

DOCUMENT NO.: KP1/6C/4/1/TSP/011/037



Kenya Power

**INTEGRATED DROP-OUT SURGE ARRESTER/FUSE (11kV &
33kV) UNIT - SPECIFICATION**

A Document of the Kenya Power & Lighting Co. Ltd
September, 2017



Kenya Power

Kenya Power & Lighting Co.
Ltd

TITLE:

**INTEGRATED DROP-OUT SURGE
ARRESTER/FUSE (11kV & 33kV) UNIT-
SPECIFICATION**

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0.1 Circulation List

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Electronic copy (pdf) on KPLC Server (currently: Network→stima-fprnt-001→techstd&specs)	

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.

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0.2 Amendment Record

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0	2017/09/07	New issue	S.K Nguli	Dr. P. Kimemia

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FOREWORD

This specification has been prepared by the Standards Department of the Kenya Power and Lighting Company Limited (abbreviated as KPLC) and it lays down the requirements for Integrated Drop-Out Surge Arrester/Fuse (11kV & 33kV) Unit.

The drop out surge diverter is used to protect equipment against overvoltage while the drop out fuse is used for overload protection. Traditionally these have been operated independently and have been isolated without proper replacement of either, thus subjecting equipment to risks and gradual failure.

This is the first specification in this series.

The Integrated Drop-Out Surge Arrester/Fuse (11kV & 33kV) Unit is a device that has the functionality of a standard cut-out fuse as well as the functionality of a distribution class drop-out surge arrester built into a single device. In the event of a surge diverter failure the Ground Lead Disconnecter (GLD) of the surge diverter shall operate and the failed arrester shall drop out, disconnecting it automatically from the network. At the same time, this causes the fuse carrier to drop out automatically and thereby isolating the affected phase from the network. An interlocking mechanism ensures that it is not possible to close the fuse carrier, unless the drop-out surge arrester is in the closed position.

The Specification stipulates the minimum requirements for the Integrated Units acceptable for use in the company and it shall be the responsibility of the supplier to ensure adequacy of the design, good engineering practice, adherence to the specification, applicable standards and regulations, as well as ensuring good workmanship in the manufacture of the units for KPLC.

It shall be the responsibility of the users of the specification for its correct application and to be knowledgeable of these standards.

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

Name	Division
Stephen Nguli	Infrastructure Development

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1. SCOPE

- 1.1 This Specification covers Integrated Drop-Out Surge Arrester/Fuse (11kV & 33kV) Unit (integrated drop-out cut-out fuse and drop-out surge diverter). It is a device that has the functionality of a standard cut-out fuse, as well as the functionality of a distribution class drop-out surge arrester, built into a single device.
- 1.2 This Specification is for a complete Integrated Drop-Out Surge Arrester/Fuse (11kV & 33kV) Unit consisting of the following items:
 - a) Drop-out surge diverters for 11kV and 33kV,
 - b) Drop-out fuse units for 11kV and 33kV
 - c) Integrating unit complete with mechanical interlocks
- 1.3 The specification also covers characteristics, dimensions, inspection, performance and parameters for test of the Integrated Unit and its accessories as well as schedule of Guaranteed Technical Particulars to be fully filled with offered values and descriptions, stamped and signed by the manufacturer and submitted for tender evaluation.
- 1.4 The Integrated Units shall be supplied complete with all necessary accessories to achieve the desired objective

2. REFERENCES

The following standards contain provisions which, through reference in this text, constitute provisions of this specification. Unless otherwise stated, the latest edition of the referenced documents (including any amendments) applies.

- ANSI C 37.42 : Specification for distribution cut outs and fuse links
- ANSI C 37.41 : Standard Design Tests for High Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches and Accessories
- IEC 60282 : High-voltage fuses - Part 2: Expulsion fuses
- IEC 60507 : Artificial pollution tests on high-voltage ceramic and glass

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insulators to be used on a.c. systems

- IEC 60099 : Surge arresters - Part 4: Metal-oxide surge arresters without gaps for a.c. systems
- IEC 60099 : Surge arresters - Part 5: Selection and application recommendations
- IEC 60270 : High-voltage test techniques — Partial discharge measurements
- IEC 61109 : Composite insulators for a.c. overhead lines with a nominal voltage greater than 1 000 V – Definitions, test methods and acceptance criteria
- IEC 60721-3-2 : Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities - Section 2: Transportation
- ISO 1461 : Hot-dip galvanized coatings on fabricated iron and steel articles – Specifications and Test Methods
- ISO/IEC 17025 : General Requirements for the Competence of Calibration and Testing Laboratories
- ISO 9001:2008 : Quality Management Systems - Requirements
- KP1/6C.1/13/TSP/11/036 : Specification for 11kV and 33kV Surge Arresters for Distribution Systems
- KP1/6C/13/TSP11/017 : Specification for 11kV Expulsion Fuse Cut-out (Drop out type)
- KP1/3CB/TSP11/018 : Specification for 33kV Expulsion Fuse Cut-out (Drop out type)

3. TERMS AND DEFINITIONS

For the purpose of this specification, the definitions given in the reference standards shall apply.

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4. REQUIREMENTS

4.1 Service Conditions

The Integrated Drop-Out Surge Arrester/Fuse (11kV & 33kV) Unit covered in this Specification shall be suitable for application under the following environmental conditions: -

Table 1: Service Conditions

S. No.	Description	Condition
1	Max. temperature (Atmospheric)	(i) 40 ⁰ C (under sun) (ii) 30 ⁰ C (in shade)
2	Min. Temperature	-1 ⁰ C
3	Humidity	95% (Up to 100% during rainy season as per IEC 60721-3-5)
4	Altitude	Max. 2200m above sea level
5	Reference site condition	Ambient temperature :30 ⁰ C
6	Dust	The dust content in air may reach as high a value as 1.6 mg/m ³
7	Atmospheric conditions in coastal areas in humidity salt laden and corrosive atmosphere	All the equipment shall be designed to work in coastal areas in humid, salt laden and corrosive atmosphere: (i) Maximum pH value: 8.5 (ii) Sulphate: 7 mg/litres (iii) Max. concentration of chlorine: 6 mg/litres (iv) Max. conductivity: 130 μ Siemens/CM

4.2 Drop Out Surge Diverter Units

4.2.1 General requirements

4.2.1.1 The drop out surge diverter 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 system characteristics shown in Table 2.

4.2.1.2 The drop out surge diverter shall be of the vertical opening, single pole operation and suitable for manual removal from and insertion into the drop out surge diverter mount from ground level with the aid of insulated operating link stick

4.2.1.3 All current carrying parts shall be of electrolytic high conductivity copper with the contacts hard drawn copper and electro tin plated.

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4.2.1.4 The drop out surge diverter shall withstand the specified impulse and power frequency voltages in all applicable mounting positions including angle mounting.

Table 2: System Characteristics

Particulars		Requirements	
System highest voltage and frequency		12 kV, 50Hz	36 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	

4.2.2 Design and Construction

4.2.2.1 General

4.2.2.1.1 The drop out surge diverter shall be designed and constructed in accordance with IEC 60099-4, IEEE Std C62.22, Specification for 11kV and 33kV Surge Arresters for Distribution Systems KP1/6C.1/13/TSP/11/036 and the requirements of this Specification. It shall be suitable for overvoltage protection of distribution networks.

4.2.2.1.2 The drop out surge diverter shall have non-linear metal-oxide varistors with highly non-linear voltage-current characteristics, connected in series, but having no integrated series or parallel spark gaps.

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4.2.2.1.3 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.

4.2.2.2 Surge arrester

The surge arresters shall have the following minimum characteristics detailed in Table 3 below

Table 3: Guaranteed Technical Protective Data for Surge Arrester

Description		Requirement	
Maximum system voltage, Um, kV		12	36
Rated voltage, Ur, kV		11	33
Maximum continuous operating voltage, kVrms	As per IEC 60099-4, Uc	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 Ur		≥ 4.5	
Long duration discharge class (current compliance)	Current, A	500	
	Duration, μs	2000	
	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	100	
	Low current at 2000μs, kApk	900	

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Description	Requirement	
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 4: Withstand capabilities of surge arrester housing

Description	Units	Requirement
Rated Voltage	kV	11 33
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 3 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 3.

4.3 Expulsion Fuses

4.3.1 General Requirements

4.3.1.1 The Expulsion Fuse Cut-out shall be designed and manufactured to IEC 60282-2, Specification for 11kV Expulsion Fuse Cut-out (Drop out type) KP1/6C/13/TSP11/017, Specification for 33kV Expulsion Fuse Cut-out (Drop out type) KP1/3CB/TSP11/018, and the requirements of this specification.

4.3.1.2 All current carrying parts shall be of electrolytic high conductivity copper with the contacts hard drawn copper and electro tin plated.

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4.3.1.3 The fuse cut out shall withstand the specified impulse and power frequency voltages in all applicable mounting positions including angle mounting.

4.3.2 Fuse carrier

4.3.2.1 The fuse carrier shall be of the vertical opening, single pole type operation and suitable for manual removal from and insertion into the fuse mount from ground level with the aid of insulated operating rod fitted with expulsion fuse head.

4.3.2.2 The fuse carrier shall be designed and manufactured to accommodate standard expulsion fuse link of the button head single tail type.

4.3.2.3 The lower and upper tubes as well as the pull ring (eye) of the fuse carrier shall all be in cast bronze.

4.3.2.4 The fuse carrier shall be spring loaded at the lower end to ensure an even tension on the fuse link and adequate contact pressure to assist in expelling the fuse carrier when the fuse blows.

4.3.2.5 The fuse carrier shall be designed such that it is removable from the fuse mount and when removed, shall provide adequate electrical isolation between the contact points.

4.3.3 Rating

The rating of the complete fuse cut out shall be as follows: -

Table 5: Withstand Capabilities of Expulsion Fuses Assembly

Item		Requirement	
Rated voltage & frequency		12kV, 50Hz	36KV ,50Hz
Rated lightning impulse withstand voltage (dry)(kV)	Across isolating distance	95	200
	To earth & between poles	85	170
Rated 1min. power frequency withstand voltage (wet)(kV)	Across isolating distance	38	95
	To earth & between poles	32	85
Rated short time withstand current of fuse base & carrier(kA,3S)		16	16
Rated current of fuse carrier(A)		100	100

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Item	Requirement	
Minimum creepage distance(mm)	320	900

4.4 Support Insulators

- 4.4.1 The insulators shall be manufactured to IEC 61109 and IEC 60383, other applicable /latest IEC standards and the requirements of this specification.
- 4.4.2 The insulator shall be moulded in one single piece and supplied complete with metal end fittings.
- 4.4.3 The insulator shall be made of either composite or porcelain materials.
- 4.4.3.1 The composite insulator shall be a 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 as per IEC 61109. The insulator shall exhibit high resistance to ultraviolet radiation, high temperatures and tropical sunshine conditions. The core shall be made of resin-impregnated glass fibre free from defects.
- 4.4.3.2 The porcelain insulator shall be a single piece, fully vitrified non-puncturable porcelain in accordance with IEC 60383-1
- 4.4.4 The insulator shall be of adequate mechanical strength to withstand the loads applied during the opening and closing cycles. Details of the design features including the mechanical rating of the insulators and testing undertaken to meet these requirements shall be provided.
- 4.4.5 The under surface and grooves of sheds or skirts shall be easy cleaning. Sheds shall be substantially symmetrical in shape without appreciable warping.
- 4.4.6 The insulator shall be suitable for both vertical and horizontal applications. The preferred colour is grey.
- 4.4.7 The mechanical and electrical characteristics of the insulators shall be as follows: -

Table 6: Withstand capabilities of insulators

Characteristics	11kV Insulator	33kV Insulator
Minimum Creepage Distance	300 mm	900 mm
Minimum Power Frequency Withstand Voltage (Wet)	38 kV	95 kV
Minimum Lightning Impulse Withstand Voltage (Dry)	95 kV	200 kV
Minimum Failing Load	10 kN	10 kN

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4.5 Integrating link

- 4.5.1 The integrating link shall provide mechanical interlocking mechanism such that it is not possible to close the fuse carrier, unless the drop-out surge arrester is in the closed position
- 4.5.2 The integrating link ferrous and ferrous alloy parts shall be hot-dip galvanized in accordance with ISO1461. This requirement also applies to assembly bolts, nuts and washer, to a minimum galvanization level of 85µm.
- 4.5.3 The adverse effects, such as galvanic corrosion, of contact between dissimilar metals shall be minimized.

4.6 Complete Unit

- 4.6.1 The general arrangement of the Integrated Drop-Out Surge Arrester/Fuse (11kV & 33kV) Unit is as per figure 1 below
- 4.6.2 Neither the fuse carrier, nor the surge arrester, will drop out due to electromagnetic forces or forces arising from gravity, vibration or reasonable shocks.
- 4.6.3 It shall be impossible to swap the fuse carrier and the drop-out diverter arrester.
- 4.6.4 It shall be possible to close, open, remove and replace the fuse carrier and drop-out arrester with a standard portable fibre-glass operating rod (link stick) from ground level.
- 4.6.5 To ensure positive drop out action under all conditions the fuse carrier and the drop-out arrester shall be mounted at an angle of 20° from vertical, as indicated in Figure 1.
- 4.6.6 Load buster' hooks, shall be provided at the cut-out upper contact arrangement to facilitate the use of portable load-break tools. These hooks shall also serve as a guide bracket, i.e. to guide the fuse-carrier into the correct position on closing.
- 4.6.7 A guide bracket shall be provided at the arrester upper contact to guide the drop-out arrester into the correct position on closing.
- 4.6.8 Stoppers shall be provided at the cut-out and arrester upper contacts to prevent the fuse carrier and arrester from travelling past the intended close position.
- 4.6.9 Terminal connections shall be provided on the Integrated Unit, preferably shear-off connectors to ensure a firm and permanent connection, for conductor size up to 75mm², copper or aluminium.

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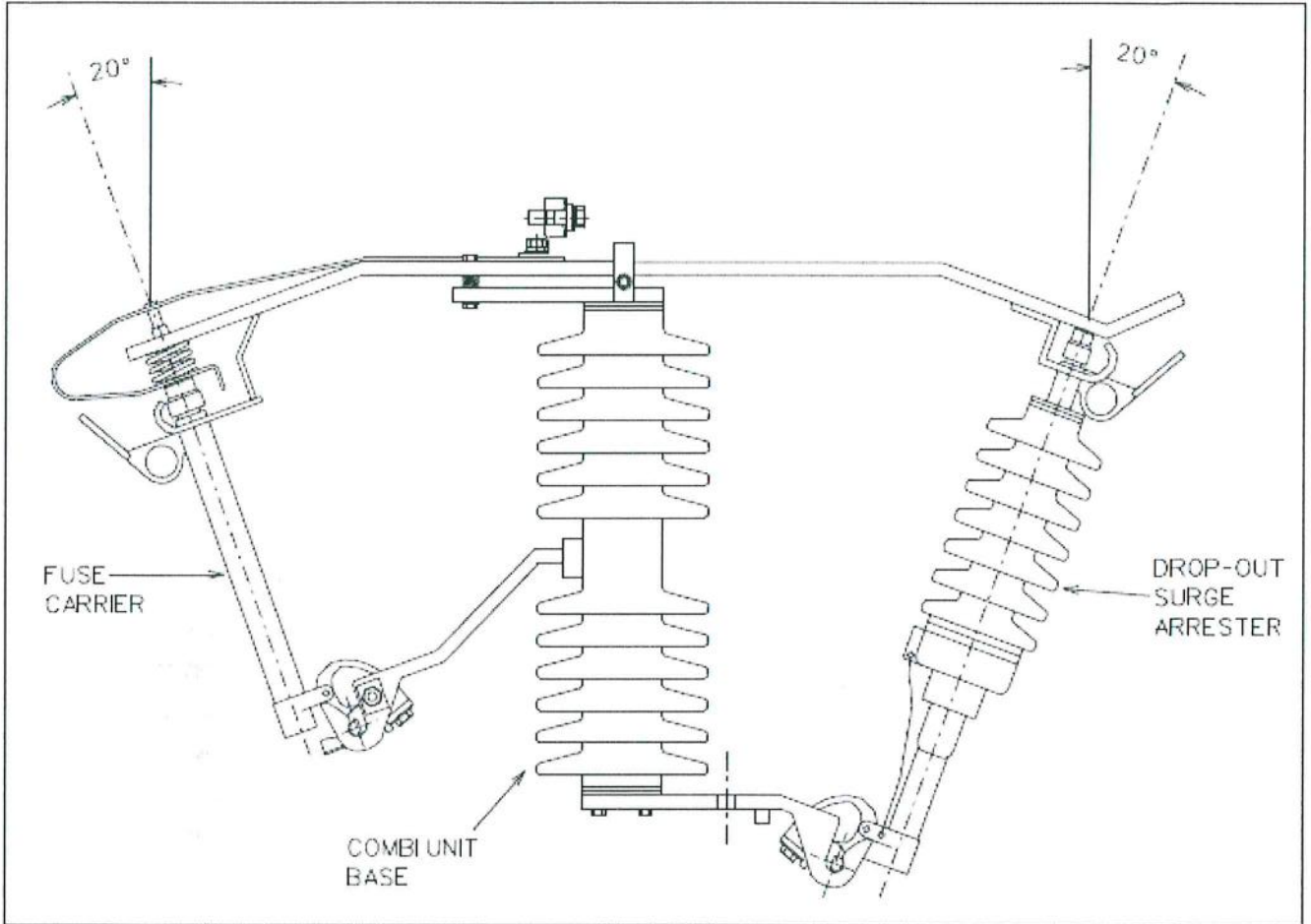


Fig 1: Typical layout of Integrated Drop-Out Surge Arrester/Fuse (11kV & 33kV) Unit in closed position

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APPENDIX A: QUALITY MANAGEMENT SYSTEM (NORMATIVE)

- A.1. The supplier shall submit a quality assurance plan (QAP) that will be used to ensure that the design, material, workmanship, tests, service capability, maintenance and documentation of the Integrated Drop-Out Surge Arrester/Fuse (11kV & 33kV) Unit complete with accessories will fulfil the requirements stated in the contract documents, standards, specifications and regulations.
- A.2. The QAP shall be based on and include relevant parts to fulfil the requirements of ISO 9001:2008 or later.
- A.3. The Manufacturer's Declaration of Conformity to applicable standards and copies of quality management certifications including copy of valid and relevant ISO 9001: 2008 or later certificate shall be submitted with the tender for evaluation.
- A.4 The bidder shall indicate the delivery time of the Integrated Drop-Out Surge Arrester/Fuse (11kV & 33kV) Unit, manufacturer's monthly & annual production capacity and experience in the production of the unit being offered.

APPENDIX B: TESTS AND INSPECTION (NORMATIVE)

- B.1 Copies of previous Type Tests Reports issued by a third-party testing laboratory that are accredited to ISO/IEC 17025 shall be submitted with the tender for the purpose of technical evaluation. The accreditation certificate to ISO/IEC 17025 for the same third party testing laboratory used shall also be submitted with the tender document (all in English Language)
- B.2. Routine and sample test reports for the integrated unit and accessories to be supplied shall be submitted by the supplier to KPLC for approval before shipment/dispatch. KPLC Engineers shall witness tests at the factory before shipment/dispatch.
- B.3. The acceptance test certificates shall be submitted for approval, before dispatch of the Integrated Unit.
- B.4. Tests to be carried out at Manufacturer's works shall include:
- a) Verification of constructional requirements.
 - b) Verification of marking and packaging.
 - c) Verifications of dimensions.
 - d) Operation of the complete unit

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B.5 On receipt of the goods KPLC may perform any of the tests specified in order to verify compliance with this specification. The supplier shall replace without charge to KPLC the Integrated Unit and accessories, which upon examination test or use; fail to meet any of the requirements in the specification.

APPENDIX C: MARKING AND PACKAGING (NORMATIVE)

C.1. MARKING

The following information shall be legibly and indelibly marked on each unit:

- a) Serial Number of Integrated Unit,
b) Designation and type,
c) Month and year of manufacture. (To be engraved),
d) Manufacturer's name and symbol
e) Standard of manufacture
f) Country of Manufacture.
g) Words "Property of KPLC".

C.2. PACKAGING (NORMATIVE)

- C.2.1 Packing shall be suitable for handling during transit by rail/road and secured to avoid any loss or damage during transit.
C.2.2 The cases shall be furnished with illustrated operating and maintenance instructions for the items.
C.2.3 Instructions for safe handling of the Integrated Unit shall be provided together with necessary safety precautions to be taken in the management of the unit

APPENDIX D: DOCUMENTATION (NORMATIVE)

- D.1. The bidder shall submit its tender complete with technical documents required by Annex A (Guaranteed Technical Particulars) for tender evaluation. The technical documents to be submitted (all in English language) for tender evaluation shall include the following:
a) Guaranteed Technical Particulars signed by the manufacturer;
b) Copies of the Manufacturer's catalogues, brochures, and technical data sheets for drop surge diverters, expulsion fuse holders and fuse links, the complete assembled unit and layout drawings.
c) Sales records for the last five years and at least four customer reference letters;

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- 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;
- g) Manufacturers letter of authorization, ISO 9001:2008 certificate and other technical documents required in the tender.

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

- a) Guaranteed Technical Particulars signed by the manufacturer;
- b) Quality assurance plan (QAP) that will be used to ensure that the design, material; workmanship, tests, service capability, maintenance and documentation will fulfil the requirements stated in the contract documents, standards, specifications and regulations.
- c) Detailed test program to be used during factory testing;
- d) Packaging details (including packaging materials).

D.3. The supplier shall submit recommendations for use, care, storage and routine inspection/testing procedures, all in the English Language, during delivery of the batteries to KPLC stores.

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APPENDIX 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, four customer reference letters, details of manufacturing capacity, the manufacturer's experience and copies of complete type test reports for tender evaluation, all in English Language)

Tender No.

Clause number	KPLC requirements	Bidder's offer (indicate full details)
Manufacturer's Name and address	Specify	
Country of Manufacture	Specify	
Bidder's Name and address	Specify	
1. Scope		
1.1-1.4	Specify	
2. Applicable Standards		
3. Terms & Definitions		
4. Requirements		
4.1 Service Conditions		
	Max. temperature (Atmospheric)	40 ⁰ C
	Min. Temperature (Atm.)	-1 ⁰ C
	Humidity	90% (Up to 100% during rainy season as per IEC 60721-3-5)
	Altitude	Max. 2200m above sea level
	Atmospheric conditions in coastal areas in humidity salt laden and corrosive atmosphere	All the equipment shall be designed to work in coastal areas.
4.2 Drop Out Surge Diverter Units		
4.2.1 Requirements		

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Clause number	KPLC requirements	Bidder's offer (indicate full details)
4.2.1.1	Surge diverter connection	Specify
4.2.1.2	Surge diverter shall be of the vertical opening, suitable for manual insertion and removal from ground level	Specify
4.2.1.3	All current carrying parts to be electrolytic high conductivity copper with the contacts hard drawn copper and electro tin plated	Specify
4.2.1.4	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
4.2.2 Design and Construction		
4.2.2.1.1	Surge diverter shall be designed and constructed in accordance with IEC 60099-4, IEEE Std C62.22 and Specification for 11kV and 33kV Surge Arresters for Distribution Systems KPI/6C.1/13/TSP/11/036	Specify
4.2.2.1.2	Non-linear metal-oxide resistors with highly non-linear voltage-current characteristics	Specify
4.2.2.1.3	The metal-oxide used shall be of quality to ensure thermal stability under service duty	Specify
4.2.2.2 Surge arresters characteristics		
Guaranteed protective data for arrester calculated as per IEC 60099-4 and IEEE Std C62.22		
	Description	
	Maximum system voltage, Um, kV	State values
	Rated voltage, Ur, kV	State values
	Maximum continuous operating voltage, kVrms	As per IEEE Std C62.22, MCOV State values
	Temporary overvoltage	1 s State values

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Clause number	KPLC requirements	Bidder's offer (indicate full details)	
	capability (TOV), kVrms	10 s	State values
Maximum residual voltage at steep, lightning and switching impulse current with current wave, kV		10kA (1/2 μs)	State values
		5 kA (8/20 μs)	State values
		10 kA (8/20 μs)	State values
		20 kA (8/20 μs)	State values
		40 kA (8/20 μs)	State values
		250A (30/70 μs)	State values
		500 A (30/70 μs)	State values
		1 kA (30/70 μs)	State values
	2 kA (30/70 μs)	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, μs		State values
	Discharge tolerance, %		State values
Accelerated ageing performance	Temperature, °C		State values
	Time, hrs		State values
	Watt loss		State values
Operating duty characteristics (Discharge current withstand)	Two 4/10μs current wave (Ur), kA		State values
	Low current at 2000μs, kA _{pk}		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
	Withstand capabilities of surge arrester housing as per IEC 60099-4		State values
	Lightning impulse withstand voltage, kV _{pk}		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

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Clause number	KPLC requirements		Bidder's offer (indicate full details)
	Short circuit withstand capability (rated short circuit (withstand) current Is), kA		State values
	Permissible length of the active part		State values
	Housing shield resistance, Ω		State values
	Number of units		State values
4.3. Expulsion Fuses			
4.3.1 General Requirements			
4.3.1.1	Applicable standards	IEC 60282-2, Specification for 11kV Expulsion Fuse Cut-out (Drop out type) KP1/6C/13/TSP11/017, Specification for 33kV Expulsion Fuse Cut-out (Drop out type) KP1/3CB/TSP11/018	Specify
4.3.1.2	All current carrying parts	Shall be of electrolytic high conductivity copper with the contacts hard drawn copper and electro tin plated	Specify
4.3.1.3	Impulse and power frequency voltages	Withstand	Specify
4.3.2	Fuse carrier		
4.3.2.1	Type	Vertical opening, single pole operation	Specify
4.3.2.2	Fuse link	Button head single tail type	Specify
4.3.2.3	Material of manufacture of lower and upper tubes, pull ring (eye)	Cast bronze	Specify
4.3.2.4	Spring loaded		Specify
4.3.2.5	Flexibility & isolation	Removable from the fuse mount Adequate electrical isolation	Specify
4.3.3	Rating		
	Rated voltage, kV	12 36	Specify
	Highest Voltage, kV		Specify
	Insulation level		

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Clause number		KPLC requirements		Bidder's offer (indicate full details)	
	i. Dry impulse withstands (1.2/50µs) voltage (positive and negative polarity) (peak)	Across isolating distance	Specify	Specify	
	ii. Wet one (1) minute power frequency withstand voltage (rms)	To earth & between poles	Specify	Specify	
	Rated short circuit withstand current of fuse base & carrier(kA,3S)		Specify	Specify	
	Rated continuous current, A		Specify	Specify	
	Minimum creepage distance, mm		Specify	Specify	
	Mounting angle degrees		Specify	Specify	
	Interrupting rating				
	(i) Symmetrical interrupting rating (minimum) rms, kA		Specify	Specify	
	(ii) Asymmetrical interrupting rating (minimum) rms, kA		Specify	Specify	
4.4. Support Insulators					
4.4.1	Applicable Standards		Specify		
4.4.2	Moulding and metal end fittings		Specify		
4.4.3	Material of manufacture, resistance to moisture, ultraviolet radiation, high temperatures		Specify		
	Core material of manufacture		Specify		
4.4.4	Material of manufacture - Housing		Specify		
4.4.5	Sheds - easy cleaning, substantially symmetrical		Specify		
4.4.6	Suitable for both vertical and horizontal applications		Specify		

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Clause number	KPLC requirements		Bidder's offer (indicate full details)
4.4.7	Withstand capabilities of insulators		
	Maximum System Voltage (kV)	11 36	Specify
	One-minute power frequency withstand voltage, 50Hz, wet. (kV)		Specify
	Lighting impulse withstand voltage, 1.2/50 pos. (kV)		Specify
	Minimum creepage distance (mm)		Specify
	Specified mechanical load (kN)		Specify
	Length of insulator with fittings (mm)		Specify
	Material of fittings and level of corrosion protection		Specify
	Material of rod		Specify
	Material of housing and sheds		Specify
4.5 Integrating Link			
4.5.1	Mechanical interlocking mechanism		Specify
4.5.2	Galvanizing of ferrous and ferrous alloy parts (also assembly bolts, nuts and washers)		Specify
4.5.3	Contact between dissimilar metals		Specify
4.6 Complete Unit			
	Manufacturer		Specify
	Product designation and type		Specify
4.6.2	Drop out due to electromagnetic forces or forces arising from gravity, vibration or reasonable shocks.	Specify	
4.6.3	Swapping not possible	Specify	
4.6.4	Use of a standard portable fibre-glass operating rod (link stick).	Specify	
4.6.5	Mounting angle 20° from vertical	Specify	
4.6.6	Provide load buster' hooks, to serve also as a guide bracket for the fuse-carrier	Specify	
4.6.7	Guide bracket at the arrester upper	Specify	

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Clause number	KPLC requirements	Bidder's offer (indicate full details)
	contact	
4.6.8	Stoppers for cut-out and arrester upper contacts	Specify
4.6.9	Terminal connections	Preferably shear-off connectors, for conductor size up to 75mm ² , copper or aluminium.
Material and finishes		
	Insulator	Specify
	Current carrying element at cut-out upper contact	Specify
	Spring at cut-out upper contact	Specify
	Load buster hook at cut-out upper contact	Specify
	Hinge at cut-out lower contact	Specify
	Current carrying elements at cut-out lower contact	Specify
	Arrester upper contact	Specify
	Guide bracket at arrester upper contact	Specify
	Hinge at arrester lower contact	Specify
A: Quality Management Systems		
A.1.-A.4.		Specify
B Tests and Inspection		
B.1 – B.5		Specify
C. Marking and Packaging		
C.1. Marking		Specify
C.2. Packing		
C.2.1 – C.2.3		Specify
D. Documentation		
D.1 – D.3		Specify
5	Manufacturer's Guarantee and Warranty	Specify
6	List catalogues, brochures, technical data and drawings submitted to support the offer.	Specify

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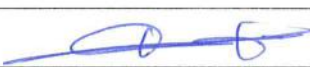
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7	List customer sales records submitted to support the offer.	Specify
8	List Test Certificates submitted with tender	Specify
10	List test & calibration reports to be submitted to KPLC for approval before shipment	Specify
11	Statement of compliance to specification (indicate deviations if any & supporting documents)	Specify

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

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