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0.1 Circulation List

COPY NO.	COPY HOLDER
1	Research & Development Manager
2	Procurement Manager
Electronic copy (pdf) on KPLC 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 2 Rev 0	2012-03-22	Cancels and replaces Issue 1 Rev 2 dated 2010-01-06 and all previous issues	S. Kimotei	G.K. Gathige

FOREWORD

This specification has been prepared by the Research and Development Department in collaboration with Transmission Department both of The Kenya Power and Lighting Company Limited (Kenya Power) and it lays down requirements for 132kV Surge Arresters. It is intended for use by Kenya Power in purchasing the items.

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

1. SCOPE

This specification is for metal-oxide type surge arresters without spark gaps for a.c. system operated at a nominal voltage of 132kV 50Hz.

The specification also covers inspection and test of the surge arresters 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 surge arresters acceptable for use in the company 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 surge arresters for Kenya Power.

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

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.

ISO 1461: Metallic Coatings – Hot dip galvanized coatings on fabricated ferrous products – Requirements

IEC 60099-4: Metal-oxide surge arresters without gaps for a.c. systems

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 surge arresters shall be suitable for continuous outdoor operation in tropical areas with the following conditions:

a) Altitude: Up to 2200 metres 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 "Very *Heavy*" (Pollution level IV: 31mm/kV) according to IEC 60815. This covers installations inland, cities and suburbs of cities as well as installations very close to the coast, areas exposed to sea spray or very strong and polluting winds from the sea.

e) High lightning intensity (isokeraunic level over 180 thunderstorm days per year)

4.1.2 The surge arrestor shall be connected between phase and earth to system that is generally earthed and with the following characteristics:

System Highest Voltage & frequency	145kV, 50Hz
Maximum Duration of Earth Fault	3 seconds
Power frequency withstand voltage, 50Hz 60s, wet	275kV rms
System lightning impulse withstand, 1.2/50μs, dry	650kV peak

4.2. DESIGN AND CONSTRUCTION

4.2.1 The surge arrester shall be designed and manufactured to IEC 60099-4 and the requirements of this specification.

4.2.2 The surge arrester shall be non-linear metal-oxide resistor type without spark gaps designed to limit voltage surges on a.c. power circuits.

4.2.3 The surge arrester shall provide primary protection for switchgear, transformers and other high voltage equipment against atmospheric and switching overvoltages.

4.2.4 The metal-oxide used shall be of quality to ensure thermal stability under service duty of the surge arrester.

4.2.5 The arrester shall be single column with no stack, self-supported and shall be installed between phase and earth.

4.2.6 The complete surge arrester shall be housed in a silicon rubber housing which shall be dimensioned to provide a leak free interface with the end caps.

4.2.7 The surge arrester shall be hermetically sealed to ensure no moisture absorption or deterioration of the metal-oxide element of the surge arrester. The design and construction shall prevent explosive shattering of the housing in the event that the arrester is stressed in excess of its design capability.

4.2.8 Each surge arrester shall be complete with a surge counter and a leakage current indicator.

4.2.9 Each surge arrester shall be complete with a disconnector/fault indicator device for disconnecting the arrester from the system in the event of arrester failure, to prevent a persistent fault on the system and to give visible indication of the failed arrester. Technical details (including interpretation of the condition indication) of the device shall be submitted with the bid.

4.2.10 Each surge arrester shall be supplied complete with fixing accessories, line terminal and earth terminal. It shall be fitted with conductor connector (suitable for conductor sizes of upto 400mm², either copper or aluminium).

The steel plates or straps and all ferrous parts shall be hot dip galvanized in accordance with ISO 1461.

4.2.11 Each surge arrester shall be complete with an insulating base. The mounting shall be on a pitch circle diameter (p.c.d.) of 127mm.

4.3. RATING

The ratings of the surge arrester shall be as indicated below:-

Description	Requirement
System rated voltage and frequency	132 kV, 50Hz
System highest voltage	145kV
Nominal discharge current	10 kA
Long duration discharge class	3
Continuous operating voltage	106kV

Creepage distance	4495mm
Internal partial discharges	≤ 10pc
Insulation withstand of arrester housing (as per IEC 60099-4 clause 6.1)	a) The lightning impulse protection level of the arrester multiplied by 1.3
	b) Power-frequency withstand voltage with a peak value equal to the switching impulse protection level multiplied by 1.06 for a duration of 1 min

ADDITIONAL INFORMATION TO BE DECLARED BY THE MANUFACTURER (to be used during evaluation and testing)	
Description	**Requirement**
Long duration impulse current withstand (2 ms)	Manufacturer to state
High current impulse withstand (4/10 µs)	100kA
Rated short circuit current (0,2 s)	65.0kA
Maximum residual voltage at :	
5 kA 8/20 µs	Manufacturer to state
10 kA 8/20 µs	≤ 303kVp
20 kA 8/20 µs	Manufacturer to state
40 kA 8/20 µs	Manufacturer to state
500 A 30/60 µs	Manufacturer to state
1 kA 30/60 µs	Manufacturer to state
2 kA 30/60 µs	Manufacturer to state
Temporary overvoltage for 1 s	≥ 150kV
Temporary overvoltage for 10 s	≥ 143kV
Energy discharge capability	≥ 7.50kJ/kVr
Lightning impulse protection level of the surge arrester	Manufacturer to state
Switching impulse protection level of the surge arrester	Manufacturer to state
Power-frequency withstand voltage for a duration of 1 min	Manufacturer to state
Insulation withstand of arrester housing (as per IEC 60099-4 clause 6.1)	Manufacturer to state
Special consideration for application at altitudes higher than 1000m (required is 2200m)	Manufacturer to state
Mechanical data	
Cantilever load, dynamic	≥ 2500N(Typical)
Overall height	>1450mm
Construction	Open Cage design
Housing	Silicone rubber directly molded onto MOV blocks

5. TESTS AND INSPECTION

5.1 Type tests, routine tests, acceptance tests and sampling shall be done in accordance with IEC 60099-4 and the requirements of 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 Certificates and Type Test Reports by accredited and independent test laboratory shall be submitted with the offer for evaluation (all in English Language). A copy of the accreditation certificate for the laboratory to ISO/IEC 17025 shall also be submitted with the tender for evaluation.

Copies of type test certificates and type test reports (as per IEC 60099-4) to be submitted shall include the following;

5.2.1 Insulation withstand tests;
5.2.2 Residual voltage tests;
5.2.3 Long duration current impulse withstand test;
5.2.4 Operating duty tests;
5.2.5 Partial discharge tests;
5.2.6 Short circuit test;
5.2.7 Bending moment test (cantilever);
5.2.8 Environmental test;
5.2.9 Arrester disconnector/fault indicator tests;
5.2.10 Radio interference voltage tests.

In addition, test reports for the following tests to the applicable IEC standard for the silicone insulating material used shall be submitted for tender evaluation.

- UV test
- Thermal endurance test
- Flammability test
- Long term water immersion test
- Dielectric Testing
- Tracking and Erosion test

5.3 Routine/sample test reports for the surge arresters to be supplied shall be submitted to Kenya Power for approval before shipment/delivery of the goods. Kenya Power Engineers will witness tests at the factory before shipment.

Routine and Acceptance tests to be witnessed by Kenya Power Engineers at the factory shall include the following:

5.3.1 Measurement of reference voltage;
5.3.2 Residual voltage test;
5.3.3 Measurement of power frequency withstand voltage on the complete arrester;
5.3.4 Lightning impulse residual voltage on the complete arrester;
5.3.5 Partial discharge test.
5.3.6 Short circuit test
5.3.7 Bending Moment test (Cantilever)
5.3.8 Environmental tests

In addition the following tests on the insulating material shall be carried out by the manufacturer and witnessed by Kenya Power engineers during the factory visit:

- UV test
- Thermal endurance test
- Flammability test
- Long term water immersion test
- Dielectric Testing
- Tracking and Erosion test

6. MARKING, PACKING AND INSTRUCTIONS

6.1 The following information shall be marked indelibly and legibly on a nameplate permanently attached to each surge arrester:

a) continuous operating voltage (kV);
b) rated voltage (kV);
c) rated frequency (Hz);
d) nominal discharge current (kA);
e) the manufacturer's name, type and identification of the complete arrester;
f) the year of manufacture;
g) serial number;
h) line discharge class;
i) rated short-circuit withstand current (kA);
j) contamination withstand level of the enclosure as per IEC 60815.

All marking shall be by engraving (or superior method) and shall include the units of measurements.

6.2 The surge arresters shall be supplied packed in wooden crates which are reinforced and held closed by external steel wire bindings. Each crate shall be internally braced

to permit stacking and the steel wire bindings shall be designed to keep the crate firmly closed and permit easy and rapid opening at time of installation.

The crates shall then be stacked on sturdy wood pallet. The assembly shall be held tightly in place with steel bands and protected against moisture by a complete covering of heat-shrinkable polyethylene film.

6.3 A set of three (3) original installation and technical manuals for the surge arresters shall be supplied with the equipment. Details on the surge counter and disconnector/fault indicator device shall also be submitted during deliver (as well as for tender evaluation).

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

Tender No.....

Clause Number	Description	Bidder's offer
	Manufacturer & Country of manufacture	
	Type Reference No./Model No.	
4.1	Service Conditions	
4.2.1	Applicable Standard(s)	
4.2.2-4	Type and design	
4.2.5-6	Insulator type and sealing	
4.2.7	Pressure relief (and technical details)	
4.2.8	Surge counter & condition indicator (and technical details)	
	Grading ring	
4.2.9	Arrester disconnector/fault indicator device	
4.2.10	Fixing accessories, line and earth terminals	
4.2.11	Insulating base and mounting p.c.d.	
4.3	**RATINGS**	
	System rated voltage and frequency	
	System highest voltage	
	Nominal discharge current	
	Long duration discharge class	
	Continuous operating voltage	
	Creepage distance of insulator	
	Insulation withstand of arrester housing (as per IEC 60099-4 clause 6.1)	
	Additional information (parameters to be declared by the manufacturer and used for tender evaluation and during factory acceptance testing)	
	Long duration impulse current withstand (2 ms)	
	High current impulse withstand (4/10 µs)	
	Rated short circuit current (0,2 s)	
	Maximum residual voltage at :	
	5 kA 8/20 µs	
	10 kA 8/20 µs	
	20 kA 8/20 µs	

	40 kA 8/20 µs	
	500 A 30/60 µs	
	1 kA 30/60 µs	
	2 kA 30/60 µs	
	Temporary overvoltage for 1 s	
	Temporary overvoltage for 10 s	
	Energy discharge capability of the surge arrester offered	
	Lightning impulse protection level of the surge arrester offered	
	Switching impulse protection level of the surge arrester offered	
	Power-frequency withstand voltage for a duration of 1 min	
	Special consideration for application at altitudes higher than 1000m (that is 2200m for this tender)	
	Mechanical data	
	Cantilever load, dynamic (N)	
	Construction (open cage design is required)	
	Overall height (mm)	
	Housing (materials)	
5.2	Submit for tender evaluation the list of Type Test Reports submitted (indicate Test Report Numbers, Testing Authority and Contact Addresses). Accreditation certificate (to ISO/IEC 17025) for the test laboratory is required	
5.3	Submit for tender evaluation the list of Tests to be witnessed by Kenya Power Engineers at the factory	
6	Marking (indicate parameters to be marked and method of marking)	
	Packing	
	Installation and technical manuals	
	List of catalogues, brochures, drawings, technical data and customer sales records submitted to support the offer.	
	Statement of compliance and or deviations from Tender Specifications	

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Manufacturer's Name, Signature, Stamp and Date