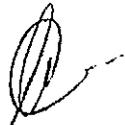


	<b>Specification</b>	<b>Technology</b>
---	----------------------	-------------------

**Title:** Specification for industrial, medical, special gases and liquefied petroleum gases  
**Unique Identifier:** 474-11014  
**Alternative Reference Number:** N/A  
**Area of Applicability:** Technology Division  
**Documentation Type:** Specification  
**Revision:** 1  
**Total Pages:** 22  
**Next Review Date:** TBD  
**Disclosure Classification:** CONTROLLED DISCLOSURE

**Compiled by**



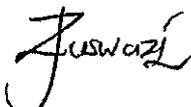
Lonke Nkunjana

**Engineer**

**Gas Plant CoE**

Date: 29/03/2016.....

**Functional Responsibility**



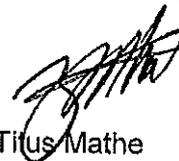
Zamaswazi Luswazi

**Engineering Manager**

**Renewables & Gas Plant CoE**

Date: 2016/03/29.....

**Authorised by**



Titus Mathe

**Senior Manager**

**Power Plant Engineering**

Date: 31/03/2016.....

**CONTENTS**

**1. INTRODUCTION ..... 3**

**1. SUPPORTING CLAUSES ..... 3**

    1.1 SCOPE ..... 3

        1.1.1 Purpose ..... 3

        1.1.2 Applicability ..... 3

    1.2 NORMATIVE/INFORMATIVE REFERENCES ..... 3

        1.2.1 Normative ..... 3

        1.2.2 Informative ..... 4

    1.3 DEFINITIONS ..... 4

        1.3.1 Classification ..... 4

        1.3.2 Special Gas ..... 4

        1.3.3 Liquefied Petroleum Gas ..... 4

        1.3.4 Cylinder ..... 4

    1.4 ABBREVIATIONS ..... 4

    1.5 ROLES AND RESPONSIBILITIES ..... 4

    1.6 PROCESS FOR MONITORING ..... 5

    1.7 RELATED/SUPPORTING DOCUMENTS ..... 5

**2. INDUSTRIAL AND LIQUEFIED PETROLEUM GAS SPECIFICATION ..... 5**

    2.1 GAS QUALITY ..... 5

    2.2 GAS QUANTITY AND FREQUENCY OF SUPPLY ..... 5

    2.3 GAS CONTAINER/SUPPLY REQUIREMENTS ..... 5

    2.4 COMPLIANCE AND ACCREDITAION ..... 6

**3. SPECIAL GASES SPECIFICATION ..... 6**

**4. AUTHORISATION ..... 6**

**5. REVISIONS ..... 7**

**6. DEVELOPMENT TEAM ..... 7**

**ANNEXURE 1: SPECIFICATION FOR INDUSTRIAL AND LIQUEFIED PETROLEUM GASES ..... 8**

**ANNEXURE 2: SPECIFICATION FOR SPECIAL GASES ..... 18**

**CONTROLLED DISCLOSURE**

## 1. INTRODUCTION

Eskom Group Commercial is currently in the process of establishing long term national supply agreements for the supply, delivery and off-loading of industrial gases, medical gases, special gases and liquefied petroleum gases to various Eskom sites. In the light of establishing these national gas contracts, the Gas plant CoE was mandated to develop a standardised gas specification.

This document entails a high level gas specification indicating, inter alia, gas quality, gas quantity, requirements for cylinder marking and valve connection details for all gases used at various Eskom sites

## 1. SUPPORTING CLAUSES

### 1.1 SCOPE

This specification focuses on defining the gas compositions and gas cylinder requirements for all gases used at various Eskom sites.

It must be noted that this first revision of the specification only focuses on specifying the gas quality requirements, i.e, gas composition.

#### 1.1.1 Purpose

The purpose of this document is to consolidate and standardize all the gas specifications used at various Eskom sites.

#### 1.1.2 Applicability

This document shall apply throughout Eskom Holdings SOC Limited and all relevant gas suppliers for various Eskom sites.

## 1.2 NORMATIVE/INFORMATIVE REFERENCES

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

### 1.2.1 Normative

- [1] SANS 532 - Standards and specifications for industrial, medical, propellant, food and beverage gases refrigerants and breathing gases.
- [2] SANS 10019 - Transportable pressure receptacles for compressed, dissolved and liquefied gases- Basic design, manufacture, use and maintenance.
- [3] ISO 17025 - General requirements for the competence of testing and calibration laboratories.
- [4] Occupational Health and Safety Act 85 of 1993.
- [5] ISO 9001:2008, Quality Management Systems requirements.

**CONTROLLED DISCLOSURE**

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is the

### 1.2.2 Informative

- [6] BS 341-1962 - Specification for Valve fittings - For compressed gas cylinders - Part 1: Valves with taper stems (excluding valves used for breathing and medical purposes).
- [7] BS 5045-7-2000 - Transportable gas containers - Part 7: Specification for seamless steel gas containers of water capacity 0.5 L up to 15 L for special portable applications.

## 1.3 DEFINITIONS

### 1.3.1 Classification

**Controlled disclosure:** controlled disclosure to external parties (either enforced by law, or discretionary).

### 1.3.2 Special Gas

Gas/ gas mixture that has specific properties and is prepared for special applications (e.g. instrument calibration, gas mixtures or technical diving mixtures)

### 1.3.3 Liquefied Petroleum Gas

Commercial butane, commercial propane, or a mixture of light hydrocarbons (predominantly propane, propene, butane and butene) that is gaseous under conditions of ambient temperature and pressure and that is liquefied by an increase of pressure or a lowering of temperature.

### 1.3.4 Cylinder

Transportable pressure receptacle of a water capacity (that may be seamless, welded, of composite) of water capacity 0.5L -150L

## 1.4 ABBREVIATIONS

Abbreviation	Description
BS	British Standard
CoE	Centre of Excellence
ISO	International Standard Organization
LPG	Liquefied Petroleum Gases
SANS	South African National Standard
SANAS	South African National Accreditation System
L	Litre

## 1.5 ROLES AND RESPONSIBILITIES

Personnel at Eskom various sites and those involved in the supply, delivery and off-loading of industrial gases, medical gases, special gases and liquefied petroleum gases, must ensure that the gases are compliant with the provisions of this specification.

### CONTROLLED DISCLOSURE

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line

The head of each site (e.g. power station manager, site manager etc.) shall be responsible for the implementation of this specification at his/her site.

Gas Centre of Excellence within Group Technology shall be responsible for periodic review of this document. Affected stakeholders (e.g. Generation, Transmission, Distribution, Medical Centres etc.) shall support Gas Centre of Excellence in this process.

The supplier/s shall be responsible for providing all information required in this specification.

## **1.6 PROCESS FOR MONITORING**

Eskom sites shall ensure regular analysis of gases qualities is conducted to verify compliance to the specification. Gases laboratory tests may be conducted by Eskom site chemical laboratories, Research, Testing and Development (RT&D) in Rosherville or and by SANAS accredited laboratories.

## **1.7 RELATED/SUPPORTING DOCUMENTS**

- Hydrogen Systems Standard, 240-56227413.
- Specifications for Hydrogen Systems, GSP 36-803
- Guidelines for the Management of SF6 (Sulfur Hexafluoride) for use in Electrical Equipment (NRS087:2008)

## **2. INDUSTRIAL AND LIQUEFIED PETROLEUM GAS SPECIFICATION**

### **2.1 GAS QUALITY**

As indicated in Annexure 1, the minimum purity required for each gas shall comply with SANS 532 - Standards and specifications for industrial, medical, propellant, food and beverage gases refrigerants and breathing gases unless indicated otherwise.

A certificate of compliance detailing the composition (including impurities) of each gas shall be provided by the supplier upon delivery. All additional information required, as illustrated in Annexure 1 shall be provided by the supplier.

All compositions of gases in Annexure 1 and 2 are (and shall be) indicated as volume percent unless otherwise stated.

### **2.2 GAS QUANTITY AND FREQUENCY OF SUPPLY**

Where cylinder volume is specified, minimum gas pressure within the cylinder shall also be specified; otherwise the total mass of the gas in the cylinder must be indicated.

### **2.3 GAS CONTAINER/SUPPLY REQUIREMENTS**

As a minimum, the supplier must provide the following information to the buyer at delivery of the gas

#### **CONTROLLED DISCLOSURE**

- Name or classification of gas(es);
- Composition of gas - (including a test certificate/certificate of compliance detailing the composition of the gas);
- Volumetric capacity (for liquefiable gases this shall be the minimum);
- Filling pressure where applicable (applicable for refilling tanks);
- Material safety data sheet for each gas;
- Statement that the cylinder conforms to the requirements of SANS 10019

## 2.4 COMPLIANCE AND ACCREDITATION

- All gas compositions (limits and impurities) shall comply to SANS 532 unless otherwise stated
- Cylinder and valve shall comply with SANS 10019
- Proof of purity in the form of test/compliance certificates to be provided by the supplier
- Compliance to the Occupational Health and Safety Act 85 of 1993 must also be indicated

## 3. SPECIAL GASES SPECIFICATION

All gases listed in Annexure 2 shall comply with the requirements of ISO 17025 - General requirements for the competence of testing and calibration laboratories and Section 2.3 of this specification. At delivery, the supplier must provide a test/compliance certificate for all gases indicating the composition of the gas.

## 4. AUTHORISATION

This document has been seen and accepted by:

Name	Designation
Saneshan Govender	Corporate Specialist Gas Turbines & Thermo-Flow Systems
Wynand Cilliers	Senior Engineer - Gas Plant CoE LDE
Rudi Van Der Wal	Power Station Manager - Komati
Mhleli Mkhize	Mechanical Engineer – Gourikwa Power Station
Julian Fourie	Plant Manager – Peaking Stations
Makobe Mudau	Engineering - Medupi Power Station
Garth Drake	Senior Advisor Electrical - Transmission Division
Grant Ruiters	Senior Advisor Electrical - Transmission Division
Bonny Nyangwa	Middle Manager – Research, Testing and Development

### CONTROLLED DISCLOSURE

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line

## 5. REVISIONS

Date	Rev.	Compiler	Remarks
20 July 2015	0.1	Lonke Nkunjana David Delekoa	First draft for review
20 August 2015	0.2	Lonke Nkunjana	Updated draft according to responses
05 Jan 2016	0.3	Lonke Nkunjana	Updated draft according to responses
12 January 2016	1	Lonke Nkunjana	Updated according to responses

## 6. DEVELOPMENT TEAM

The following people were involved in the development of this document:

- David Delekoa

**ANNEXURE 1: SPECIFICATION FOR INDUSTRIAL AND LIQUEFIED PETROLEUM GASES**

	Name	Molecular formula	Purity (% composition of gas components)	Standard to Comply with	Additional requirements	Pressure (where applicable)
1	Air	N <sub>2</sub> +O <sub>2</sub>	Air :19- 23 % Oxygen Nitrogen- Balance	GAS COMPOSITION, INCLUDING IMPURITY LIMITS TO COMPLY WITH SANS 532:2009 Table 1- Specification for Industrial gases	GAS COMPOSITION TO COMPLY TO SANS 532:2009- Standards and specifications for industrial, medical, propellant, food and beverage gases refrigerants and breathing gases CYLINDER AND VALVE TO COMPLY WITH SANS 10019:2001- Transportable pressure receptacles for compressed dissolved and liquefied gases- Basic Design, manufacture, use and maintenance PROOF OF PURITY IN THE FORM OF QUALITY/TEST CERTIFICATES TO BE SUPPLIED ON DELIVERY MATERIAL SAFETY DATA SHEETS TO BE PROVIDED WITH EVERY DELIVERY AS REQUIRED BY THE OCCUPATIONAL HEALTH AND SAFETY ACT	
2	Air, Synthetic	N <sub>2</sub> +O <sub>2</sub>	Air :21- 22.5% Oxygen Nitrogen- Balance	GAS COMPOSITION, INCLUDING IMPURITY LIMITS TO COMPLY WITH SANS 532:2009 Table 2- Specification for Medical gases	GAS COMPOSITION TO COMPLY TO SANS 532:2009- Standards and specifications for industrial, medical, propellant, food and beverage gases refrigerants and breathing gases CYLINDER AND VALVE TO COMPLY WITH SANS 10019:2001- Transportable pressure receptacles for compressed dissolved and liquefied gases- Basic Design, manufacture, use and maintenance PROOF OF PURITY IN THE FORM OF QUALITY/TEST CERTIFICATES TO BE	

Name	Molecular formula	Purity (% composition of gas components)	Standard to Comply with	Additional requirements	Pressure (where applicable)
3	C2H2	98.0 %	GAS COMPOSITION, INCLUDING IMPURITY LIMITS TO COMPLY WITH SANS 532:2009 Table 1- Specification for Industrial gases	<p>SUPPLIED ON DELIVERY MATERIAL SAFETY DATA SHEETS TO BE PROVIDED WITH EVERY DELIVERY AS REQUIRED BY THE OCCUPATIONAL HEALTH AND SAFETY ACT</p> <p>GAS COMPOSITION TO COMPLY TO SANS 532:2009- Standards and specifications for industrial, medical, propellant, food and beverage gases refrigerants and breathing gases</p> <p>CYLINDER AND VALVE TO COMPLY WITH SANS 10019:2001- Transportable pressure receptacles for compressed dissolved and liquefied gases- Basic Design, manufacture, use and maintenance</p> <p>PROOF OF PURITY IN THE FORM OF QUALITY/TEST CERTIFICATES TO BE SUPPLIED ON DELIVERY</p> <p>MATERIAL SAFETY DATA SHEETS TO BE PROVIDED WITH EVERY DELIVERY AS REQUIRED BY THE OCCUPATIONAL HEALTH AND SAFETY ACT</p>	
4	NH3	99.70%	GAS COMPOSITION, INCLUDING IMPURITY LIMITS TO COMPLY WITH SANS 532- 2009 Table 6: Specifications for ammonia	<p>GAS COMPOSITION TO COMPLY TO SANS 532:2009- Standards and specifications for industrial, medical, propellant, food and beverage gases refrigerants and breathing gases</p> <p>CYLINDER AND VALVE TO COMPLY WITH SANS 10019:2001- Transportable pressure receptacles for compressed dissolved and liquefied gases- Basic Design, manufacture, use and maintenance</p>	

	Name	Molecular formula	Purity (% composition of gas components)	Standard to Comply with	Additional requirements	Pressure (where applicable)
5	ARGON	Ar	99.99%	GAS COMPOSITION, INCLUDING IMPURITY LIMITS TO COMPLY WITH SANS 532:2009 Table 1- Specification for Industrial gases	PROOF OF PURITY IN THE FORM OF QUALITY/TEST CERTIFICATES TO BE SUPPLIED ON DELIVERY MATERIAL SAFETY DATA SHEETS TO BE PROVIDED WITH EVERY DELIVERY AS REQUIRED BY THE OCCUPATIONAL HEALTH AND SAFETY ACT  GAS COMPOSITION TO COMPLY TO SANS 532:2009- Standards and specifications for industrial, medical, propellant, food and beverage gases refrigerants and breathing gases CYLINDER AND VALVE TO COMPLY WITH SANS 10019:2001- Transportable pressure receptacles for compressed dissolved and liquefied gases- Basic Design, manufacture, use and maintenance PROOF OF PURITY IN THE FORM OF QUALITY/TEST CERTIFICATES TO BE SUPPLIED ON DELIVERY MATERIAL SAFETY DATA SHEETS TO BE PROVIDED WITH EVERY DELIVERY AS REQUIRED BY THE OCCUPATIONAL HEALTH AND SAFETY ACT	
6	CARBON DIOXIDE LIQUEFIED GAS	CO2	99%	GAS COMPOSITION, INCLUDING IMPURITY LIMITS TO COMPLY WITH SANS 532:2009 Table 1-	GAS COMPOSITION TO COMPLY TO SANS 532:2009- Standards and specifications for industrial, medical, propellant, food and beverage gases refrigerants and breathing gases CYLINDER AND VALVE TO COMPLY WITH SANS 10019:2001- Transportable pressure	

**Specification for Industrial, Medical,  
Special and Liquefied Petroleum Gases**

Unique Identifier: 474-11014  
 Revision: 1  
 Page: 11 of 22

	Name	Molecular formula	Purity (% composition of gas components)	Standard to Comply with	Additional requirements	Pressure (where applicable)
				Specification for Industrial gases	receptacles for compressed dissolved and liquefied gases- Basic Design, manufacture, use and maintenance  PROOF OF PURITY IN THE FORM OF QUALITY/TEST CERTIFICATES TO BE SUPPLIED ON DELIVERY  MATERIAL SAFETY DATA SHEETS TO BE PROVIDED WITH EVERY DELIVERY AS REQUIRED BY THE OCCUPATIONAL HEALTH AND SAFETY ACT	
7	CARBON DIOXIDE;	CO <sub>2</sub>	99%	GAS COMPOSITION, INCLUDING IMPURITY LIMITS TO COMPLY WITH SANS 532:2009 Table 1- Specification for Industrial gases	GAS COMPOSITION TO COMPLY TO SANS 532:2009- Standards and specifications for industrial, medical, propellant, food and beverage gases refrigerants and breathing gases  CYLINDER AND VALVE TO COMPLY WITH SANS 10019:2001- Transportable pressure receptacles for compressed dissolved and liquefied gases- Basic Design, manufacture, use and maintenance  PROOF OF PURITY IN THE FORM OF QUALITY/TEST CERTIFICATES TO BE SUPPLIED ON DELIVERY  MATERIAL SAFETY DATA SHEETS TO BE PROVIDED WITH EVERY DELIVERY AS REQUIRED BY THE OCCUPATIONAL HEALTH AND SAFETY ACT	
8	Carbon dioxide and Carbon monoxide mixture	CO <sub>2</sub> +CO	40% CO <sub>2</sub> 60% CO			

	Name	Molecular formula	Purity (% composition of gas components)	Standard to Comply with	Additional requirements	Pressure (where applicable)
9	CARBON MONOXIDE:NITROGEN	CO+N <sub>2</sub>			Supplier to specify composition	
10	CHLORINE	Cl	99.50%	GAS COMPOSITION, INCLUDING IMPURITY LIMITS TO COMPLY WITH SANS 532:2009 Table 1- Specification for Industrial gases	GAS COMPOSITION TO COMPLY TO SANS 532:2009- Standards and specifications for industrial, medical, propellant, food and beverage gases refrigerants and breathing gases CYLINDER AND VALVE TO COMPLY WITH SANS 10019:2001- Transportable pressure receptacles for compressed dissolved and liquefied gases- Basic Design, manufacture, use and maintenance PROOF OF PURITY IN THE FORM OF QUALITY/TEST CERTIFICATES TO BE SUPPLIED ON DELIVERY MATERIAL SAFETY DATA SHEETS TO BE PROVIDED WITH EVERY DELIVERY AS REQUIRED BY THE OCCUPATIONAL HEALTH AND SAFETY ACT	
11	HELIUM	He	99%	GAS COMPOSITION, INCLUDING IMPURITY LIMITS TO COMPLY WITH SANS 532:2009 Table 1- Specification for Industrial gases	GAS COMPOSITION TO COMPLY TO SANS 532:2009- Standards and specifications for industrial, medical, propellant, food and beverage gases refrigerants and breathing gases CYLINDER AND VALVE TO COMPLY WITH SANS 10019:2001- Transportable pressure receptacles for compressed dissolved and liquefied gases- Basic Design, manufacture, use and maintenance PROOF OF PURITY IN THE FORM OF QUALITY/TEST CERTIFICATES TO BE	

	Name	Molecular formula	Purity (% composition of gas components)	Standard to Comply with	Additional requirements	Pressure (where applicable)
12	HYDROGEN	H <sub>2</sub>	99.5%	GAS COMPOSITION, INCLUDING IMPURITY LIMITS TO COMPLY WITH SANS 532:2009 Table 1- Specification for Industrial gases	SUPPLIED ON DELIVERY MATERIAL SAFETY DATA SHEETS TO BE PROVIDED WITH EVERY DELIVERY AS REQUIRED BY THE OCCUPATIONAL HEALTH AND SAFETY ACT  GAS COMPOSITION TO COMPLY TO SANS 532:2009- Standards and specifications for industrial, medical, propellant, food and beverage gases refrigerants and breathing gases CYLINDER AND VALVE TO COMPLY WITH SANS 10019:2001- Transportable pressure receptacles for compressed dissolved and liquefied gases- Basic Design, manufacture, use and maintenance PROOF OF PURITY IN THE FORM OF QUALITY/TEST CERTIFICATES TO BE SUPPLIED ON DELIVERY MATERIAL SAFETY DATA SHEETS TO BE PROVIDED WITH EVERY DELIVERY AS REQUIRED BY THE OCCUPATIONAL HEALTH AND SAFETY ACT	
13	LIQUID PETROLEUM:	Propane Butane Mixture		GAS COMPOSITION, INCLUDING IMPURITY LIMITS TO COMPLY WITH SANS 1774: Liquefied Petroleum gases	GAS COMPOSITION TO COMPLY TO SANS SANS 1774: Liquefied Petroleum gases CYLINDER AND VALVE TO COMPLY WITH SANS 10019:2001- Transportable pressure receptacles for compressed dissolved and liquefied gases- Basic Design, manufacture, use and maintenance PROOF OF PURITY IN THE FORM OF	

	Name	Molecular formula	Purity (% composition of gas components)	Standard to Comply with	Additional requirements	Pressure (where applicable)
14	NITRIC OXIDE	NO	Supplier to specify		QUALITY/TEST CERTIFICATES TO BE SUPPLIED ON DELIVERY MATERIAL SAFETY DATA SHEETS TO BE PROVIDED WITH EVERY DELIVERY AS REQUIRED BY THE OCCUPATIONAL HEALTH AND SAFETY ACT	
15	NITROGEN	N2	99.50%	GAS COMPOSITION, INCLUDING IMPURITY LIMITS TO COMPLY WITH SANS 532:2009 Table 1- Specification for Industrial gases	GAS COMPOSITION TO COMPLY TO SANS 532:2009- Standards and specifications for industrial, medical, propellant, food and beverage gases refrigerants and breathing gases CYLINDER AND VALVE TO COMPLY WITH SANS 10019:2001- Transportable pressure receptacles for compressed dissolved and liquefied gases- Basic Design, manufacture, use and maintenance PROOF OF PURITY IN THE FORM OF QUALITY/TEST CERTIFICATES TO BE SUPPLIED ON DELIVERY MATERIAL SAFETY DATA SHEETS TO BE PROVIDED WITH EVERY DELIVERY AS REQUIRED BY THE OCCUPATIONAL HEALTH AND SAFETY ACT	

	Name	Molecular formula	Purity (% composition of gas components)	Standard to Comply with	Additional requirements	Pressure (where applicable)
16	NITROGEN	N2	99.997%		CYLINDER AND VALVE TO COMPLY WITH SANS 10019:2001- Transportable pressure receptacles for compressed dissolved and liquefied gases- Basic Design, manufacture, use and maintenance PROOF OF PURITY IN THE FORM OF QUALITY/TEST CERTIFICATES TO BE SUPPLIED ON DELIVERY MATERIAL SAFETY DATA SHEETS TO BE PROVIDED WITH EVERY DELIVERY AS REQUIRED BY THE OCCUPATIONAL HEALTH AND SAFETY ACT	
17	NITROGEN:CARBON MONOXIDE	N2+CO	Supplier to specify			
18	NITROGEN Tank	N2	99.50%	SANS 532- Standards and specifications for industrial, medical, propellant, food and beverage gases refrigerants and breathing gases	GAS COMPOSITION TO COMPLY TO SANS 532 CYLINDER AND VALVE TO COMPLY WITH SANS 10019; PROOF OF PURITY IN THE FORM OF QUALITY CERTIFICATES TO BE SUPPLIED ON DELIVERY AS WELL AS PROOF THAT THE CYLINDERS MEET THE REQUIRED STANDARDS	
19	NITROGEN:SULPHUR DIOXIDE:	N2+SO2	Supplier to specify			

Name	Molecular formula	Purity (% composition of gas components)	Standard to Comply with	Additional requirements	Pressure (where applicable)
20  OXYGEN	O2	99.5%	GAS COMPOSITION, INCLUDING IMPURITY LIMITS TO COMPLY WITH SANS 532:2009 Table 1- Specification for Industrial gases	GAS COMPOSITION TO COMPLY TO SANS 532:2009- Standards and specifications for industrial, medical, propellant, food and beverage gases refrigerants and breathing gases CYLINDER AND VALVE TO COMPLY WITH SANS 10019:2001- Transportable pressure receptacles for compressed dissolved and liquefied gases- Basic Design, manufacture, use and maintenance PROOF OF PURITY IN THE FORM OF QUALITY/TEST CERTIFICATES TO BE SUPPLIED ON DELIVERY MATERIAL SAFETY DATA SHEETS TO BE PROVIDED WITH EVERY DELIVERY AS REQUIRED BY THE OCCUPATIONAL HEALTH AND SAFETY ACT	
21  OXYGEN- Medical	O2	99.5%	GAS COMPOSITION, INCLUDING IMPURITY LIMITS TO COMPLY WITH SANS 532:2009 Table 2- Specification for Medical gases	GAS COMPOSITION TO COMPLY TO SANS 532:2009- Standards and specifications for industrial, medical, propellant, food and beverage gases refrigerants and breathing gases CYLINDER AND VALVE TO COMPLY WITH SANS 10019:2001- Transportable pressure receptacles for compressed dissolved and liquefied gases- Basic Design, manufacture, use and maintenance PROOF OF PURITY IN THE FORM OF QUALITY/TEST CERTIFICATES TO BE SUPPLIED ON DELIVERY MATERIAL SAFETY DATA SHEETS TO BE PROVIDED WITH EVERY DELIVERY AS	

	Name	Molecular formula	Purity (% composition of gas components)	Standard to Comply with	Additional requirements	Pressure (where applicable)
22	SULPHUR DIOXIDE: NITROGEN	SO <sub>2</sub> +N <sub>2</sub>	Supplier to specify		REQUIRED BY THE OCCUPATIONAL HEALTH AND SAFETY ACT  GAS COMPOSITION TO COMPLY TO SANS 532:2009- Standards and specifications for industrial, medical, propellant, food and beverage gases refrigerants and breathing gases CYLINDER AND VALVE TO COMPLY WITH SANS 10019:2001- Transportable pressure receptacles for compressed dissolved and liquefied gases- Basic Design, manufacture, use and maintenance PROOF OF PURITY IN THE FORM OF QUALITY/TEST CERTIFICATES TO BE SUPPLIED ON DELIVERY MATERIAL SAFETY DATA SHEETS TO BE PROVIDED WITH EVERY DELIVERY AS REQUIRED BY THE OCCUPATIONAL HEALTH AND SAFETY ACT	
23	Mixture of Nitrogen, Nitric Oxide and Carbon Monoxide	N <sub>2</sub> , NO & CO	NO: 140ppm CO: 100ppm N <sub>2</sub> : Balance	Allowable uncertainty of 1%. Aluminium cylinder to be used		5L 20Mpa 80L
24	Pyroshield		Ar: 50% N <sub>2</sub> :50%			

**ANNEXURE 2: SPECIFICATION FOR SPECIAL GASES**

Name	Molecular formula	Purity (% composition of gas components)	Pressure (where applicable)	Cylinder Volume (L)	Standard to Comply with	Additional Information
<b>NITROGEN</b>						
Mixture of Nitrogen and Carbon Monoxide	N <sub>2</sub> & CO	CO: 500 ppm N <sub>2</sub> : Balance	N/A	10 L		Allowable Tolerance between 1-5%. The Gas composition must be compliant/verified by SANAS
Mixture of Nitrogen and Carbon Monoxide	N <sub>2</sub> & CO	CO: 2000 ppm N <sub>2</sub> : Balance	N/A	10 L		Allowable Tolerance between 1-5%. The Gas composition must be compliant/verified by SANAS
Mixture of Nitrogen and Carbon Dioxide	N <sub>2</sub> & CO	CO <sub>2</sub> : 25% N <sub>2</sub> : Balance	N/A	10 L		Allowable Tolerance between 1-5%. The Gas composition must be compliant/verified by SANAS
Mixture of Nitrogen, Oxygen, Nitrogen Monoxide and Sulphur dioxide	N <sub>2</sub> , O <sub>2</sub> , NO & SO <sub>2</sub>	O <sub>2</sub> : 4.5% NO: 4000ppm SO <sub>2</sub> : 6000ppm N <sub>2</sub> : Balance	N/A	10 L	Gas shall be tested and verified according to ISO 17025	Allowable Tolerance between 1-5%. The Gas composition must be compliant/verified by SANAS
Mixture of Nitrogen and Dinitrogen oxide (Nitrous oxide)	N <sub>2</sub> & N <sub>2</sub> O	N <sub>2</sub> O: 500 ppm N <sub>2</sub> : Balance	N/A	10 L	Gas shall be tested and verified according to ISO 17025	Allowable Tolerance between 1-5%. The Gas composition must be compliant/verified by SANAS
Mixture of Nitrogen and Nitric Oxide	N <sub>2</sub> & NO	NO: 4000 ppm N <sub>2</sub> : balance		10 L	Gas shall be tested and verified according to ISO 17025	Allowable Tolerance between 1-5%.
Mixture of Nitrogen and Nitric Oxide	N <sub>2</sub> & NO	NO: 500 ppm N <sub>2</sub> : balance		10 L	Gas shall be tested and verified according to ISO 17025	Allowable Tolerance between 1-5%.
Mixture of Nitrogen and Nitric Oxide	N <sub>2</sub> & NO	NO: 70ppm N <sub>2</sub> : Balance	10 Mpa	10 L		Allowable Tolerance between 1-5%. The Gas composition must be compliant/verified by

Name	Molecular formula	Purity (% composition of gas components)	Pressure (where applicable)	Cylinder Volume (L)	Standard to Comply with	Additional Information
Mixture of Nitrogen and Nitric Oxide	N <sub>2</sub> & NO	NO :800 ppm N <sub>2</sub> : balance		10 L	Gas shall be tested and verified according to ISO 17025	SANAS Allowable Tolerance between 1-5%.
Mixture of Nitrogen and Sulphur Dioxide	N <sub>2</sub> & SO <sub>2</sub>	SO <sub>2</sub> :600 ppm N <sub>2</sub> : Balance		10 L	Gas shall be tested and verified according to ISO 17025	Allowable Tolerance between 1-5%.
Mixture of Nitrogen and Sulphur Dioxide	N <sub>2</sub> & SO <sub>2</sub>	SO <sub>2</sub> :2000 ppm N <sub>2</sub> : Balance		10 L	Gas shall be tested and verified according to ISO 17025	Allowable Tolerance between 1-5%.
Mixture of Nitrogen, Carbon Dioxide and Hydrogen	N <sub>2</sub> , CO <sub>2</sub> & H <sub>2</sub>	CO <sub>2</sub> : 5% H <sub>2</sub> : 10% N <sub>2</sub> : Balance		10 L		Allowable Tolerance between 1-5%.
Mixture of Nitrogen, Carbon Dioxide, Nitric Oxide and Sulphur Dioxide	N <sub>2</sub> , CO <sub>2</sub> , NO & SO <sub>2</sub>	SO <sub>2</sub> :800ppm NO:400ppm CO <sub>2</sub> : 13.5% N <sub>2</sub> : Balance	N/A	50 L		Allowable Tolerance between 1-5%. The Gas composition must be compliant/ verified by SANAS
Mixture of Nitrogen, Oxygen, Carbon Dioxide and Carbon Monoxide	N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> & CO	O <sub>2</sub> :4% CO <sub>2</sub> :500ppm CO :500ppm N <sub>2</sub> : Balance	N/A	10 L		Allowable Tolerance between 1-5%. The Gas composition must be compliant/ verified by SANAS
Mixture of Nitrogen, Oxygen, Carbon Dioxide and Carbon Monoxide	N <sub>2</sub> , O <sub>2</sub> , CO <sub>2</sub> & CO	O <sub>2</sub> : 3-5% CO <sub>2</sub> : 15% CO: 800 ppm N <sub>2</sub> : Balance		10 L		
Nitrogen VGL Liquid High Pressure		N <sub>2</sub> : 99.5%	Filling pressure to be specified	Minitank		Allowable Tolerance between 1-5%. The Gas composition must be compliant/ verified by SANAS
Mixture of Nitrogen and Sulphur Dioxide	N <sub>2</sub> & SO <sub>2</sub>	SO <sub>2</sub> : 70 ppm N <sub>2</sub> : Balance	10 Mpa	10 L	Gas shall be tested and verified according to ISO 17025	Allowable Tolerance between 1-5%.
Mixture of Nitrogen, Sulphur Dioxide, Oxygen and Carbon Dioxide		SO <sub>2</sub> : 800 ppm O <sub>2</sub> :6% CO <sub>2</sub> :13.5% N <sub>2</sub> :Balance		50 L		Allowable Tolerance between 1-5%. The Gas composition must be compliant/

Name	Molecular formula	Purity (% composition of gas components)	Pressure (where applicable)	Cylinder Volume (L)	Standard to Comply with	Additional Information
Synthetic Air	N <sub>2</sub> & O <sub>2</sub>	O <sub>2</sub> : 19-23% N <sub>2</sub> : Balance CnHm ≤ 4ppm H <sub>2</sub> O ≤ 4ppm	19.6 MPa	50 L/11.8kg		verified by SANAS
Zero Air	N <sub>2</sub> & O <sub>2</sub>	O <sub>2</sub> : 19-23% and 3% RAT N <sub>2</sub> : Balance CnHm ≤ 0.5ppm and 3%RAT	15MPa	50 L/11.8kg	ASTM D1933, Type III	Allowable Tolerance between 1-5%. The Gas composition must be compliant/ verified by SANAS
Nitrogen(Lasal Alphagaz 1)	N <sub>2</sub>	N <sub>2</sub> : 99.95%	20 Mpa	50 L/17.5kg		
Liquid Nitrogen	N <sub>2</sub>			5L		
Nitrogen 5(Lasal Alphagas 1)	N <sub>2</sub>	N <sub>2</sub> : 99.99%	19.6 Mpa	50 L/11.8kg	UN 1066 (ALPHAGAZ 1)	
<b>ARGON</b>						
Argon 5.0 Mixture	Ar & CO <sub>2</sub> & H <sub>2</sub> O & N <sub>2</sub> & O <sub>2</sub> & 2.0 & CnHm	Ar: 99.999% CO <sub>2</sub> ≤ 0.5ppm H <sub>2</sub> O ≤ 2.0ppm N <sub>2</sub> ≤ 5ppm O <sub>2</sub> ≤ 2.0 ppm CnHm ≤ 0.5ppm				The Gas composition must be compliant/verified by SANAS
Argon mix P10	Ar	CH <sub>4</sub> : 10% Ar: Balance	19.6 MPa	50 L		
Argon minitank	Ar		15 Mpa	50L/12.32 kg		
			Fill pressure to be specified	High Pressure Minitank (VGL)	GAS COMPOSITION TO COMPLY TO SANS 532:2009- Table 1 specification for industrial gases	
<b>OXYGEN</b>						
Pure Oxygen	O <sub>2</sub>	O <sub>2</sub> : 99.998%		10L and 50L		
Medical Oxygen	O <sub>2</sub>	O <sub>2</sub> : 99.95%	15MPa	50L/9.5kg	UN 1072	
Welding Oxygen						

Name	Molecular formula	Purity (% composition of gas components)	Pressure (where applicable)	Cylinder Volume (L)	Standard to Comply with	Additional Information
<b>OTHER GAS MIXTURES</b>						
		SF6 ≥ 99.70 % by weight Air: 2 g/kg CF4: 2400 mg/kg H2O: 25 mg/kg Mineral Oil: 10 mg/kg Acidity i.t.o HF: 1 mg/kg			Eskom Transmission specification: New SF6 Supplied in standard Gas cylinders	Allowable Tolerance between 1-5%. The Gas composition must be compliant/verified by SANAS
Sulphur Hexafluoride	SF6	CO :60% CO2:40%				
Special Gas(Mixture of Carbon monoxide and Carbon dioxide)						
H2S mix		H2S:70 ppm		10 L	Gas shall be tested and verified according to ISO 17025	
		He: 99.999% O2 ≤ 2 ppm N2 ≤ 5 ppm H2O ≤ 2ppm CO ≤ 0.5 ppm CO2 ≤ 0.5 ppm	200 Bar /300 Bar	50L/17.5kg	SANS 532 Table 1- Specification for Industrial gases	Allowable Tolerance between 1-5%. The Gas composition must be compliant/verified by SANAS
Helium						
Hydrogen (N5)		H2 ≥ 99.999% O2 ≤ 3 ppm H2O ≤ 5 ppm	19.6 Mpa	50 L/11kg	SANS 532 Table 1- Specification for Industrial gases	Allowable Tolerance between 1-5%. The Gas composition must be compliant/verified by SANAS
Air(Synthetic)	N2+O2	Air :19- 23 % Oxygen Nitrogen- Balance			SANS 532 Table 2- Specification for Medical gases	

Name	Molecular formula	Purity (% composition of gas components)	Pressure (where applicable)	Cylinder Volume (L)	Standard to Comply with	Additional Information
Gas Mixer		H2 :1000ppm CH4 : 1000ppm CO :1000ppm CO2 : 1000ppm C2H4::1000ppm C2H2:1000ppm C3H8:1000ppm C4H6:1000ppm C4H10:1000ppm C4H8: Balance Synthetic air.	15Mpa	50L		
Mixed Gas Standard		H2 :1000ppm ± 2% accuracy CH4:1000ppm ± 2% accuracy CO :1000ppm ± 2% accuracy CO2 : 1000ppm ± 2% accuracy C2H4:1000ppm ± 2% accuracy C2H6:1000ppm ± 2% accuracy C2H2:1000ppm ± 2% accuracy C3H8:1000ppm ± 2% accuracy C3H6:1000ppm ± 2% accuracy C4H10:1000ppm ± 2% accuracy N2&O2:Balance	1.1MPa	2R	Traceable to NIST	Contents: 1730 litre, Valve type CGA 590 BR