

Carbon monoxide**019****SECTION 1. Identification of the substance/mixture and of the company/undertaking****1.1. Product identifier**

Trade name : Carbon monoxide , CARBON MONOXID (N18, N25, N37, N47)
SDS Nr : 019
Chemical description : Carbon monoxide
CAS No :630-08-0
EC No :211-128-3
Index No :006-001-00-2
Registration-No. : 01-2119480165-39-0023
Chemical formula : CO

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

Relevant identified uses : Industrial and professional. Perform risk assessment prior to use. Test gas / Calibration gas.
Chemical reaction / Synthesis. Laboratory use. Use for metal treatment. Use for manufacture of electronic/photovoltaic components. Laser gas.
Contact supplier for more uses information.
Uses advised against : Consumer use.

1.3. Details of the supplier of the safety data sheet

Company identification : AIR LIQUIDE Deutschland GmbH
Hans-Günther-Sohl-Straße 5
D-40235 Düsseldorf GERMANY
Telefon: +49 (0)211 6699-0 - Fax: +49 (0)211 6699-222
E-Mail address (competent person) : Info.SDB@AirLiquide.de

1.4. Emergency telephone number

Emergency telephone number : +49 (0)2151 398668
- Availability : (24 / 7)

SECTION 2. Hazards identification**2.1. Classification of the substance or mixture****Hazard Class and Category Code(s), Regulation (EC) No 1272/2008 (CLP)**

- Health hazards : Acute toxicity, Inhalation - Category 3 - Danger - (CLP : Acute Tox. 3) - H331
Reproductive toxicity - Unborn Child - Category 1A - Danger - (CLP : Repr. 1A) - H360D
Specific Target Organ Toxicity - Repeated exposure - Category 1 - Danger - (CLP : STOT RE 1) - H372
- Physical hazards : Flammable gases - Category 1 - Danger - (CLP : Flam. Gas 1) - H220
Gases under pressure - Compressed gas - Warning - (CLP : Press. Gas) - H280

Classification EC 67/548 or EC 1999/45

Classification : F+; R12
Repr. Cat. 1; R61
T; R23-R48/23

2.2. Label elements**Labelling Regulation EC 1272/2008 (CLP)**

- Hazard pictograms





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SECTION 2. Hazards identification (continued)

- Hazard pictograms code : GHS06 - GHS02 - GHS08 - GHS04
- Signal words : Danger
- 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.
- Precautionary statements
 - Prevention : P260 - Do not breathe gas, vapours.
P210 - Keep away from heat, sparks, open flames or hot surfaces. – No smoking.
P202 - Do not handle until all safety precautions have been read and understood.
 - Response : P304+P340+P315 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get immediate medical advice / attention.
P308+P313 - If exposed or concerned : get medical advice.
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.

2.3. Other hazards

Other hazards : None.

SECTION 3. Composition/information on ingredients

3.1. Substance / 3.2. Mixture

Substance.

Substance name	Content [Vol-%]	CAS No EC No Index No Registration no.	Classification(DSD)	Classification(CLP)
Carbon monoxide	: 100 %	630-08-0 211-128-3 006-001-00-2 01-2119480165-39-0023	F+; R12 Repr. Cat. 1; R61 T; R23-48/23	Flam. Gas 1 (H220) Repr. 1A (H360D) Acute Tox. 3 (H331) STOT RE 1 (H372) Press. Gas (H280)

Contains no other components or impurities which will influence the classification of the product.

* 1: Listed in Annex IV / V REACH, exempted from registration.

* 2: Registration deadline not expired.

* 3: Registration not required: Substance manufactured or imported < 1t/y

Full text of R-phrases see chapter 16. Full text of H-statements see chapter 16

SECTION 4. First aid measures

4.1. Description of first aid measures

- Inhalation : Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.
- Skin contact : Adverse effects not expected from this product.
- Eye contact : Adverse effects not expected from this product.
- Ingestion : Ingestion is not considered a potential route of exposure.

4.2. Most important symptoms and effects, both acute and delayed

- : Delayed adverse effects possible.
Symptoms may include dizziness, headache, nausea and loss of co-ordination.
Refer to section 11.



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SECTION 4. First aid measures (continued)

4.3. Indication of any immediate medical attention and special treatment needed

- : Obtain medical assistance.
- Provide oxygen.

SECTION 5. Fire-fighting measures

5.1. Extinguishing media

- Suitable extinguishing media : Dry powder.
Water spray or fog.
- Unsuitable extinguishing media : Carbon dioxide.
Do not use water jet to extinguish.

5.2. Special hazards arising from the substance or mixture

- Specific hazards : Exposure to fire may cause containers to rupture/explode.
- Hazardous combustion products : None.

5.3. Advice for firefighters

- Specific methods : Move containers away from the fire area if this can be done without risk.
Do not extinguish a leaking gas flame unless absolutely necessary. Spontaneous/explosive re-ignition may occur. Extinguish any other fire.
If possible, stop flow of product.
Use fire control measures appropriate to the surrounding fire. Exposure to fire and heat radiation may cause gas receptacles to rupture. Cool endangered receptacles with water spray jet from a protected position. Prevent water used in emergency cases from entering sewers and drainage systems.
Use water spray or fog to knock down fire fumes if possible.

SECTION 6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

- : Act in accordance with local emergency plan.
Stay upwind.
Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe.
Ensure adequate air ventilation.
Eliminate ignition sources.
Evacuate area.
Try to stop release.
Consider the risk of potentially explosive atmospheres.
Monitor concentration of released product.

6.2. Environmental precautions

- : Try to stop release.

6.3. Methods and material for containment and cleaning up

- : Ventilate area.

6.4. Reference to other sections

- Reference to other sections : See also sections 8 and 13.

Carbon monoxide**019****SECTION 7. Handling and storage****7.1. Precautions for safe handling****Safe use of the product**

- : Do not breathe gas.
- Avoid release of product into atmosphere.
- Take precautionary measures against static discharge.
- Keep away from ignition sources (including static discharges).
- Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Contact your gas supplier if in doubt.
- Purge air from system before introducing gas.
- Avoid exposure, obtain special instructions before use.
- Do not smoke while handling product.
- Avoid suck back of water, acid and alkalis.
- Only experienced and properly instructed persons should handle gases under pressure.
- Ensure the complete gas system was (or is regularly) checked for leaks before use.
- Installation of a cross purge assembly between the cylinder and the regulator is recommended.
- Purge system with dry inert gas (e.g. helium or nitrogen) before gas is introduced and when system is placed out of service.
- Assess the risk of potentially explosive atmosphere and the need for explosion-proof equipment.
- Consider the use only non-sparking tools.
- The product must be handled in accordance with good industrial hygiene and safety procedures.
- Consider pressure relief device(s) in gas installations.

Safe handling of the gas receptacle

- : Suck back of water into the container must be prevented.
- Refer to supplier's container handling instructions.
- Do not allow backfeed into the container.
- Replace valve outlet caps or plugs and container caps where supplied as soon as container is disconnected from equipment.
- Protect cylinders from physical damage; do not drag, roll, slide or drop.
- 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.
- 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.
- Keep container valve outlets clean and free from contaminants particularly oil and water.
- Never attempt to transfer gases from one cylinder/container to another.
- Never use direct flame or electrical heating devices to raise the pressure of a container.
- Damaged valves should be reported immediately to the supplier.

7.2. Conditions for safe storage, including any incompatibilities

- : Keep container below 50°C in a well ventilated place.
- Segregate from oxidant gases and other oxidants in store. Store containers in location free from fire risk and away from sources of heat and ignition. Stored containers should be periodically checked for general condition and leakage.
- Observe all regulations and local requirements regarding storage of containers.
- 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. Container valve guards or caps should be in place. All electrical equipment in the storage areas should be compatible with the risk of potentially explosive atmosphere. Keep away from combustible materials.

7.3. Specific end use(s)

- : None.



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Carbon monoxide**019****SECTION 7. Handling and storage (continued)****SECTION 8. Exposure controls/personal protection****8.1. Control parameters****Occupational Exposure Limits****Carbon monoxide**

- : ILV (EU) - 8 H - [mg/m³] : 23
- : ILV (EU) - 8 H - [ppm] : 20
- : ILV (EU) - 15 min - [mg/m³] : 117
- : ILV (EU) - 15 min - [ppm] : 100
- : AGW (8h) - Germany [mg/m³] TRGS 900 : 35
- : AGW (8h) - Germany [ppm] TRGS 900 : 30
- : Exceeding factor AGW - Germany TRGS 900 : 2

DNEL: Derived no effect level (Workers)**Carbon monoxide**

- : Inhalation-short term (local) [ppm] : 100
- : Inhalation-short term (systemic) [ppm] : 100
- : Inhalation-long term (local) [ppm] : 20
- : Inhalation-long term (systemic) [ppm] : 20

PNEC: Predicted no effect concentration

- : No data available.

8.2. Exposure controls**8.2.1. Appropriate engineering controls**

- : Provide adequate general and local exhaust ventilation. Alarm detectors should be used when toxic gases may be released. Systems under pressure should be regularly checked for leakages. Product to be handled in a closed system and under strictly controlled conditions. Ensure exposure is below occupational exposure limits (where available). Consider work permit system e.g. for maintenance activities. Preferably use only permanent leak-tight installations (e.g. welded pipes).

8.2.2. Individual protection measures, e.g. personal protective equipment

- : A risk assessment should be conducted and documented in each work area to assess the risks related to the use of the product and to select the PPE that matches the relevant risk. The following recommendations should be considered. PPE compliant to the recommended EN/ISO standards should be selected.

• Eye/face protection

- : Wear safety glasses with side shields
Standard EN 166 - Personal eye-protection.

• Skin protection**- Hand protection**

- : Wear working gloves when handling gas containers.
Standard EN 388 - Protective gloves against mechanical risk.

- Other

- : Consider the use of flame resistant anti-static safety clothing.
Standard EN ISO 14116 - Limited flame spread materials.
Standard EN ISO 1149-5 - Protective clothing: Electrostatic properties.
Wear safety shoes while handling containers.
Standard EN ISO 20345 - Personal protective equipment - Safety footwear.

• Respiratory protection

- : Keep self contained breathing apparatus readily available for emergency use. Never use any kind of filtering respiratory protection equipment when working with this substance due to it having poor or no warning properties.
Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask.
Self contained breathing apparatus is recommended, where unknown exposure may be expected, e.g. during maintenance activities on installation systems.

Carbon monoxide**019****SECTION 8. Exposure controls/personal protection (continued)**

- Thermal hazards : None necessary.
- 8.2.3. Environmental exposure controls : Refer to local regulations for restriction of emissions to the atmosphere. See section 13 for specific methods for waste gas treatment.

SECTION 9. Physical and chemical properties**9.1. Information on basic physical and chemical properties**

- Appearance
- Physical state at 20°C / 101.3kPa : Gas.
- Colour : Colourless.
- Odour : Odourless.
- Odour threshold : Odour threshold is subjective and inadequate to warn for overexposure.
- pH value : Not applicable.
- Molar mass [g/mol] : 28
- Melting point [°C] : -205
- Boiling point [°C] : -192
- Critical temperature [°C] : -140
- Flash point [°C] : Not applicable for gases and gas-mixtures.
- Evaporation rate (ether=1) : Not applicable for gases and gas-mixtures.
- Flammability range [vol% in air] : 10.9 to 76
- Vapour pressure [20°C] : Not applicable.
- Relative density, gas (air=1) : 1
- Relative density, liquid (water=1) : 0.79
- Solubility in water [mg/l] : 30
- Partition coefficient n-octanol/water [log Pow] : 1.78
- Auto-ignition temperature [°C] : 620
- Viscosity at 20°C [mPa.s] : Not applicable.
- Explosive Properties : Not applicable.
- Oxidising properties : Not applicable.

9.2. Other information

- Other data : None.

SECTION 10. Stability and reactivity**10.1. Reactivity**

- : No reactivity hazard other than the effects described in sub-sections below.

10.2. Chemical stability

- : Stable under normal conditions.

10.3. Possibility of hazardous reactions

- : Can form explosive mixture with air.
- May react violently with oxidants.

10.4. Conditions to avoid

- : Keep away from heat/sparks/open flames/hot surfaces. – No smoking.

Carbon monoxide**019****SECTION 10. Stability and reactivity (continued)****10.5. Incompatible materials**

: Air, Oxidiser.
For additional information on compatibility refer to ISO 11114

10.6. Hazardous decomposition products

: Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11. Toxicological information**11.1. Information on toxicological effects**

Acute toxicity : Toxic if inhaled.
Rat inhalation LC50 [ppm/4h] : 1300
LC50 [ppm/1h] : 3760 ADR P200 / ISO 10298
Skin corrosion/irritation : No known effects from this product.
Serious eye damage/irritation : No known effects from this product.
Respiratory or skin sensitisation : No known effects from this product.
Carcinogenicity : No known effects from this product.
Germ cell mutagenicity : No known effects from this product.
Reproductive toxicity : May impair fertility and cause harm to the unborn child.
STOT-single exposure : Suppresses the oxygen uptake by red blood cells.
Target organ(s) : Blood.
STOT-repeated exposure : Causes damage to organs through prolonged or repeated exposure.
Target organ(s) : Heart.
Aspiration hazard : Not applicable for gases and gas-mixtures.

SECTION 12. Ecological information**12.1. Toxicity**

Assessment
EC50 48h - Daphnia magna [mg/l] : Study scientifically unjustified.
EC50 72h - Algae [mg/l] : Study scientifically unjustified.
LC50-96h - fish [mg/l] : Study scientifically unjustified.

12.2. Persistence and degradability

Assessment : Will not undergo hydrolysis.
Not readily biodegradable.

12.3. Bioaccumulative potential

Assessment : Not expected to bioaccumulate due to the low log Kow (log Kow < 4).
Refer to section 9.

12.4. Mobility in soil

Assessment : Because of its high volatility, the product is unlikely to cause ground or water pollution.

12.5. Results of PBT and vPvB assessment

: Not classified as PBT or vPvB.

12.6. Other adverse effects

Carbon monoxide**019****SECTION 12. Ecological information (continued)**

Effect on ozone layer : None.
Effect on the global warming
Global warming potential [CO2=1] : 1.9

SECTION 13. Disposal considerations**13.1. Waste treatment methods**

: Must not be discharged to atmosphere.
Contact supplier if guidance is required.
Refer to the code of practice of ELGA (Doc. 30/10 "Disposal of Gases, downloadable at <http://www.eiga.org>) for more guidance on suitable disposal methods
Ensure that the emission levels from local regulations or operating permits are not exceeded.

List of hazardous waste codes (from Commission Decision 2001/118/EC) : 16 05 04: Gases in pressure containers (including halons) containing dangerous substances.

13.2. Additional information

: None.

SECTION 14. Transport information**14.1. UN number**

UN number : 1016
Labelling ADR, IMDG, IATA



: 2.3 : Toxic gas.
2.1 : flammable gas.

14.2. UN proper shipping name

Transport by road/rail (ADR/RID) : CARBON MONOXIDE, COMPRESSED
Transport by air (ICAO-TI / IATA-DGR) : CARBON MONOXIDE, COMPRESSED
Transport by sea (IMDG) : CARBON MONOXIDE, COMPRESSED

14.3. Transport hazard class(es)

Transport by road/rail (ADR/RID)
Class : 2
Classification code : 1 TF
H.I. nr : 263
Tunnel Restriction : B/D Tank carriage: Passage forbidden through tunnels of category B, C, D
Transport by air (ICAO-TI / IATA-DGR)
Transport by sea (IMDG)
Emergency Schedule (EmS) - Fire : F-D
Emergency Schedule (EmS) - Spillage : S-U

14.4. Packing group



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Transport by road/rail (ADR/RID) : Not applicable.

Transport by air (ICAO-TI / IATA-DGR) : Not applicable.

Transport by sea (IMDG) : Not applicable.

14.5. Environmental hazards

Transport by road/rail (ADR/RID) : None.

Transport by air (ICAO-TI / IATA-DGR) : None.

Transport by sea (IMDG) : No

14.6 Special precautions for user

Packing Instruction(s)

Transport by road/rail (ADR/RID) : P200

Transport by air (ICAO-TI / IATA-DGR)

Passenger and Cargo Aircraft : DO NOT LOAD IN PASSENGER AIRCRAFT.

Cargo Aircraft only : FORBIDDEN.

Transport by sea (IMDG) : P200

Special precautions for user

: - Ensure there is adequate ventilation.

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.

Before transporting product containers :

- Ensure that containers are firmly secured.

- Ensure cylinder valve is closed and not leaking.

- Ensure valve outlet cap nut or plug (where provided) is correctly fitted.

- Ensure valve protection device (where provided) is correctly fitted.

Avoid transport on vehicles where the load space is not separated from the driver's compartment.

14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Not applicable.

SECTION 15. Regulatory information**15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture**EU legislation

Restrictions on use : Restricted to professional users (Annex XVII REACH).

Seveso directive 96/82/EC : Covered

National legislation

: Ensure all national/local regulations are observed.

- 4. BImSchV (Germany) : Listed.

- Water hazard class (WGK) : WGK Germany: 1 - Low hazard to waters.

- Other regulations and technical rules (not complete) : [German regulations]
BetriebssicherheitsV mit TRBSen insbesondere TRBS 3145 / TRGS 725 "Ortsbewegliche Druckgasbehälter", TRGS 2141, BGR 500 Teil 2.33: "Umgang mit Gasen", GefahrstoffV mit Technischen Regeln Gefährliche Stoffe TRGS insbesondere TRGS 407 "Tätigkeiten mit Gasen - Gefährdungsbeurteilung", TRGS 400, 500, 510, 900.
BGR 104, TRBS 2152.**15.2. Chemical safety assessment**

: A Chemical safety assessment (CSA) has been carried out for this product.



AIR LIQUIDE

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SECTION 15. Regulatory information (continued)

SECTION 16. Other information

- Indication of changes** : Revised safety data sheet in accordance with commission regulation (EU) No 453/2010
- Training advice** : Ensure operators understand the flammability hazard.
Users of breathing apparatus must be trained.
Ensure operators understand the toxicity hazard.
- Further information** : This Safety Data Sheet has been established in accordance with the applicable European Union legislation.
This Safety Data Sheet has been established in accordance with the applicable European Union legislation.
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This Safety Data Sheet has been established in accordance with the applicable European Union legislation.
- List of full text of R-phrases in section 3.** : R12 : Extremely flammable.
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.
- List of full text of H-statements in section 3.** : 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.
- DISCLAIMER OF LIABILITY** : Before using this product in any new process or experiment, a thorough material compatibility and safety study should be carried out.
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.

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