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0.1 Circulation List

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

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	2010-04-06	Cancels and replaces 3rd Issue Rev 3 dated 2004-10-26	S. Kimitei	G. Owuor

FOREWORD

This specification has been prepared by the Research and Development Department in collaboration with Technical Services Department both of The Kenya Power and Lighting Company Limited (KPLC) and it lays down requirements for 132kV Circuit Breakers. It is intended for use by KPLC in purchasing the equipment.

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 outdoor 132kV SF_6 circuit breaker (3 phase) complete with controls, operating mechanism and ancillary equipment.

1.2 This specification is for the following circuit breakers:

(i) Triple pole operated circuit breaker

(ii) Single pole operated circuit breaker

Note: The type required shall be stated on the schedule of requirements in the tender.

The specification also covers inspection and test of the circuit breaker 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 132kV circuit breaker acceptable for use in the company (KPLC) and it shall be the responsibility of the Manufacturer to ensure adequacy of the design, good workmanship and good engineering practice in the manufacture of the circuit breakers for KPLC.

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

2. REFERENCE STANDARDS

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.

IEC 62271-100: High Voltage Switchgear and Controlgear - Part 100: High Voltage Alternating Current Circuit Breakers.

IEC 60376: Specification and acceptance of new sulphur hexafluoride.

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 The Circuit Breakers shall be suitable for continuous operation outdoors in tropical areas at altitudes of up to 2200m above sea level, humidity of up to 90%, average ambient temperature of +30°C with a minimum of -1°C and a maximum of +40°C and heavy saline conditions along the coast.

4.1.2 The circuit breaker shall be connected to an overhead system which is generally earthed i.e with a continuous aerial earth wire.

4.2. DESIGN AND CONSTRUCTION

4.2.1. The circuit breakers shall be single pole or three pole operated (as per requirement) , out-door type, SF_6 gas insulated and shall comply with the requirements of IEC 62271-100 and this specification.

4.2.2. The circuit breaker shall be live tank type.

4.2.3. All the three poles shall be interconnected by a suitable shaft, linked to the operating mechanism so that poles are operated simultaneously with a common gas pressure monitor (or independently for single pole operated type).

All the three poles of circuit breakers shall be operated by local electrical and remote/electrical controls from the mechanism in the housing.

4.2.4. The circuit breaker shall have SF_6 gas for electrical interrupting medium.

The SF_6 gas shall comply with the requirement of IEC 60376 and be suitable for use in the circuit breaker when it is operated under the service and system conditions specified.

Sufficient gas shall be provided for filling the circuit breaker at installation with additional 20% for any losses.

Gas filling equipment shall also be provided.

When the circuit breaker is in closed position a rapid fall in the SF_6 gas pressure, to a level below that at which safe operation is possible shall not result in tripping the circuit breaker. A remote alarm indication to signal this condition shall be provided.

4.2.5. Insulation creepage distance shall not be less than 25mm per kV of rated voltage between phases.

4.3. OPERATING MECHANISM

4.3.1. The operating mechanism shall be suitable for mounting at the circuit breaker supporting structure, and below the circuit beaker in a weather-proof, dust-proof, vermin-proof and well ventilated housing. The degree of protection shall be at least IP 54 as per IEC.

4.3.2. Operating duty shall be standard and operating mechanism shall be trip free during the entire closing sequence.

4.3.3. Operating mechanism shall be provided with motor wound spring mechanism with provision for hand charge.

Motor operating voltage shall be 110 Volts d.c.

4.3.4. A set of at least ten normally closed and ten normally open spare potential free contacts shall be provided for remote electrical indication as well as electrical interlocking and shall be wired to a terminal block in the housing.

4.3.5. A minimum of twenty (20) spare terminals shall be provided for connection to the current and voltage transformers.

4.3.6. The circuit breaker shall be provided with Local/Remote selector switch. The selection of local operation shall inhibit the operation of the circuit breaker from any remote source.

4.3.7. The circuit breaker shall be provided with a local switch for Open/Neutral/Close Operation.

4.3.8. Mechanically operated indication to show the status of the circuit breaker operations (open/close and springs charged/discharged) shall be provided.

4.3.9. The circuit breaker shall be provided with suitable terminals for connecting clamps for up to 3" outside diameter copper or aluminium tubes.

4.3.10 The circuit breaker interrupter contacts and arcing tips shall be copper tungsten.

4.3.11 The circuit breaker shall be provided with means to prevent contact pumping while the closing circuit remains energized, should the circuit breaker either fail to latch or be tripped during closing due to operation of the protective relays.

4.3.12 Mechanical interlock key arrangement shall be provided on the mechanism such that it will not be possible to withdraw the interlock key with circuit breaker in closed position.

4.3.13 The circuit breaker shall be provided with duplicate trip coils in order to facilitate duplication of protection tripping, where required.

4.3.14 The circuit breaker shall have separate operating mechanism for each pole.

4.4 RATINGS

The circuit breaker shall be of the following ratings:

Nominal System Voltage	132 kV
Highest Voltage of equipment	145 kV
Frequency	50 Hz
Rated normal current	2000 Amps
Rated short-time withstand current	40kA
Rated duration of short circuit	3 Sec.
Rated short circuit making current	80kA
First pole to clear factor	1.5
Operating sequence	0-0.3 sec – CO – 3 min - CO
Auxiliary D.C Voltage for closing & tripping coils	110 V d.c.
Auxiliary A.C Voltage	415/240 V, 50 Hz
Impulse withstand voltage	750 kV peak (1.2/50µs, dry)
One minute power frequency withstand voltage	325 kV r.m.s. (50Hz 60s, wet)
Creepage distance of insulator	3625 mm
Minimum clearance between phases	1475mm
Minimum clearance to earth	1270mm

4.5 QUALITY MANAGEMENT SYSTEM

4.5.1 The supplier shall submit a quality assurance plan/programme (QAP) that will be used to ensure that the circuit breaker design, material, manufacture, 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.

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

5. TESTS AND INSPECTION

5.1 Type and Routine Tests shall be done in accordance with the requirements of IEC 62271-100 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 Type Test Certificates and Type Test Reports by the relevant International or National Testing/Standards Authority of the country of manufacture (or ISO/IEC 17025 accredited independent laboratory) shall be submitted with the offer for evaluation (all in English Language). A copy of accreditation certificate for the laboratory shall also be submitted.

The copies of Type Test Reports to be submitted shall, as a minimum, include the following tests in accordance with IEC 62271-100:

a) Dielectric tests
b) Radio interference voltage tests
c) Measurement of the resistance of the main circuit
d) Temperature-rise tests
e) Short-time withstand current and peak withstand current tests
f) Tightness tests
g) EMC tests
h) Mechanical operation test at ambient temperature
i) Short-circuit current making and breaking tests
j) Capacitive current switching tests: line-charging current breaking tests
k) Verification of degree of protection
l) Humidity test

5.3 Routine test reports for the circuit breakers to be supplied shall be submitted to KPLC for approval before shipment/delivery of the goods. KPLC intends to send two engineers to witness the following tests at the factory before shipment:

a) Dielectric test on main circuit
b) Dielectric test on auxiliary and control circuits
c) Measurement of the resistance of the main circuit
d) Tightness test
e) Design and visual checks
f) Mechanical operating tests

5.4 On receipt of the circuit breaker KPLC will inspect it and may perform or have performed any of the relevant tests in order to verify compliance with the specification. The manufacturer shall replace/rectify without charge to KPLC, circuit breakers which upon examination, test or use fail to meet any or all of the requirements in the specification.

6. MARKING, LABELLING AND INSTRUCTIONS

6.1 The nameplates of the circuit breaker and its operating devices shall be marked in accordance with clause 5.10 of IEC 62271-100. The nameplate shall be visible in the position of normal service and installation.

All markings shall be permanent.

6.2 A set of five (5) Original Hard Cover Installation, Operation and Maintenance Manuals for the circuit breakers shall be supplied with the equipment.

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ANNEX A: Guaranteed Technical Particulars *(to be filled and signed by the Manufacturer and submitted together with copies of relevant Manufacturer's catalogues, brochures, drawings, technical data, sales records and copies of type test certificates and type test reports for tender evaluation)*

Tender No .....

	DESCRIPTION	BIDDER'S OFFER
1	Manufacturer's name and address	
2	Type reference number/model of circuit breaker offered	
3	Operating temperature, humidity and altitude	
4	Applicable Standard(s)	
5	Nominal system voltage (kV)	

6	Highest voltage of equipment (kV)	
7	Rated frequency (Hz)	
8	Rated normal current (A)	
9	Rated short-time withstand current (kA)	
10	Rated duration of short circuit (seconds)	
11	Rated short circuit making current (kA)	
12	First pole to clear factor	
13	Operating sequence	
14	Auxiliary D.C Voltage for closing & tripping coils (V)	
15	Auxiliary A.C Voltage (V)	
16	Impulse withstand voltage (1.2/50μs, dry) kVp	
17	One minute power frequency withstand voltage (50Hz 60s, wet) kV	
18	Creepage distance of insulator (mm)	
19	Minimum clearance between phases (mm)	
20	Minimum clearance to earth (mm)	
21	Rated filling pressure for operation and interruption	
22	Design & Construction (also indicate components and accessories that the circuit breaker shall be supplied complete with)	
23	Operating Mechanism (also indicate features)	
24	List of copies of type test certificates and type test reports submitted	
25	Name and address of International or National Testing/Standards Authority or ISO/IEC 17025 accredited independent laboratory where type tests were carried out (including copy of accreditation certificate)	
26	List of tests to be witnessed at the factory	
27	Marking (indicate parameters and method of marking to be used during manufacture)	
28	Deviations from tender specifications and supporting data, test reports, technical documents etc.	
29	Copy of ISO 9001:2008 Certificate submitted (indicate validity)	
30	Quality Assurance Programme	

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Manufacturer's Name, Signature, Stamp and Date