

Product: Carbon Monoxide
UN No: 1016

1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND THE COMPANY/UNDERTAKING

Product identifier : Carbon Monoxide
Chemical formula : CO
Synonyms : Carbon Monoxide, Carbonic Oxide, Carbon Oxide

Relevant identified uses of the substance or mixture and uses advised against

Use of the Substance/Mixture : General Industrial
Restrictions on use : No data available

Details of the Supplier : CK Special Gases Ltd
Ashby Suite, Wellington House
Leicester Road, Ibstock
Leicestershire
LE67 6HP

Email Address : sales@ckgas.com

Telephone : +44(0)1530 267209
Emergency Telephone (24 hours) : Web Version

2. HAZARDS IDENTIFICATION

Classification according to Regulation 1272/2008 (CLP)

Flammable gases – Category 1 H220:Extremely flammable gas

Gases under pressure - Compressed gas. H280:Contains gas under pressure; may explode if heated.

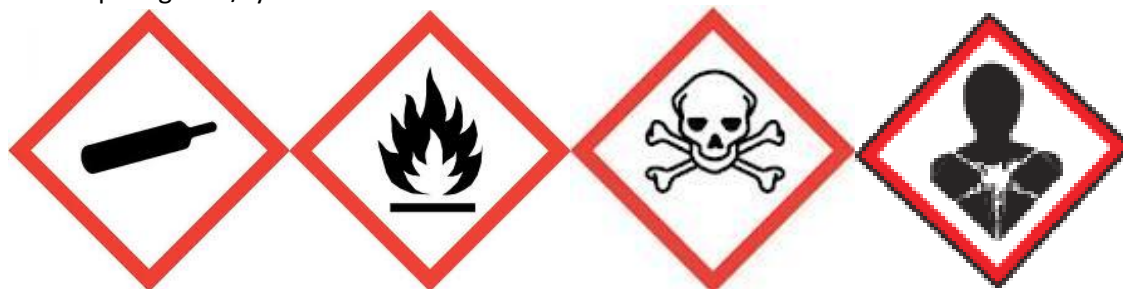
Acute toxicity – Inhalation Category 3 H331:Toxic if inhaled

Reproductive toxicity – Category 1A H360d:May damage the unborn child

Specific target organ toxicity – repeated exposure – Category 1 H372:Causes damage to organs through prolonged or repeated exposure

Label Elements according to Regulation 1272/2008 (CLP)

Hazard pictograms/symbols



Signal Word : Danger

Product: Carbon Monoxide

UN No: 1016

Hazard Statements :

H220:Extremely flammable gas
H280:Contains gas under pressure; may explode if heated.
H331:Toxic if inhaled
H360:May damage fertility or the unborn child
H372: Causes damage to organs through prolonged or repeated exposure

Precautionary Statements :

Prevention

P202:Do not handle until all safety precautions have been read and understood
P210:Keep away from heat/sparks/open flames/hot surfaces.
No smoking
P260:Do not breathe dust/fume/gas/mist/vapours/spray

Response

P304+P340:If inhaled: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P308+P313:If exposed or concerned: Get medical advice/attention
P377:Leaking gas fire: Do not extinguish unless leak can be stopped safely
P381:Eliminate all ignition sources if safe to do so

Storage

P403:Store in a well-ventilated place.
P405:Store locked up

Classification (Directive)

F+ Extremely flammable

T Toxic

R61 May cause harm to the unborn child

R12 Extremely flammable

R23 Toxic by inhalation

R48/23 Toxic: Danger of serious damage to health by prolonged exposure through inhalation

Other Hazards

Toxic by inhalation

High pressure gas

Extremely flammable

May form explosive mixtures in air

Immediate fire and explosion risk hazard exists when mixed with air at concentrations exceeding the lower flammability limit (LFL).

Do not breathe gas

Self-contained breathing apparatus (SCBA) may be required.

Environmental Effects

Dangerous for the environment

Product: Carbon Monoxide

UN No: 1016

Treatment : Hyperbaric oxygen is the most efficient treatment of carbon monoxide and dramatically reduces the biological half-life of carboxyhaemoglobin. Although less effective, 100% oxygen mask is useful if hyperbaric facilities are not available. Stimulant drugs are not indicated.

5. FIRE-FIGHTING MEASURES

Extinguishing media

Suitable extinguishing media : All known extinguishing media can be used.

Extinguishing media which must not be used for safety reasons : No data available.

Special hazards arising from the substance or mixture : If flames are accidentally extinguished, explosive re-ignition may occur; therefore, appropriate measures should be taken (e.g. total evacuation to protect persons from cylinder fragments and toxic fumes should a rupture occur). Upon exposure to intense heat or flame, cylinder will vent rapidly and or rupture violently. Combustion by-products may be toxic. Move away from container and cool with water from a protected position. Keep adjacent cylinders cool by spraying with large amounts of water until the fire burns itself out. If possible, shut off the source of gas and allow the fire to burn itself out. Do not extinguish a leaking gas flame unless absolutely necessary. Spontaneous/explosive re-ignition may occur. Extinguish any other fire. Do not allow run-off from fire fighting to enter drains or water courses. Extinguish fire only if gas flow can be stopped

Advice for fire-fighters : Use self-contained breathing apparatus and chemically protective clothing.

Further information : No data available.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures : Evacuate personnel to safe areas. Remove all sources of ignition. Approach suspected leak areas with caution. Never enter a confined space or other area where the flammable gas concentration is greater than 10% of its lower flammable limit. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. Ventilate the area.

Environmental precautions : Should not be released into the environment. Prevent further leakage or spillage. Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous.

Product: Carbon Monoxide

UN No: 1016

Methods and material for containment and cleaning up :

Ventilate the area. Approach suspected leak areas with caution.

Additional advice :

If possible, stop flow of product. Increase ventilation to the release area and monitor concentrations. If leak is from cylinder or cylinder valve, call the CK Special Gases emergency telephone number. If the leak is in the user's system, close the cylinder valve and safely vent the pressure, and purge with an inert gas before attempting repairs.

7. HANDLING AND STORAGE

Precautions for safe handling

Protect cylinders from physical damage; do not drag, roll, slide or drop. Do not allow storage area temperature to exceed 50°C (122°F). Only experienced and properly instructed persons should handle compressed gases/cryogenic liquids. Before using the product, determine its identity by reading the label. Know and understand the properties and hazards of the product before use. When doubt exists as to the correct handling procedure for a particular gas, contact the supplier. Do not remove or deface labels provided by the supplier for the identification of the cylinder contents. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. Leave valve protection caps in place until the container has been secured against either a wall or bench or placed in a container stand and is ready for use. Use an adjustable strap wrench to remove over-tight or rusted caps. Before connecting the container, check the complete gas system for suitability, particularly for pressure rating and materials. Before connecting the container for use, ensure that back feed from the system into the container is prevented. Ensure the complete gas system is compatible for pressure rating and materials of construction. Ensure the complete gas system has been checked for leaks before use. Employ suitable pressure regulating devices on all containers when the gas is being emitted to systems with lower pressure rating than that of the container. Never insert an object (e.g. wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, causing a leak to occur. Open valve slowly. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. Close container valve after each use and when empty, even if still connected to equipment. Never attempt to repair or modify container valves or safety relief devices. Damaged valves should be reported immediately to the supplier. Close valve after each use and when empty. Replace outlet caps or plugs and container caps as soon as container is disconnected from equipment. Do not subject containers to abnormal mechanical shock. Never attempt to lift a cylinder by its valve protection cap or guard. Do not use containers as rollers or supports or for any other purpose than to contain the gas as supplied. Never strike an arc on a compressed gas cylinder or make a cylinder a part of an electrical circuit. Do not smoke while handling product or cylinders. Never re-compress a gas or a gas mixture without first consulting the supplier. Never attempt to transfer gases from one cylinder/container to another. Always use backflow protective device in piping. Purge air from system before introducing gas. Installation of a cross purge assembly between the cylinder and the regulator is recommended. When returning cylinder install valve outlet cap or plug leak tight. Never use direct flame or electrical heating devices to raise the pressure of a container. Containers should not be subjected to temperatures above 50°C (122°F). Prolonged periods of cold temperature below -30°C (-20°F) should be avoided. Ensure equipment is adequately earthed.

Product: Carbon Monoxide
UN No: 1016

Conditions for safe storage, including any incompatibilities

Containers should be stored in a purpose built compound which should be well ventilated, preferably in the open air. Full containers should be stored so that oldest stock is used first. Observe all regulations and local requirements regarding storage of containers. Stored containers should be periodically checked for general condition and leakage. Local codes may have special requirements for toxic gas storage. Protect containers stored in the open against rusting and extremes of weather. Containers should not be stored in conditions likely to encourage corrosion. Containers should be stored in the vertical position and properly secured to prevent toppling. The container valves should be tightly closed and where appropriate valve outlets should be capped or plugged. Container valve guards or caps should be in place. Keep containers tightly closed in a cool, well-ventilated place. Store containers in location free from fire risk and away from sources of heat and ignition. Full and empty cylinders should be segregated. Do not allow storage temperature to exceed 50°C (122°F). Smoking should be prohibited.

Technical measures/Precautions

Containers should be segregated in the storage area according to the various categories (e.g. flammable, toxic, etc.) and in accordance with local regulations. Provide sufficient air exchange and/or exhaust in work rooms. Keep away from combustible material. All electrical equipment in the storage areas should be compatible with flammable materials stored. Containers containing flammable gases should be stored away from other combustible materials. Where necessary containers containing oxygen and oxidants should be separated from flammable gases by a fire resistant partition.

Specific end use(s)

Refer to section 1 or the extended SDS if applicable

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Control parameters

Exposure limit(s)

Carbon monoxide	Time Weighted Average (TWA): EH40 WEL	30 ppm	35 mg/m3
Carbon monoxide	Short Term Exposure Limit (STEL): EH40 WEL	200 ppm	232 mg/m3

If applicable, refer to the extended section of the SDS for further information on CSA.

Exposure controls

Engineering measures

Handle product only in closed systems or provide appropriate exhaust ventilation machinery.
 Provide natural or explosion-proof ventilation adequate to ensure concentrations are kept below exposure limits.
 Provide readily accessible eye wash stations and safety showers.

Product: Carbon Monoxide

UN No: 1016

Personal protective equipment

Respiratory protection :

Keep self-contained breathing apparatus (SCBA) readily available for emergency use. Use self-contained breathing apparatus or positive pressure air line with mask and escape pack in areas where concentration is unknown or above the exposure limits. Users of breathing apparatus must be trained.

Hand protection :

Sturdy work gloves are recommended for handling cylinders. The breakthrough time of the selected glove(s) must be greater than the intended use period.

Eye protection :

Safety glasses recommended when handling cylinders.

Skin and body protection :

Flame retardant antistatic protective clothing. Safety shoes are recommended when handling cylinders. Wear as appropriate flame retardant protective clothing.

Special instructions for protection and hygiene :

Provide good ventilation and/or local exhaust to prevent accumulation of concentrations above exposure limits. Ensure adequate ventilation, especially in confined areas.

9. PHYSICAL

Information on basic physical and chemical properties

Appearance :	Compressed gas. Colourless gas
Odour :	No odour warning properties.
Odour threshold :	No data available.
pH :	Not applicable.
Melting point/range :	-337 °F (-205.1 °C)
Boiling point/range :	-313 °F (-191.5 °C)
Flash point :	Not applicable.
Evaporation rate :	Not applicable.
Flammability (solid, gas) :	No data available.
Upper/lower explosion/flammability limit :	74 % (V) / 12.5 % (V).
Vapour pressure :	Not applicable.
Water solubility :	0.030 g/l.
Relative vapour density :	0.967 (air = 1)
Relative density :	0.79 (water=1)
Partition coefficient (n-octanol/water)	Not applicable.
Autoignition temperature :	620°C.
Decomposition temperature :	No data available.
Viscosity :	Not applicable.
Explosive properties :	No data available.
Oxidizing properties :	No data available.

Product: Carbon Monoxide
UN No: 1016

Molecular Weight : 28.01 g/mol
Density : 0.0012 g/cm³ (0.075 lb/ft³) at 21°C (70°F)
Specific Volume : 0.8615 m³/kg (13.80 ft³/lb) at 21°C (70°F)

10. STABILITY AND REACTIVITY

Reactivity : Refer to possibility of hazardous reactions and/or incompatible materials sections.
Chemical Stability : Stable under normal conditions.
Possibility of hazardous reactions : No data available.
Conditions to avoid : Heat, flames and sparks.
Incompatible materials : Iron, natural rubber, neoprene, nickel, oxygen and oxidising agents.
Hazardous decomposition products : No data available.

11. TOXICOLOGICAL INFORMATION

Information on toxicological effects

Likely routes of exposure
Effects on Eye : No data available.
Effects on Skin : No data available.
Inhalation Effects : May be fatal if inhaled.
Ingestion Effects : Ingestion is not considered a potential route of exposure.
Symptoms : No data available.

Acute toxicity

Acute Oral Toxicity : No data is available on the product itself.
Inhalation : LC50 (1h) : 3760 ppm Species : Rat.
Acute Dermal Toxicity : No data is available on the product itself.
Skin corrosion/irritation : No data available.
Serious eye damage/eye irritation : No data available.
Sensitization. : No data available.

Chronic toxicity or effects from long term exposures

Carcinogenicity : No data available.
Reproductive toxicity : No data is available on the product itself.
Germ cell mutagenicity : No data is available on the product itself.
Specific target organ systemic toxicity (single exposure) : No data available.
Specific target organ systemic toxicity (repeated exposure) : No data available.
Aspiration hazard : No data available.

Product: Carbon Monoxide

UN No: 1016

12. ECOLOGICAL INFORMATION

Toxicity

Aquatic toxicity :	No data is available on the product itself.
Toxicity to other organisms :	No data is available on the product itself.
Persistence and degradability :	No data available.
Bioaccumulative potential :	Does not bio accumulate.
Mobility in soil :	Carbon monoxide will be mobile in the environment.
Results of PBT and vPvB assessment :	If applicable, refer to the extended section of the SDS for further information on CSA.
Other adverse effects :	This product has no known eco-toxicological effects.

13. DISPOSAL CONSIDERATIONS

Waste treatment methods :	In accordance with local and national regulations. Contact supplier if guidance is required. Return unused product in original cylinder to supplier. Must not be discharged to atmosphere.
Contaminated packaging :	Return cylinder to supplier.

14. TRANSPORT INFORMATION

ADR

UN/ID No. :	UN1016
Proper shipping name :	CARBON MONOXIDE, COMPRESSED
Class or Division :	2
Tunnel Code :	(B/D)
Label(s) :	2.3 (2.1)
ADR/RID Hazard ID no. :	263
Marine Pollutant :	No

IATA

Transport forbidden

IMDG

UN/ID No. :	UN1016
Proper shipping name :	CARBON MONOXIDE, COMPRESSED
Class or Division :	2.3
Label(s) :	2.3 (2.1)



SAFETY DATA SHEET

MSDS No: CKSG-01-1016

Product: Carbon Monoxide
UN No: 1016

Marine Pollutant No

RID
UN/ID No. : UN1016
Proper shipping name : CARBON MONOXIDE, COMPRESSED
Class or Division : 2.3
Label(s) : 2.3 (2.1)
Marine Pollutant No

Further Information

Avoid transport on vehicles where the load space is not separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency. The transportation information is not intended to convey all specific regulatory data relating to this material. For complete transportation information, contact a CK Special Gases customer service representative.

15. REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture

Country	Regulatory list	Notification
USA	TSCA	Included on Inventory.
EU	EINECS	Included on Inventory.
Canada	DSL	Included on Inventory.
Australia	AICS	Included on Inventory.
South Korea	ECL	Included on Inventory.
China	SEPA	Included on Inventory.
Philippines	PICCS	Included on Inventory.
Japan	ENCS	Included on Inventory.

WGK Identification Number : 1 - slightly water endangering.

Chemical Safety Assessment

Refer to extended SDS for CSA information

If this product does not contain exposure scenarios, the components in this product are either exempt from REACH, does not meet the minimum volume threshold for a CSA, or the CSA has not yet been completed.

16. OTHER INFORMATION

Ensure all national/local regulations are observed.

R-phrases) – Components

R12 Extremely flammable.

Product: Carbon Monoxide

UN No: 1016

R23 Toxic by inhalation.

R48/23 Toxic: danger of serious damage to health by prolonged exposure through inhalation.

R61 May cause harm to the unborn child. Toxic to Reproduction Category 1

Hazard Statements:

H220 Extremely flammable gas.

H280 Contains gas under pressure; may explode if heated.

H331 Toxic if inhaled.

H360d May damage the unborn child.

H372 Causes damage to organs through prolonged or repeated exposure

Prepared by : CK Special Gases Ltd

For additional information, please visit our website at www.ckgas.com

This Safety Data Sheet has been established in accordance with the applicable European Directives and applies to all countries that have translated the Directives in their national laws. Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC.

Details given in this document are believed to be correct at the time of going to press. Whilst proper care has been taken in the preparation of this document, no liability for injury or damage resulting from its use can be accepted.

Exposure Scenario - Carbon Monoxide

Short Title: Industrial use of the gas in closed systems – large volume

Use Descriptors:

Process Category: PROC1

Sector of Use: SU8, SU9

Product Category: Not applicable.

Environmental Release Category: ERC1, ERC6a

Refer to ECHA guidance for further information on the use descriptor system.

Description of Activities/Processes:

Manufacture and distribution of the substance. Use as feedstock in chemical processes, use as an intermediate (transported, on-site isolated).

Physical Form:

Refer to Section 9 of the SDS for physical properties

Maximum Amount Used for this Exposure Scenario:

1000 t/year

Concentration:

Refer to Section 3 of the SDS for concentration information



SAFETY DATA SHEET

MSDS No: CKSG-01-1016

Product: Carbon Monoxide

UN No: 1016

Duration and Frequency of Use:

> 4 hr/day

Operational Conditions - General:

This Exposure Scenario refers to closed systems. In closed systems exposure is negligible., Containment plus good work practice should ensure negligible exposure., Clearly mark areas where the substance may be present with warning signs, control staff entry to work area.

Risk Management Measures - Occupational:

Organizational Protective Measures: Workers shall be trained in the relevant procedures. Apply appropriate management supervision. Technical Protective Measures: Good general ventilation at workplace assumed. Where substance is being transferred outside of a closed system local exhaust ventilation should be used.

Personal Protective Measures: Respiratory Protective Equipment (self-contained) may be used only in emergency situations where operators are exposed to the substance.

Risk Management Measures - Environment:

Air: Locally measured concentrations of the substance have been estimated. The maximum estimated concentrations are of a similar level to global background levels. Therefore there is no need for concern for air emissions.

Water: No exposure to water has been considered as exposure is not expected.

Soil: No exposure to the soil has been considered as exposure is not expected.

Waste Related Measures:

Waste Treatment: Not applicable as substance is a gas. Cylinders used for transport can be reused.

Predicted Exposure:

PNEC:

PNEC is not available for this substance.

DNEL: 23.0 mg/m

Methods and Parameters:

Calculation Method: Assessment done using ECETOC TRA and EUSES v 2.1.1.

Additional Advice: The risk management measures presented here are based on the exposure estimates using indicated tools. You should perform your own analytical determination of the exposure levels under the operational conditions at your site, if you can demonstrate that.

Exposure Scenario - Carbon Monoxide

Short Title: Industrial use of the gas in closed systems - medium volume.

Use Descriptors:

Process Category: PROC1, PROC3, PROC4, PROC8b, PROC9

Sector of Use: SU8, SU12, SU14, SU15

Product Category: PC14, PC19, PC32

Product: Carbon Monoxide

UN No: 1016

Environmental Release Category: ERC2, ERC6b

Refer to ECHA guidance for further information on the use descriptor system.

Description of Activities/Processes:

Formulation of mixtures with gas in pressure receptacles, transfilling gas or liquid in the closed systems. Metal surface treatment products including galvanic and electroplating products. Intermediate use.

Physical Form:

Refer to Section 9 of the SDS for physical proper ties

Maximum Amount Used for this Exposure Scenario:

100t/year

Concentration:

Refer to Section 3 of the SDS for concentration information

Duration and Frequency of Use:

> 4 hr/day

Operational Conditions - General:

This Exposure Scenario refers to closed systems. In closed systems exposure is negligible., Containment plus good work practice should ensure negligible exposure., Clearly mark areas where the substance may be present with warning signs, control staff entry to work area.

Risk Management Measures - Occupational:

Organizational Protective Measures: Workers shall be trained in the relevant procedures. Apply appropriate management supervision. Technical Protective Measures: In closed systems, workers exposure to the substance should be limited by physical containment of the substance within the system. Good general ventilation at workplace assumed. Where substance is being transferred outside of a closed system local exhaust ventilation should be used. Personal Protective Measures: Respiratory Protective Equipment (self-contained) may be used only in emergency situations where operators are exposed to the substance.

Risk Management Measures - Environment:

Air: Locally measured concentrations of the substance have been estimated. The maximum estimated concentrations are of a similar level to global background levels. Therefore there is no need for concern for air emissions.

Water: No exposure to water has been considered as exposure is not expected.

Soil: No exposure to the soil has been considered as exposure is not expected.

Waste Related Measures:

Waste Treatment: Not applicable as substance is a gas. Cylinders used for transport can be reused.

Predicted Exposure:

PNEC:

PNEC is not available for this substance.

DNEL: 23.0 mg/m



SAFETY DATA SHEET

MSDS No: CKSG-01-1016

Product: Carbon Monoxide

UN No: 1016

Methods and Parameters:

Calculation Method: Assessment done using ECETOC TRA and EUSES v 2.1.1.

Additional Advice: The risk management measures presented here are based on the exposure estimates using indicated tools. You should perform your own analytical determination of the exposure levels under the operational conditions at your site, if you can demonstrate that.