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#### KEBS Head Office

P.O. Box 54974, Nairobi 00200  
Tel: +254 (0) 20 605490,605506,  
Mobile: 0722 202 137/8.  
0734 600 471/1  
Fax: +254 (0) 20 609 660  
Direct Dial: +254 (0) 20 694 8000  
E-mail: [infor@kebs.org](mailto:infor@kebs.org)  
Web: <http://www.kebs.org>

#### KEBS Coast Region

P.O. Box 99376, Mombasa  
80100  
Tel: +254 (0) 41 229 563, 230  
939/40  
Fax: +254 (0) 41 229 448  
E-mail: [kebs-msa@kebs.org](mailto:kebs-msa@kebs.org)

#### KEBS Lake Region

P.O. Box 2949, Kisumu 40100  
Tel: +254 (0) 57 202 8396, 202  
9549  
Fax: +254 (0) 57 202 7814  
E-mail: [kebs-kisumu@kebs.org](mailto:kebs-kisumu@kebs.org)

#### KEBS Rift Valley Region

P.O. Box 2138, Nakuru 20100  
Tel: +254 (0) 51221 0553/5, 221  
1208  
Fax: +254 (0) 51221 0076  
E-mail: [kebs-nakuru@kebs.org](mailto:kebs-nakuru@kebs.org)

#### KEBS Mt. Kenya Region

P.O. Box 1790, Nyeri 10100  
Tel: +254 (0) 61 203 1410/1  
Fax: +254 (0) 61 203 2038  
Email: [kebs-nyeri@kebs.org](mailto:kebs-nyeri@kebs.org)

#### KEBS North Eastern Region

P.O. Box 978, Garissa 70100  
Tel: +254 (0) 46 2519  
Fax: +254 (0) 46 3455  
E-mail: [kebs-garissa@kebs.org](mailto:kebs-garissa@kebs.org)

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### PUBLIC REVIEW DRAFT DKS 2438:2012

This Draft Kenya Standard has been prepared by the **Gases** Technical Committee in accordance with the procedures of the Bureau, and is now being circulated for public comments.

The Committee would appreciate any comments on this Draft Standard, which should be submitted before **2013-02-10** using the attached template. It will also be appreciated if those who have no specific comments to make but find the draft standard generally acceptable can notify us accordingly. **Absence of any reply or comments shall be deemed to be an acceptance of the technical contents of the draft Kenya standard and shall constitute an approval vote.**

Suggestions entailing amendments of the text should include wording preferred and the relevant clause number quoted against any comments made.

**This draft standard is subject to change and should not be referred to or used as a Kenya Standard.** All correspondence pertaining to this draft standard should be addressed to the Managing Director, Kenya Bureau of Standards for the attention of Mr. Samson Ombok.

Yours faithfully,

**Samson Ombok**

**For: DIRECTOR**

STANDARDS DEVELOPMENT AND INTERNATIONAL TRADE

**High Purity Compressed Air—Specification**

PUBLIC REVIEW DRAFT DECEMBER 2012

**TECHNICAL COMMITTEE REPRESENTATION**

The following organizations were represented on the Technical Committee:

Consumer Information Network  
BOC Kenya Ltd  
Noble Gases International Ltd  
Chemigas Ltd  
Government Chemist's Department  
Kenya Industrial Research and Development Institute (KIRDI)  
Kenyatta University, Chemistry Dept  
Ministry of Roads and Public Works – Materials Branch  
Kenya Industrial Estates  
Kenya Medical Association  
Kenyatta National Hospital  
Ministry of Medical Services  
Kenya Bureau of Standards — Secretariat

**REVISION OF KENYA STANDARDS**

In order to keep abreast of progress in industry, Kenya Standards shall be regularly reviewed. Suggestions for improvements to published standards, addressed to the Managing Director, Kenya Bureau of Standards, are welcome.

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# High Purity Compressed Air—Specification

PUBLIC REVIEW DRAFT DECEMBER 2012

## **KENYA BUREAU OF STANDARDS (KEBS)**

**Head Office:** P.O. Box 54974, Nairobi-00200, Tel.: (+254 020) 605490, 602350, Fax: (+254 020) 604031  
E-Mail: [info@kebs.org](mailto:info@kebs.org), Web:<http://www.kebs.org>

### **Coast Region**

P.O. Box 99376, Mombasa-80100  
Tel.: (+254 041) 229563, 230939/40  
Fax: (+254 041) 229448

### **Lake Region**

P.O. Box 2949, Kisumu-40100  
Tel.: (+254 057) 23549, 22396  
Fax: (+254 057) 21814

### **Rift Valley Region**

P.O. Box 2138, Nakuru-20100  
Tel.: (+254 051) 210553, 210555

## **Foreword**

This standard has been prepared by the Technical Committee on Gases under the guidance of the Standards Projects Committee, and it is in accordance with the procedures of the Kenya Bureau of Standards.

High purity Compressed air is mainly used in analytical instruments as fuel such as in GC(FID) and oxidant in AAS. The zero air is desired because if the instrument is 'zeroed' with contaminated air and subsequently encounters a cleaner atmosphere (test sample), negative readings could result, ultimately affecting the detection limits of the instrument. Impurities can also cause the AAS flame to discolor or burn unevenly. Furnace atmospheres require low moisture levels to maintain instrument sensitivity.

This standard covers characteristics touching on their purity, packaging and marking. The major impurities limits covered include Carbon dioxide, carbon monoxide, moisture and hydrocarbons.

During the development of this standard, reference was made to the following documents:

KS 2170-2:2008 Medical gases — Specification, Part 2: Medical air

Linde group speciality gas equipment, Publication number 1-866-385-5349, Zero gas 2— Specification

EN 1089-3:2004 Transportable gas cylinders—Cylinder identification, Part 3: Colour coding

Acknowledgement is hereby made for the assistance received from these sources.

## High Purity Compressed Air—Specification

### 1 Scope

This Kenya standard specifies requirements and test methods for compressed High Purity Air. It does not apply to the gas intended for medicinal use or inhalational purposes.

### 2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this Kenya Standard. For undated reference, the latest edition of the normative document referred to applies.

KS ISO 7225, *Gas cylinders — Precautionary labels*

KS 09-532, *Specification for standard atmospheric conditions for test purposes*

### 3 Terms and Definitions

For the purposes of this Standard the following terms and definitions shall apply.

#### 3.1

**R**  
reagent

#### 3.2

**STP**  
standard atmospheric temperature and pressure as per KS 09-532

### 4 Requirements

#### 4.1 Odour

When tested in accordance with the method specified in annex A, the product shall pass the test.

#### 4.2 Oxygen content

When tested in accordance with the method specified in annex B, the product shall have oxygen content in the range 20.0% v/v —22.0 % v/v.

#### 4.3 Identity

When tested in accordance with the method specified in annex C, the product shall pass the test.

#### 4.4 Impurities

The product shall be colourless and shall comply with the impurities limits given in table 1.

Table 1 - Impurity limits for High Purity Air

SL NO.	Characteristic	Requirement	Test method
1.	Carbon dioxide ppm, max	400	Annex D
2.	Carbon monoxide ppm, max	5	
3.	Total hydrocarbons as methane ppm, max	2	
4.	Water ppm, max	4	Annex E

## 5 Packing and marking

### 5.1 Packing

The product shall be supplied as compressed gas in appropriate steel cylinders/containers complying with relevant Kenya standards. Valves or taps shall not be lubricated with oil or grease.

### 5.2 Marking

#### 5.2.1 Cylinder

Each cylinder/container shall have labels which are clearly and indelibly marked with the following information:

- a) The words " high purity compressed air";
- b) The name or registered trade mark and address of the manufacturer;
- c) The content of oxygen;
- d) The impurities limits in table 1, as applicable;
- e) Batch number;
- f) Date of filling;
- g) Filling pressure (at STP).

#### 5.2.2 Colour

Each cylinder shall in addition to the markings in 5.2.1, be clearly and indelibly painted with the colour bright green.

#### 5.2.3 Precautionary labels

Each cylinder shall in addition to the markings in 5.2.1, be clearly and indelibly marked with precautionary labels as specified in KS ISO 7225.

**Annex A**  
**(Normative)**

**Test Method for odour**

**A.1 Principle**

The method uses the principle of human olfactory detection system of odour in air.

**A.4 Procedure**

**A.4.1** Carefully open the container valve of the test gas to produce a moderate flow of gas.

**A.4.2** Do not direct the gas stream toward the face, but deflect a portion of the stream toward the nose.

**A.4.3** The gas shall be deemed to have passed the test if no appreciable odour is discernible.

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**Annex B****(Normative)****Determination of Oxygen content****B.1 Principle**

Oxygen in gases is determined using a paramagnetic analyzer. The principle of the method is based on the high paramagnetic sensitivity of the oxygen molecule. Oxygen exerts a strong interaction on magnetic fields, which is measured electronically, amplified and converted to a reading of oxygen concentration.

The measurement of oxygen concentration is dependent upon the pressure and temperature and, if the analyzer is not automatically compensated for variations in temperature and pressure, it must be calibrated immediately prior to use.

As the paramagnetic effect of oxygen is linear the instrument must have a suitable range with a readability of 0.1 per cent or better.

**B.2 Apparatus** Paramagnetic analyzer with a suitable range and readability of 0.1 per cent or better.

**B.3 Reagents****B.3.1 Calibration mixtures****B.3.2 Nitrogen R1 N<sub>2</sub>**

Commercially available nitrogen (N<sub>2</sub>) reference gas of suitable grade

**B.4 Procedure**

**B.4.1** Set the zero by passing nitrogen R1 through the instrument at a suitable flow rate until a constant reading is obtained. It should be set to zero according to the manufacturer's instructions.

**B.4.2** Set the appropriate limit by passing air (20.9 per cent v/v O<sub>2</sub>) through the instrument at a suitable flow rate until a constant reading is obtained. The limit should be set to 20.9 per cent v/v in accordance with the manufacturer's instructions.

**B.4.3** Pass the gas to be examined through the instrument at a constant flow rate until a suitable reading is obtained.

## Annex C

### (Normative)

#### Identity test method

##### C.1 Principle

This method covers the determination of identity of Air by means of glowing splinter test, oxygen burette test and paramagnetic analyzer tests.

##### C.2 Apparatus

C.2.1 25-ml capacity gas burette (Fig. 1).

C.2.2 A cylindrical funnel

C.2.3 A splinter of wood

##### C.3 Reagents

C.3.1 Freshly prepared potassium hydroxide solution (~560 g/l)

A solution of potassium hydroxide R containing about 560 g of KOH per litre

C.3.2 Freshly prepared sodium dithionite solution (200 g/l)

A solution of sodium dithionite R containing about 200 g of  $\text{Na}_2\text{O}_4\text{S}_2$  per litre.

C.3.3 A cylindrical funnel

C.3.4 A cylindrical funnel

##### C.4. Procedure

C.4.1 Place a glowing splinter of wood into the test gas. The splinter remains glowing.

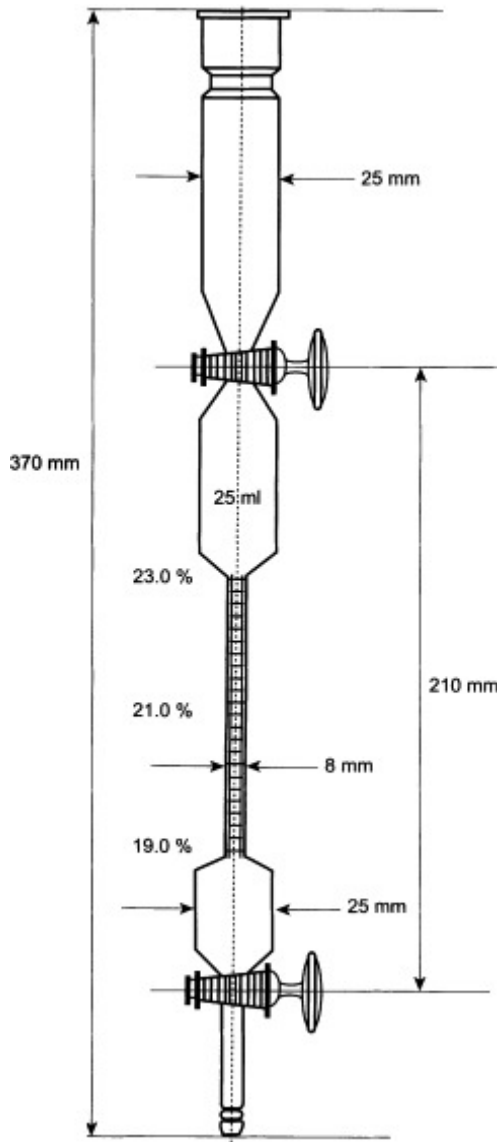
C.4.2 For the determination, use a 25-ml capacity gas burette (Fig. 1) in the form of a chamber with at its upper end, a tube graduated in 0.2 % between 19.0 and 23.0, and isolated at each end by a tap with a conical barrel. The lower tap is joined to a tube with an olive-shaped nozzle and is used to introduce the test gas into the apparatus. A cylindrical funnel above the upper tap is used to introduce the absorbent solution.

C.4.3 Wash the burette with water and dry. Open the two taps. Connect the nozzle to the container of the test gas and set the flow rate to 1 litre per minute. Flush the burette by passing the gas through it for 1 minute. Close the upper tap of the burette and immediately afterwards the lower tap. Rapidly disconnect the burette from the container of the test gas, and give a half turn to the upper tap to eliminate any excess pressure in the burette.

C.4.4 Keeping the burette vertical fill the funnel with a freshly prepared mixture of 21 ml of potassium hydroxide (~560 g/l) and 130 ml of sodium dithionite (200 g/l). Open the upper tap slowly. The solution absorbs the oxygen and enters the burette. Allow to stand for 10 minutes without shaking.

**C.4.5** Read the level of the liquid meniscus on the graduated part of the burette and record the figure. The recorded figure represents the content of oxygen as a percentage in v/v. The read value shall be between 20 % — 22 %.

**C.4.6** The test gas shall be deemed to have passed identity test if the splinter remains glowing as per C.4.1, the read value in C.4.5 is between 20 % — 22 % and the oxygen content is between 20.4 % — 21.4 %, when tested in accordance with annex B.



**Figure 1. Gas Burette**

## Annex D

### (Normative)

#### Determination of carbon dioxide, carbon monoxide and total hydrocarbons (as methane)

##### D.1 Principle

This method covers the determination of carbon dioxide, carbon monoxide and total hydrocarbons (as methane) content of Air by means of gas chromatography.

##### D.2 Apparatus

**D.2.1 Gas chromatograph**, with thermal conductivity detector with stainless steel column (4m × 4.6mm) packed with molecular sieve 5A and using Ultra High purity Helium as the carrier gas. The carrier gas shall be purified further by passing through argon gas purifying system. Maintain the column at 60 °C and the detector at 130 °C.

**Note** Many other variables, such as column type, length, carrier flow, detector temperature, detector type and oven temperature, may be left open, and still provide a suitable system for determination of these impurities.

##### D.3 Reagents

**D.3.1 Reference gas**, commercially available calibration gas mixture of carbon dioxide, carbon monoxide and methane in Air.

##### D.4 Procedure

**D.4.1** Set the GC conditions in accordance with the manufacturer's instructions. Calibrate the instrument by injecting a suitable volume of the reference gas (D.3.1).

**D.4.2** Inject a suitable volume of both the test gas and the reference gas (D.3.1).

**D.4.3** Adjust the volume, as well as the conditions specified above (D.2), to produce a peak response for the reference gas (D.3.1) that gives a height of not less than 35 % on the recorder.

**D.4.4** Measure the areas of the peak responses obtained in the chromatograms from the injections of test gas and reference gas, and calculate the percentage content of each analyte by comparing with the peak response obtained from the reference gas (D.3.1).

**D.4.5** The result of the calibration for hydrocarbons shall be expressed as total hydrocarbons calibrated as Methane.

**Annex E**  
**(Normative)**

**Method for the determination of water content**

**E.1 Principle**

The gas is passed through a direct reading hygrometer.

**E.2 Apparatus**

**E.2.1 A direct reading hygrometer** – of one of the following types:

- a) cooled mirror dew point;
- b) electrolytic;
- c) capacitance;

**E.3 Calibration**

Ensure that the instrument has a current certificate of calibration demonstrating traceability to a physical standard held at the KEBS Metrology Laboratory or a recognized international body.

**E.4 Procedure**

Operate the direct reading hygrometer in accordance with the manufacturer's instructions. Keep all sample lines as short as practicable and, together with all ancillary equipment, ensure that they have only polytetrafluoroethylene or stainless product in accordance with the manufacturer's instructions.

Record the water content that is displayed by the instrument.