports and their certificates, as well as labeled drawings complete with dimensions, catalogues and/or brochures for the purpose of tender evaluation.

2) Bidders should note that the above Guaranteed Technical Particulars Schedules must be fully completed and submitted with the bid. Wherever there is conflict between the GTPs and the clauses in the specification, the clauses in the specification take precedence. Failure to complete the schedules shall lead to rejection of the bid.

3) Guaranteed values shall be specified.

** Words like 'agreed', 'confirmed', 'As per KPLC specifications', Yes, etc. shall not be accepted and shall be considered non-responsive.*

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Manufacturer's Name, Signature, Stamp and Date