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Kenya Power

SF6 GAS SERVICE CART - SPECIFICATION

A Document of the Kenya Power & Lighting Co. Ltd
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0.1 CIRCULATION LIST

COPY NO.	COPY HOLDER
1	1st Asst. Engineer, E/plant Nairobi
2	Snr Engineer, E/Plant Nairobi

0.2 AMENDMENT RECORD

Rev No.	Date (YYYY-MM-DD)	Description of Change	Prepared by (Name & Signature)	Approved by (Name & Signature)
0	2026-01-14	New issue	Beatrice Gitonga	Zacheus Oluoch

FOREWORD

This specification has been prepared by the E/plant Nairobi of The Kenya Power and Lighting Company Limited (KPLC) and it lays down requirements for SF6 Gas Handling Plant.

SF6 Gas Service Cart is intended for use by the E/plant to treat and handle gas in GIS stations and other HV and MV circuit breakers employing SF6 as arc quenching media.

This specification was prepared to ensure the adaptability of Gas handling equipment to the existing operating and climatic conditions in Kenya.

There are no other specifications in this series.

This specification stipulates the minimum requirements for SF6 Gas Service cart acceptable for use in the company and it shall be the responsibility of the suppliers and manufacturer to ensure that the offered design is of the highest quality and guarantees excellent service to KPLC, good workmanship and good engineering practice in the manufacture of the service cart for KPLC.

Users of Kenya Power specifications are responsible for their correct interpretation and application.

1. SCOPE

1.1. This specification is for SF6 Gas service cart for use by company's E/plant department.

1.2. The specification covers requirements, design, tests and inspection and schedule of Guaranteed Technical Particulars of Gas Service Cart.

2. NORMATIVE REFERENCES

The following standards contain provision which, through reference in this text, constitute provisions of this specification. For dated editions the cited edition will apply; for undated editions the latest edition of the referenced document shall apply.

IEC International standard 60376: Criteria for use and handling of new SF6 Gas.

IEC 60480: Criteria for re-use of SF6 Gas.

EN 61326: Emission (group 1, class B) and immunity.

IEC 62271-4: Procedure for safe and environmentally friendly handling of SF6 gas during Installation, commissioning, operation and end of life disposal of switchgear.

3. DEFINITIONS AND ABBREVIATIONS

For the purpose of this specification the definitions and abbreviations given in the reference standards shall apply together with the following abbreviations.

3.1. ABBREVIATIONS

KPLC- Kenya Power and Lighting Company Limited

ISO – International Organization for Standardization.

IEC- International electrotechnical commission

Kg –Kilogram

KV - Kilovolt

LV – Low Voltage

EN – European Standard

SF6-Sulphur hexafluoride.

Mbars-Millibars

4. REQUIREMENTS

4.1. SERVICE CONDITIONS

4.1.1. Operating conditions.

The SF6 Gas Service Cart shall be suitable for continuous outdoor operation in tropical areas with the following conditions.

(a) Altitude: Up to 2200 meters above sea level.

(b) Temperature: Average of +30°C with minimum of -1°C and Maximum of +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.

(e) Isokeraunic level: 180 thunderstorm days per year.

4.1.2 System characteristics

(a) The Plant shall be used in GIS and AIS Substations of 220/132/66/33/11kV System voltage levels.

4.2 General requirements

4.2.1 The SF6 Gas Service Cart shall be compact, portable, semi-automated with high performance components and shall be of optimum design suitable for equipment with gas volume upto 40kg. Shall have both manual and semi-automatic operation mode and shall be equipped with at least 7inch touch screen to facilitate ease of operation.

4.2.2 The Plant shall have a filter process that allows the SF6 Gas treatment to the desired humidity at site.

4.2.3 The service cart plant shall have low downtimes and shall have long service intervals of more than 2000 hours hence less service requirements.

4.2.4 The Service cart and accessories shall be designed and constructed to withstand sufficient forces due to shipping, transportation and maintenance.

4.2.5 The SF6 Gas service cart shall have facilities for SF6 gas filling, dryer and particle filters of SF6 recovery of SF6 gas, and evacuation of air to < 1mbar.

4.2.6 The service cart plant shall be designed and assembled in such a manner that the Average sound level will not exceed the standard sound level during operation.

4.2.7 The service cart shall be composed of oil free compressor and vacuum compressor and shall have the capability of on-site gas handling.

4.2.8 The SF6 Gas service cart components shall be of high performance and shall be capable of fast recovery of sf6 gas of at least 3.3 m^3/hr for large gas compartments of volume upto 40kg. The final vacuum of <5mbar.

4.2.9 The Service cart shall be equipped with strong and durable wheels for ease of movement from point to point. The tyres shall be solid rubber of adequate size with rollover protection.

4.2.10 For ease of gas recovery and storage, the plant shall be equipped with the following hoses:

i) One 10m DN20 rubber hose pipe with DN20 coupling on one end

ii) One 10m DN20 rubber hose pipe with DN8 coupling on one end

iii) One 5 m hose DN20 stainless steel wire braided hose with DN 20 coupling

iv) One 5 m hose DN20 stainless steel wire braided hose with DN5 coupling

4.2.11 The supply voltage shall be single phase 230V AC, 50HZ.

4.2.12 The SF6 Gas oil free compressor shall have gas flow rate of at least 1.6m^3/h with medium sunction pressure and output pressure of at least 50 bars above the sea level.

4.2.13 The oil free vacuum compressor for SF6 Gas shall have a flow rate of at least 3.3m^3/h and final vacuum pressure of less than 5 mbar.

4.2.14 The vacuum pressure for air shall have flow rate of 19m^3/h and final vacuum pressure of less than 1mbar

4.2.15 The filter elements of the SF6 Gas handling plant shall be made of molecular sieve, aluminium oxide and shall be capable of filtering particles upto 1µm and water absorption capacity of 175g at a dew point of -36°C

4.2.16 The weight of the SF6 Gas Handling plant shall not be more than 195kg without storage bottles.

4.2.17 The SF6 Gas Handling Plant shall come complete with SF6 gas adapter kit and service hose kit for different circuit breakers brands like Crompton Greaves, ABB, Siemens, spretcher schuh, L and R, Rockwill. Pinggao, XD

4.2.18 The accessories and spares shall be provided as shown in the table 1 below.

Table 1

	Nominal width	Length	Material
Hoses	DN8	10M	Rubber
	DN20	10M	Rubber
Adapters	DN8 Male to DN20 FEMALE	-	Brass
	DN8 Female to DN20 Male	-	Brass

Spares

i. Filter catridge

ii. Filter catridge for particle filter

iii. Service kit for compressor (SF6 Gas)

iv. Service kit for vacuum compressor (SF6 Gas)

v. Service kit for vacuum pump (Air)

vi. Rain Cover

4.3 Specifications of Gas Analyzer.

4.3.1 The gas analyser shall be strong, robust, light weight weighing not more than 25kgs and with dimensions allowing for easy transportation. The dimensions should not be more than 540×270×410mm (W×H×D)

4.3.2 The Analyzer shall have integrated and durable rolling case.

4.3.3 The Analyzer shall have not less 6inch colour touch screen interface and shall have mobile operation capabilities to allow remote control via smart devices.

4.3.4 The Analyzer shall have required hardware to allow for remote access for quick and efficient diagnosis of problems by the vendor.

4.3.5 The Analyzer shall require no warmup time and shall be ready for immediate operation after switching on.

4.3.6 The Analyzer shall be emission free and shall be capable of the following measurements with only one sample.

i. SF6 Gas volume percentage.

ii. Moisture concentration.

iii. SO_2 Concentration ppm.

iv. HF Concentration ppm

v. H_2S Concentration ppm

vi. CO Concentration ppm

4.3.7 The SF6 Gas Analyzer sensors shall be easily exchanged on site by user after which the device is ready for immediate use with no down time.

4.3.8 The Analyzer shall have Gas pump back facility into the external cylinder, vessel or gas Compartment.

4.3.9 The Analyzer shall have storage of upto 480 measurement results with name, date and time.

4.3.10 The Analyzer shall be battery operated and/or external power supply.

4.3.11 Remote control and data download shall be achieved via wifi, Ethernet connection.

4.3.12 Key features.

i. Inlet pressure range 0.3-35bars.

ii. SO2 Sensor measuring range 0-20PPMv.

iii. Pump back pressur: Max 10bar

iv. Measuring pressure: 0.01-8bar.

v. Moisture sensor accuracy:±3°C

vi. SO2 Sensor accuracy: <±2%

4.4 SF6-Leak Spy

4.4.1 The leakage spy device is a cordless, battery-operated, handheld device that uses a non-dispersive infrared (NDIR) sensor for the precise detection and quantification of small SF_6 leaks.

4.4.2 The measuring Principle shall be non-dispersive infrared sensor (**NDIR**)

4.4.3 The detection limit shall be 3 ppmv SF_6

4.4.4 Sensitivity shall be 3 g SF_6 / year

4.4.5 Measuring Range shall be 0 – 1,000 ppmv SF_6

4.4.6 Accuracy shall be < 50 ppmv: ±4% (min ±2 ppmv); 50-100 ppmv: ±5% (min ±5 ppmv); 100-1000 ppmv: ±2% (min ±20 ppmv)

4.4.7 Response Time shall be T90 < 1 second

4.4.8 Indication shall be graphic display and audible signal

4.4.9 Power Supply shall be Lithium-ion battery (operating time > 12 hours)

4.4.10 Operating Temperature shall be 0 °C to +50 °C (32 °F to 122 °F)

4.4.11 Weight shall be less than 1.6 Kgs

5. TESTS AND INSPECTION REQUIREMENTS

5.1. The SF6 Gas analyzer and Gas handling equipment shall be inspected and tested in accordance with the requirements of this specifications and relevant IEC standards. It shall be the responsibility of the manufacturer to perform or to have performed all the tests specified. Tenderers shall confirm the manufacturer's capabilities in this regard when submitting tenders. Any limitations shall be clearly specified

5.1.1 Routine Tests.

Accuracy and resolution tests.

5.2. Copies of calibration certificates and performance data by accredited laboratory.

6. PACKING

6.1. PACKING

6.1.1. The Service cart and associated components shall be packed in a manner as to protect it from any damage in transportation and handling. Accessories /fittings shall be protected against mechanical damage.

6.1.2. The Service Cart shall be provided with a rating plate of weather proof material, fitted in a visible position, showing the appropriate details. The entries on the plate shall be indelibly marked either by etching, engraving or stamping.

6.1.3. Each accessory and package of items associated with the Service Cart shall be suitably marked for ease of identification.

APPENDICIES

A: TESTS AND INSPECTION (Normative)

A.1 It shall be the responsibility of the supplier/manufacturer to test or to have all the relevant tests performed.

A.2 On receipt of the SF6 Gas Service Cart Kenya Power 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 Kenya Power, any equipment which upon examination, test or use fail to meet any or all of the requirements in the specification.

B: QUALITY MANAGEMENT SYSTEM (Normative)

B.1 The bidder shall indicate the delivery time of the equipment

C: DOCUMENTATION AND DEMONSTRATION (Normative)

C.1 The bidder shall submit its tender complete with technical documents for tender evaluation. The technical documents to be submitted (all in English language) for tender evaluation shall include the following:

a) Fully filled clause by clause guaranteed technical particulars (GTP) signed by the manufacturer;
b) Copies of the Manufacturer's catalogues, brochures, drawings giving all relevant dimensions and technical data;
c) Bidder's warranty and guarantee; subject to 12 months from date of delivery to KPLC stores
d) User manual

C.2 The supplier shall submit recommendations for use, care, storage and routine inspection/testing procedures, all in the English Language, during delivery of the SF6 gas service cart to KPLC stores.

D: GUARANTEED TECHNICAL PARTICULARS (Normative)

To be filled and signed by the Bidder and submitted together with relevant copies of the Manufacturer's catalogues, brochures, drawings, technical data, for tender evaluation, all in English Language)

Tender No. .....

Bidder's name and Address.....

Clause number	Requirement	Bidder's offer	
Manufacturer's Name		Specify	
Country of Manufacture		Specify	
Name and model Number		Specify	
1.	Scope	State	
4.	**Requirements**		
4.1	Service conditions	State	
4.1.1	Operating condition	specify	
4.1.2	System characteristics	specify	
4.2	General requirements		
4.2.1	Design of service cart, size, weight, portability and operation mode	state	
4.2.2	Filter components	state	
4.2.3	Service intervals	state	
4.2.4	Design to withstand forces during shipment, transportation and maintenance	state	
4.2.5	Facilities for sf6 gas filling, drying, recovery and air evacuation.	state	
4.2.6	Sound levels during operation	state	
4.2.7	Oil free compressor and vacuum compressor	state	
4.2.8	Rate of SF6 Gas recovery	state	
4.2.9	Type of wheels and tyre material	state	
4.2.10	Type and size of hoses	state	
4.2.11	Supply voltage	state	
4.2.12	Oil free compressor gas flow rate	state	
4.2.13	Oil free vacuum compressor gas flow rate	state	

Clause number	Requirement	Bidder's offer	
4.2.14	Air vacuum compressor flow rate	specify	
4.2.15	Filter elements of sf6 Gas service cart	specify	
4.2.16	Weight of SF6 Gas service cart	State	
4.2.17	Adaptor and service carts for different CB models	State	
4.2.18	Service cart accessories and spares	State	
4.3	SF6 Gas Analyzer		
4.3.1	Design, weight and dimensions of Analyzer	State	
4.3.2	Rolling case	State	
4.3.3	Touch screen size, remote operation	State	
4.3.4	Hardware for remote access by vendor	State	
4.3.5	Warm uptime on switch on	Specify	
4.3.6	Measurements per one sample	Specify	
4.3.7	Field changing of sensors	State	
4.3.8	Gas pump back facility	State	
4.3.9	Storage capacity	State	
4.3.10	Operation both by battery and external power supply	Specify	
4.3.11	Remote control and data download	State	
4.3.12	Key features	State	
4.4	SF6 Leak spy		
4.4.1	Cordless, battery operated, handheld device	State	
4.4.2	Measuring principle	State	
4.4.3	Detection limit	State	
4.4.4	Sensitivity	State	
4.4.5	Measuring range	State	
4.4.6	Accuracy	State	
4.4.7	Response time	State	
4.4.8	Indication type	State	
4.4.9	Power supply battery	State	
4.4.10	Operating temperature	State	
4.4.10	Weight	State	

Clause number	Requirement	Bidder's offer	
5	**Test and inspection**		
5.1	Responsibility of the test	State	
5.1.1	Routine Tests	State	
5.2	Calibration certificate and performance data.	State	
6	**Packing**	State	
6.1.1	Kind of packing to protect the service cart from damage	State	
6.1.2	Name plate	State	
6.1.3	Marking of the accessories	Specify	
A1	Testing responsibility	State	
A2	Inspection of the Service cart by KPLC on receipt in stores	State	
B1	Delivery time	State	
C1	Documents to be submitted for evaluation	State	
C2	Recommendations for use	Attach	

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Bidder's Name, Signature, Stamp and Date