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ANNEX A: Technical Particulars

0.1 Circulation List

COPY NO.	COPY HOLDER
1	Research & Development Manager
2	Supplies Manager
3	Stores & Stock Control Manager
4	Technical Services Manager
5	Transmission Manager
6	Assistant Manager, Technical Audit

0.2 Amendment Record

Rev No.	Date (YYYY-MM-DD)	Description of Change	Prepared by (Name & Signature)	Approved by (Name & Signature)
1	2008-02-25	1) Separate categories to cover installations along the coast and inland. 2) More details in the ratings	S. Kimitei	

FOREWORD

This specification has been prepared by the Research and Development Department in liaison with the Energy Transmission Division both of The Kenya Power and Lighting Company Limited (KPLC) and it lays down requirements for 132kV Current Transformers (132kV CT). It is intended for use by KPLC in purchasing the equipment.

It shall be the responsibility of the manufacturer to ensure adequacy of the design and good engineering practice in the manufacture of the current transformers for KPLC. The manufacturer 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 newly manufactured current transformers for use with electrical measuring instruments and electrical protective devices for system highest voltage of 145kV at power frequency of 50Hz.

1.2 This specification covers Types/CT Ratios given in clause 4.3 and the following categories of current transformers:

1.2.1 132kV Current Transformer, Pollution Level: Heavy (specific creepage distance of 25mm/kV) – For installations inland, cities and suburbs of cities.

1.2.2 132kV Current Transformer, Pollution Level: Very Heavy (specific creepage distance of 31mm/kV)– For installations very close to the coast, areas exposed to sea spray or very strong and polluting winds from the sea.

Note: The category and type required shall be specified on the schedule of requirements in the tender document.

2. REFERENCES

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

IEC 60044-1: Instrument Transformers – Part 1: Current Transformers

IEC 60815: Guide for the selection of insulators in respect of polluted conditions

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

4.1.1 Site Conditions

The site conditions under which the current transformers shall operate are specified in clause 4.3. The mean isokeraunic level is up to 180 thunderstorm days per year and average ambient temperature is +30°C with a minimum of -1°C and a maximum of +40°C.

4.1.2 System Conditions

The current transformer will be connected to overhead system operating at a nominal voltage of 132kV and maximum voltage of 145kV, 50Hz and are generally of earthed construction i.e with continuous aerial earth wire.

4.2 DESIGN AND CONSTRUCTION

4.2.1 The current transformer (CT) shall be designed and manufactured to IEC 60044-1 and the requirements of this specification.

4.2.2 The current transformer shall be outdoor; oil insulated and hermetically sealed type. The porcelain portion of the current transformer shall be made of high-grade brown-glazed porcelain.

4.2.3 The current transformer shall be suitable for vertical installation on a steel structure.

4.2.4 All external parts of the current transformer shall be resistant to atmospheric corrosion.

4.2.5 The current transformer shall have primary, secondary and earth terminals.

4.2.5.1 The primary terminal shall be of high conductivity copper, tin-plated, suitable for connection of both copper and aluminium conductors. It shall have palm clamp connectors with 2 No. U – bolts suitable for both stranded conductor and tube connection. Conductor overall diameter being 18.3-25mm and busbar tubes of 76.2mm diameter.

4.2.5.2 The secondary terminals of the current transformer shall be wired to a terminal box and earthed at one point. The terminal box shall be weatherproof with a cable plate at the bottom and shall be covered with removable plate. The terminal box shall be capable of accommodating up to 12 secondary terminals each suitable for conductor size of up to 3.2mm diameter.

4.2.6 The current transformer shall have cores as per clause 4.3. The ratio selection shall be done on the secondary side.

4.2.6.1 The protection cores shall be suitable for conventional overcurrent and for true transformation of the fully asymmetrical fault currents.

4.2.6.2 The measuring core shall have high accuracy (low loss) and low saturation levels.

4.3 **Ratings**

The ratings of the current transformer shall be as indicated in Table 1.

Table 1: Ratings

Description/Category	**132kV CT, Pollution Level: Heavy**	**132kV CT, Pollution Level: Very Heavy**
Site Conditions	Areas inland, cities, suburbs of cities and altitude of 1000-2200m above sea level.	Areas very close to the coast, areas exposed to sea spray or very strong and polluting winds from the sea and altitude less than 1000m above sea level.
Rated voltage and frequency	145kV, 50Hz	145kV, 50Hz
Minimum creepage of insulator	3625mm	4495mm
Minimum lightning impulse withstand voltage	750kV (peak)	650kV (peak)
Minimum power frequency withstand voltage	325kV (rms)	275kV (rms)
Overload factor	1.5	1.5
Rated short circuit withstand	31.5kA, 3 seconds	31.5kA, 3 seconds

Additional ratings (for both categories)

		TYPE I	TYPE II	TYPE III	TYPE IV
Rated primary current		600A	100A	50A	800A
CT ratio		600/300/1	100/50/1	50/25/1	800/400/200/1
Rated secondary current		1A	1A	1A	1A
Accuracy class and rated burden	Core 1	Class 0.5, 15VA	Class 0.5, 15VA	Class 0.5, 15VA	Class 0.5, 15VA
	Core 2	Class 5P20, 15VA	Class 5P20, 15VA	Class 5P20, 15VA	Class 5P20, 15VA
	Core 3	Class X, V_k = 350V, Ik≤ 30mA	Class X, V_k = 350V, Ik≤ 30mA	Class X, V_k = 350V, Ik≤ 30mA	Class X, V_k = 350V, Ik≤ 30mA
	Core 4	Class X, V_k = 350V, Ik≤ 30mA	-	-	Class X, V_k = 350V, Ik≤ 30mA

5. TESTS AND INSPECTION

5.1 The current transformer shall be inspected and tested in accordance with the requirements of this specification and IEC 60044-1. It shall be the responsibility of the manufacturer to perform or to have performed the tests specified.

5.2 Certified true copies of previous type test reports by the relevant International or 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.

Copies of Type Test Reports to be submitted shall include the following tests as per IEC 60044-1:

5.2.1 Short-time current tests;
5.2.2 Temperature rise test;
5.2.3 Lightning impulse test (with both positive and negative polarity – fifteen consecutive impulses of each polarity);
5.2.4 Wet test for outdoor type transformers;

5.2.5 Determination of errors;

5.3 Routine test reports for the current transformers to be supplied shall be submitted to KPLC for approval before shipment/delivery of the goods. KPLC Engineers (2) shall witness tests at the factory before shipment.

Tests to be witnessed by KPLC Engineers at the factory shall include the following:

5.3.1 Verification of terminal markings;
5.3.2 Power-frequency withstand test on primary winding;
5.3.3 Partial discharge measurement;
5.3.4 Power-frequency withstand tests on secondary winding;
5.3.5 Inter-turn overvoltage test;
5.3.6 Determination of errors.

6. MARKING AND LABELLING

6.1 The current transformer shall be fitted with a permanent rating plate indicating the following:

a) The manufacturer's name or identification mark;
b) The type reference number and serial number;
c) The rated primary and secondary current;
d) The rated frequency;
e) The rated output and the corresponding accuracy class of the cores;
f) The highest voltage of equipment (e.g. 145kV);
g) The rated insulation level;
h) The class of insulation;
i) The short-time current ratings and time;
j) The rated continuous thermal current.

All the marking shall be by engraving (or superior method), permanent and legible.

6.2 The terminals shall be marked clearly and indelibly and in accordance with IEC 60044-1. The terminal marking shall consist of letters followed by numbers. The letters shall be in block capitals.

6.3 A set of three (3) original hard cover installation and technical manuals for the instrument transformers shall be supplied with the equipment.

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

Tender No..... Category:.....

Clause	Description		Bidder's offer
	Manufacturer, Country & Type Reference No./Model		
4.1	Service Conditions		
4.2	Applicable Standard(s)		
4.2.2	Type and insulators		
4.2.3	Installation		
4.2.5	Terminals	Primary	
		Secondary	
4.2.6	**RATINGS**		
	Rated Primary Current		
	Rated Secondary Current		
	Rated Frequency		
	Minimum Creepage Distance of Insulator		
	Lightning impulse withstand voltage, primary winding		
	Power frequency withstand voltage, primary winding, r.m.s.		
	Power frequency withstand voltage, secondary winding, r.m.s.		
	Accuracy class and rated burden	Core 1	
		Core 2	
		Core 3	
		Core 4	
5.2	List of Type Test Reports submitted (indicate Test Report Numbers)		
5.3	List of Tests to be witnessed at factory		
6	Marking		
	List of catalogues, brochures, drawings, technical data, test reports and customer sales records submitted to support the offer		

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Manufacturer's Name, Signature, Stamp and Date

Issued by: Research and Development Department	Authorized by: Research and Development Manager
Signed:	Signed:
Date: 2008-03-19	Date: 2008-03-19