



TITLE:  
**SPECIFICATION FOR 11kV & 33  
kV SURGE ARRESTERS FOR  
DISTRIBUTION SYSTEMS**

Doc. No.	KP1/6C.1/13/TSP/11/03 6
Issue No.	3
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## ANNEX A: SCHEDULE OF GUARANTEED TECHNICAL PARTICULARS FOR OFFERED INSULATORS

*(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)*

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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 2 Rev. 0	2011-01-17	Cancels and replaces Issue 1 rev. 0 dated 2006-06-27 and all previous issues	S. Kimiti	G. K. Gathige
Issue 3 Rev. 0	2015-07-31	New Issue	M. Apudo N. Wairimu	Eng. Dr. Peter Kimemia
Issue 3 Rev. 1	2015-10-19	Site pollution severity (SPS) and specific creepage distance	M. Apudo	Eng. Dr. 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 minimum requirements for 11kV and 33 kV distribution surge arresters. It intended for use by KPLC in purchasing the surge arresters.

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

**1. SCOPE**

- 1.1. This specification is for a non-linear metal-oxide resistor type, 10kA distribution class surge arresters without spark gaps designed to limit voltage surges on a.c. power circuits operated at 11kV with highest system voltage of 12 kV at 50 Hz and 33 kV with highest system voltage of 36 kV at 50 Hz.
- 1.2. 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.
- 1.3. The specification stipulates the minimum requirements for 11kV and 33 kV surge arresters acceptable for use in the company and it shall be the responsibility of the supplier 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 documents were referred to during the preparation of this specification; in case of conflict, the requirements of this specification shall take precedence.

- ISO 1461:           Metallic Coatings – Hot dip galvanized coatings on fabricated ferrous products – Requirements.
- ISO 48:             Rubber, vulcanized or thermoplastic – Determination of hardness (hardness between 10 IRHD and 100 IRHD),
- IEC 60099:         Surge arresters - Part 4: Metal-oxide surge arresters without gaps for a.c. systems - Part 5: Selection and application recommendations

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- IEC 60270: High-voltage test techniques — Partial discharge measurements
- IEC 60721-3-2: Classification of environmental conditions. Classification of groups of environmental parameters and their severities. Transportation
- IEC 60071: Insulation co-ordination -- Part 1 definitions, principles and rules; -- Part 2: Application Guide
- IEC 60507: Artificial pollution tests on high voltage insulators to be used on ac systems
- IEC/TS 60815-1: Selection and dimensioning of high-voltage insulators intended for use in polluted conditions –Part 1: Definitions, information and general principles
- ANSI/IEEE C62.11: Design Test Report Polymer Distribution Arresters
- IEEE Std C62.22: Guide for the application of metal-oxide surge arresters for alternating current systems.
- IEEE Std 592: IEEE Standard for Exposed Semiconducting Shields on High-Voltage Cable Joints and Separable Connectors

**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 and System Data**

4.1.1. The surge arresters shall be suitable for continuous operation outdoors 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) Annual mean isokeraunic level of up to 180 thunderstorm days.
- f) Seismic level (Horizontal acceleration). : 0.3 g (horizontal); 1.5g (vertical)

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4.1.2. The surge arrester shall be connected between phase and earth to an overhead system that is generally solidly earthed neutral 11kV and 33 kV-systems and with the following system characteristics shown in Table 1.

**Table 1: System requirements**

Particulars	Requirements	
	System highest voltage and frequency	12 kV, 50Hz
Maximum duration of earth fault	≤ 3 seconds	
Earth fault factor as per IEC 60099-4	1.4	
Maximum short circuit current, kA	20	
Discharge class as per IEC 60099-4	Class 2	
Power frequency withstand voltage, wet, kVrms	38	95
Lightning impulse withstand voltage, kVpk	95	200
Site pollution severity (SPS) as per IEC/TS 60815:2008	Inland - class d	Heavy
	Coastal/industrial – class e	Very Heavy
Specific creepage distance as per IEC/TS 60815:2008	Inland - class d	25mm/kV
	Coastal/industrial – class e	31mm/kV

**4.2. Design and Construction**

**4.2.1. General**

- 4.2.1.1. The surge arrester shall be designed and constructed in accordance with IEC 60099-4, IEEE Std C62.22 and the requirements of this specification. It shall be suitable for overvoltage protection of distribution networks.
- 4.2.1.2. The surge arrester shall have one non-linear metal-oxide resistors with highly non-linear voltage-current characteristics, connected in series, but having no integrated series or parallel spark gaps.
- 4.2.1.3. The metal-oxide used shall be of quality to ensure thermal stability under service duty of the surge arrester and shall be single column; self-supported and be installed between phase and earth.
- 4.2.1.4. The guaranteed protection characteristics of the surge arrester based on IEC 60099-5 and ANSI/IEEE Std C62.11.selection formulas shall be required to comply during tests, with all the withstand capabilities stated in Table 1 and the general arrangement of the surge arrester with all the features and accessories drawing shall be as per Annex B.

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**4.2.2. Housing**

- 4.2.2.1. The housing of the surge arrester shall be made of high quality reinforced high temperature vulcanized (HTV) silicone rubber based on dimethyl siloxane, which exhibit hydrophobicity with the capability to transfer hydrophobicity to the layer of pollution.
- 4.2.2.2. The reinforced HTV silicone rubber shall have a Shore 'A" hardness of not less than 60 as per ISO 48 and the track resistance of the sheath and shed materials shall meet the requirements of IEC 60587 Method 1 Class 1A4.5 or 1B4.5 or Method 2 Class 2A4.5.
- 4.2.2.3. The housings shall meet the requirements of IEEE Std. 592-1990 by demonstrating shield resistance of less than 5000Ω and capability of initiating two consecutive fault-current arcs to ground.
- 4.2.2.4. The surge arrester shall be designed and constructed in a manner so as to prevent explosive shattering relief capability (short circuit) as per Table 2.
- 4.2.2.5. The entire insulator housing shall have the rated withstand voltage given in Table 2 based on IEC 60099-4 clause 6.1 with creepage distance shall be based on Table 1 and tested as per IEC 60507.
- 4.2.2.6. Insulator sheds shall be open type, designed to minimize trapping of contamination. It shall be made of polymer having glazed brown or gray color. The silicon rubber housing shall be made by direct molding method.

**4.2.3. Over pressure relief device**

Arrester shall be provided with a pressure relief device, a means for relieving internal pressure in an arrester and preventing explosive shattering of the housing following prolonged passage of flow current or internal flashover of the arrester.

**4.2.4. Fault indicators**

Fault indicators shall give a clear visual indication of a failed arrester without disconnecting the arrester from the line. The device shall be an integrated part of the arrester and the working principle shall be based on the amplitude and duration of the arrester current, or on the temperature of the non-linear metal-oxide resistors.

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**4.2.5. Disconnectors**

4.2.5.1. Disconnectors shall be an integral part of the arrester to give a visual indication of a failed arrester by disconnecting it from the system while the line remains in operation after disconnection of the arrester. This shall be an explosive device triggered by the fault current; but shall extinguish the fault current.

4.2.5.2. The disconnector shall be incorporated in the arrester and shall withstand, without operating, long-duration current impulse test and operating duty tests as per IEC 60099-4 clause 6.12.

**4.2.6. Moisture Sealing**

4.2.6.1. The surge arrester shall be sealed (end caps) with a controlled permanent seal to ensure no moisture absorption or deterioration of the metal-oxide element of the surge arrester.

4.2.6.2. The supplier shall describe the moisture sealing system used and shall state his own experience with the design offered. The method of factory testing of the sealing shall be described. It is the discretion of KPLC either to accept or to ask the manufacturer to modify the surge arrester design and construction.

**4.2.7. Mounting Arrangement**

4.2.7.1. The surge arrester shall be supplied complete with an insulating mounting bracket made of a base polymer or cast resin. The device shall withstand each of the following tests without damage:

- a) Environmental tests –
  - (i) Temperature cycling tests
  - (ii) Salt mist tests in accordance with IEC 60099-4 clause 8.10
- b) Bending tests as per IEC 60099-4 clause 8.9

4.2.7.2. The mounting brackets shall be NEMA type mounting brackets to facilitate mounting of arresters on angle or channel iron type cross arms suitable for both horizontal and vertical mounting on a steel cross-arm (U-channel).

4.2.7.3. The brackets shall have fixing accessories and clamp connector suitable for both copper and aluminium conductors of up to 12.5mm diameter. (See Annex B). All parts shall be protected against corrosion.

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**4.2.8. Corrosion Protection:**

All metal parts shall be hot dip galvanized with average minimum coating thickness of 85µm in accordance with the ISO 1461 with exception to stainless steel. In all cases the supplier shall clearly mention the protective measure used when dissimilar metals are in contact.

**4.2.9. Terminals:**

Terminals shall be clamp type and shall be constructed for both copper and aluminium conductors of up to 12.5mm diameter and a continuous work shall be guaranteed without any deterioration. Full details of the design of terminals shall be submitted at the time of tendering and must receive KPLC approval.

**4.3. Characteristics**

The surge arresters shall be of the following minimum characteristics:

**Table 2: Technical protective data for Surge Arrester**

Guaranteed protective data for Arrester		Requirement	
Description		Requirement	
Maximum system voltage, $U_m$ , kV		12	36
Rated voltage, $U_r$ , kV		11	33
Maximum continuous operating voltage, kVrms	As per IEC 60099-4, $U_c$	9.6	28.8
Temporary overvoltage capability (TOV), kVrms	1 s	13.8	41.4
	10 s	13.1	39.2
Maximum residual voltage at steep, lightning and switching impulse current with current wave, kV	10kA (1/2 µs)	35.1	105.4
	5 kA (8/20 µs)	30.0	90.1
	10 kA (8/20 µs)	31.9	95.8
	20 kA(8/20 µs)	35.1	105.4
	40 kA (8/20 µs)	40.2	120.7
	250A (30/70 µs)	24.9	74.8
	500 A (30/70 µs)	25.8	77.4
	1 kA (30/70 µs)	26.9	80.7
	2 kA (30/70 µs)	28.1	84.5
Lightning impulse protective level, max, kV as per IEC 60099-5		60	130
Steep current impulse protective level, max, kV as per IEC 60099-5		65	140
Energy discharge capability , kJ/kV at $U_r$		≥ 4.5	
Long duration discharge class (current compliance)	Current, A	500	
	Duration , µs	2000	

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Guaranteed protective data for Arrester		
Description		Requirement
	Discharge tolerance, %	5
Accelerated ageing performance	Temperature, °C	115
	Time, hrs	100
	Watt loss	Continuous decreasing
	Operating duty characteristics (Discharge current withstand)	Two 4/10µs current wave (Ur), kA
	Low current at 2000µs, kApk	900
	Discharge tolerance, %	5
Partial discharge performance, pC as per IEC 60270.		< 10
Pressure relief withstand capability (Short circuit)	High symmetrical RMS (A), duration (s)	20 kA at 0.2s
	Low symmetrical RMS (A), duration (s)	2 kA at 1s
	Asymmetrical peak (A)	50 kA at 0.2s

**Table 3: Withstand capabilities of surge arrester housing**

Description	Units	Requirement	
Lightning impulse withstand voltage,	kVpk	95	200
Power frequency withstand voltage for 1 min, wet	kVrms	46	116
Creepage distance, 25mm/kV,	mm	300	900
Permissible head load static (SLL),	N	175	
Permissible head load dynamic (SLL),	N	250	
Short circuit withstand capability (rated short circuit (withstand) current Is)	kA	20	
Minimum permissible length of the active part	mm	135	145
Housing shield resistance	Ω	<5,000	
Number of units		1	

**NOTE:** Deviations from the values on Table 1 shall clearly be declared by the manufacturer in the table of **Guaranteed Technical Particulars (GTP)** in Annex A at the time of bidding for purposes of tender evaluation. Manufacturers shall be required to declare all the offered values in Table 1.

**4.4. QUALITY MANAGEMENT SYSTEM**

4.4.1. The supplier shall submit a quality assurance plan (QAP) that will be used to ensure that the surge arrester 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.

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- 4.4.2. 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.
- 4.4.3. 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 insulators being offered. A detailed list & contact addresses (including e-mail) of the manufacturer's previous customers outside the country of manufacture for the surge arrestor 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 60099-4, IEC 60587, IEEE std C62.11, IEEE std. 592 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 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 per Table 3 of IEC 60099-4 tests and as stated:
  - a) Insulation withstand of the arrester housing
  - b) Residual voltage tests
  - c) Long duration current impulse withstand tests
  - d) Operation duty tests
    - (i) Accelerated ageing tests
    - (ii) Verification of thermal section
    - (iii) Switching surge operating duty test
  - e) Pressure relief tests
  - f) Test of arrester disconnectors/fault indicators
  - g) Artificial pollution tests
  - h) Partial discharge tests
  - i) Seal leakage tests
  - j) Current distribution tests
  - k) Temporary overvoltage tests.
  - l) Radio interference voltage (RIV)

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**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 surge diverters 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 surge diverters to be supplied shall be submitted to KPLC for approval before shipment of the goods. Tests to be witnessed by KPLC Engineers at the factory before shipment shall be in accordance with IEC 60099-4, IEC 60587, KS C IEC 60099-4, ISO 48, IEEE std C62.22, IEEE std. 592 and this specification and shall include the following:

- a) Verification of dimensions
- b) Pressure relief tests
- c) Measurement of reference voltage (Uref)
- d) Residual voltage test.
- e) Seal leakage tests for arrester units with sealed housing
- f) Current distribution test.
- g) Measurement of power-frequency voltage on the complete arrester at the reference current measured at the bottom of the arrester.
- h) Lightning impulse residual voltage on the complete arrester or arrester unit at nominal discharge current
- i) Internal partial discharge test
- j) Thermal stability test

**5.5. MOV block requirements routine tests**

5.5.1. **Discharge voltage 5kA** - Each MOV block shall be subjected to a 5 kA discharge with a wave shape of 8/20 and the resulting discharge voltage measured with an accuracy of 1.5percent. This measured value must be stamped on the disc and used as the basic reference value in assembling multiple blocks into complete arresters.

5.5.2. **Rated Energy Test** - Each block will receive a single 8/20 high current impulse. The magnitude of the discharge current is maintained such that the resulting energy per discharge is greater than 196 +/- 10 percent joules per cubic centimeter of block material.

**5.6. Quality assurance tests**

5.6.1. **Square-wave energy test** - Sample blocks shall be subjected to a two shot series of high energy discharges which are increased in magnitude on successive series until the block

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fails. This indicates the ultimate energy capability by the magnitude of the energy absorbed on the last shot prior to failure. The minimum energy of the block will exceed 196 J/cc block material.

5.6.2. **High Current Test 65kA** - Sample blocks shall be subjected to two 65-kA discharges with permissible wave shape 4-6/10-15. After a minimum one-hour cooling period, blocks may have a maximum increase in 5-kA discharge voltage of less than 2%.

5.6.3. **AC Tests** - After the disc is energized to  $\geq 15$  mApk, the current is reduced to 3 mApk ( $I_{ref}$ ) and the reference voltage measured ( $V_{refpk}$ ). Then the voltage is reduced to MCOV where the watts loss and capacitive current are measured. Maximum watts loss must be  $\leq 0.035$  Watts per kV of MCOVpk for the block under test. The capacitive current must be  $0.30 \pm 0.10$  mA.

5.6.4. **Accelerated aging test** - A sample of blocks from each batch will be subjected to accelerated aging test. The blocks are energized at  $\geq$  MCOV at  $135^\circ$  C for 160 hours. At the conclusion of the test, the curve of watts loss vs. time has a negative slope, and the final/minimum watts loss must be  $\leq 1.08$  and the final/initial watts loss must be  $< 1.00$ . This test is equivalent to over 100 years at an operating temperature of  $40^\circ$  C.

**5.7. Arrester performance requirements:**

The following tests are to be done on 100% of the arresters. Certification that all arresters were tested must be supplied.

5.7.1. **Starting (Reference) Voltage** - The voltage necessary to produce 3 mA peak resistive current must be measured.

5.7.2. **Partial Discharge** – P.D must be measured and must be less than 10 pC with an applied voltage of 1.25 times MCOV or greater.

5.7.3. **Power Frequency Test** – Energize arrester for minimum of 1 second withstand at 1.25 times MCOV.

**5.8. Guarantee**

Bidder must provide certification that the supplier has at least 20 years' experience in manufacturing gapless polymer housed surge arresters and must have an installed base of at least 10,000,000 of these arresters in service.

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5.9. On receipt of the surge diverters 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

**NOTE: Bidders that cannot comply with section will not be considered.**

**6. MARKING AND PACKING**

**6.1 Marking**

The following information shall be marked indelibly and legibly on a nameplate permanently attached to the surge arrester in English language.

- a) Continuous operating voltage;
- b) Rated voltage;
- c) Rated frequency, if other than one of the standard frequencies (see 5.2);
- d) Nominal discharge current;
- e) Rated short-circuit withstand current in kilo amperes (kA).
- f) The manufacturer's name or trade mark, type and identification of the complete arrester;
- g) The year of manufacture;
- h) Line discharge class
- i) The letter, "PROPERTY OF KPLC"



**6.2 Packing**

6.2.1 The surge arrester shall be packed in such a manner as to protect it from damage during transportation and storage. The package shall bear the manufacturer's name, type and identification of the complete arrester.

6.2.2 Surge arresters enclosed within their package should withstand the transportation loads specified by the user in accordance with IEC 60721-3-2, but not less than Class 2M1.

**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:

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- a) Guaranteed Technical Particulars fully filled and signed by the manufacturer;
- b) Copies of the Manufacturer's catalogues, brochures, drawings and technical data;
- c) Sales records for previous five years and reference letters from at least four of the customers;
- d) Details of manufacturing capacity and the manufacturer's experience;
- e) Copies of required type test certificates and 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;
- g) Manufacturer's warranty and guarantee;
- h) 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:

- a) Guaranteed Technical Particulars fully filled and signed by the manufacturer;
- b) Design drawings & construction details of the insulators including 3-D views;
- c) 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;
- d) Test Program to be used after manufacture;
- e) Marking details and method to be used in marking each insulator;
- f) 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 insulators for The Kenya Power and Lighting Company Limited;
- g) 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, 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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**TITLE:**  
**SPECIFICATION FOR 11kV & 33  
 kV SURGE ARRESTERS FOR  
 DISTRIBUTION SYSTEMS**

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**ANNEX A: SCHEDULE OF GUARANTEED TECHNICAL PARTICULARS FOR OFFERED SURGE DIVERTERS** (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 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)

Tender No.....

Bidders Name and address.....

Clause	Description and KPLC requirements	Bidder's offer
	Name of Manufacturer	State
	Country of manufacture	State
	Type Reference No./Model No.	State
1	Scope	State
2	Design standards complied with	State
3	Terms and definitions	State
4.	Requirements	State
4.1	Service Conditions and system data	State
4.1.1	Environmental requirements	State
4.1.2	System requirements	
	System highest voltage and frequency	State values
	Maximum duration of earth fault	State values
	Earth fault factor as per IEC 60099-4	State values
	Maximum short circuit current, kA	State values
	Discharge class as per IEC 60099-4	State values
	Power frequency withstand voltage, wet, kVrms	State values
	Lightning impulse withstand voltage, kVpk	State values
	Site pollution severity (SPS) as per IEC/TS 60815:2008	State values
	Specific creepage distance as per IEC/TS 60815:2008	State
4.2	Design and Construction	
	Compliance with all the clauses	State
4.3	<b>RATINGS</b>	
	<b>Guaranteed protective data for arrester calculated as per IEC 60099-4 and IEEE Std C62.22</b>	
	<b>Description</b>	
	Maximum system voltage, Um, kV	State values

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Kenya Power

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Rated voltage, Ur, kV		State values
Maximum continuous operating voltage, kVrms	As per IEEE Std C62.22, MCOV	State values
Temporary overvoltage capability (TOV), kVrms	1 s	State values
	10 s	State values
Maximum residual voltage at steep, lightning and switching impulse current with current wave, kV	10kA (1/2 $\mu$ s)	State values
	5 kA (8/20 $\mu$ s)	State values
	10 kA (8/20 $\mu$ s)	State values
	20 kA(8/20 $\mu$ s)	State values
	40 kA (8/20 $\mu$ s)	State values
	250A (30/70 $\mu$ s)	State values
	500 A (30/70 $\mu$ s)	State values
	1 kA (30/70 $\mu$ s)	State values
	2 kA (30/70 $\mu$ s)	State values
Lightning impulse protective level, min, kV		State values
Steep current impulse protective level, kV		State values
Energy discharge capability, kJ/kV at Ur		State values
Metal oxide (MO) diameter, mm		State values
Height of the MO resistor column, mm		State values
Long duration discharge class (current compliance)	Current, A	State values
	Duration, $\mu$ s	State values
	Discharge tolerance, %	State values
Accelerated ageing performance	Temperature, $^{\circ}$ C	State values
	Time, hrs	State values
	Watt loss	State values
Operating duty characteristics (Discharge current withstand)	Two 4/10 $\mu$ s current wave (Ur), kA	State values
	Low current at 2000 $\mu$ s, kA <sub>pk</sub>	State values
	Discharge tolerance, %	State values
Partial discharge performance, pC - IEC 60270.		
Pressure relief withstand capability (Short circuit)	High symmetrical RMS (A), duration (s)	State values
	Low symmetrical RMS (A), duration (s)	State values
	Asymmetrical peak (A)	State values
<b>Withstand capabilities of surge arrester housing as per IEC 60099-4</b>		State values
Lightning impulse withstand voltage, kVpk		State values
Power frequency withstand voltage for 1 min, wet, kVrms		State values
Creepage distance, 25mm/kV, mm		State values
Permissible head load static (SLL), N		State values
Permissible head load dynamic (SLL), N		State values
Short circuit withstand capability (rated short circuit (withstand) current Is), kA		State values

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	Permissible length of the active part	State values
	Housing shield resistance, $\Omega$	State values
	Number of units	State values
4.5	Quality Management System	
	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	Copies of Type Test Reports submitted with tender	Provide
5.3	Acceptance tests to be witnessed by KPLC at factory before shipment	Provide
5.4	Test reports to be submitted by supplier to KPLC for approval before shipment	Provide
5.5	MOV block requirements routine tests	Provide
5.6	Quality Assurance tests	
5.7	Arrester performance requirement tests	
5.8	Guarantee	Provide
5.9	Replacement of rejected surge arresters	Provide
6.1	Markings	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

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**NOTE:**

- 1) Bidders shall give full details of the offered design parameters 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 be automatically disqualified from bidding this item.

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

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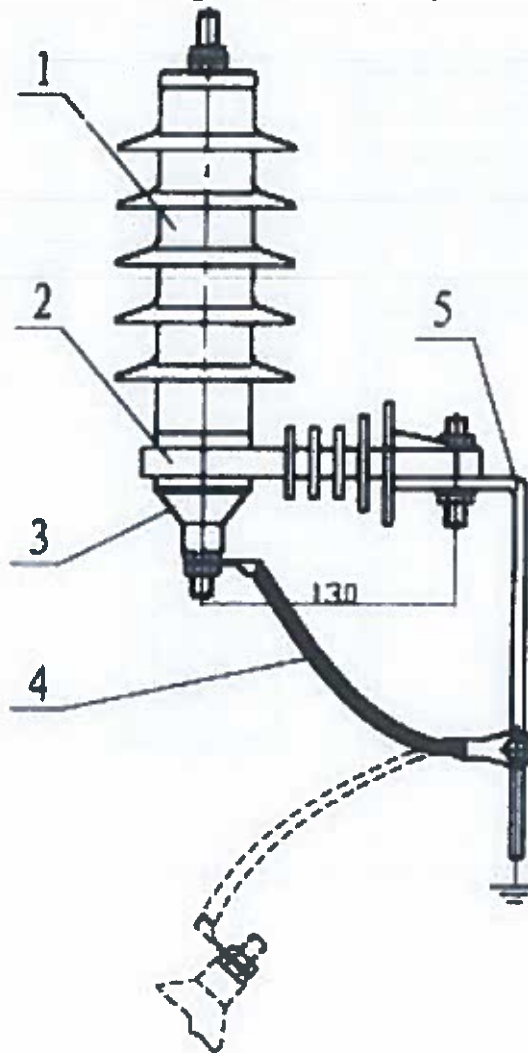
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**Annex B : Arrangement for Surge Arresters complete with mounting base with bracket**



Where:

- 1. Moa
- 2. Insulation Base
- 3. Disconnector
- 4. 30cm Soft Grounding
- 5. Installation Bracket

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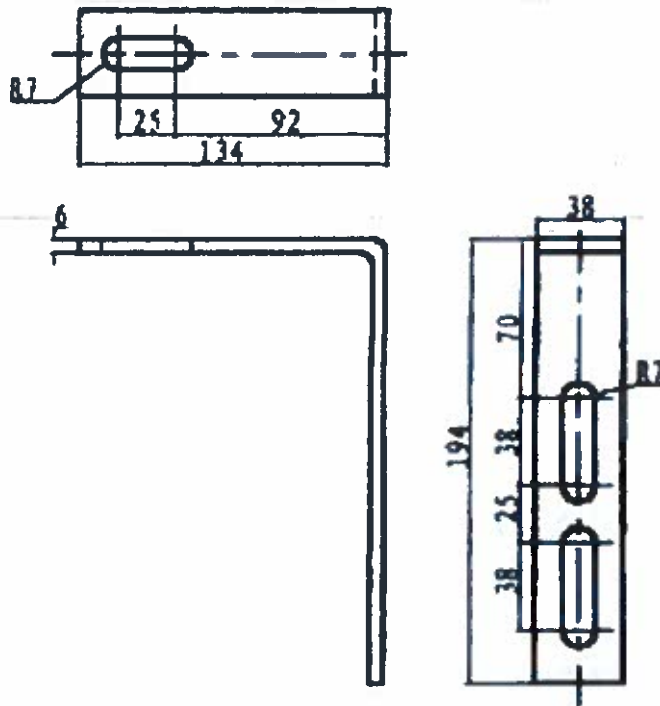
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**Fig. 1: Arrangement for polymer Surge Arrester complete with mounting base and brackets**



**Fig. 2: Details of the mounting bracket**

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