

**Material Safety Data Sheet (MSDS)  
Carbon Monoxide**

Please ensure that this MSDS is received by an appropriate person

Date: January 2015

Version 2

Ref: MS114

**1 PRODUCT AND COMPANY IDENTIFICATION**

**PRODUCT IDENTIFICATION**

|                        |   |
|------------------------|---|
| Product Name           | CARBON MONOXIDE   |
| Chemical Formula       | CO  |
| Trade Name             | Carbon Monoxide (N3.7)  |
| Colour coding          | Signal Red (A.11) body with a Yellow (C.61) shoulder.   |
| Valve                  | Neriki Brass 5/8-inch BSP left hand female.   |
| Company Identification | African Oxygen Limited<br>23 Webber Street<br>Johannesburg, 2001<br>Tel. No: (011) 490-0400<br>Fax No: (011) 490-0506 |
| <b>EMERGENCY No</b>    | <b>086002020 (24 Hr)</b>  |

60 - 70

coma with intermittent convulsions.

Coma with intermittent convulsions, depressed heart action and respiration, possibly death.

70 -80

Weak pulse and slow respiration, respiratory failure and death

|                     |                  |
|---------------------|------------------|
| <b>Eye Contact</b>  | No known effect. |
| <b>Skin Contact</b> | No known effect. |
| <b>Ingestion</b>    | No known effect. |

**4 FIRST AID MEASURES**

Conscious persons should be assisted to an uncontaminated area and be treated with supplemental oxygen. Quick removal from the contaminated area is most important. Unconscious persons should be removed to an uncontaminated area, and given artificial respiration and oxygen at the same time. The administering of the oxygen at an elevated pressure (up to 2 to 2.5 atmospheres) has shown to be beneficial as has treatment in a hyperbaric chamber. The physician should be informed that the patient has inhaled toxic quantities of carbon monoxide. Prompt medical attention is mandatory in all cases of overexposure to carbon monoxide. Rescue personnel should be equipped with self-contained breathing apparatus and be cognisant of extreme fire and explosion hazard.

**2 COMPOSITION/INFORMATION ON INGREDIENTS**

|                 |                                |
|-----------------|--------------------------------|
| Chemical Name   | Carbon Monoxide                |
| Chemical Family | Flammable, toxic, reactive gas |
| CAS No.         | 630-08-0                       |
| UN No.          | 1016                           |
| ERG No.         | 119                            |
| Hazchem Warning | Toxic gas                      |

**3 HAZARDS IDENTIFICATION**

**Main Hazards.** All cylinders are portable gas containers, and must be regarded as pressure vessels at all times Carbon monoxide is a toxic, flammable gas. The flammability limits in the air are between 12,5% and 74,2% by volume. Inhaled carbon monoxide binds to the blood haemoglobin, greatly reducing the red blood cells ability to transport oxygen to body tissues. Effects may include headaches, dizziness, convulsions, loss of consciousness and death.

**Adverse Health effects.** Carbon monoxide is a chemical asphyxiant, and the inhalation of concentrations as low as 400 ppm in air could result in headache and discomfort within 2 - 3 hours. Inhalation of concentrations of 4000 ppm in air could prove fatal in less than one hour.

**Chemical Hazards.** Carbon monoxide containing moisture and sulphur-containing impurities can cause corrosion of steel at any pressure. Dry, sulphur-free carbon monoxide is safe for use with steel and other common metals at pressures up to 13790 kPa.

**Biological Hazards.** Carbon monoxide in excess of 50 ppm will produce symptoms of poisoning if breathed in for a sufficiently long time. As little as 200 ppm will produce slight symptoms (slight headache, discomfort) in several hours. A concentration of 400 ppm will produce headache and discomfort within two to three hours. With moderate exercise, 1000 - 2000 ppm will produce slight palpitation of the heart in 30 minutes, a tendency to stagger in 1,5 hours, and confusion of the mind, headache, and nausea in 2 hours. A concentration of 2000 - 2500 ppm will usually produce unconsciousness in about 30 minutes. Its effects at higher concentrations may be so sudden that a man has little or no warning before he collapses. These effects are summarised in the following table.

| Effect   | Concentration (ppm) |
|--|---------------------|
| Permissible for an exposure of 8 hours   | 50                  |
| Concentration which can be inhaled for 1 hour without appreciable effect             | 400 - 500           |
| Concentration causing a just appreciable effect after 1 hour of exposure             | 600 - 700           |
| Concentration causing unpleasant but not dangerous symptoms after 1 hour of exposure | 1000 - 2000         |
| Dangerous for exposure of 1 hour   | 1500 - 2000         |
| Fatal in exposures of less than 1 hour   | 4000 & above        |

**Vapour Inhalation.** The concentration, exposure time and physical activity of the individual will determine the percentage conversion of haemoglobin to carboxyhaemoglobin. The effects produced depend on the degree and duration of saturation of blood with carbon monoxide. The symptoms caused by various amounts of carboxyhaemoglobin in the blood are given in the following table.

| Blood Saturation %<br>Carboxyhaemoglobin | Symptoms  |
|--|---|
| 0 - 10                                   | No symptoms.  |
| 10 - 20                                  | Tightness across forehead, possibly slight headache.  |
| 20 - 30                                  | Headache and throbbing in temples.  |
| 30 - 40                                  | Severe headache, weakness, dizziness, dimness of vision, nausea, vomiting, collapse.                      |
| 40 - 50                                  | Same as previous item but with more possibility of collapse and syncope, increased respiration and pulse. |
| 50 - 60                                  | Syncope, increased respiration and pulse,   |

**5 FIRE FIGHTING MEASURES**

**Extinguishing media.** Dry powder. Carbon dioxide. Fog-water spray. (In the absence of fog equipment a fine spray of water may be used.)

**Specific hazards.** Highly flammable. May form explosive gas mixtures with air is a chemical asphyxiant.

**Emergency actions.** Evacuate area. Post warnings to prevent persons from approaching with lit cigarettes or open flames. Using water, keep all cylinders in the vicinity of the fire cool. Remove cylinders from the vicinity of the fire if possible. Remove all cylinders with signs of overheating to a safe area. Keep cool. CONTACT THE NEAREST AFROX BRANCH.

**Protective Clothing.** Exposed fire fighters should wear approved self-contained breathing apparatus with full-face mask. Safety gloves and shoes, or boots, should be worn when handling cylinders.

**Environmental precautions.** As carbon monoxide is only slightly lighter than air it will not diffuse rapidly. Caution should be taken when entering confined spaces as pockets of high concentrations may occur. Ventilate all confined spaces using forced draught if necessary. Ensure that all electrically powered equipment is flameproof.

**6 ACCIDENTAL RELEASE MEASURES**

**Personal Precautions.** As carbon monoxide is a chemical asphyxiant, self-contained breathing apparatus should be used when entering confined spaces where leaks have occurred. Do not enter any potentially hazardous area with any source of ignition such as a lit cigarette or match.

**Environmental precautions.** Carbon monoxide does not pose a hazard to the environment. An explosive gas-air mixture could be formed when leaks occur, so eliminate all forms of ignition.

**Small spills.** Small leaks should be extinguished by shutting off the source of supply, e.g. closing the valve on the cylinder, or tightening the gland nut. If unable to stop small leaks the cylinder should be moved into the open, well away from any source of ignition. Should a small leak have ignited, use a multi-purpose dry powder or carbon dioxide extinguisher. Should there be no extinguisher available, a welder's glove or heavy cloth, soaked in water may be used to extinguish the flame.

**Large spills.** Stop the source if it can be done without risk. Eliminate all sources of ignition and static discharges. Restrict access to the area until completion of the clean-up procedure. Post-relevant warning signs. Wear adequate protective clothing when working near the source of the leak. Ventilate the area using forced-draught if necessary. Ensure that all equipment is flameproof.

**7 HANDLING AND STORAGE**

Do not allow cylinders to slide or come into contact with sharp edges. Carbon monoxide cylinders may be stacked horizontally provided that they are firmly secured at each end to prevent rolling. Ensure that equipment is adequately earthed. Conspicuous signs should be posted in the storage area forbidding smoking or the use of naked lights. Do not store reserve stocks of carbon monoxide with cylinders containing oxygen, or other highly oxidising or flammable materials. Use the "first-in first-out" inventory system to prevent full cylinders from being stored for excessive periods of time. Compliance with all relevant legislation is essential. Keep out of reach of children.

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**8 EXPOSURE CONTROLS/PERSONAL PROTECTION**

**Occupational exposure hazards.** Lacking odour and colour, carbon monoxide gives no warning of its presence, and inhalation of high concentrations can cause sudden, unexpected collapse. The eight-hour time-weighted average threshold limit value (TLV) adopted by the American Conference of Governmental Industrial Hygienists is 50 ppm (55 mg/m<sup>3</sup>) for exposure to carbon monoxide. Occupational Safety & Health Administration has adopted an eight-hour time-weighted average exposure limit of 35 ppm (40 mg/m<sup>3</sup>) and a ceiling limit of 200 ppm (229 mg/m<sup>3</sup>) for carbon monoxide.

**Engineering control measures.** Engineering control measures are preferred to reduce exposures. General methods include mechanical ventilation, process or personal enclosure, and control of process conditions.

Administrative controls and personal protective equipment may also be required. Use a suitable flameproof ventilation system separate from other exhaust ventilation systems. Exhaust direct to outside. Supply sufficient replacement air to make up for air removed by exhaust system.

**Personal protection.** Use self-contained breathing apparatus when fighting large fires.

**Eyes** Use safety glasses when working with cylinders

**Hands** Use suitable protective gloves when working with cylinders

**Skin** No known effect.

**9 PHYSICAL AND CHEMICAL PROPERTIES**

**PHYSICAL DATA**

|  |                         |
|--|-------------------------|
| Chemical Symbol                        | CO                      |
| Molecular Weight                       | 28,01                   |
| Specific volume @ 20°C & 101,325 kPa   | 850 ml/g                |
| Density gas @ 20°C & 101,325 kPa       | 1,165 kg/m <sup>3</sup> |
| Auto-ignition temperature              | 652°C                   |
| Relative density (Air=1) @ 101,325 kPa | 0,967                   |
| Flammability limits in air             | 12,5 - 74,2% (by vol)   |
| Colour                                 | None                    |
| Taste                                  | None                    |
| Odour                                  | None                    |

**10 STABILITY AND REACTIVITY**

**Conditions to avoid.** Overheating of cylinders. Never test for leaks with a flame. Use soapy water when testing for leaks. Never use cylinders as rollers or supports, or for any other purposes other than the storing of carbon monoxide. Do not use carbon monoxide cylinders for the storage of any other gas.

**Incompatible materials.** Steel and other common metals are satisfactory for use with dry, sulphur-free carbon monoxide at pressures up to 13790 kPa. The presence of moisture and sulphur-compounds appreciably increases the corrosive action on steel at any pressures.

**Hazardous decomposition products.** Only carbon dioxide is formed when carbon monoxide burns in air.

**11 TOXICOLOGICAL INFORMATION**

|                      |   |
|----------------------|---|
| Acute Toxicity       | Exposure to concentrations of more than 4000 ppm could be fatal in less than one hour. (See Table in Section 3)         |
| Skin & eye contact   | No known effect   |
| Chronic Toxicity     | The effects of prolonged exposure to low concentrations of carbon monoxide are similar to the acute effects (see above) |
| Carcinogenicity      | No known effect   |
| Mutagenicity         | No known effect   |
| Reproductive Hazards | No known effect   |

**12 ECOLOGICAL INFORMATION**

As carbon monoxide is only slightly lighter than air it will not disperse rapidly. However, it does not pose a hazard to the ecology.

**13 DISPOSAL CONSIDERATIONS**

AB

A member of The Linde Group

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**Disposal Methods** Small amounts may be blown to the atmosphere under controlled conditions. No sources of ignition should be in the vicinity. Large amounts should only be handled by the gas supplier.

**Disposal of packaging** The disposal of containers must only be handled by the gas supplier.

**14 TRANSPORT INFORMATION**

**ROAD TRANSPORTATION**

|                 |                     |
|-----------------|---------------------|
| UN No.          | 1016                |
| Class           | 2.3                 |
| Subsidiary risk | Chemical asphyxiant |
| ERG No.         | 119                 |
| Hazchem warning | Toxic gas           |

**SEA TRANSPORTATION**

|                 |      |
|-----------------|------|
| IMDG            | 1016 |
| Class           | 2.3  |
| Packaging group |      |
| Label           |      |

**AIR TRANSPORTATION**

|                          |                     |
|--------------------------|---------------------|
| ICAO/IATA Code           | 1016                |
| Class                    | 2.3                 |
| Subsidiary risk          | Chemical asphyxiant |
| Packaging group          |                     |
| Packaging instructions   |                     |
| - Cargo                  | 200                 |
| - Passenger              | Forbidden           |
| Maximum quantity allowed |                     |
| - Cargo                  | 25 kg               |
| - Passenger              | Nil                 |

**15 REGULATORY INFORMATION**

|                      |  |
|----------------------|--|
| EEC Hazard class     | Toxic gas  |
| Risk phrases         | R11 Highly flammable<br>R18 In use may form flammable explosive vapour-air mixture<br>R 20 Harmful by inhalation<br>R 23 Toxic by inhalation<br>R 44 Risk of explosion if heated under confinement.<br>R48 Danger of serious damage to health by prolonged exposure  |
| Safety phrases       | S2 Keep out of reach of children<br>S9 Keep container in a well-ventilated place<br>S16 Keep away from sources of ignition<br>S33 Take precautionary measures against static discharges<br>S36 Wear suitable protective clothing<br>S38 In case of insufficient ventilation, wear suitable respiratory equipment<br>S44 If you feel unwell, seek medical advice (show the label where possible)<br>S51 Use only in well ventilated areas |
| National legislation | none   |
|                      | Refer to SANS 10234 for explanation of the above.  |

**16 OTHER INFORMATION**

**Bibliography**  
Compressed Gas Association, Arlington, Virginia  
Handbook of Compressed Gases - 3rd Edition  
Matheson. Matheson Gas Data Book - 6th Edition  
SANS 10265 - Labelling of Dangerous Substances

**17 EXCLUSION OF LIABILITY**

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